UNIVERSITY OF GUYANA

FACULTY OF AGRICULTURE AND FORESTRY

DEPARTMENT OF FORESTRY

TURKEYEN CAMPUS

BOOK OF ABSTRACTS OF STUDENTS FINAL YEAR RESEARCH PROJECTS

2015-2019

COMPILED BY: DONNA RAMDIAL

LECTURER II

EANED STUDY LEAVE RESEARCH REPORT

2021

FOREWORD

With praise and thanks to Almighty God for the strength, guidance, wisdom, knowledge and understanding he blessed me with to do this task of compiling this book of Abstracts.

This book of abstracts was compiled as part of an Earned Study Leave (ESL) Programme beginning in the August of 2020 and culminating in 2021. This book of abstracts of students' undergraduate research has been compiled with research in both agriculture and forestry for the period 2015-2019. While, majority of the research in this document were from research done by students of the Turkeyen Campus several from Berbice Campus were included. With a compilation of the 178 abstracts from both agriculture and forestry undergraduate research, this document adds to previous work on done by other staff of the Faculty, with the latest Book of Abstracts compiled in 2013.

The Faulty of Agriculture and Forestry's Bachelor of Science programmes culminates with a capstone project. These undergraduate studies are conducted in a wide area of focus in both the forestry and agricultural disciplines and cover many focal areas of national importance. It is hoped that this compilation will not only help to showcase the students research to our many stakeholder groups, but assist other students who may wish to develop their research ideas around the recommendations coming out of the students reports.

I take this opportunity to thank Dr. Elroy Charles (HOD, Agriculture) and Dr. Lawrence Lewis (Dean, Faculty of Agriculture and Forestry) for their support. I would also like to my children Britney and Damien, my niece Tifara Campbell and my mother Farida Kamaluddin for whatever assistance they provided.

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Forestry 2015

An Assessment of Differences of Density among Three Major Mangrove Species on the Seacoast of Guyana

Ojasvi Kandhi

Along the coast of Guyana, mangrove forests occur in more or less contiguous fringes and has been subjected to activities that contribute to loss of forest cover. As a result, a mangrove restoration project funded by the European Union and in collaboration with the National Agricultural Research and Extension Institute (NAREI) was implemented, with replanting activities starting in 2010. Several sites along the coast of Guyana were replanted with black mangrove seedlings at a density of 2500 seedlings/ha. This study assessed densities of black mangroves (*Avicennia germinans*), White mangroves (*Laguncularia racemosa)* and Red Mangroves (*Rhizophora mangle)* in natural and planted mangrove stands on the Atlantic Coast of Guyana. A complete randomized design was used to establish $5m^2$ plots in both natural and replanted mangrove stands along the coast of Regions 4 and 5, Guyana. In each plot densities of red, white and black mangrove species were counted. ANOVA Factorial Analysis was carried out to test for significant differences and LSD All-Pairwise Comparisons were used to separate means.

The black mangrove species, as expected, was the dominant species ($p=0.005$) at density of 2020 trees/ha^{-1} followed by white mangroves with 1000 trees/ha^{-1} and red mangroves with a density 160 trees/ha^{-1}. In the natural stands, black mangroves reached a density of 1560 trees/ha^{-1}, followed by white mangroves (760 trees/ha^{-1}) and red mangroves (120 trees/ha^{-1}). At the replanted sites, black mangroves trees were greater in density with 2480 trees/ha^{-1} followed by white mangroves (1240 trees/ha^{-1}) and red mangroves (120 trees/ha^{-1}). White and red mangroves had higher density in the replanted stands, possibly indicating that replanting had a positive influence on recruitment of these two species. Total tree density was greater in planted stands which could imply that replanting was successful with low mortality. Density studies be carried out at other sites along the coast of Guyana.

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KEYWORDS: Red Mangroves, Black Mangrove, White Mangroves, Density, Mangrove Stands

The Importation of Pinewood Products and the Effects on LUS

Renrick Ramgobin

The sale of Pine wood products has been increasing due to the versatility of applications of pine wood products in Guyana. The project sought to determine if the imported Pine products (doors and lumber) are competing with the doors and lumber made from the lesser utilized species (LUS) of Guyana. The factors of Demand, Price and Characteristics of both the imported Pine and the local products made from LUS were investigated. A total of eighteen participants were interviewed (nine from Georgetown and nine from the East Coast of Demerara). Data was collected via semi-structured interviews and literature reviews. The target population was conveniently sampled.

Most of the respondents were of the view that the demand for Pine products is currently higher than that of products made from LUS. In Georgetown, 89% of respondents believed that the demand for Pine products is higher than that of LUS products. On the East Coast of Demerara, 89% of respondents believed that the demand for Pinewood doors is higher than that of doors made from LUS and 56% of them believed that the demand for Pinewood lumber is higher than that of lumber from LUS. With regards to the factor of Price, the Pine doors were cheaper when compared to doors made from LUS. However, the price for Pine lumber was higher than lumber from LUS. Respondents, Yellow silverballi (*Aniaba Hypoglauca* Sandw.) and Simarupa (*Quassia simarouba* L.f.) as potential substitutes for the Pine. However, review of the literature revealed Huruasa (*Abarema jupunba*) and Futui (*Jacaranda copaia*) as potential substitutes for pine wood.

The results indicated that some level of competition exists between some local wood and pinewood products. To reduce this competition the sector may need to consider upgrading of technology to make the production costs for local lumber and doors cheaper and improve the dimensional quality of local wood products.

KEYWORDS: Pinewood, Lesser Used Species, Lumber, Quality, Demand

An Investigation into the Level of Awareness and Knowledge of Low Carbon Development Strategy (LCDS) Among Three (3) Communities in Region # (4) Guyana

Ongel F. W Hamlet

This research investigated the levels of awareness and knowledge of the Low Carbon Development Strategy among three communities in Demerara/Mahaica, Region # 4. In this survey, 120 questionnaires were distributed randomly among households in Kuru-Kuru, St Cuthbert's Mission and Yarrowkabra. Residents between the age ranges of 18-55 years were targeted. Data were analyzed with Statistix 10 statistical software. Shapiro-Wilk test was done to assess the normality of data. Kruskal-Wallis One Way-ANOVA was used to check if the awareness and knowledge of the LCDS differed

The level of awareness was not significantly different between communities (P=0.0557), nor was knowledge (P=0.3399). In Yarrowkabra, 98% of respondents indicated awareness, while 95% and 80% of persons indicated awareness in St Cuthbert's Mission and Kurukuru, respectively. Most of the respondents claimed that their awareness came via the media. Less than 50% were knowledgeable of the LCDS. Television was identified as the most effective medium in the three communities. Kurukuru and Yarrowkabra had a wider variety of media through which information is disseminated. In St Cuthbert's Mission, the three major sources of information were Television, Radio and Friends.

The results indicate a high level of awareness, but poor Knowledge of LDCS programmes among respondents. The use of television-based programmes should be capitalized on to disseminate information on the LCDS as this seemed to be the most effective medium.

KEYWORDS: Awareness, Low Carbon Development Strategy, Knowledge

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An Assessment of Crab Population in Natural, Restored and Degraded Mangrove Forests along the Coasts of Regions 4,5 & 6, Guyana

Sayeed Allishaw

The abundance and species diversity of crab population was assessed in Natural, Restored and Degraded Mangrove Forest dominated by *Avicennia germinans* (black mangroves). Six sites along Guyana's coasts were selected, two for each condition. The natural forests were

selected at Belfield and #51 Village (Regions 4 & 6 respectively), the replanted forests at Felicity and Chateau Margot/Success (Region 4), and the degraded forests were Mon Repos/Triumph and Woodley Park (Regions 4 & 5 respectively). Transects were set up using a Complete Randomized Design. A total of 20 quadrats of $4m^2$ were set up along transects. Each quadrat was established 10 m apart. Within each quadrat, the number of crabs was counted and recorded. To identify crab species three individual crabs were collected. Sampling was done during February.

Statistical Analysis was done using STATISTIX Software V10. ANOVA was performed to test for significant differences, and the Least Significant Difference (LSD) Test was done to test for differences in crab population between sites and stand conditions. *Scylla Serrata* (mud crab) was the only species of crab found at the sites. Crab abundance was significantly higher at the regenerated sites (x=377) than the natural forest (x=83) and degraded forests (x=25). Abundance varied by site with some sites (Woodley Park and #51 Village) having very low abundance. From this baseline study, it can be assumed that replanted forests have a greater potential influence on the crab population. Given the limitation of the period of this study further research should be conducted during different times of the year and at other sites for more detailed information of crab population and population changes.

KEYWORDS: Scylla Serrata, mangrove forests, abundance, diversity, black mangroves

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An Investigation on the Level of Awareness and Importance of the Reduced Emission from Deforestation and Degradation (REDD+) and the Low Carbon Development Strategy (LCDS) Among Students in three (3) Post-Secondary Institutions in Region 4

Anecia Pookraj

This survey was conducted to assess the level of awareness and importance of the Reduced Emission from Deforestation and Degradation (REDD+) and the Low Carbon Development Strategy (LCDS) among final year students at the Guyana School of Agriculture, Government Technical Institute and The University of Guyana within disciplines of such as Agriculture, Biology, Forestry and Engineering. Students were systematically sampled from class lists.

Cross-tabulation between demographics and the level of awareness showed that a greater percentage of males were aware of the LCDS. Overall, 83% of respondents from the three

institutions were aware of the LCDS in contrast to 29% of respondents who were aware of REDD+. A greater number of students at the University of Guyana were aware of both initiatives. Quite surprisingly, more students of the agriculture programme indicated awareness of both initiatives. Younger students tended to indicate greater awareness. No significant association between the level of understanding and importance of awareness of LCDS (X^2 value =2.85, p=0.2408), nor between the level of understanding and importance of awareness of REDD+ (X^2 value =4.01, p=0.2609).

The results showed that 41% of students had an average understanding of the LCDS, but thought that awareness of this strategy was important, while 63% of students indicated no understanding of REDD+ but thought that awareness of this initiative was important. The respondents felt that more action to increase awareness was needed such as increasing radio and television discussions. As such, this research identifies the need for greater effort into improving awareness and understanding among students at not only these educational institutions, but others as well.

KEYWORDS*:* Awareness, understanding, importance, students, climate change, LCDS, REDD+

Analysis of Fuel Characteristics of Woody Biomass of *Goupia glabra* (Kabukalli) and *Catostemma fragrans* (Sand Baromalli)

Varsha Gopaul

The fuel characteristics of bark, sapwood and heart wood of *Gopia glabra* (Kabukalli) and *Catostemma fragrans* (Sand Baromalli) were determined. Proximate values (moisture and ash content, fixed carbon, volatile carbon) and Higher Heating Values (HHV) were determined. The Parr Oxygen Bomb Calorimeter was used to determine HHV.

At 12% moisture content, air-dried density of kabukalli and sand baromalli was 840 kg/m^3 and 590 kg/m^3, respectively. Higher moisture content was found in the bark for both species. Proximate values and HHV of bark, sapwood and heart of the two species, were found to be significantly different. Ash content of bark, sapwood and heartwood of sand baromalli were found to be significantly higher compared to kabukalli ($p < 0.05$). Ash content of sand baromalli bark, sapwood and heartwood were 4.2%, 1% and 1.2%, respectively. Kabukalli bark, sapwood and heartwood had ash contents of 3.7%, 0.6%, and 0.7%, respectively. Kabukalli

was identified as a more desirable species for fuel due to the higher HHV with values for bark, sapwood and heartwood being 17.4MJ/Kg, 18. 1MJ/Kg and 18.7MJ/Kg respectively. It is recommended that the fuel characteristics of other species be assessed, which can add valuable information on the usefulness of various species as potential energy sources, given the large amount of wastage produced at sawmills in Guyana.

KEYWORDS: Proximate Values, Fuel Characteristics, Higher Heating Values, Parr Oxygen Bomb Calorimeter

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An Investigation of the Influence of Sea Surface Temperature (SST) on Coastal Mangroves

Vishnu Khemraj

The use of thermal infrared satellite sensors provides time-lapse data of the temperature radiating from mangrove ecosystems and Sea Surface Temperature (SST). This research aimed to determine the usefulness of Landsat thermal bands to estimate SST, and to determine the relationship between SST and the spatial pattern of mangroves at three sites along the seacoast of Guyana; Somerset and Berks (Site 1), Windsor Forest (Site 2), and Hope (Site 3). Landsat Images from 2000 to 2015 were obtained from the USGS archive, all the optical bands were composed. A model was first built to be used to automate the process of sea surface temperature estimation. Images were pre-processed using radiometric correction to convert the digital numbers of the Landsat thermal bands to readable temperature values for the sites. Ground truthing was done to validate remotely sensed data.

The data obtained from the images showed that at site 2 mangrove forest size fluctuated over time but increased at sites 1 and 3 over time. Regression analysis showed no correlation between SST and the spatial pattern of mangroves at the three study sites (Somerset and Berks, R^2=0.0007, p=0.821; Windsor Forest, R^2=0.0068, *p-value*=0.565; Hope, R^2=0.00301, p=0.147). Temperature values obtained from the thermal bands and ground-truthing showed a temperature value disparity of 2-3^{0}C. In terms of SST this was constant within a range of 20-30^{0}C at all sites, except in 2001 when the temperature dropped to a low of 15^{0}C at site 2, and in 2006 at site 3.

This study showed that Landsat images which are readily available can be used to cost-effectively provide reliable data to monitor temperatures, with ground truthing only being

necessary for any major observed abnormality. Because of time limitation of this study, monitoring should be carried out over a longer time, as well as on a seasonal basis to determine whether seasonal variations of SST influence spatial patterns of mangroves.

KEYWORDS: Thermal bands, Mangroves, Spatial patterns, Optical bands, Sea Surface Temperature

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An analysis of the Spatial Distribution of Pine Doors and its Potential Impacts on the Utilization of Doors made from Lesser Used Species (LUS)

Tenisha Deally

This study sought to create a geo-database and a spatial distribution map of pine wood doors and doors made from Lesser Used Species (LUS) and to determine consumer preference for pine doors in Diamond Housing Community, Region #4. This research explored the applicability of the Open Data Kit (ODK) technology for data collection and compatibility with Geographic Information Systems (GIS) ARC GIS 10.0 to map the spatial distribution of pinewood doors and locally made doors made from LUS. Data were collected via interviews with distributors and consumers. A total of 480 consumers were interviewed at Diamond Housing Development.

Fifty-five (55%) percent of consumers owned pinewood doors while the remaining 45% owned doors made of commercial species and/ or LUS. Only 16% owned LUS doors. There were only two (2) distributors of doors made of local LUS species *Parahancornia fasciculata* (dukalli) and *Hymenolobium flavum* Kleinh (darina). Seven (7) major distributors in Georgetown sell clear and knotty pine doors. Pinewood doors are used for interior purposes and seemed to be more dominant in higher-income zones of the Housing Community. Factors, in order of price, purpose, appearance, availability and durability influenced the choice to utilize pinewood doors. This study revealed that there is potential for the application of ODK and GIS Technologies when used together to map the distribution of pine doors and LUS doors and can be used by sectorial agencies to improve data collection and management for marketing analyses.

KEYWORDS: ODK, GIS, Value Added, Pine Doors, LUS Doors

Growth, Biomass and Carbon Sequestration in Black Mangrove Saplings along the East Coast of Demerara of Guyana

Sevistri Rajcoomar

The mean rate of growth of diameter of black mangrove saplings, above-ground biomass and organic carbon content of Black mangrove (*Avicennia Germinans)* saplings along the Eastern Coast of Demerara, Region #4 were estimated. Sites were Mon Repos, La Bonne Intention and Chateau Margot. Above-ground biomass was estimated using allometric equations proposed by Komiyama *et al*., (2005) (Eqn 1) and Chave *et al*., (2005) (Eqn 2). To sample the population of mangrove saplings, five (5) plots of 100 m^2 were established at the sites. All black mangrove saplings from 3-10 cm dbh were measured within each plot. A total of 198 saplings were measured. Two measurements of dbh were taken three months apart, after the initial visit. The measurements were extrapolated to estimate annual increments.

Overall mean growth increment of black mangrove saplings across the five plots was 0.76 cm, and a yearly increment of 1.52 cm. The data when inputted into the two equations showed potential for these stands to sequester carbon in biomass at much higher values than those published for this species. Using Equation 1, standing biomass and carbon in black mangrove saplings were estimated to be 3770.11 kg/m^3 and 1185.06 kg/m^3 respectively. Standing biomass and carbon as estimated by equation 2 were 2571.75 kg/m^3 and 1285.88 kg/m^3. Based on the results of using Eqn 1 to estimate biomass accumulation, over one year, a total of 2859.52 kg/m^3 of biomass and 1429.76 kg/m^3 would be accumulated, while a total of 1960.24 kg/m^3 biomass and 980.12 kg/m^3 carbon would be accumulated as estimated by Eqn 2. This study revealed that biomass and carbon estimates are linked to the number and diameter class of saplings. Further, in-depth research on carbon sequestration of other carbon pools of mangrove ecosystems, as well as other mangrove species should be explored.

Keywords: Biomass estimation, carbon sequestration, *Avicennia Germinans*, Allometric equations

Assessment of the Marketing Potential of Korokororo (*Ormosia coutinhoi*) Seeds as a Potential Non-Timber Forest Product

Sherry Ann Charles

This research investigated the uses of the seeds of Korokororo (*Ormosia coutinhoi*) in Guyana's craft industry, and the productivity of the species in terms of the amount of useable seeds produced. Artifact producers in Central Georgetown, seed collectors and sellers were surveyed. Belt transects were established to identify trees to be sampled. Traps of $1m^2$ were set around trees at three (3) sites along the Soesdyke/Linden Highway in Region 4 to collect seed data.

The number of seeds produced per tree ranges from 200 to 500. There is an average of 90% viability of seeds. The main products made are key rings and necklaces which would retail in Guyana dollars at price ranges of $300- $500 and $500- $700 respectively. Production of hand crafts was predominantly among women within the age ranges of 20-30 and 30-40 years and men 41 years and older. Twenty-two percent of respondents felt that there is an adequate supply of seeds, and 12% indicated that there was not a reliable supply of seeds. Seasonality was the main reason cited for the unreliable supply of seeds among those who responded. Some craft makers pay $10 to $25 Guyana dollars for seeds. Most seeds are obtained from members of communities where seeds are found. The cost attached to production depends on the product made and ranges from $200 to $500 Guyana dollars. Some problems identified with seed quality were size, irregularity of shape and insect damage. The results indicate that there is a market for crafts made with korokororo seeds in Guyana.

KEYWORDS: Artisans, Livelihood, Seed collection, market potential, fruiting cycle

An Investigation of the Potential for Large Scale Commercial Utilization of Five Lesser Used Species (LUS).

Kenford Fraser

The rainforests of Guyana are considered species-rich, but there has been a heavy dependency on a few species for commercial timber production. The exploitation of few species may lead to changes in species composition. This research was conducted to determine the potential for large scale commercial utilization of Black kakaralli (*Eschweilera spp*.), Suya (*Pouteria speciosa*), Wadara (*Couratari guianensis*), Darina (*Hymenolobium flavum*), and Limonaballi (*Chrysophyllum pomiferum*) in five forestry concessions in Regions 6, 7 and 10. Inventory data obtained from the Guyana Forestry Commission were analyzed using Statistix 10 Software. ANOVA and LSD tests were conducted to determine differences between densities and volumes of each species.

Though densities of the species within the concessions were not significantly different (P>0.0601, α=0.05), black kakaralli had the highest mean density (0.48 trees) and Wadara had the lowest mean density (0.02 trees). There were significant differences between the mean volume of the species (p value=0.000). Darina had the highest mean volume per hectare (0.0605m^3) followed by Wadara (0.0514m^3), Suya (0.0406 m^3), Limonaballi (0.036 m^3) and Black kakaralli (0.0273 m^3). However, black kakaralli had the highest total volume (2620 m^3), followed by Darina (1179.94 m^3), Limonaballi (1116.55 m^3), Suya (581.32 m^3) and Wadara (231.61 m^3). In comparison to densities of the main commercial species, the densities of LUS were very low (<1 tree/ha). Due to the potential of LUS as substitutes, the potential for these species to be harvested in combination with primary species should be explored. Greater marketing and promotional activities for LUS both at the producer and consumer levels are needed.

KEYWORDS: Lesser Used Species, commercial timber production, volume, density, species composition.

An assessment of NTFP based activities in two Amerindian Communities in Region # 2, Guyana

Safraz Samad

This research investigated the harvesting of Non-Timber Forest Products (NTFPs), their use for household consumption, processing, and trading by the two Indigenous communities in Region # 2. Structured questionnaires were administered to 50 households in each community. In Mainstay, 48% of respondents indicated that they were engaged in harvesting activities while only 32% respondents were engaged in processing compared to 30% respondents in Tapakuma. NTFPs are mainly processed manually, and processing is done mostly at the household level. Only 20% engaged in selling in Mainstay and 42% in Tapakuma. Overall, a larger percentage of respondents indicated that they use NTFPs as food. NTFPs harvested for construction are the most traded of the NTFPS. The local trade is a major market for products, but trade within communities and between communities is not uncommon. Chi-square analysis revealed no association between age and NTFP related activities. In Tapakuma, the younger persons were engaged in the selling in both communities. A relationship existed between gender and the NTFP related activities in Tapakuma. Males were typically involved in the harvesting of NTFPS. Research to gain insight into the role of NTFPs in other communities in Guyana is important.

KEYWORDS: Non-Timber Forest Products, Processing, Harvesting, household consumption

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An Inventory of the Density and Habitat of the Two-Toed Sloth (*Choloepusdidactylus*) in the Forests of Guyana

Steven Jones

This inventory was conducted to assess population density and habitat preferences of the two-toed sloth (*Choloepusdidactylus*) in four forested regions in Guyana. This inventory was conducted in Barima River (Region #1); Fort Island (Region #2), Molsen Creek/Orealla (Region #6) and Linden-Malali (Region #10). Data were collected through observations along 12 transects ranging from lengths of 5km to 20 km with a width of 50m. Observation from a boat

in the river were done where observations along transects were not possible. Transects were sampled once per month, between 7 am to 2 pm. To determine differences in density estimations among the three sites, a Kruskal-Wallis non-parametric test and the Tukey's mean separation test was done

There was a total of 84 sloth sightings at three of the sites. Density differences were found among the four forested areas and the three areas (F=36.50, n=4, p=0.000). The population densities for four selected sites are 7, 5, 2, 12 sloths/sq.km at Linden/Malali; Molsen Creek/Orealla; Barima River and Fort Island respectively. The overall population density for the four sites combined was 7±4 sloths\sq.km. Average sloth densities were lowest in Barima and highest in Fort Island. The lowest density recorded in Barima may be attributed to high trapping activity in that area. The most common habitat of the sloth was the Mora spp. However, this may be coincidental since there was a dominance of *Mora* in the study areas. The highest number of sloths were found on edge and gap colonizing species Trysil (*Pentaclethra macroloba*). More sites should be surveyed to get a clearer understanding of the sloth population and habitat preference. In addition, assessments of areas away from waterways should be done to determine if densities may differ from sites adjacent to the rivers and creeks. Studies in non-trapping areas may also be useful.

KEYWORDS: *Pentaclethra macroloba,* Population Density, Abundance, Habitat, Wildlife

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An investigation of the disparities of Acai berry (*Euterpe oleracea)* beverage production in Siriki (upper Pomeroon River) Guyana

Kaneesha Garraway

The purpose of this study was to evaluate the disparities of Acai berry (*Euterpe oleracea*) beverages in Siriki community (upper Pomeroon River) Guyana. Data were collected through interviews and questionnaires. A total of 60 Questionnaires were distributed to the harvesters, processors, and consumers of acai berry and acai berry beverage.

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The findings revealed that ninety-five percent (95%) of the respondents consumed Acai berry beverages. Persons of age range 26-35, most of whom were females were the highest consumers of the berry. Sixty percent (60%) of the respondents that consumed Acai berry beverages said they were satisfied with the quality and quantity of the Acai berry beverages but were unwilling to pay prices that were similar to that of imported wines. The value chain is a very simple process, starting with the harvesters, followed by processing, packaging and then distribution. Acai berry is distributed both in Siriki and Georgetown. No intermediaries are involved in the distribution. Acai berry beverage is being produced on a small scale with a total of 75 bottles of acai berry produced within the two seasons of harvesting with a 77% profit.

The challenges of harvesting of the berry due to of the height of the palm trees, access to capital and the high cost of electricity were faced. However, despite these challenges, the acai berry processor in Siriki is making a profit.

KEYWORDS: *Euterpe oleracea,* Acai Berry, Acai Berry Beverage, NonTimer Forest Product

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An Assessment of Abiotic Factors at Potential Planting Sites along the Seacoast of Demerara

Luan Gooding

The Guyana Mangrove Restoration Project is in the process of rehabilitating the coastal areas with Black Mangroves (*Avicennia germinans*). The success of replanting depends on the suitability of the sites to facilitate survivability of the planted seedlings. This study was carried at Abary and Good Faith (Region #5), Greenfield, Hope and Kitty (Region#4) along the Seacoast of Guyana. Physico-chemical characteristics (soil pH, soil salinity, soil temperature, soil texture and elevation) were the factors used to determine the sites suitability for replanting of mangroves. To conduct data collection, three 100 m transects were established 100m apart, perpendicular to the shorelines, beginning at the low tide waterline. Sample points were established at 30m intervals. Samples were taken at 3 points. ANOVA was used to compare means, and Tukeys All Pairwise Comparison Tests were done to identify differences. Soil Textural Analysis was done at the Guyana Sugar Corporation Laboratory.

The four main soil textures found were Silty Clay, Loamy Silt and Sandy Loam. Only the Abary Site had the ideal soil texture. There were significant differences in salinity between locations (df=4, F=2.07, P=0.0460). Hope had the highest salinity (29ppt), and Greenfield had the lowest (17.3 ppt). Sites that were furthest away from the freshwater outflow of the Demerara River showed higher salinities. There were no significant differences in temperature (df=4, F=1.46, P=0.1270). The temperature ranged from 28.3 – 38.2 ^{o}C across the sites. Soil pH was significantly different between sites (df=4, F=5.43, P-0.0003) and ranged between 7.7-8.3. One site had a higher pH value. Elevation ranged between 1.2-1.8 m above Chart Datum. The site at Hope had the highest elevation and the site at Kitty had the lowest elevation. None of the sites satisfied all the requirements for planting black mangroves but may have met at least one criterion. The site at Hope had the closest approximation of an ideal site for planting Black Mangroves. Other sites should be assessed for their suitability for replanting of mangroves.

KEYWORDS: *Avicennia germinans*, Temperature, Salinity, Soil Texture, Soil pH

An Assessment of Termite Attack on Four (4) Lesser Used Timber Species (LUS)

Loris Vangenderen

The natural durability of Fukadi (*Buchenavia fanshawei*), Tauriniro (*Humira balsamifera*), Darina (*Hymenolobium flavum*), and Dakama (*Dimorphandra conjugata*.) representing four (4) lesser-used species (LUS) of Guyana were assessed for termite resistance. To test resistance, heartwood blocks measuring 2 x 2 x 2cm of each species were subjected to four weeks of in-ground bioassay tests at the Guyana Forestry Commission's Yarrowkabra Research Station located along the Soesdyke/Linden Highway, Region 4. Samples were buried in ditches of 15-20cm depth, which were partly layered with residues from oil palm (*Elaeis guineensis*) fibres and covered with topsoil to bait or aggregate termites. The FIRM test was used to assess the durability of wood. The termite resistance levels of the 4 LUS were individually compared with four commercial species in Guyana used in construction. The four commercial species selected are *eperua falcalta* (soft wallaba), *peltogyne venosa* (purpleheart), *mora excelsa* (mora) and lexopterygium *sagotii (*hububalli).

The results indicated that all the species were relatively resistant to termite attacks. Tauroniro species was found to be the most resistant followed by Darina and fukadi. Tauroniro species seems to have higher resistance than the *mora excelsa* (mora). Dakama was the most susceptible to termites and had similar natural durability against termite attack to soft wallaba. Darina and hububalli were similar in the level of resistance to termite. Fukadi seemed to be more resistant than the purpleheart. Fukadi is rated at 1 indicating higher resistance to attack while purpleheart is rated 2, indicating a moderate attack level of resistance. This study present valuable information to determine the susceptibility and comparability of some species in terms of degradation by termites. It is recommended that extended testing of these species as well as other species should be done.

KEYWORDS: Termite Resistance, Lesser Used Species, Natural Durability, Termites, FIRM Test

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An Investigation of the Habitat Preference of Kufa (*Clusia grandiflora* & *C. palmicida*) and Nibbi (*Heteropsis flexuosa*) in a Mixed Forest. A Case Study of Kairuni Silvehill Concession

Devika Gurucharran

Host tree traits are known to affect the characteristics of epiphyte communities in forests. Nibbi (*Heteropsis flexuosa*) and Kufa (*Clusia grandiflora* and *C. palmicida*) are two commercially important epiphytes in Guyana. While extractions of these species are regulated by the Code of Practice for Harvesting, it is necessary to investigate the natural species behaviour to make recommendations for improvement in the current harvesting methods. This study investigated the habitat preference of Nibbi and Kufa by assessing their occurrence on host trees in a Mixed Forest at Kairuni Silverhill Concession in Region 3, Guyana. A map of the spatial distribution of these epiphytes was produced for this concession. Data were collected using the Point Sampling Method, where 50-meter transects were randomly established across different forest types within the study area and sample points established based on the presence of Nibbi and Kufa on host trees.

A Pearson product-moment correlation coefficient was computed to assess the relationship between host tree size (dbh) and the distribution of Nibbi and Kufa. The results indicated that Nibbi and Kufa are host specific in that most of them are found on Mora (*Mora excelsa)*. A second preferred host for Kufa was Manobodin (*Emmotum fagifolium*). In addition to species

identity, tree diameter was found to have a relationship with the probability of trees being occupied by an epiphyte. For Kufa, a weak positive correlation ($r = 0.4286$, $n = 36$, $p = 0.0091$) was found, while for Nibbi, a weak negative relationship ($r = -0.5150$, $n = 36$, $p = 0.0013$) was found. Spatial distribution of Nibbi and Kufa showed the epiphytes occurring in clumps along minor creeks in Swamp Forest within the concession. Given the distribution pattern of these epiphytes in this study, it is suggested that these epiphytes prefer forest habitat that is seasonally inundated. Further studies should be conducted to investigate the behaviour of these epiphytes in other areas across Guyana and other forest types.

KEYWORDS: Kufa, Nibbi, epiphytes, habitat preference, host trees, host tree size

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An Assessment of the Differences in Levels of Satisfaction of Benefits, and Severity of Challenges in the Mainstay and Capoey Community Forestry Organizations, Region #2.

Kisheba Higgins

The Guyana Forestry Commission (GFC) in 2000 launched its Community Forestry Programme to promote social development in hinterland communities. Since then, there has been an increase in the formation of Community Forestry Organizations (CFO). This study investigated the perception of members of two CFOS of the benefits of CFO to its membership, level of satisfaction with benefits gained (social and economic), the differences of perceptions in each CFO and between the two CFOs of the challenges faced by members and the severity of challenges faced. The two CFOs were the Capoey Loggers Association (CLA) and Mainstay Loggers Association (MLA) in Region # 2. Members of the CFOS were surveyed via questionnaires and semi-structured interviews. The Wilcoxon Rank Sum Test was done to test for differences between the levels of satisfaction with benefits (social and economic), and severity of challenges faced in the two CFO's.

The majority of respondents in both communities felt that joining the CFO has had a positive economic impact on them. However, lack of capital, limited market access, poor infrastructure and low economic returns were some of the main obstacles to obtaining greater economic returns. Level of employment and environmental awareness as benefits

were areas of satisfaction. Dissatisfaction was expressed with the level of access to better markets, which is an expected benefit of forming these associations. Similarities in the levels of satisfaction of benefits and severity of challenges were found between the two CFOs, but not within the CFO's. These findings can serve to guide the creation of initiatives towards improving benefits and reducing challenges in the two CFO's. Similar assessments of other CFOs should be carried out to have a broader understanding of these issues at a national level.

KEYWORDS: Community Forestry, Community Forestry Associations, Benefits, Rural Communities

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An Investigation into the Sustainability of the Plywood Industry in Guyana: A Perspective of *Catostemma* Species Use

Tenisha Jordan

Plywood production in Guyana has been declining over the years. This decline, if continued may not only lead to constraints in the sector. Plywood is one of the major products exported and is a part of forestry's contribution to the national GDP. Any impact on production can result in a lowering of forestry's contribution to the GDP of Guyana. For this study, the demand for locally produced plywood on the domestic market and imported composite wood products in Guyana was assessed. Semi-structured interviews were conducted with small scale and large-scale retailers of plywood in Region #4. Importation records for composite products and annual market reports for 2006 to 2013 were reviewed to identify market trends.

During the period 2006 to 2015, a total volume of 90,969 m^3 plywood was supplied on the local market. Local plywood sales on the local market fluctuated for that period. The volume of plywood produced by Barama Company Limited, the largest plywood manufacturer in Guyana remained constant. A 33% increase in the volume supplied to the local market indicated an increased demand for locally produced plywood. Local plywood production only accounted for 9% of total plywood supplied to the market. Overall, a decline in production volume and export volume over the years was evident. Imported composite wood products dominated local markets, however, there is a demand for Barama ply on the local market, but

the company is unable to supply the volume demanded locally. Access to raw materials has been identified as a major constraint facing the local plywood industry. Firms must adapt business strategies to remain on top of the industry based on an understanding of the market for plywood. As such, this information can be used to inform such actions that enable business to plan strategically.

KEYWORDS: Plywood, Composites, Export Volume, Market Trends, Production Volume

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An Assessment of the Current Assets of the Botanical Garden and its Maintenance

Donnica Thornhill

The Botanical Garden and its assets are important to the local population and the country. This study assessed the use and maintenance of the Botanical Garden. Semi-structured interviews were conducted from July-August, 2016, using the convenient sampling method. An inventory of extant assets was conducted, and the data was mapped using ArcMap 10. A total of 100 visitors were interviewed.

Of the total number of visitors, 40% were males, 35% were females. Couples made up 25% of the respondents. Weekly visits to the garden were most common. Main reasons for visiting the Botanical Gardens were recreation (63%) followed by business (22%). Educational and other purposes were not main reasons for visiting the garden. A total of 573 species of trees and palms were inventoried. A total of 198 palm species were recorded with the Royal palms being the dominant species. In terms of amenities, the Botanical Garden is furnished benches with tables, single benches and waste disposals. Visitors were generally satisfied with the maintenance works currently carried out, however, some believed that more can still be done to enhance the environment of the gardens. The study revealed the need for a holistic maintenance schedule and improved record-keeping to assist in better management of this key recreational resource.

KEYWORDS*:* Botanical gardens, Maintenance, Importance, Assets

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An Assessment of the Harvesting of *Eperua falcata*: The Impact on its Seedling and Sapling Regeneration at Linden Soesdyke Highway.

Jermaine Hunte

Based on an informal report done by R. Peters that as of September 2015 the 16ha logged over forest located on the white sand forest near to the Linden-Soesdyke Highway was poorly stocking with mature stems of Soft Wallaba *(Eperua falcata*) with few apparent signs of natural regeneration, this research project was formulated. The research aimed to assess the impact of the harvesting of the species on its natural regeneration in the study area, its seedling and sapling population was selected as the primary indicators. A systematic point sampling design was employed utilizing a 400m interrupted belt transect with 32 plots each measuring 100m^2 and three (3) equally sized plots selected by convenience sampling.

The resulting total area of the sample was 3500m^2. A density of 77 plants/ha and 26 plants/ha was observed for seedlings and saplings, respectively. While statistically there was no significant difference found between the density of seedlings and saplings in the study area, the seedlings present were found to have an estimated growing time of approximately 2.4 years, and their density appeared to be lower than those reportedly observed in an unlogged forest in French Guiana (1270 plants/ha). It is recommended that at least two replicates be repeated in the area, and further research be done to compare logged and unlogged sites.

KEYWORDS: Regeneration, *Eperua falcata*, Harvesting, Soft Wallaba, Linden/Soesdyke Highway, Seedlings, Sapling

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Urban Forestry: Identification and Mapping of Tree Species on the University of Guyana Campus (Turkeyen)

Felix Braithwaite

In recent years urban forestry has developed as an integrative, multidisciplinary approach to the planning and management of forest and tree resources. In Guyana, limited studies have been conducted to generate information on tree species found in urban forest ecosystems. The University of Guyana Turkeyen Campus was selected as the area for this study because it is dominated by trees planted around the campus for aesthetic purposes. The University of

Guyana is a public university established in 1963 by the Guyana government and is Guyana's premier tertiary education institution.

This research aimed to determine benefits of trees to campus users and the most common trees species found on campus. As part of this research, trees <15cm near walkways, roads, tracks and buildings were identified and labelled with common name, scientific name, family name and use (s). A map of the distribution and location of the trees was created using the ArcGIS software. To gather information on campus users' knowledge, 30 questionnaires were distributed randomly to campus users.

The inventory showed that the Rain tree (*Samanea saman)* followed by the Cannon Ball tree (*Couroupita guianensis*) were the most common species of trees on the campus. In terms of the benefits that these trees provide, close to half of the respondents indicated that the trees on campus have an aesthetic appeal, helping to beautify the campus environment. Some (23.3%) felt that the trees provide comfort in the form of shade to campus users. Others felt that the trees provide recreational and ecological benefits. Given that these trees provide benefits to campus users, the planting of more trees on the UG Turkeyen Campus should be considered to increase these benefits but this must be done under careful planning and the right expertise to achieve maximum benefits of tree planting. A key recommendation is that further research be conducted to determine the status of the trees on the UG campus, as well as benefits and uses of Indigenous and Endemic Urban tree species in Guyana.

KEYWORDS: Urban Forestry, Aesthetics, Benefits, Social Benefits, Urban Tree Species

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An Assessment of the Mycorrhizal Association with Dominant Plant Species in Mined-out Bauxite Sites in Linden

Adiola Walcott

Mycorrhizal association is said to be one of the support mechanisms for plants growing on mined-out sites. This research investigated mycorrhizal association in dominant plant species and the relationship between pH and the presence of mycorrhizae in mined-out bauxite sites. This study was done at Nicdoc in Region # 7 (21N 0356671, UTM 0663628) and Coomacka Mines in Region # 10 **(**21N 0.358172, UTM 0.658366). Thirty-eight root samples of the

dominant species were collected and examined for the presence of mycorrhizae**.** Data were analyzed using Microsoft Excel and Statistix 10 Software. Spearman's rank correlation test was conducted to determine the relationship between pH and the presence of mycorrhizae.

The results showed that *Clusia* species *and Cecropia* species (Congo pump) were associate species found at Nicodoc. *Vismia* species (Bloodwood) and *Chrysobalanaceae icaco* (Fat pork) were the dominant species found at both Nicodoc and Coomacka Mines. There was a mycorrhizal association with the dominant species, where there was the presence of arbuscules and hyphaes, indicating the presence of endomycorrizae fungi. Mycorrhizae was present in 63% of the root samples, of which *Vismia* species accounted for 42%, and *Chrysobalanaceae icaco* accounted for 21%. At both sites, eight (8) root samples of *Vismia* species were found to have mycorrhizae. The presence of mycorrhizae was found in five of the *Chrysobalanaceae icaco* root samples at Nicodoc, while three of the root samples Coomacka Mines showed the presence of mycorrhizae. No relationship was found between pH and the presence of mycorrhizae (p= 0.4813, R=-0.1173). The results showed that mycorrhizae were present at acidic levels in the soil. In-depth studies may reveal more in the areas of relationship between soil nutrients and the presence of mycorrhizae and mycorrhizal association in the less dominant species at the site.

KEYWORDS: Mycorrhizae, Mycorrhizal Association, Mined-Out Soils, Mining

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An Examination of the Change in Species Composition of Seedlings and Saplings, with the Change in Elevation on the Secondary White Sand Forest Along Soesdyke/Linden Highway

Royston Peters

The areas along the Soesdyke/Linden Highway were heavily forested with Dry Evergreen Forests on white sands, with associated species. The presence of Wallaba (*Eperua Falcata*), the principal species after which the general forest type has been described had not been accounted for. Thus, interest was generated to investigate the current state of species composition, with particular reference to seedling and sapling densities at different elevations within state lands between Long Creek to Dora, approximately twenty-seven kilometres (27km) up the highway from Soesdyke.

Along a transect, thirty-five (35) sample plots measuring $10m^2$ were established fifty metres apart. All trees were counted, and the species were identified. Height and other parameters were measured. The results revealed no significant differences in species composition and species density along the gradient from low areas (peat soil) to uphill areas (white sands). Higher elevations tended to have greater richness and species composition. The results also point to the sparse distribution and site-specificity of certain species, as well as an association with elevation and species composition. Species that are specific to certain elevation were Dakama, Cedar and Duka. The lower species richness at lower elevations could be attributed to several factors including land use and environmental variables. Therefore, factors and challenges affecting changes in species compositions associated with elevation changes should be explored. A major challenge encountered was the insufficient data obtained in the areas of low elevation where peat or swamp forests were located. A more detailed assessment of this area could be done to give a more comprehensive interpretation of changes in species composition in that area.

KEYWORDS: Species Richness, Species Composition, Elevation, Evergreen Forests, White Sands

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An Assessment of the Differences of Host Perceptions of the Social Impacts of Tourism within and Between Two Rural Communities

Edwin Moore

The tourism industry is one of the growing world markets for many countries, because of its multi-benefits. However, when promoting different types of tourism such as rural, community based and nature tourism in one's country, more thought must be given to the social, cultural and environmental impacts that will develop over time. Residents' perceptions of impacts of tourism were investigated in St. Cuthbert Mission and Lake Mainstay Communities. Data were collected via structured questionnaires and semi-structured interviews. Fifty households in each community were interviewed. ANOVA was done to determine if there are significant differences between perceptions of the severity of social impacts. Tukey HSD All-Pairwise Comparisons Test was used to compare mean percentages.

In Lake Mainstay (LMS) 60% of the respondents were males and 40% were females, while in St. Cuthbert's Mission (SCM) 53% were females and 48% males. The number of persons in tourism-related employment was 14% and 12% for LMS and SCM respectively. Tourists were seen in large grouping with more seen during weekends and special occasions. Contact was generally through sales of goods and services. Drugs and alcohol use was perceived to be an impact of tourism with 50% of the respondents in CSM and 64% in LMS viewing this as a moderately serious problem. A small percentage felt that tourism was contributing to change in culture. In each community, tourism was not generally perceived as a problem by many residents. While the results of this study can be useful in identifying potential problematic areas to address, longer term studies should be carried out to further validate the findings.

KEYWORDS: Host Perception, Social Impacts, Tourist, Tourism, Rural Communities

Forestry 2017

The Relationship between Soil Textural Classes and Mangrove Population Densities along the Demerara Mahaica Foreshore

Tracy Clarke

This research was done to investigate whether a relationship exists between soil textural classes and the presence of three mangrove species along the seacoast of Demerara to Berbice. A total of twelve sites were sampled along the Demerara-Berbice Foreshore. To assess population density three 10m x 10m plots at each site and plant counts were taken in each plot. Soil samples were collected at all sites at depths of 0-15cm and 15-30cm.

Seven soil textural classes were found: Clay, Loam, Loamy Sand, Sandy Clay, Sandy Clay Loam, Sandy Loam, Silty Loam. While black Mangroves were found at all sites. Densities of Mangroves species were not significantly different across soil textural classes and a weak correlation ($0 < |r| < .3$) between mangrove density and soil textural classes was observed. Black Mangroves had a significantly, positive relationship with clay soils (R-Value =0.5194; P-Value = 0.0093**), while negative correlations were found between Red mangroves and clay soils (R-value = -0.1915; P-Value = 0.3701), and White Mangroves and clay soils (R-Value = -

0.5497; P-Value = 0.0054**). Both Red and White Mangroves were found in higher densities on Sandy Loam Soils. White mangroves showed a high preference for sandy soils. Due to insufficient data for Red Mangrove, a well-informed conclusion is lacking for that species. It is recommended that the relationship between the population densities should be further investigated in other areas within Guyana.

KEYWORDS: Red Mangroves, Black Mangroves, White Mangroves, Soil Textural Classes

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Community Involvement/Participation in the Management of Mangroves

Surjpaul Singh

This research assessed the level of awareness and community involvement in mangrove management in the coastal villages of Hope and Victoria. The residents' willingness and commitment to promote and sustain mangrove management were also examined. Sampling was done systematically, with a questionnaire was administered to every 5th household.

The results showed that over 90% of the respondents were aware of mangroves and their main importance and benefits. A greater percentage of persons with primary education indicated awareness. There were no significant differences between awareness levels between the villages (T= 1.86, P= 0.0659). In addition, over 85% of the respondents from both villages indicated their willingness and commitment to manage mangroves because they perceived that these forests protect them from flooding, and provide community services, among others. More females were aware of the Guyana Mangrove Restoration Project (GMRP), willing to promote mangrove management, and remain committed to promoting mangrove management. No significant differences were found in the level of willingness (T= 0.26, P= 0.7926) and commitment levels (T= 0.54, P= 0.5898) between villages. Given that both villages share similar levels of awareness, willingness, and commitment, the GMRP through the Village Mangrove Action Committee should introduce a pilot management strategy targeting villagers as the custodians.

KEYWORDS: Mangroves, involvement, awareness, willingness, commitment

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A Comparison of the Quality of Charcoal Produced Using the Traditional Pit Method and the Double Barrel Biochar Kilns in Charcoal Production

Stacy Robertson

The quality of charcoal produced from mixed hardwood species using three charcoal production methods (Traditional Pit, Portable Kiln and Double Barrel Biochar Kiln) were compared. Percentage recovery and production time for 1kg of charcoal were assessed. Moisture content (MC), ash content, volatile matter content and fixed carbon content were parameters used in the determination of quality. The charcoal was produced in the first phase of the research, from which samples were collected for analysis of proximate values. The Experimental design was a Complete Randomized Block Design.

The time of production varied from 2.15 to 13.21 hours. The double-barrel biochar kiln was the most efficient in terms of recovery and production time, with a 30.70% recovery, and an average of 2.15 hours of production time. The moisture content of the material influenced the production time, as the wood used in the Portable Kiln had the highest Moisture Content (25-35%) and took the longest to produce charcoal. Mean Moisture Content were significantly different between the three production methods (p=0.000), as was Ash Content (P=0.000). The maximum percentage of Moisture Content was found in the charcoal produced in the Portable Kilns (7.15%), while the Double Barrel Kiln charcoal was of lower MC (4.89%). No relationship was found between Fixed Carbon Content and Moisture Content. There was a strong positive relationship between Ash Content and Moisture Content, but a weak negative relationship between Volatile Matter Content and Moisture Content. Compared to FAO standards, except for Moisture Content, the other proximate values were not within the specifications. It can be concluded that charcoal produced using the three methods differed in quality and that uniformity in size and Moisture Content is required.

KEYWORDS: Charcoal, Moisture Content, Ash Content, Fixed Carbon Content

An Investigation of the Production Chain of Kufa and Nibbi Furniture.

Rene Sandy

Kufa and Nibbi are the aerial roots of several hemi-epiphytes and is the most commercially used non-timber forest products in the cottage and small-scale furniture production in Guyana. This study investigated the production chain of Kufa (*Clusia grandiflora* and *C. palmicida*) and Nibbi (*Heteropsis flexuosa*) furniture within the Pomeroon and Georgetown area. Surveys were conducted with harvesters, middlemen, local furniture producers, and furniture factory managers to gather data on product flows and prices.

The production chain of nibbi and kufa involves harvesting, processing and manufacturing. Nibbi and Kufa are harvested from the Pomeroon area in Region #2 and sold to local furniture manufacturers in Pomeroon and two main wicker furniture makers in Georgetown. The two main furniture makers in Georgetown buy raw materials either from middlemen or directly from Amerindian communities. The local manufacturers buy from individual harvesters, middlemen, Amerindian communities along the Pomeroon River or harvest themselves. An average daily harvest is 400 pieces per day. Harvesting is carried out 3-4 times per week. The distance to the harvesting sites affects the cost of transportation. The average cost is between five thousand to five thousand five hundred Guyana dollars (US$$20-$$27.5 equivalent) for distances of 9-15 miles. Most of the wicker furniture made is sold locally. The two main wicker furniture manufacturers in Georgetown export their furniture. It was estimated that a profit of 33% could be made by a furniture manufacturer. Some of the main challenges facing this industry are reduced demand due to closing of main markets in the Caribbean.

KEYWORDS: Kufa, Nibbi, Non-timber Forest Product, Wicker Furniture

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An Assessment of the Growth Performance of *Acacia mangium* in the Pruned & Unpruned Treatments at Mahdia and the Recruitment of Native Species within the Pruned & Unpruned Treatments

Troy Van-Rossum

This project was conducted to assess the growth performance of *Acacia mangium*, and the recruitment of native species within the pruned and unpruned plots of an experimental

restoration project which was initiated to rehabilitate mined out soils in Mahdia. Planting was done in 2011 and pruning in 2014 and this study was conducted in 2016. The study was conducted at St. Elizabeth (5°16'N, 59°9'W or 5.267°N, 59.15°W (5.267; -59.15). To assess performance, tree height and diameter were measured, and tree volume (m^3) was calculated using the height and diameter parameters.

Trees in the pruned treatment were significantly taller than those in the unpruned treatment, where the mean height of the pruned trees was 6.45m and 4.54m for the unpruned trees (P=0.000). DBH was larger in the pruned treatments with an average increase of 1.23 cm. The mean diameter of the pruned treatment was 7.35cm and the unpruned was 6.12cm. The mean volume was 0.04 m^3 in the pruned treatment and 0.026 m^3 in the unpruned treatments. The pruned treatment had a greater number of native species (n=24) compared to the unpruned treatment (n=13). As such, it concluded that pruning influenced the growth of trees and the recruitment of native species at Mahdia.

KEYWORDS: *Acacia mangium* Pruned, Unpruned, Mahdia, Height, Volume, Diameter

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An Investigation into the Incidence of Sapstain and Wood Decay Fungal Infestation on the Surface of Lumber at Lumberyards in Georgetown

Tyronne Austin

Fungi play important ecological roles in our environment and are represented by a large number of species in the tropical forest, but to lumberyard owners they are considered a nuisance as they invade commercial timber and diminish the value during storage. This study aimed to investigate the incidence of wood decay and surface stain fungal infestation on lumber in lumberyards within Georgetown. A total of 300 BM of 1 inch (thick) x 12 inches (width) boards of *Quassia simarouba* (Simarupa), *Sextonia rubra* (Determa) and *Ocotea oblonga* (Kereti Silverballi) were purchased and stored at four storage facilities within Georgetown. Inspection was conducted for two months (March and April of 2017). Variables such as the presence of fungus, discolouration of wood, moisture content and surface area infested were measured.

Observations showed that all species were infested by the mould fungi. Corticioid fungi occurring on the surface of *Quassia* were identified based on visual observations and fungi from the genus *Aspergillus*, *Trichoderma* and *Cladiosporium* were identified based on microscopy. The findings showed that there were significant differences among the means of all variables measured i.e. prevalence among sites, surface area infested among species, growth rate on surface area among species and moisture content among species. Pearson Correlations showed that there was a weak positive relationship between relative humidity and moisture content of the fungal infested lumber. It is recommended that lumber should be treated with a wood fungicide and dried to a moisture content of below 16% to prevent fungal growth.

KEYWORDS: Fungal infestation, Lumberyard, Ocotea oblonga, Quassia simarouba content

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An Investigation of the Habitat Preference of Kufa *(Clusia Grandiflora & C. Palmicicda) and* Nibbi *(Heteropsis Flexuosa)* in a Primary Forest (Toolsie Persaud Concession, Manaka)

Royquinn Fredericks

Host tree traits are known to affect the characteristics of epiphyte communities in forests; however, few studies have investigated these relationships in Guyana. This study investigated the habitat preferences of epiphytes Kufa (*Clusia Grandiflora & C. Palmicicda*) and Nibbi (*Heteropsis Flexuosa*) by assessing their occurrence on host trees in the Forestry Training Centre Inc (FTCI) field station, located in Toolsie Persaud Concession, Region # 7. Manaka is located along the Essequibo River, approximately 30 miles from Georgetown. Geographical coordinates of all host trees were collected to map the spatial distribution of the epiphytes. Trees sampled (host trees) were selected during transect walks based on the presence of epiphytes. Pearson's correlation (α =0.05) was used to determine the relationship between host diameter size and distribution of Nibbi and Kufa. ArcGIS 10 software was used to map the data, and a distribution map of Nibbi and Kufa were created.

There were 33 species representing 5 families acting as hosts of Nibbi and/or Kufa. There were 55 host trees of Nibbi and Kufa, 78 host trees of Nibbi and 56 host trees of Kufa. Black Kakaralli (*Eschweilera spp*), Soft Wallaba (*Eperua falcata*), Greenheart (*Chlorocardium Rodeii*) were notable host species for these epiphytes. Host tree diameter of Kufa was more variable,

but Kufa was more frequently found on trees of 10-50 cm diameter range. Nibbi were more frequently found on trees of 15-35 m height range.

It can be concluded that in this forest Kufa and Nibbi did not prefer any particular tree species or tree characteristics, as these epiphytes can be found on trees of varying diameters. The data seems to suggest that Nibbi can establish quite successfully on hosts of varying diameter, Kufa occupancy occurred more frequently on larger diameter trees.

KEYWORDS: Kufa, Nibbi, Habitat Preference, Host Trees, Host Tree size

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An Investigation into the Conformity of Sawmillers within Demerara Division to Lumber (GR04) Specifications as Set out in the Timber Grading Rules of Guyana.

Toyce De Cunha

This research was carried out within the Demerara division to investigate the conformity of sawmillers to GR04 specifications of the Timber Grading Rules of Guyana for locally marketed timber. The challenges to produce GR04 lumber and the effect of the mill type used on the quality of lumber were investigated. Data was collected via semi-structured interviews onsite with relevant personnel to assess their competence. Visual assessments of lumber were done against the criteria set out by the Guyana Timber Grading Rules (2002).

Thirty-five percent (35%) of the total licensed sawmilling operators were targeted. Out of the four (4) quality standards of lumber under the GR04 specifications, only two were met by the sawmillers. Merchantable timber or lower grade lumber is produced by 72% of sawmillers and sound lumber is produced by 28%. The higher production of merchantable may be influenced by the preference of the local market, and little pressure by the enforcement body. Some sawmillers (44%) use circular saws to produce lumber, while 44% use portable band sawmills in combination with circular saws. The band sawmills produced better quality GR04 lumber without the need for highly skilled personnel. Sawmillers utilizing the circular saws mainly produce merchantable quality lumber. Dimension uniformity was observed to be an issue. The challenges faced by sawmillers in producing lumber to meet the GR04 specification were access to loans (36%) followed by unfair competition (24%), market demand (20%) and

poor infrastructure. Poor infrastructure is a contributory factor to the higher cost of production. Further studies should be conducted in other divisions, as challenges may vary based on location.

KEYWORDS: Sawmill, Quality, Bandsaw, Circular Saw, Specifications, Timber Grading Rules

An Assessment of the Seedling Population of Common Baromalli and Sand Baromalli in a Primary Forest Located in Manaka

Lisa Martin

Natural regeneration of timber species within forest stands of tropical forests is necessary for sustainable management. Persistent seeds and seedlings on the forest floor are important for regeneration. Seedling population of Common Baromalli (*Catostemma commune*) and Sand Baromalli (*Catostemma fragrans*) in a primary forest at Manaka, Region # 7 was assessed. A Point Sampling Method was used to enumerate 100 Baromalli tree species across two different forest types within the study area. To assess seedling density circular plots of 5m and 10 m radius were established around tree selected for inventory. ArcGIS 10 Software was used to map the data collected.

A larger number of common baromalli trees (n=66) were present than sand baromalli trees (n=34). Common baromalli trees had larger greater variability in diameters. There was a higher seedling density of Common Baromalli (p=0.1955) than Sand Baromalli. Seedlings of both species were more prevalent in the 0-5 m radii, however, the seedling density of Common Baromalli was higher at both distances away from the parent tree. Common Baromalli trees showed clumped distribution. A Simple Linear Model found a weak positive association between seedling density and parent tree diameter. Seedling density showed a typical leptokurtic distribution, with a decrease in density with distance away from the parent tree. Seedling mortality was not observed at the time of the study. A longer-term study should be done to determine the level of survivability of seedlings.

KEYWORDS: Common Baromalli, Sand Baromalli, Seedling Density, Parent Tree, Abundance

Assessment of Impacts of Mangroves Resulting from Human Induced Stressors in Regions # 3 and 4

Rhoda Persaud

Mangrove forests in Guyana have been declining over the years. The remaining standing mangrove forests are threatened by either natural or human stressors. This study identified human stressors and residents' perceptions whether these stressors affected floral and faunal biodiversity in the mangrove ecosystems of Regions 3 and 4. A cross-sectional survey was carried out at Vreed-en-Hoop and Crane (Region 3), and Mon Repos and Hope (Region 4). The data collected were coded and recorded in Microsoft Excel and analyzed with Statistix 10 software. Kruskal-Wallis tests were conducted to compare responses.

Garbage dumping was a main human-induced stressors affecting mangroves at the Vreed-en-Hoop (19%), Crane Community (33%) and Mon Repos (24%). Grazing of animals and mangrove cutting were cited as major human stressors at Hope Community, accounting for 23% of the responses, respectively. In Hope Community 40% of respondents felt that human stressors affect the floral and faunal biodiversity while 42% respondents in Vreed-en-Hoop, 46% in Mon Repos and 46% in Crane shared the same opinion. No significant differences were found between the means of the responses (DF= 3 F= 0.18 P = 0.9099). The most selected measure for minimizing human-induced stressors by respondents at Vreed-en-Hoop was educating persons about the mangroves, while at Crane Community public awareness and institution of fines and penalties were selected by respondents. Increasing the number of rangers was the measure most selected for both Mon Repos and Hope Community. Targeted campaigning to implement measures should be instituted at the specific locations to address these human stressors.

KEYWORDS: Human stressors, Mangrove forests, flora, fauna, mangrove ecosystems

A Determination of Phytoremediation by Native Species in Mined Out Areas

Keola Wilkinson

Mining degrades significant areas of land and replacing it with undesirable waste materials in the form of mined out areas which are contaminated with heavy metals. These heavy metals are naturally present in the soil but manmade activities such as mining tend to increase them to levels that are highly toxic to plants and animals. As a result, effective rehabilitation of the environment post mining is essential. Phytoremediation is considered to be one method to achieve this rehabilitation. A study to assess the phytoremediation properties of the native species in bauxite mined out areas was carried out at a bauxite mined out area at Kara Kara, Linden, Guyana. Soil and Plant samples were collected from the mined-out area and analyzed for elemental concentration which found low levels of heavy metals presence. The four dominant native species identified at the mined-out area were *Chrysobalanus icaco* (Fat pork), *Tapirira guianensis* (Duka), *Maprounea guianensis* (Awati) and Anacardium occidentale (Cashew). The results from this research confirmed that Await and Cashew were found having the two highest heavy metals concentration present in their plant tissues. However, out of the four main heavy metals, the native species were only able to phytoremediate As and Hg but not Cd and Pb.

KEYWORDS: Mining, Land degradation, Phytoremediation, Heavy Metals, Native Species

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Forestry 2018

An Assessment of *Carapa* Species Response to Logging in The Pibiri Forest Reserve in Central Guyana after Two Decades of Selective Logging

Randy S.A. Belgrave

Logging can influence tree species regeneration and growth. Little is known about the impact of logging at different intensities. An assessment was carried out to determine the impact of logging on *Carapa* species population in a mixed tropical forest after two decades of selective logging at different densities. The study was conducted at the Pibiri Experimental Plot (ESP)

in Central Guyana (5^0 01' N, 58^0 37' S), where 1 hectare PSPs were established in 1994 to monitor the impact of logging intensities on population. Plots subjected to selective logging at two intensities of 8 trees/ha (medium intensity) and 16 trees/ha (high intensity), and a control (no logging) were selected in this study. Population density and diameter of the two logging intensities were compared to that of the control. QGIS was used to map the spatial distribution of trees and seedlings. All trees were measured in the plots and classified into mature trees, poles, saplings and seedlings.

Overall, there was a significantly higher mean density of trees/ha^{-1} ($\bar{x}$ =35.31) compared to saplings ($\bar{x}$ =7.52), poles ($\bar{x}$ =14.84) and seedlings ($\bar{x}$ =0.44). At the plot level, the high logging intensity plot had the lowest seedling density. Trees in the high logging intensity plot had the largest mean diameter, while the control plot had the smallest mean diameter. Significant differences were found in the overall class structure (horizontal strata). The low intensity logged plots accounted for the largest percentage of the total seedlings (46%). The high intensity logged plots and control plots accounted for 20% and 34% of seedlings respectively. Visual representation of the density showed the tendency for seedlings to occur in clumps. This information obtained can be used to identify key demographic changes or ecological variables that merit focus on the management of this species.

KEYWORDS: *Carapa,* Tree, Density, Class structure, Distribution Patterns, Selective Logging

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An Investigation of Waste Disposal Practices in Sawmills Along the Soesdyke/Linden Highway

Carla Thomas Payne

Managing waste is a problem sawmillers in Guyana are faced with. This research sought to determine sources of waste, types of waste generated, waste disposal methods employed, awareness of proper waste disposal methods, and status of training in proper waste disposal techniques at the sawmills along the Linden/Soesdyke Highway, Region #4, Guyana. All ten (10) licensed sawmills were surveyed. Data obtained were analyzed using content analysis and descriptive statistics.

The edger, moulder and circle saw were the most common waste generating equipment used. Composition of sawmilling waste is similar, the quantity of each waste produced differed.

Sawdust was the most common waste generated (n=10), followed by strips (n=9). Tree bark waste was least frequently generated. Open dumping was the most frequent method of waste disposal (n=8). Waste was utilized by other persons for charcoal production (n=3), poultry litter (n=5), household cooking (n=3). A small number of sawmills burned their waste (n=3). Availability of waste disposal site and labour cost were common factors contributing to improper waste disposal practices. Sawdust/cement bricks area a viable option for use of sawmill waste. There should be greater emphasis on educating sawmillers on the legislative requirements regarding waste disposal.

KEYWORDS: Sawmill Waste, Waste Disposal, Wood Offcuts, Sawdust, Wood Rejects

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Assessing the Rate of Germination of Carapa guianensis (Crabwood) Seeds after Pre-Sowing Treatments.

Devon George

Poor germination can result in poor regeneration of tropical forest species. Pre-treatment methods can be useful in improving the germination of the seeds of *Carapa guianensis* (Crabwood). In this study, the germination rate of C*arapa* seeds following pre-sowing treatments (cold stratification and soaking) were assessed. Seeds were collected from the Demerara Timbers Limited Concession 02/9. Seeds were subjected to cold stratification treatment for fifteen (15) days at 1-5^{o}C, soaking at room temperature for 24 hours and no treatment (control). Fifty seeds were used for each treatment and the control. Planting substrate consisted of brown sand and manure at a ratio of 2:1. Seeds were monitored for two months.

The results showed that cold stratification does not work for seeds of this species but soaking the seeds before sowing can result in a high germination (80%). The soaking method produced the fastest germination with germination occurring at day 15. The mean Germination Time for the soaking method was 35.6 days, and the control was 36.2 days. Germination increased with time. A longer period of study may provide additional information on the survivability of seedlings germinated using the various treatments.

KEYWORDS: Cold Stratification, Germination, Pre-treatment, *Carapa guianensis*

Determination of the Volume of Tree Residues for the Production of Value-Added Niche Market Products of Three Timber Species; Shibidan (*Aspidosperma Spp.*), Purpleheart (*Peltogyne Venosa*) and Soft Wallaba (*Eperua Falcata*).

Renatta Lim

Forest residues consisting of small trees, branches, tops left after harvesting, thinning and felling is estimated at 25-45%, with no additional value placed on the residues. The volume of tree residues of Shibidan (*Aspidosperma spp.*), PurpleHeart (*Peltogyne venosa*) and Soft Wallaba (*Eperua falacte*) were estimated and compared using ANOVA to determine their suitability to manufacture value-added wood products. Residues were converted into several household products. Local furniture manufacturers and retailers were surveyed to determine if there is a demand for these products. The results showed that a significantly higher volume was produced from branches that are in the 40 cm diameter class. Volume per tree/species varied among species; 0.0069m^3/tree (Shibidan), 0.010 m^3/tree (Soft Wallaba), and 0.0158 m^3/tree (Purpleheart). While Purpleheart had the highest volume of residues of the three species, it was similar to the volume of residues of Soft Wallaba.

The results showed an overall favourable response towards value-added products manufactured from tree residues. Just above half of the respondents (55%) indicated they currently use tree residues to manufacture value-added products. More than 80 percent of respondents indicated a preference for products made from tree residues, while over 70 percent of the respondent indicated a willingness to purchase these products at current market prices. Respondents showed a greater preference for particular products made with purpleheart wood waste. It can be concluded that the volume of tree residues is sufficient to produce a range of wood products with Purpleheart being a viable source of wood from residues.

KEYWORDS: Forest Residues, Value Added, Thinning, Volume, Furniture

An Assessment of Seedling Density of *Catostemma Commune* (Common Baromalli) and *Catostemma Fragrans* (Sand Baromalli) in Three (3) Plots Subjected to Three Logging Intensities at the Pibiri Forest Reserve in Central Guyana after Two Decades of Selective Logging

Tresanna Headley

Seedling recruitment is an important means of regeneration in tropical forests. Removal of mature trees can potentially reduce the regeneration capacity of tree species. To understand the response of *Catostemma commune (Common baromalli)* and *Catostemma fragrans (Sand baromalli)* to different logging intensities, an assessment of seedling density was conducted. The study was conducted at the Pibiri Experimental Plot (ESP) in Central Guyana (5^0 01' N, 58^0 37' S). The area was subjected to logging at three intensities (based on the number of trees per hectare that were removed). At Low Intensity (LI), 4 trees/ha were removed, Moderate Intensity (MI), 8 trees/ha were removed and High Intensity (HI), 16 trees/ha were removed. To assess density, circular plots with a radius of 20m were established, and the number of seedlings counted. Stock maps for adult trees and seedlings were prepared using QGIS 3.0.3 Software.

Seedling densities of both species were higher in the high logging intensity plots. There were a greater number of mature Sand baromalli trees in the three logging intensities with the highest density of Sand baromalli trees in the high intensity logged plot. Common baromalli trees had greater median diameters in the low intensity logged plots. Diameter of common baromalli trees ranged from 7.7- 46 cm in the High-intensity logged plot, 5.7-68 cm in the moderate-intensity logging plot, and 24.7-47.7 cm in the low-intensity logged plot. For sand baromalli, the diameter range for the high-intensity logged plot was 5.5-47.3 cm, the moderate logged intensity plot was 2.5-41 cm, and the high-intensity logged plot was 6.1-46.3 cm. An association of the distance of seedlings from conspecific adults for both Sand baromalli (X^2- 38.99, P<0.0%) and Common baromalli (X^2- 20.39, P<0.05). Seedlings were more abundant at a 20 m distance.

KEYWORDS: seedlings, recruitment, regeneration, logging intensities, Reduced Impact Logging

Sawdust, Wood Shaving and Cement Composite Blocks; An Investigation of Ethanol Treatment and Paint and Varnish Application on Durability

Mark Austin

The compatibility of sawdust/wood chips with cement to produce composite blocks may be affected by the presence of extractives. Pre-treatment of wood by-products to remove extractives before mixing with cement is recommended. The effectiveness of ethanol in pretreating wood waste to improve the durability of the composite blocks was assessed. The effectiveness of coating with varnish and paint in reducing water absorption was also investigated. Composite blocks specimens of two different ratios of cement to sawdust (2:1 and 3:1), and cement to wood shaving (2:1 and 3:1), were made with pretreated and untreated wood waste. Water absorption rate and compression strength of the specimens were tested according to the American Society for Testing Materials (ASTM) procedures.

ANOVA tests were done to determine if there were significant differences between the water absorption rates of the blocks. After 28 days of curing, composite blocks of 3:1 ratio showed a better compression value that best fits the non-load bearing unit standards of the ASTM. Water absorption rates of both untreated and treated test specimens of the 3:1 ratio were not significantly different (P=0.43). Therefore, it can be concluded that treating wood waste with ethanol was found to have no effect on the water absorption rate for this ratio. However, water absorption rates of treated and untreated composite blocks of the 2:1 ratio were found to be significantly different with specimens made with the woodshaving at a 2:1 ratio having the highest cumulative water absorption rate. It is expected that the results of this study can provide valuable information to generate stronger impetus for the use of sawdust to produce sustainable building materials.

KEYWORDS: Sawdust, Composite Blocks, Water Absorption Rate, Compression Strength, Wood Shaving

A Comparative Analysis of Residents' Perception of Social Impacts of Tourism in Rockstone and Coomacka Mines Communities

Shenika Duncan

Residents of host communities are a fundamental part of the tourism product; their perceptions have a tremendous impact on the success of tourism in a destination. This exploratory research sought to investigate the perceptions of residents *Rockstone and Coomacka Mines Communities*, Region Ten. Residents were surveyed for their opinions. Data from the questionnaires were coded and entered in SPSS V22 for analysis. A Chi-square test of independence was performed to determine differences in the number of responses between communities.

A larger number of persons interviewed in Coomacka were teachers (24%), and Rockstone housewives (23%) compared to any other form of employment. A higher number of residents in Coomacka Mines felt that tourism contributed to preserving traditions/customs, while in Rockstone respondents felt that tourism contributed to improved infrastructure and improved standard of living in their community. Members of Rockstone Community felt that tourism increased the level of prostitution, crime and sexually transmitted diseases. Both Rockstone and Coomacka felt that tourism had contributed to an increase in the use of drugs and alcohol, crowding and congestion. While tourism was perceived as a contributory factor to some social issues in the communities, residents were also cognizant of the many social positives of tourism. The results of this study can be used as a baseline study for future, longer-term research in these two communities.

KEYWORDS: Tourism, Social Impacts, Perception, Communities

The Preservation and Seasoning of *Quassia simarouba* (simarupa) Lumber Using Boric Acid to Reduce Fungal Proliferation

Leroy Wilson

Quassia simarouba (Simarupa), a low-density wood used in the furniture industry in Guyana is highly susceptible to fungal attack, making it an underutilized species. The effectiveness of different concentrations of boric acid using dip diffusion method to reduce the proliferation

of fungi on Simarupa was investigated. The research focused on determining which concentration of boric acid was most effective at reducing the proliferation of fungi, the relationship between solution strength and depth of penetration of the chemical, and the cost of treatment. Three solution strengths of boron (10%, 15% and 25%) mixed with water were tested against a control method where no application of boric acid was applied to Simarouba lumber. Analysis of Variance tests were performed to determine if penetration levels were significantly different among the different solution strengths.

The highest chemical penetration was found for the 25% solution of boric acid, while the 10% solution had the lowest chemical penetration ($P<0.05$). Mean depth of penetration for the 25%, 15% and 10% were 0.61mm, 0.44mm, and 0.27mm respectively. The surface areas of infestation of the specimens treated with the three solutions were not significantly different. At the end of the treatment, 87% of the total surface area of all treated samples was found to be uninfected compared to 50% of the total surface area of the control. The cost of treatment was highest for the 25% solution strength at $554.36 per BM of wood treated. Therefore, it can be concluded that the highest concentrated solution of boric acid would not be economical, as it incurred the highest cost, and gave similar results to those of lower concentrations. It is recommended that further research in this area be conducted for longer periods, on large pieces of lumber, and using alternative methods of preservation application such as non-pressure treatment method.

KEYWORDS: Low Density, Fungi, Boric Acid, Fungal Attack, Chemical Penetration

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A Determination of Heavy Metals in Mined-Out Bauxite Soils at Linden, and the Use of Native Species for Phytoremediation

Rebecca Brehaspat

Phytoremediation is a method used to remove heavy metals from soils, using plant species with inherent abilities to detoxify soils. This study assessed the presence of heavy metals in soils and the effectiveness of five native species for phytoremediation of these soils at BOASI Mineral Inc., Kara Kara mined out bauxite area, Linden, Region Ten (6° 00' 24.3" N, 58° 16' 46.0" W). Seedlings of *Catostemma fragrans* (Sand Baromalli), *Carapa guianensis* (Crabwood), *Tapirira marchandii* (Duka), *Dimorphandra conjugata* (Dakama), *Dicymbe altosonii* (Clump

Wallaba) were planted at the site, and thirteen (13) weeks after plants were collected and tested for presence heavy metals, Lead (Pb), Cadmium (Cd), Mercury (Hg) and Arsenic (AS), and micro elements. The soil was also tested for pH, salinity, and the presence of heavy metals. Significant differences between the concentrations of heavy chemicals by species were tested using ANOVA.

The first 30 cm depths of soils at Kara Kara had the highest concentrations of lead (25-65ppm). Micro elements, chromium (Cr) and manganese (Mn) were present in the soil at higher concentrations. Both soil pH and salinity decreased after planting. No significant differences were found in accumulated concentrations of heavy metals between species. Mercury levels were constant in all species at 0.5mg/Kg. All species, except for crabwood were able to phytoremediate Arsenic. Dakama had the lowest concentration of all micro elements. Sand baromalli had the highest accumulation of Arsenic (1.94mg/Kg), the highest concentrations of Zinc (Zn) at 36mg/Kg and Chromium at 12mg/Kg. However, at this concentration of Zinc, there is no potential threat of toxicity to the species. High mortality of seedlings of Dakama and Clump Wallaba were observed after 4 months. Sand Baromalli and Duka showed the best survival with 94% and 89% respectively, and the best growth in height and diameter growth. It can be concluded that mining contributed to the high concentrations of lead, but not other heavy metals in these soils. Further research to determine the phytoremediation capability of these species and their survival over a longer period is recommended.

KEYWORDS*:* Mining, Contamination, Heavy Metals, Phytoremediation, Soils, Mercury, Survival

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An Evaluation of the Influence of Sawdust and Wood-Shaving on the Production of (Sawdust Cement) and (Wood Shaving-Cement) Blocks to Use in Construction

Alex Stewart

Within Guyana, sawdust and wood shavings are being produced in large quantities which are burnt or dumped resulting in environmental pollution. The research investigated the utilisation of sawdust and wood-shaving as aggregate materials in the production of blocks bonded by cement, as building units for construction. The study aimed to develop an acceptable cement mixture with sawdust and wood shavings for the production of lightweight

sawdust-cement and wood-shaving blocks for construction based on the compressive strength of the series of mixtures and the water absorption characteristics. The series includes the ratio of cement to sawdust (3:1) and (2:1), cement-wood shaving (3:1) and (2:1) and a cement mixture mixed with wood shavings and sawdust in ratios 3:1 and 2:1. The blocks were cured for 14 and 28 days before testing. The American Society for Testing and Materials (ASTM) procedures was used for testing.

The mixture of cement, sawdust and wood-shaving of the 3:1 ratio yielded the highest Psi value over 28 days curing. The mix ratio 2:1 had the highest cumulative water absorption rate of cement and wood shavings. The cement sawdust mixture in ratio 3:1 derived compression values that best fit the non-load-bearing application according to the American Society for Testing Materials. The main limitation was the inability to identify what species of wood the sawdust was obtained as it was collected from two different mills that produced two different sizes of sawdust. Therefore, a key recommendation is the identification of timber species to determine species influences. The main conclusion is that despite the high psi values for test specimens compared to the conventional mixture, test specimens were still had high cumulative water absorption per unit area.

KEYWORDS: ASTM, Cement, Compression, PSI, Ratio, Sawdust, Water Absorption

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An Investigation into the Influence of Soil Parameters on the Growth and Survival of Black Mangroves in the Demerara Mahaica Region

Stephen Charles

The research project investigated the influence of soil elevation on the *Avicennia germinans* (Black Mangrove) species. More specifically, emphasis was placed on determining if there is a relationship between soil parameters, and growth and survival of black mangrove populations. Two sites were randomly selected from the Mon Repos and Belfield area, Demerara-Mahaica Area for this research. Transects, 100 metres in length were marked out and five sub-plots of $5m^2$ were demarcated within randomly selected transects. Sub-plots were established at 20-meter intervals. Five (5) black mangrove seedlings, four weeks old were planted within each sub-plot.

After the 8th week, plant survival remained constant at 16% at Lusignan but continued to decrease at Paradise to 8%. There was variation in the survival of black mangrove seedlings at different elevations but was not to be dependent on this factor (P= 0.0619). Soil elevation, pH levels, soil salinity and bulk density was found to have an impact on height and diameter of black mangrove seedlings but not their leaf number. Survival of black mangrove seedlings at varied at the different pH levels, salinities and dry bulk density levels. The greater survival percentage was at the Lusignan site which had a higher soil elevation (1.89 - 2.03 m), soil salinity of 7.7 - 16.09ppt range and dry bulk density values of 1.25 – 1.42gm/cm³. Heights were more or less similar across the different soil elevations. However, the diameter varied with soil elevations. Height of the black mangrove plants was shown to be dependent on elevation as well as pH, bulk density and soil salinity (P = 0.0000). The site at Lusignan met soil elevation, salinity and dry bulk density criteria, hence making it a more suitable site for replanting. It is recommended that this study be replicated at other sites to monitor survivability over a longer.

KEYWORDS*:* Black Mangroves, White Mangroves, Red Mangroves, Soil Elevation, Soil pH, Bulk Density, Soil Salinity, *Avicennia germinans*

Forestry 2019

An Investigation of the Current Use of Geographical Information System (GIS) by Natural Resource Management Agencies in Guyana

Mahendra Sahadeo

Natural Resources Management in the context of sustainable use is a necessity and can be supported through the use of Geographic Information System (GIS). GIS is a system that captures, stores, analyzes, manages and presents data in such a way that allows for efficient analysis, retrieval, planning and decision making. Guyana has many natural resources, but little is known of the current uses and applications of GIS. In this study, eleven agencies responsible for natural resource management in Guyana were surveyed to document the current use, applications, opportunities and challenges of using GIS in natural resources management. Frequency graphs and charts were used to display the research findings.

Land (n=7) and water (n=6) were the most managed resources by these agencies. The applications of GIS varied by agencies; however, applications were more common for mapping land-use changes, land management, forest cover change, and environmental monitoring. Other applications appeared to be agency-specific, for example, flood risk modelling and hazard analysis and water resource and infrastructure management. While GIS has been used to manage natural resources in Guyana, management agencies are grappling with similar challenges faced by countries worldwide. Expensive software limited human resources, limited training opportunities and lack of expertise were the most cited challenges faced. The adoption of real time data tracking and drone surveys were cited by four (4) agencies, as possible new applications of GIS. The need for greater coordination and use of GIS is evident.

KEYWORDS*:* Geographic Information System, Natural Resource Management, Software

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A Field Survey of Street Trees in Central Georgetown

Rajendra Singh

Avenue or street trees play an integral role in supporting healthy urban communities. The Capital City of Georgetown, Guyana has been called the 'Garden City' because of the many trees that graces its avenues. This research assessed species richness, relative species abundance in Georgetown. Trees of diameter at breast height (DBH) >20 cm were included in this study. Spatial distribution of trees was mapped using QGIS 2.18.18. Forty-five (45) streets were surveyed of which 23 had trees.

A total of 686 trees with 11 tree species belonging to 8 families were found. Over 90% of the trees were exotics. Average DBH was 47.63 cm and average height was 3.71 m. The most frequently occurring species was the *Delonix regia* with 370 trees representing 53% of all trees, followed by the *Samanea saman* (n=101) and *Tabebuia pentaphylla* (n=73) and *Lagerstroemia speciosa* (n=42) trees. The most prominent family was the Fabaceae comprising four (4) species, and the highest number of trees (n=521) followed by Bignoniaceae (n=73), Lythraceae (n=42) and Combretaceae (n=22). The Shannon-Wiener diversity index (H') for the overall study area was low (1.552). This poor diversity can be attributed to the fact that a single exotic ornamental tree dominated. Historical planting of

streets with avenues influenced diversity among streets. The information on street trees can provide baseline information for the conservation and management of the trees in Georgetown.

KEYWORDS*:* Species Richness, Avenues, Urban Communities, Ornamental trees

Assessing Land Use Changes along Rockstone, Mabura Junction Using Images Classification Techniques

Nickie Hamilton

The use of Geographic Information System (GIS) and remote sensing techniques have great potential for quantifying or identifying changes in land quality at lower costs. This study assessed accuracy of supervised Maxlike classification in assessing forest degradation compared to unsupervised Isocluster classification using ArcGIS 10.5 using Sentinel satellite imagery. This study was conducted at the Rockstone-Mabura-Makouria Road, located on the right bank of the Essequibo River in the Upper Demerara-Berbice Region of Guyana (05°58'59"N, 58°32'59"W).

With supervised Maxlike, 37.5 % accuracy was achieved in identifying road classes, and 63 % for forest. The low levels of accuracy obtained was assumed due to misclassification of the classes. However, the identification of bare land using this technique was very successful with 100% accuracy. With the removal of potential human error, the results in the unsupervised classification were favourable with a higher percentage of accuracy (81 %) in the classification of forested land. These two techniques are very useful in identifying forest and land clearing for specific interests, but not determining specific causes of deforestation. Two main limitations of this project were high percentage cloud cover on images, and human error in selecting sites while conducting supervised classification.

KEYWORDS: Forest Degradation, Geographic Information System, Deforestation, Cloud Cover

Mapping Coastline Changes and Assessing Vegetation Changes at Almond Beach, Using GIS and Remote Sensing Techniques

Ronell Lewis

Coastline changes occur as a result of social and natural factors. Mapping coastline change is important for sustainable development of coastal zones. The formation of the Guyana coast is the result of accretion over the last millennia. However, over time, there has been a general recession of the coastline. This study used available Rapideye (2011-2014) and Sentinel (2016-2017) imagery to map coastline changes and assess vegetation changes at Almond Beach, along the northwestern coast of Guyana. Almond Beach is located along the Shell Beach Protected Area (8^0 29'22.24" N and 59^0 41'56.11" W and8^0 25' 10.27" N and 59^0 34'22.74" W) and is approximately 12 miles long. The rates of coastal and vegetation changes were estimated using the QGIS software.

The results of this study showed that erosion is taking place at the eastern end of the beach and accretion taking place at the western end of the beach. Between the years 2016 and 2017 using Sentinel satellite imagery, a 55.6% increase of coastline was evident at the western end of the beach. However, a comparison of 2017 and 2019 sentinel imagery showed a 63.6% increase in coastline at the western end. Geometric calculation in the QGIS found 247.42 ha of vegetation in 2016 and 241.78 ha of vegetation in 2017, an estimated 2.3% decrease in one year. In 2019, there was 213.81 ha of vegetation. When compared to 2016 imagery, there was an 11.6% reduction in vegetation. From August 2016 to May of 2019 vegetation has reduced by 15.7%. The results indicated as the coastline increased, vegetation decreased.

KEYWORDS: Coastline, Coastal Zone, Sentinel Satellite Imagery

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To Determine the Effects of Thinning on the Regeneration of Coppice from Kabukalli (*Goupia Glabra*) Stumps

Koyel Reid

Sprouting on Kabukalli (*Goupia glabra*) stumps was investigated in the concession of the Ituni Small Loggers Association (ISLA) located in Region 10. Sprouting densities, growth rate of sprouts and the effects of thinning on growth rate of stump sprouting on lateritic and brown

sand soils were assessed. The Completely Randomized Design (CRD) was used in this study. Stumps were randomly selected for thinning. Seventy five percent of the stumps were selected for thinning under light, moderate and heavy intensities. Under the light thinning intensities 17%, 28% and 34% of the sprouts were removed, while the moderate and heavy thinning intensities 47% and 57% of the sprouts were thinned, respectively. Growth was measured from February to July.

Seven stumps out of 13 stumps had sprouts. A total of thirty-one (31) sprouts were counted. Stump sprouts on brown sand had significantly greater mean diameter (x=2.27 cm) than stump sprouts on laterite soils (x=1.82 cm). Stump sprouts on lateritic soils exhibited greater mean height (x=206.47 cm) than those on brown sand (x=190.46 cm). Stumps sprouts subjected to the light intensity thinning had significantly higher mean height (x=318 cm), than those subjected to no thinning (228.47), high intensity thinning (134.25 cm) and moderate intensity thinning (x=113.13cm). Incremental growth in sprout diameter was highest where no thinning was done. June and July, which are months considered to account for the highest mean rainfall were the months where higher mean diameter increments were observed. Stump density increased with sprout height (r=1.000). On the other hand, diameter of stumps was found to have a weak, but positive relationship with the density of sprouts (r=0.4113).

KEYWORDS: Stump Sprouts, Stump Diameter, Height, High Intensity Thinning, Coppicing

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Soil Characterization and Reclamation of a Borrow Pit at Karouni Mines Guyana

Ronika Holder

The physical and chemical characteristics of the materials used in reclamation of a borrow pit were evaluated at Karouni Mines, Region #7, Guyana. Soil samples were randomly selected from the saprolite and topsoil and from the undisturbed (laterite) plot for analysis of physical characteristics and chemical characteristics. Seedlings of cashew, baromalli, Ituri wallaba, Soft wallaba, and kamahora were planted, and their growth performance monitored monthly. The RCBD was utilized to randomize each of the five native species in the rows. Each plot was replicated twice. A total of 10 experimental plots having dimensions of 5m x 7m, 15 (fifteen) seedlings of the five species were planted in each plot.

Soil pH were similar for all three soil types, but soils had an acidic pH level ranging from 4.3 to 5.3. Organic matter content ranged from 1.2 to 13.8. Topsoil had the lowest OC. P was similar between lateritc and Saprolite. Topsoil had the highest P, and this may have contributed to the better performance in plant growth. CEC was higher in the topsoil material. Lower mortality was found with topsoil (4.5%) compared to Saprolite soil (36%). Only baromalli (3.5%) and ituri wallaba (1.5%) had mortality on topsoil. On Saprolite soil Baromalli had the highest at mortality (16.5%) followed by ituri wallaba with 12% mortality. Baromalli and Cashew performed well in diameter growth on both soil types. Soft wallaba, Ituri wallaba and baromalli performed comparably in height. For the topsoil, cashew performed least in height increment and baromalli had the highest increment. On Saprolite, cashew had the lowest height increment, and Ituri wallaba had the highest (P = 0.00). DBH for each species had no significant differences. The species were able to survive and thrive on both soil materials, with kamahora showing greater adaptability on both soil material. Kamahora, Cashew, Soft wallaba, and Ituri wallaba may be considered for the use of reclamation of borrow pits. However more trials are needed and should be conducted at different mined out sites.

KEYWORDS: Native Species, Reclamation, Borrow Pits, Saprolite, Topsoil

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Agriculture 2015

An Investigation of the Reproductive Parameters and Market Age and Weight of Cattle in Region # 2

Kishan Narine

An investigation to check the reproductive parameters, market weight and age of cattle was carried out in Essequibo Coast, Region #2, between Supenaam to Pomeroon. The investigation's objective was to attain general baseline data about the farmers, their farms and the number of animals present. Some parameters were investigated about the animal such as age at first calving, conception rate, calving interval, market age and weight. Fifty (50) farmers were randomly selected with the help of a Senior Livestock Extension Officer attached to the Guyana Livestock Development Authority (G.L.D.A). The five (5) boroughs were:

Supenaam to Adventure, Onderneeming to Queentown, Little Alliance to Lima Sands, Henrietta to Perth, and Dunkeld to Pomeroon. Ten (10) farmers were randomly selected from each borough.

Age at first calving was 22.9 months while conception rate was 1.32 services per conception. Average calving interval was 387.7 days. Market age was 27.1 months and market weight were calculated at 151 kgs. This baseline research is important in understanding the 48 cattle industry in this region of Guyana and may be used a baseline for more in-depth study of the factors affecting this industry.

KEYWORDS: Age at First Calving, Conception Rate, Calving Interval, Market Age, Market Weight

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An Investigation into the Effect of Different Syrup Concentrations on the Shelf Life of 'Passion Fruit in Syrup'

Kenisha Gordon

The Research Project aimed to investigate which of three syrup concentrations of the 'Passion fruit in Syrup', a value-added product created by The Guyana school of Agriculture's Agro Processing Unit in 2013, has the longest shelf life. A Completely Randomized Design was used with four (4) treatments which were replicated eight (8) times. The treatments were Passion fruit in its own juice (control), passion fruit in light syrup, passion fruit in medium syrup, and passion fruit in heavy syrup. Light. Medium and Heavy Syrup were mixed at the ratio of 4 litres of water to 907, 1814 and 3628 grams of sugar, respectively. The products were checked once a week to observe any changes in the colour of the treatments. Monthly tests were carried out for the microbial contents, pH and Brix. A general sensory evaluation was done after six months using randomly selected, untrained panelists. The data collected was subjected to One Way Analysis of Variance ANOVA and Chi-Square.

The results showed after the third month, pH decreased for all trials. Brix of passion fruit in its own juice remained constant. Mean brix value for the trial fluctuated between 7.8^{o}-13.3^{o} for Passion fruit in its own juice, 15.1^{o} -22.3^{o} for the light syrup, 23.0^{o} -25.0^{o} for the medium

syrup, and 24.0 º -38.8 º for the heavy syrup. Passion fruit in its own juice had the highest microbial activity but this was not significantly different to the other concentrations. Majority of persons (96%) preferred the color of the passion fruit juice over the heavy syrup. Significant differences were not found between the levels of acceptability of aroma and levels of acceptability of texture. Most of the panel (94%) liked the aroma of the original juice. Greater preference was shown toward flavor and texture of the heavy syrup and medium syrup. Storage period and variation in concentrations did not have a significant effect on overall acceptability as the overall levels of acceptability did not differ significantly. The most organolytically accepted was the Heavy Syrup.

KEYWORDS: Passion Fruit, Syrup, Shelf Life, Concentration, Rind

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The Effects of Varying Levels of Blackstrap Molasses on Shelf-Life of Silage

Damian Jairam Vallidum

This research investigated the relative amount of blackstrap molasses added at the beginning of ensiling that influences the short-term shelf life of Antelope Grass silage upon re-exposure to the atmosphere. The research was conducted at the Soesdyke/Linden Highway. The experiment using three levels of treatment and a control, and four animal units. Treatments were replicated three times using the Completely Ramdomized Design (CRD). The three treatments were 40kg antelope grass and 2000ml water, mixed together with molasses at 2% (800g), 4% (1600g), 6% (2400g) wet weight of the grass, respectively. The control had no molasses added. The silage was allowed to ferment for one (1) month in concrete silos before being fed to livestock. The experiment also followed a Repeated Measures Design (RMD). Animals were fed over a two (2) week period each with one (1) week rest period. The effect of additional substrates on short term shelf life of the silage before ensilling was determined by measuring the amount of silage consumed by the livestock per day for a period of two weeks. Palatability was used an as an indicator, as it was assumed that there was degeneration of shelf life as consumption decreased.

The results showed that for the treatments there were significant difference in the amount of silage consumed by treatment (F=21.95, P=0.000) and between the number of days the silage was consumed by livestock (F=28.05, P=0.000). The treatments with o% molasses and 2% molasses showed rapid decrease in consumption after day 7, indicating that there was rapid degeneration of the silage. This may have been because of rapid proliferation of anaerobic degradation causing the silage to spoil. Treatments 3 and 4 had a greater period of consumption of up to 9 days before decline in consumption was evident. Less drastic decline in consumption of the two other treatments seem to suggest that adding the substrate to forage produces an effect on sillage, slowing degeneration of antelope grass silage.

KEYWORDS: Antelope Grass, Sillage, Palatability, Blackstrap Molasses, Fermentation, Anaerobic Degradation

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An Evaluation of Two Treatment Protocols against the Conventional Treatment Protocol to Control/Reduce the Incidence of Black Sigatoka (*Mycosphaerella fijiensis*) in Plantain Production (*Musa Spp*.)

Tifanna Ross

This research evaluated three methods to determine their effectiveness in reducing *Mycosphaerella fijiensis* at a lower cost. The three treatments were based on Innovative Eco-Care's Protocol, Food and Agriculture Organization's Protocol and Farmer's Practice. Innovative Eco-Care's consist of commercial organic products, FAO consists of Commercial Inorganic Products. Farmers' practices consist of using chicken manure, 15:15:15 fertilizer and urea used in a monthly rotation system. The research was carried out at Hague Backdam, West Coast Demerara. Three treatments were replicated three times using the Completely Randomized Design (CRD). There were twelve (12) plants per replicate with a total of 180 plants. Spacing were 2.1m between rows and 2.1m between plants. Results were based on an eight- month period of plantain production. A sample size of twelve (12) plants per treatment was used for data collection.

The results showed that all treatments were affected by Black sigatoka disease. Framer's practice treatment had the highest number of diseased leaves (36%) followed by both FAO protocol and IEC's protocol with 32%, respectively. The IEC's protocol produced plants with highest average heights (73.3 cm). FAO's protocol and Farmer's practice showed similarity in plant height. Girth was significantly different between treatments, with the IEC having the highest average girth (32.4cm) and the FAO protocol producing the lowest average girth (23.8cm). The lowest average number of leaves were produced by the FAO's protocol and the highest with IEC's protocol. IECs protocol also showed highest number of average leaves present on plants daily. The farmer practice showed the highest average death rate of leaves with the other two treatments having similar death rates. The actual cost of treating 36 plants without yield showed that the IEC treatment had the highest cost, followed by the FAO's protocol and farmers' practice. Farmers' current practice was shown to be ineffective in improving vegetative growth and reducing the incidence of the disease. However, it was observed that farmers' practices do not follow a set protocol. Further research should be undertaken with stratification based on different levels of the disease.

KEYWORDS: *Mycosphaerella fijiensis*, Plantains, Innovative Eco-Care's, FAO, Organic Products, Inorganic Products, Fungus

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Investigating the effects of hydrogen peroxide (H2O2) on seed germination and seedling quality of two solanaceous crops; *Capsicum Frutescens* (Pepper) and *Solanum Melongena* (Boulanger)

Rebecca Prabhulall

The aim of this research was to test the effects of Hydrogen Peroxide on seed germination and seedling quality of Pepper and Boulanger. These trails were carried out using two varieties of each crop which were tested by hydrogen peroxide at 1% and 3% concentration. A third treatment was added as a control where the seeds were treated with water.

The results showed an increase in the seedling quality and a decrease in the number of days to germination by treatments compared to the control. Both crops responded differently to the treatments. The boulanger seeds treated with 1% concentration Hydrogen Peroxide had over 91% germination. The pepper crop did not respond as well as the boulanger to this

treatment but showed better results with the water treatment with over 91% germination. Both crops did not respond well to the 3% hydrogen peroxide. Boulanger seedlings developed a total number of 8 leaves and a length of 4 inches at the time of transplant under the 1% treatment while pepper seedling developed an average of 7 leaves and a length of 3.5 with the water treatment.

KEYWORDS: Hydrogen Peroxide. Seed Germination, Pepper, Boulanger, Seedling Quality

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The Control of Red Palm Mite (*Raoiella indica Hirst*) of Cocoa Nucifera Using Chemical Treatment

Clevand Kellawan

The Coconut palm (*Cocos nucifera L*) industry is the third largest agricultural sub-sector in Guyana. Red palm mite (*Raoiella indica Hirst*) infestation has become a pest in coconut palm. This study focused the effectiveness of chemical treatments in controlling this red palm mite on the coconut palm. This research was carried out at Wakenaam Island, Essequibo River, Region #3, Guyana. Three treatments were used and replicated three times. The Completely Randomized Design was used for this experiment. Treatment A, which was the control, entailed no chemical insecticide being applied to coconut palm, while Treatment B (T b) – contained Fastac Insecticide and Treatment C was Abamectin Insecticide. The treatments were done in field. Observations were made over a 4-week period.

There was no significant difference in the three treatments used on red palm mite in coconut palms. Th effect of the two insecticide treatments varied. Palm treated with Fastac insecticide showed a steady decrease of red palm mite population over the 3 weeks after treatment while the abamectin treatment showed a rapid decrease at the 1st week after treatment and a small increase in population for the 2nd and 3rd week. The control treatment showed fluctuations in population over the 4 weeks period. Palms selected for treatment with Fastac had the highest mean population followed by Abamectin and control treatment before treatment began. After week 3, the same pattern was observed. Though not significantly different, the bottom layer of the crown had the highest population followed by the top and then the middle layer before the treatment. After treatment, no change was observed.

Since most palms are very tall, chemical control of the red palm mite is complex and can be impractical for external application. Further investigation should be done to select additional products and determine threshold levels at which red palm mite can be effectively controlled.

KEYWORDS: *Cocos nucifera L, R.indica,* Fastac, Pest, Systemic Chemical, Abamectin

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To Evaluate the Effects of Pre-Soaking Seeds in Ethephon and Hydrogen Peroxide on Germination of Red Peas (Minica 4)

Althea Melville

This experiment was carried to evaluate the effects of pre-soaking seeds at different periods in Ethephon and Hydrogen Peroxide. The research was aimed at determining which treatments yield the best germination percentage, which soaking period yields the greatest germination percentage, and the length of time to germination for each treatment. The study was conducted at Paradise, East Coast Demerara. The Completely Randomized Experimental Design (CRD) was used with three (3) treatments (water, hydrogen peroxide and Ethephon) and each treatment replicated three (3) times. Seeds were soaked for 6, 12 and 24 hours respectively for the three treatments. The parameters of interest were germination percentage, length of the radicle and plumule. One way ANOVA and Chi-Square Analysis were done to determine if there were significant differences between the means. The means were further compared using LSD All Pairwise comparisons tests.

The results of the study revealed that there were significant differences among the treatments and length of time to maximum germination. The soaking time to the time of sowing influenced germination results. Seeds soaked for 12 hours had the highest germination percentage (%) and radicle growth. The germination percentage of seeds soaked in water increased slightly with soaking times. Overall, water and hydrogen peroxide had significantly higher germination percentage than Ethephon. Seed germination percentage decreased with the length of soaking for Ethephon, with no seeds germinating after 24 hours. Water took the least time from sowing to maximum germination, with the soaking period of 24 hours producing the best results. Hydrogen peroxide treatments took 72 hours respectively for maximum germination. Therefore, pre-soaking seeds for longer than 12 hours in water and hydrogen peroxide would not increase germination. Pre-soaking seed at

different periods did not produce significant differences in germination percentage. Further research of this nature should be explored with different concentrations of each treatment.

KEYWORDS: Germination, Growth, Ethephon, Hydrogen Peroxide, Pre-soaking, Germination

The Effects of Innovative Eco Care Products on Commercial Broiler Production under Local Conditions

Naomi Mc Kenzie

A study was carried out to determine the effects of Innovative Eco Care Products (Renerzyme, INNO GRO+ and AQUACHIL) on commercial broiler production under local conditions. A total of 60 Cobb 500 chicks were randomly assigned to one of two dietary treatments. The two treatments used were Farmer based practices used as the control and feed supplemented with Innovative Eco Care Products. Each treatment was replicated three times. INNO-GRO+ was administered from day 1-42 at a rate of 0.024ml/L of water/day. Renerzyme was administered at week 1 at a rate of 0.06ml/L of water, week 2 at a rate of 0.3/L of water and from week 3 onwards at a rate of 0.015ml/L of water. Parameters investigated were weekly weight gain, final body weight, survival percentage and feed conversion ratio. The study was carried out at the Guyana School of Agriculture Livestock Farm, Mon Repos, East Coast Demerara. AQUACHIL was applied at a rate 0f 40ml/100L of water for rinsing of water pipelines and spraying over bed and walls.

Overall, the birds fed the diet supplemented with Innovative Eco Care Products showed better performance in average weight gain and Feed conversion ratio, though not statistically different. The better performance of the birds under the Innovative Eco Care Products indicates that supplementing feed with these products is a more feasible and economical option to generate maximum profitability in broiler production. Its application in intensive commercial operations, due to overall feed utilization efficiency is recommended, however, further research in larger studies and other parameters of focus such as meat composition, dressing percentage and organ weights should be done to inform such a move.

KEYWORDS: Innovative Eco Care Products, Renerzyme, INNO GRO+, AQUACHIL, Feed Conversion Ratio, Weight Gain, Broiler Production, Broiler Diet

A Comparative Analysis of Growth (Weight Gain) and Biogas Produced from the Manure of Pigs Fed on Duck Weed and those Fed with Conventional Feed Alone

Steve Razack

This study aimed to determine whether animals fed with duckweed mixed with feed will outperform animals fed conventional feed in weight gain and biogas production from fecal matter. Three treatments were used with conventional feed being the control group and 25% and 50% duckweed mixed with feed being the two test groups. The study was carried out at the Guyana School of Agriculture Livestock Farm, Mon Repos, East Coast Demerara.

Results revealed that animals fed with duckweed mix performed better in weight gain and biogas production than those fed with conventional feed. Those fed with 25% duckweed- mix has significant weight gain compared to those fed with conventional feed, and those fed 50% duckweed-mix. No significant differences were observed in weight gain by piglets fed 25% and 50% duckweed mix feed. Animals fed with 50% duckweed mix yielded significantly higher portions of biogas than conventional feed (P=0.08). While biogas yields of the conventional feed and 25% duckweed mix were similar (P=0.110). An average of 7.75, 9.25, 10.375mmhg of biogas was produced over the 4-week period for conventional feed, 25% duckweed mix and 50% duckweed mix respectively. While this research points to the potential use of duckweed and its positive impact of weight gain, the results of this study was based on a small sample size. It is therefore recommended that a study should be carried out with a larger sample size be used, and a wider variety of feed replacements. Additional parameters of growth such as size differences (length and diameter) should be measured. Animals should be of same age and weight to give more accurate results. Tests should be conducted on the quality of biogas produced.

KEYWORDS: Duckweed, Biogas, Weight, Piglets, Lemnaceae

Evaluating the Effects of Plant Growth Regulator (Ethephon®) on the Growth and Yield Parameters of Cucumbers (*Cucumis sativus* L.)

Christine Evans

Farmers of Region #3 in collaboration with NAREI have initiated interest in using growth hormones to increase production and reduce the time to harvesting of Cucumbers (*Cucumis sativus* L.). This field experiment was carried out on a farm at Parika backdam, East Bank Essequibo to evaluate the effects of Plant Growth Regulator (Ethephon®) on the Growth and Yield Parameters of Cucumbers (*Cucumis sativus* L.). The Completely Randomized Experimental Design was used with one treatment (Ethephon®) at rates of application of 0 ml/L (Treatment 4/control), 0.05 ml/L (Treatment 1), 0.15ml/L (Treatment 2) and 0.3ml/L (Treatment 3). Treatments were replicated four times with seven plants used per replicate. The parameters of interest were days to 1st flower, number of pistillate flowers, number of fruits per vine, length and weight of fruits.

Variation among the rates of ethephon were observed. The highest rate of ethephon did not produce the overall best results which may have been due to the unpredictable weather conditions. Ethephon at the rate of 0.15ml/L (Treatment 2) had significantly lowest number of days to 1st flowering, the highest number of pistillate flowers (F=7.91, P=0.0010), and highest number of average fruits per plant (F=2.21, P=0.1128). All the other treatments showed similarities in all three of the parameters. Ethephon applied at a rate of 0.3ml/L produced significantly heavier fruits (F=6.72, P=0.0019), as well as longer fruits than the other treatments (F=1.39, P=0.2707). Fruits in this treatment averaged 300g more than the fruits in the control treatment. While the application rate of 0.15ml/L produced more pistillate flowers, the fruits were similar in weight to the two lower treatment rates. Further research using higher rates of ethephon should be conducted to supplement the baseline information collected in this study.

KEYWORDS: Cucumbers, Ethephon®, Pistillate flowers, Yield Parameters

An Investigation of the Effects of Limestone on pH, fruit yield and the presence of Bacterial and Fungal Disease in Pepper (*Capsicum annum* L.) Production

Phibian Joseph

This research was undertaken to assess the effects of limestone on pH, fruit yield and the presence of bacterial and fungal disease in pepper (*Capsicum annum* L.) and the impact of different rates of limestone on vegetative growth and yield parameters of Wiri Wiri and Ball of Fire peppers. The study was conducted in Region #3 Canal Polder#2 on clay soil. The Completely Randomized Experimental Design was used with five (5) treatments used per plant species. Limestone was applied to soil using the spot and broadcast application methods and applied at rates of 0, 50% and 100%. The treatments were: Control (Treatment 1), 50% spot application (Treatment 2), 100% spot application (Treatment 3), 50% broadcast (Treatment 4) and 100% broadcast (Treatment 5). Treatments were replicated three times and 20 plants were used per replicate. Parameters of interest were plant height, average fruit weight per treatment, soil pH. Plant height was measured one week after transplanting for three months, fruit weight data was collected for three weeks. Data were subjected to ANOVA and LSD tests were conducted to compare treatment means. The first pH test revealed a pH of 4.38 while the second test revealed a pH of 5.79. The results showed that there were significant differences in vegetative growth performance, but not for yield parameters of hot peppers when different methods and rates of limestone were applied. Wiri wiri pepper plants that were grown where the limestone was broadcasted were taller than those grown in spot application areas. Plants treated with limestone had similar average heights. No significant differences in average weight of fruits (lbs) were found between treatments for wiri wiri peppers. The recommended six-week period between application of limestone and the planting of the crop was done which may have influenced the results. Additionally, heavy rainfall caused flooding which may have influenced the impact of the treatment. It is recommended that a block experimental design be used in future trials to account for environmental variables that will impact calcium in soil.

KEYWORDS: Limestone, Broadcast Application, Spot Application, Yield Parameters, Vegetative Growth Parameters.

An Investigation into the Post-Harvest Losses of Pineapple on the Linden Highway

Anika Alexander

Post-harvest losses are collective food losses along the value chain from production in the field to the food being placed on a plate for consumption. Losses of horticultural produce are a major problem in the post-harvest chain. The research sought to determine the specific sources of pineapple losses along the farm to consumer chain, and to quantify the losses (qualitative and quantitative) of pineapples from farm to consumer. This study was conducted on the Soesdyke/Linden Highway. This survey utilized structured questionnaires which were distributed to a total of ten (10) farmers.

Majority (90%) of the farmers were males, while majority were aged between 40-50 years. Literacy rate of the farmers were low with only 60% attaining up to junior high school education. The number of years being in pineapple farming varied, but a greater number of respondents were in the business for 7 years. Montserrat was the dominant variety planted, and half the respondents planted sugarloaf variety. Pests and diseases were common problems faced by all farmers. Average number of fruits harvested ranged from 100-320 units, with an estimated loss of between 9-20 fruits. Majority of farmers (80%) indicated that they experience post-harvest losses and the magnitude of losses depended on how the produce was harvested, stored and transported. Losses were not proportionate to number of fruits harvested. Estimates of losses ranged between 4.8-14.4% and value range of losses were between $1710-$4200. Overall, greater losses were experienced during field harvest and storage. Losses due to physical, pathological and entomological factors were the most common. Pest and diseases, poor handling, overpacking of fruit in storage containers and lack of storage facilities were factors contributing to losses. Physical factors contributed to the greatest amount of loss during harvesting and storage. Pathological and entomological factors contributed to greater losses during storage and retail marketing stages. The results show that there is need for promotion of good harvesting and post harvesting management. There is also need for improvement of record keeping by farmers.

KEYWORDS: Pineapple, Post-Harvest Losses, Value Chain, Harvesting, Packaging, Storage, Processing, Handling

Comparing the Effectiveness Wood Shaving Mulch (Organic) and Plastic Mulch (Inorganic) on the Cultivation of Bullnose Peppers

Mahendra Persaud

The use of mulching is one of the safest, least expensive, more practical, yet equally profitable methods of enhancing soil. The aim of this study was to compare the effectiveness wood shaving mulch (organic) and plastic mulch (inorganic) on the cultivation of Bullnose peppers. The treatments were black plastic mulch, wood shaving mulch and control (No mulch), which were laid out in a complete randomized design (CRD) and replicated three times. This research project was carried out at Eccles, East Bank of Demerara, Region #4. Soil type is Front land clays.

After 60 days plant heights were not significantly different (F=2.23, P=0.1204). Plants under the plastic mulch showed the highest mean height (53.17 cm), followed by the wood shaving (52.49 cm) and the control treatment (50.02 cm. Average weight of fruit was highest in the wood shaving mulch treatment (89.83 g), followed by the plastic mulch treatment (83.88 g), and the control (75.40g). Plants in the control took 27 days to flower, one week longer than the other two treatments. The plastic mulch produced the highest total number of fruits (n=35), followed by the wood shaving treatment (n=31) and the control (n=20). The plastic mulch was shown to have a greater effect on weeds. Moisture % was significantly higher under the wood shaving mulch (18.15%) compared to the plastic mulch (12.34%) and control (7.37%). There were no significant differences between treatments in height, number of fruits and weight of fruits. Although the wood shaving mulch produced better in terms of fruit weight, the plastic mulch performed better in terms of fruit number. There is still room for more research with mulching and its effect on bullnose pepper production.

Keywords: Mulching materials, Wood Shaving Mulch, Bullnose

Potting Soil: Evaluating the Growth of Tomato Seedlings Using Cow, Poultry and Sheep Manure as Part of the Potting Soil

Satyanand Ramdowar

Animal manures are an efficient nutrient source for crop production and there is a need for more extensive use of these resources that are more cost effective and environmentally friendly. This experiment was carried out to compare the effectiveness of cow, poultry and sheep manure when incorporated in potting for growing tomato seedlings. This trial was conducted at Hope Estate on the East Coast of Demerara, Region #4. The experiment was laid out in a Completely Randomized Design (CRD). The variety used in the trial was the F1 Mongol. The seeds were sown in trays and kept under UV plastic and Shade mesh (40%). The Trial consisted of four different potting. Treatments I, II, and III consisted of 2 parts animal manure (sheep, poultry and cow) mixed with 1 part Front land clay and 1 part sand. Treatment IV (control) consisted of Front clay soil and sand in equal proportions. There were 3 replicates for each treatment, each replicate consisted of 128 seedlings. Data was collected every week for 5 weeks. Analysis of variance and LSD All-pairwise comparison tests were done on the data using Statistix 10.0 Software.

Germination time was faster with poultry manure. High mortality was recorded in the control treatment. Seedlings grown with sheep manure performed better in terms of the growth parameters when compared to the seedlings grown with poultry manure, cow manure and control treatment. Mean plant heights for seedlings for cow, sheep, and poultry manure and control treatment were 2.8 cm, 4.8 cm, 4.5 cm and 2.2 cm respectively. Mean plant biomass for seedlings grown with sheep manure was 131.6 mg while those grown with cow manure, poultry manure and control were 23.4 mg, 75.4 mg and 16.8 mg, respectively. Over the 5 weeks period, sheep manure produced the highest shoot biomass. Sheep manure was found to have a better effect compared to poultry and cow manure. Growth parameters of poultry manure were better than cow manure while that of cow manure were higher than the control treatment. Animal manure can be recommended as a good alternative additive to potting soil. Further research should be done to determine the specific proportion of animal manure in potting soil.

KEYWORDS: Manure, tomato seedlings, plant biomass, poultry manure, plant height

A Comparative Analysis of the Efficacy of Biochar on the Tiwiwid Sands for the Production of Peppers

Jason Persaud

With fertile agricultural lands being placed under housing development, the option of cultivating the sandy regions needs to be explored. However, these lands are nutrient poor. This experiment sought to investigate the benefits of amending white sands with biochar to improve the physicochemical properties and determine its effect on production of the *Habanero* variety of pepper. The biochar was produced form the woody biomass of the Dakama (*Dimorphandra conjugate*). This research was conducted at CARANA's farm in Hararuni, Linden Soesdyke highway, Region #4. The soil type of this area is predominately coarse textured Tiwiwid sands (white sands). A Completely Randomized Design (CRD) was used for this research. The materials were incorporated into the first 30cm of subsoil at a rate of 150g per planting hole. Two treatments were used: biochar amendment soil (T1) and soil without biochar (T2). Each treatment was replicated three times. The seedlings were transplanted 2 weeks after incorporation and monitored until fruiting.

The plants grown on biochar amended soils showed no significant differences in vegetative growth compared to the plants grown in the unamended soils (control). At 80 days, plants in T1 had a mean height of 36.33 cm, and T2 had a mean height of 33.45 cm ($F=0.65$, $P=0.4252$). There were no significant differences in fruit weight among treatments. Plants grown on biochar amended soil produced significantly more fruits (73.13) than the plants in the control treatment (24.40) ($F=5.83$, $P=0.0226$). The average weight of fruit produced per plant in T1 was 4.32g and T2 was 4.33g. An increase of 0.5 in the pH was observed from an initial reading of 4.1 in the soil amended with biochar. There was also a 31.8 mg/kg increase in potassium in the biochar amended soil. The results showed that the use of biochar as a soil amendment on the Tiwiwid Sands had some positive effect on the reproductive potential of the crop. The overall status of the soil did not change dramatically either after biochar amendment. Based on the results, it is recommended that different rates of biochar application be used and or varied with fertilizer rates to investigate plant response.

KEYWORDS: Biochar, Intermediate Savannahs, Tiwiwid Sands, Habenero, Soil Amendment

The Efficacy of Liming for the Control of Fusarium Wilt Affecting Boulanger

Leelawattie Manohar

Fusarium wilt, caused by the pathogen, *Fusarium oxysporum* is a significant constraint in the production of solanaceous crops in Guyana. This study was done to investigate the efficacy of liming for the control of Fusarium wilt, using two application methods, in Ruby Backdam, East bank Essequibo. The experiment was conducted using the Completely Randomized Design. Three treatments were tested (T1) – Control, (T2) – Broadcast application, (T3) – Spot application and each treatment replicated three times. Liming was done based on recommendation for 2000 lbs limestone per acre. The soils in the study area are considered to be moderately to strongly acidic. Soil samples were analyzed for pH levels at the soils laboratory at NAREI. For this field trial, the Black Beauty variety of Boulanger was used because it is one of the most popular and high yielding varieties of Boulanger grown in Guyana. Liming, using the two methods of application did not have a significant effect on disease incidence, plant height at maturity, and fruit weight and number compared to the control method. Symptoms of the disease were seen on all the treatments and percentage disease incidence was highest in the control method, followed by the broadcast and spot treatments. The number of days to 50% flowering were similar across the treatments ($F=1.24$, $P=0.355$), with an average of 50.7 days for for T1, followed by T2 with 49.3 days and T3 with 49 days. At maturity, mean plant heights were 48.7, 49.6, 51.0 cm for T1, T2 and T3, respectively. The broadcast application method (T2) produced the highest average number of fruits per plants (1.5), followed by T1 (0.9) and T3 (0.75). Average weight per fruit per did not differ significantly ($F=1.07$, $P=0.353$). Fruit average weight for T1 was 160.4 g, 213.1g for T2, and 134.6 g for T3. Notable changes in pH were recorded for soil depths of 0”-6” and 6”-12” for all treatments, except the control method. The liming rate used in the trial was lower than rates used in published studies. Further trials should be carried out with different rates of limestone using spot application method but should focus on determination of levels of Ca. Uptake.

KEYWORDS: Liming, *Fusarium oxysporum,* Broadcast Application, Plant height, Disease Incidence

An Investigation into the Reproductive Parameters, Age and Weight at Which Cattle are Marketed in Region#4 (Georgetown to Mahaica)

Saskia Tull

The objective of this study was to investigate the Reproductive Parameters of cattle Georgetown to Mahaica, Region #4. The parameters of interest were age at first calving, calving interval, services per conception, market weight and age of animals at slaughter. The information will help stakeholders develop herd projections to determine production levels nationally and to meet the requirements of government's policy for beef export. Farmers were randomly selected from the Georgetown- Mahaica Area, Region # 4. Questionnaires comprising of twenty- three questions were administered to farmers. Of sixty-two (62) farmers surveyed, 51.6% of the respondents reared dairy animals, 3.2% reared beef animals and 45.2% reared dual-purpose cattle. While a higher number of farmers (58%) chose to calve at 24 months compared to 42% who chose to calve over 24 months, there were no significant difference in the number of respondents between the two practices (P=0.0489). A higher number of farmers (82%) chose a calving interval of 365 days while eighteen percent (18%) chose an interval of over 365 days (P=0.000). The age and weight at which cattle are slaughtered varied. Most farmers chose to sell over a standard of 200 kg with seventy-six percent (76%) of farmers selling at a higher age. A small percentage of farmers (1.6%) chose to slaughter at 200 kg while ninety- eight percent (98%) chose to slaughter over 200 kg. The highest conception rate was twice (50%), followed by once (24%), 3 times (23%), 4 times (2%) and 5 times (2%). Artificial Insemination was the preferred choice of farmers, which saw faster conception rates after two tries. The data for Market age and Weight collected varied when compared to the standard parameters. A limitation to this research is that with no to little record keeping being done by farmers, the respondents relied on their memories to provide critical information. It is recommended that various husbandry practices can be implemented to help farmers manage their farms effectively. Farmers should be trained in record keeping.

KEYWORDS: Cattle, Reproductive Parameters: Age at First Calving, Calving Interval, Number of Services per Conception, Market Age and Weight of Animals at Slaughter

An Investigation into the Effects of Using Different Packaging Materials on the Shelf Life of "Queso De Mano" and to Evaluate the Sensory Attributes of Cheese and Whey

Shanelli Jerome

This research project investigated the effect of three packaging materials on shelf life of "Queso de Mano". The research sought to quantify the microbial activity of Queso de mano, identify which packaging material affected the cheese based on sensory attributes and to conduct a sensory evaluation on whey energy shakes. Shakes were prepared in the flavors Banana express, the Passion fruit & watermelon spin and carrot & orange burst. Three packaging materials were Low Density Polyethylene pouches (LDPE), Formaticum and Cheese foil wrap. The study was laid out using the RCBD- Randomized Complete Block Design and consisted of three treatments and nine (9) experimental units. Crude fat, crude protein and moisture components were analyzed. Shakes were made in three flavours and assessed for preference. Sensory attributes were rated on a 9-point Hedonic scale questionnaire.

The types of packaging were found to have no significant effect on microbial activity. Microbial content ranged from 7.1767- 8.0133 Log CFU/ml ($F=1.13$, $P=0.3844$). Cheese in the polyethylene pouches had a longer shelf life. The cheese in the foil wrap had the highest fat percentage (37%), followed by Formaticum (30%) and the Polyethylene pouches (27%). Fat percentage was higher compared to USDA standards of 22.35g of fat. The cheese in the polyethylene pouches contained the most moisture (57.14%), followed by Formaticum (54.32%), and foil wrap (53.01%). Most of the panelists (96%) "liked" the colour of the cheese packaged in Formaticum. All the of panel "liked" the flavour of the cheese in Polyethylene pouches. Eighty percent (80%) of the panel liked the aroma of the cheese in the Polyethylene pouches, while 100% preferred the aroma of the cheese in both the Formaticum and the foil wrap. However, the panelists seemed to have a greater preference for the texture of the cheese in the Polyethylene pouches and foil wrap. The Banana express and the Passion fruit & watermelon spin flavours were preferred. No problems were identified with the texture of the shakes. Further research should be conducted using different types of animal milk for Queso de Mano/ Mozzarella.

KEYWORDS: Mozzarella, Formaticum, Cheese, Whey, Microbial activity, Sensory Attributes

Effect of Timing of NPK Fertilizer on Growth and Yield of Sweet Pepper (*Capsicum annum L.)*

Purnan Ramnarine

The influence of different timing of application of NPK (15-15-15 and 6-25-25) fertilizer on sweet pepper (*Capsicum annuum* L.) variety King Arthur was evaluated at National Agricultural Research and Extension Institute (NAREI) demonstration farm, East Coast Demerara, Guyana. Six-week-old seedlings from a nursery were transplanted on ridges in the field with recommended row to row and plant to plant spacing of 75 cm and 45 cm respectively. NPK Fertilizer applied at a rate of 296kg/ha (31.11 kg/ha N, 59.26 kg/ha P and 59.26 kg/ha K), at different times (at transplanting, 3 weeks after transplanting, 6 weeks after transplanting and a control treatment of no fertilizer,) was investigated. The experiment was laid out in a Completely Randomized Design (CRD) with 3 replications. Data collection on plant height, leaf width, leaf length and weight of fruits were done weekly. Fertilizer applied at 6 weeks after transplanting showed significant effect on yield parameters. Average weight of fruits was highest for plants treated with fertilizer 6 weeks after transplanting (2017.81g), followed by plants treated with fertilizer 3 weeks after transplanting (1824.13), plants treated with fertilizer at transplanting (1082.37g) and the control (808.63g). Significant differences were found between the timing of fertilizer application and the number of fruits per plant ($P<0.05$). The maximum number of fruits per plant (35.67) and maximum yield (59.79 t/ha) were recorded with the fertilizer application 6WAT and was statistically similar to yields of fertilizer applied 3WAT. There were no significant differences treatments for shoots biomass, leaf length, and leaf width ($P<0.05$), while NPK fertilizer applied at transplanting had the greatest effect on shoot biomass (23.67g), leaf length (21 cm) and leaf width (6 cm). Application of fertilizer at transplanting is recommended for better growth and at 6WAT for better yield of sweet pepper under the agro-climatic conditions of Guyana. Further research should be carried out on the different rates and time of application of NPK fertilizer for sweet pepper variety king Arthur at different locations in determining a maximum yield.

KEYWORDS: NPK fertilizer, Sweet Pepper, weight of fruits, Shoot Biomass, Leaf Width

An Investigation of the Response of Sweet Corn (*Zea Mays* L.) to Organic Manure and an Inorganic Fertilizer

Anthony Jones

A study was conducted to investigate the response of sweet corn (*Zea mays L*.) to organic fertilizer (poultry manure) at a rate of 3 t/ha, inorganic fertilizer (NPK; 15:15:15) at 0, 30, 70, 120 kg/ha and a combination of the two fertilizers at a rate of 1.5 t/ha (poultry manure) + 60kg/ha (15:15:15). The experiment was arranged in a Randomized Complete Block Design (RCBD) with treatments replicated three times. The experiment was carried out at Linden. The soil type in the experiment is sandy soil. The maze hybrid Super Sweet Corn (Bright Jean) was selected for this trial. Analysis of Variance (ANOVA) tests were done at 95% confident interval and Least Significant Difference (LSD) post – hoc test was done to further compare means.

Significant differences between treatments for some vegetative growth parameters were not observed. The inorganic fertilizer treatment of 120 kg/ha produced plant with the highest average mean height (211.1 cm), and the control produced the shortest plants (112.8cm). The longest cob length (17 cm), as well as the highest number of cobs (n=7) was achieved by the inorganic fertilizer treatment of 120 kg/ha. Average cob length was not significantly different between treatments (F=1.21, P=0.3709). Cob weight without husk cover in the combination treatment (111.77g) was similar to the inorganic fertilizer treatment of 120 kg/ha (94.5g) but was significantly higher than the other treatments (F=6.01; p=0.0080). Average kernels per cobs were significantly higher in combination treatment (n=176) but were similar to the inorganic fertilizer treatment of 120 kg/ha (n=161) and the 70kg/ha (n=144) treatments. Results showed that the combination fertilizers and inorganic fertilizer treatment of 120 kg/ha had the highest reproductive yield, but the combination treatment it produced greater results. The trial should be repeated in different seasons and with a different variety of sweet corn.

KEYWORDS: *Zea mays L*., Organic Fertilizer, Inorganic Fertilizer, Cob weight, Tasseling

An Investigation into the Reproductive Parameters and Market Age and Weight of Cattle in East Canje and Central Corentyne, Region #6

Wilton Fordyce

The research investigated the reproductive status, market age and weight of cattle in two major cattle rearing districts (East Canje and Central Corentyne) of East Berbice- Corentyne (Region #6). The project was geared towards beef cattle because a high population of the cattle there are beef breeds. Three parameters were measured: Number of Services per Conception, Age at First Calving, and Calving Intervals. With the aid of standardised prompts, the desired information was obtained. Fifty-seven (57) farmers in two major cattle rearing districts were interviewed, in the presence of Livestock Officers. One sample T- test was used to analyze data collected.

The results showed that majority of the farmers (60%) were unaware of the Number of Services per Conception. The Statistical Analysis showed significant differences for Age at First Calving ($p=0.0468$), Calving Interval ($p=0.0000$) and Number of Services per Conception. The Age of First Calving ranged between 33 and 48 months; however, the mean was 33 months. The Calving Interval ranged between 12 to 18 months, with an average of 16.4 months. Market Age and Weight fluctuated from 1 year at 150 lbs to 7 years at 800 lbs. These results showed that more work is needed to be done by farmers to improve the reproductive and productive performances of beef cattle in the region. It was discovered that these farmers do not rear their beef animals to a specific age and weight for the market. Animals are sold as the need arises. This information can be used to draft policies to improve reproductive performances of cattle. An appropriate record keeping system should be developed and introduced to farmers. Farmers should be educated on improved husbandry practices and management.

KEYWORDS: Cattle; Reproductive Parameters: Number of Services per Conception, Age at First Calving, Calving Intervals; Market Age and Weight

A Comparison of Poultry Manure and a Mixed Fertilizer (12:12:17:2) on the Growth, Yield and Economics of Scotch Bonnet Pepper

Vishan Persaud

Appropriate soil fertility is essential for increased and sustainable crop production. However mineral fertilizers are expensive. This experiment was carried out to find a suitable fertilizer which could give an economic yield of pepper (C*apsicum chinense).* This experiment was arranged in a Completely Randomized Design with three replicates. Treatments were: inorganic fertilizer (12:12:17:2) (T1), poultry manure applied at 4 t/ha (T2) and the control (without any fertilizer) (T3). The research was conducted at the National Agricultural Research and Extension Institute (NAREI) Demonstration farm, Mon-Repos, Region #4. Root and shoot biomass were recovered as growth parameters while fruit weight and number of fruits obtained were evaluated as yield parameters.

The effect of organic and inorganic fertilizer on the weight of fruits was statistically significant at $P < 0.05$. The highest average data recorded was obtained from the poultry manure treated plots being 4.31 (number of fruits); 35.07g (root biomass) and 75.27g (shoot biomass). Mixed fertilizer treated plots produced the second highest averages of 3.36 fruits, 24.63g of root biomass and 72.67g of shoot biomass. Therefore, the response to fruit weight to the various treatments over the experimental period was ranked as poultry manure> inorganic fertilizer (12:12:17:2) >Control. The nutrient content in the soil in terms of Nitrogen (N), Phosphorous (P) and Potassium (K) were also higher with fertilizer treatments compared to the control treatment. The poultry manure treatment had higher levels of P and K. The total cost of organic and inorganic fertilizer was $300 and $2750 to produce an average fruit yield of 4.31 and 3.36, respectively. Based on the results of this study, the use of poultry manure in pepper production at a rate of 4 t/ha on frontland clay soils will yield better results. Further studies are needed to determine if higher poultry manure rates can further increase growth and production of pepper.

KEYWORDS: Poultry Manure, Scotch Bonnet Pepper, Root Biomass, Shoot Biomass, Phosphorous, Nitrogen, Potassium

An Investigation into the Reproductive Parameters of Cattle from Mahaica - Mahaicony, Region #5, Guyana

Colvin Alfred

The objectives of this research were to identify four (4) factors of reproductive efficiency on farms located in Mahaica –Mahaicony Region # 5, Guyana. The factors used were Age at First Calving, Calving Interval, Number of Services Per Conception, and Market Age and Weight of animals at slaughter. Questionnaires were administered to seventy-five farmers and supported by interviews to illicit deeper information on the parameters of interest. Brahman and Holstein were the two most popular beef and dairy breeds in this area. Majority of the farmers (82.6 %) are involved in both beef and milk production, 13% in beef production, and 4.3% in only dairy production. The average Age at First Calving was 31.34 months, and Conception Interval at 14.64 months, the Number of Services Per Conception with 1-1 and 2-1 services per conception. Majority of the farmers (69 %) had Conception Interval which fell between a range of 10 -16 months. The result showed that most of the animal are used for milking purposes, so cows that are more matured tend to be used for beef production. There was an average market age and weight of 31 months and 343 lb, respectively. More experienced farmers tended to have better conception rates: 71.2 % of the farmers had conception at the first time (1-1) the animals were served/ bred. Farmers who used the natural breeding method (96.7%) had greater success than farmers who used artificial insemination (55.6%) or the combination of natural service and artificial insemination (63.9%). There was no significant difference in each of the three (3) reproductive parameters for the farms. Results on the marketable age & weight were inconclusive. Poor/no record keeping, and inaccurate data/secondary data were limitations to data collection. There should be the development of various strategies (reproductive and others) to improve the production and productivity on the farms, as well as training of farmers in proper record keeping.

KEYWORDS: Cattle, Reproductive Parameters: Age at First Calving, Calving Interval, Number of Services Per Conception, Market Age and Weight of Animals at Slaughter

The Effects of Varying Phosphorus Application Rates and Placements on the Growth and Yield of Cherry Peppers

David Pusslewhyte

This research sought to determine the critical limits for phosphorus in cherry peppers (Miwiri Red). The research was conducted on a Silty- clay loam at the Tuschen, East Bank Essequibo, Region # 3. The experiment was laid in a 4*2 factorial design. Eight treatments were used: 80 Kg/ha, 2.5 cm (T1), 80 Kg/ha, 7.5 cm (T2), 140 Kg/ha, 2.5 cm (T3), 140 Kg/ha, 7.5 cm (T4) and 200 Kg/ha, 2.5 cm (T5), 200 Kg/ha, 7.5 cm (T6) and no added phosphorus (T7/control & T8/control). Phosphorus in the form of Triple Superphosphate was applied at different rates at two placement distances of 2.5 cm and 7.5 cm away from plants. Seedling heights were recorded once per week until the onset of flowering, and at first and final harvest. ANOVA was used to analyze the data from the RCB using the factorial design. LSD tests were done where there were differences amongst treatment means. The test was done at the 95% confidence level.

The T7/control Treatment was the first on average to reach 50% flowering, at 52.4 days whilst the last to flower was treatment 8 at 58.75 days. Treatment 2 had the shortest plants (37.13 cm) whilst the tallest plants were found in the T8 (42.5 cm). No clear pattern could be seen, so no conclusion can be made as to whether increasing the phosphorus rate had a positive or negative impact on plant height at floweringg. Treatment 8/control gave the highest yield (773.48g), whilst Treatment 4 recorded the lowest (558.73g). Treatment 8/control had the highest average fruit weight (3.67g) and this was found to be significantly different from those recorded from treatments 1- 5. The least number of fruits were recorded from treatment four (n=203.11), whilst the most were recorded from treatment 5 (n=262.89).

It can be concluded that rate and placement of phosphorus in this trial had no effect on the vegetative growth of the Miwiri variety plant. There was no interaction between rate and placement. Rate and placement had no effect on the reproductive performance of Miwiri red except for fruit weight. This research should be repeated using other varieties of pepper.

KEYWORDS: Cherry Peppers, Phosphorus, Vegetative Growth, Rate of Application, fruit weight

An Evaluation of Various Foliar Fertilizer Applications on the Growth and Production of Tomato Plants

Dexter Van-Veen

It is evident that nutritional programs for tomato production in Guyana are a limiting factor in the quantity of production. This limiting of potential production results in wastage of arable land, human capital and energy resources. There is a need to provide tomato growers with an alternate or enhanced approach of supplying nutrients to the plant.

This research sought to determine the quantity of limestone and triple supper phosphate to be applied to facilitate the optimum growth of tomato, and a sequence of application of the products on trial that has the greatest positive impact on tomato production. The study was conducted in the Essequibo Island-West Demerara (Region Three, Parika), Guyana. Three (3) experimental treatments were applied to the tomatoes (cv Heatmaster) using APSOL/Excel-Ag products. The treatments entailed the use of the same products on all the plants at varying rates and sequences. The fourth treatment was the control level.

In this study, there were no apparent differences in the vertical growth of the tomato plants. This could possibly be because existing humic and fulvic acids in the soil were sufficient to enable the tomato plants to reach peak growing potentials. Although the findings of this study were not statistically significantly different, farmers exposed to the products may still find them useful to apply due to what they perceive to be increases in yield after application.

KEYWORDS: Yield, APSOL/Excel-Ag, Tomato, Vegetative Growth

A Determination of the Efficacy of Two Commercial Mycorrhizal Preparations in Improving Phosphorus Nutrition in Tiwiwid Sand

Jewel Nicole Anna Todd

A pot experiment was done using a Completely Randomized Design (CRD) to compare the effect of two commercial mycorrhizal inoculants on Bull Nose sweet peppers grown in nutrient poor Tiwiwid sand. The inoculants were: a product containing a single strain of mycorrhiza (*Glomus intraradices*) and a product containing four species of mycorrhizae (*G.*

intraradices, *G. mosseae, G. aggregatum* and *G. etunicatum).* Treatments consisted of Bull Nose sweet pepper seeds inoculated with both products and compared to a non-inoculated control treatment. Each treatment was replicated four times. The parameters measured were phosphorus content, days to 50% flowering, fruit yield and percentage root colonization. It was found that the cocktail mycorrhizal product gave earlier flowering and higher yields in mature plants than the single strain mycorrhizal product and control treatment, though the single strain mycorrhizal product produced the greatest level of colonization among the three treatments. Some limitations were the unavailability of a microscope with x4 magnification which would have reduced systematic errors in colonization counts. The results of this small pot experiment will not necessarily be a true representation of the efficacy of the commercial mycorrhizal preparations used. When used under field conditions variability may occur. It was observed that PRO_MIX BX, the medium used in this study had poor water infiltration and this could have resulted in high vermiculite and perlite contents. This medium is a sterile, soilless medium that requires fertilization to support plant growth and would benefit from being mixed with a sandy loam soil to better facilitate water movement. Future experimentation should be done with mycorrhizal inoculants in Twiwid sand using various organic matter amendments in varying quantities.

KEYWRODS: *Glomus intraradices, G. mosseae, G. aggregatum, G. etunicatum,* Mycorrhizae, Bull Nose Sweet Pepper, Inoculants

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A Comparison of Vermicompost and Poultry Litter to Determine Optimum Planting Times after Application

Shanicia Bellamy

A pot experiment was conducted to determine the optimum planting times after application using two sources of organic matter (vermicompost and poultry litter) applied at three separate time times (0-month, 1 month and 2 months) before planting. A Completely Randomized Design (CRD) was used with a factorial approach. There were 3 replications. Each experimental unit consisted of 3 plants. The study was conducted at the Faculty of Agriculture and Forestry Research Station, University of Guyana Turkey Campus, Greater Georgetown. Ithaca Sandy Loam was used in this research. Initially, soils were slightly acidic but acidity

decreased with addition of organic matter (OM). Nutrients such as N, P and K, exchangeable K and Mg were considered adequate.

Time to 50% flowering were significantly different among treatments (P=0.000). Treatments in which the organic matter was not allowed to decompose took longer times to flower (46.33 days for both treatments). No significant differences were found in days to 50% flowering when both sources of OM was applied immediately and 1 month after. Plants transplanted immediately after organic matter application were significantly taller while plants where OM was added two months after had the shortest plants. Plants treated with poultry manure applied one month prior to planting reached harvesting after 71 days, approximately 1 day faster than plants treated with vermicompost 1 month prior to planting. Poultry manure applied at time of planting performed superior to the other treatment, producing the highest total yield of 92.43g and average fruit weight of 37.43g. The two treatments applied 1 month before planting performed comparably in yield while plants treated 2 months prior to planting with OM produced the lowest yields. Fruits from plants that were left two months to decompose produced significantly smaller fruits. Plants flowered faster when the fertilizer was left to decompose. The benefits of poultry litter can be seen when plants were transplanted immediately after application. Vermicompost is best utilized after 1 month, however, the benefits decreased with time. Further research can be undertaken with other soil types.

KEYWORDS: Vermicompost, Poultry Litter, Days to 50% Flowering, Organic Matter, Fruit Weight

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An Investigation into the Effects of Three Chemicals on Blossom End Rot on Tomato Production

Teressa Jacobs

This study investigated the effects of three chemicals on Blossom End Rot on Tomato Production. Blossom end rot is caused by calcium deficiency and results in reduced tomato yield. In this experiment, two trials were conducted using two varieties of tomato to compare production rates. The two varieties were Mongol and Heat Master. Treatments were Epsom

salt (3tsp/3L water/36 plants), Limestone (2.2963kg/36 plants), Calmax (11.7ml/3L water/36 plants) and the control (no treatment). The treatments were replicated three times. Limestone was applied one (1) week before transplanting, while Calmax and Epsom salts were applied after there was evidence of end rot disease. Limestone was incorporated into the soil, while Calmax and Epsom salt were applied via foliar treatment. There was a total of 12 plots. The research was conducted at the Guyana School of Agriculture Farm, Mon Repos, East Coast Demerara, Region #4.

The results showed that the number total yield of diseased fruits for Mongol were significantly different after the Calmax and Epsom salts were applied ($F=3.30$, $P=0.0327$). The Epsom salt had the highest total yield of diseased fruit before and after application. Limstone and Calmax had the lowest total yield before treatment, but this increased after treatment. For the Heatmaster variety, no significant differences were found in total yield of diseased fruits before Calmax and Epsom salts were applied ($F=1.17$, $P=0.3276$). The total yield of diseased fruit was higher in the Calmax plots before treatment, but this decreased after treatment. The total yield of non-diseased fruits of Heatmaster varied by treatment, with the Calmax treatment showing slightly higher yields compared to limestone and the control, but not Epsom salts treatment. It appeared that the treatments worked better for the Heatmaster variety. It was observed that while calcium was adequate the soil pH level was below the required rate which may have caused restriction in calcium uptake, therefore allowing for BER to occur.

KEYWORDS: Heatmaster, Mongol, Blossom End Rot, Tomatoes, Calmax, Epsom salts

Detection of Viruses in Exotic Sweet Potato (Ipomoea Batatas) Accessions Using Visual Symptomology

Stephon Paul

Production of sweet potato (Ipomoea batatas L.) is constrained by viruses which reduce yield by up to 90%. It is therefore important to detect the type of viruses that affect the plant. In this study, visual symptomatology was used for the detection of viruses in seven exotic sweet potato accessions. Visual symptomatology revealed virus associated symptoms including vein clearing, interveinal chlorosis, chlorotic spots, leaf curling, leaf narrowing and distortion, chlorosis and death of premature leaves among the seven exotic sweet potato accessions.

Disease Incidence (DI) was 100% in all the accessions. Disease severity varied between accessions with EA#3-"PB13" having the lowest (69%) while four accessions had relatively high percentages of disease severity ranging from 71% - 78%. EA#7-"Vardaman" had the highest disease severity (93%) at the end of the study. Sweet potato viral disease symptom severity ranged from moderate to severe (19 – 42 mean severity score) in the accessions. All the plants were consequently diseased; therefore, both the index of symptom severity of all plants (ISSap) and index of symptom severity of diseased plants (ISSdp) were the same mean values. The EA#1-"PB11" had the lowest (19) of both ISSap and ISSdp suggesting that it was a moderately susceptible accession in the beginning of the study while EA#7-"Vardaman had the highest (42) indicative that it is highly susceptible to viral diseases.

Based on the viral associated symptoms, five possible sweet potato virus diseases were identified within the exotic accessions, namely, Sweet Potato Feathery Mottle Virus (SPFMV), Sweet Potato Virus Disease complex (SPVD), Sweet Potato Virus G (SPVG), Sweet Potato Leaf Curl Virus (SPLCV) and Sweet Potato Collusive Virus (SPCV) & Begomovirus complex.

Key words: Virus indexing, Ipomoea setosa, visual symptomatology, sweet potato virus diseases

The Response of Rice (*Oryza sativa*) to Three Levels of Potassium in Single and Split Applications

Travis Pilgrim

This study investigated the response of rice (*Oryza sativa*) varieties to three levels of potassium application rates. The varieties were GRBD 10, GRDB 12 and GRDB 14. This experiment was laid out in split plot design with three replications. Rates tested were: k_1 0 Kg ha^{-1}, K_2 40 Kg ha^{-1} (basal), $K_3$60 Kg ha^{-1} (basal), K_4 60 Kg ha^{-1} (2 equal splits), K_5 80 Kg ha^{-1} (2 equal splits) and K_6 80 Kg ha^{-1} (3 equal splits). The research was conducted at Burma Rice Research Station of the Guyana Rice Development Board.

Plant heights did not differ significantly between fertilizer treatments, but GRDB 12 showed superiority in plant heights. The highest and lowest grain yields were observed in the varieties GRDB 10, and GRDB 14, respectively. The K rates of 60 kg K_2O ha^{-1}(2 splits) and 40 kg K_2O ha^{-1}(basal) gave the best grain yields. Rice weight differed among K application rates with 40 Kg K_2O ha^{-1} (basal) producing the highest weight (78 g) and the 80 Kg K_2O ha^{-1} (3 equal splits) the lowest weight (76.2g). Rice varieties GRDB10 and GRBD 12 had the similar total rice recovery. The two 80 Kg rates of applications showed no significant increases over the two 60 Kg treatments and 0 Kg K_2O ha^{-1}. For levels of K applications, the 40 kg K_2O ha^{-1} (basal) treatment produced significantly higher grain yield and yield parameters. For treatment and variety combination, GRDB 10 with the 40 kg K_2O ha^{-1} (Basal) rate produced maximum grain yield followed by 60 kg K_2O ha^{-1} rate. Further research should be done on the different soil types.

KEYWORDS: Potassium, *Oryza sativa*, Rice weight, Grain Yield

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Assessing the Impact of Organic Fertilizers and a Growth Hormone on the Performance of Cucumbers

Jamaine Samuels

The impact of organic fertilizers and a growth hormone on the vegetative growth, yield and flowering of cucumbers were assessed. This field trial was conducted at the Faculty of Agriculture and Forestry Research Station, University of Guyana. The trial was laid out in Completely Randomized Design (CRD). Five treatments were replicated three times; each

experimental unit had 5 plants giving a total of 75 plants. Treatments used were Wholesome (1.5 ml), I-Boost (3ml), Cytokin (5ml), Wholesome and I- Boost (1.5 and 3ml respectively), Control. Data was analyzed using the Statistix 10 Program. ANOVA for the CRD was used to compare treatment means at 95% Confidence Interval.

The Control treatment took a significantly longer time period to 50% flowering while plants in the Cytokin took the shortest time 50% flowering (28 Days). Cytokin had a greater influence on flowering (60 flowers), but it was the Wholesome and the Wholesome& I-Boost treatments that produced the highest average number of fruits. Wholesome treatment gave the highest average fruit weight per plant at 300g, followed by the Wholesome & I Boost treatments with 284g, and I- Boost treatment which produced an average weight of 264g. Wholesome fertilizer produced the highest total yield per plot (1.6Kg), followed by the Wholesome & I-Boost treatment (1.4 Kg). The control treatment yielded 1 kg of fruit per plot. The various organic fertilizers gave the best yield results, which corresponds with what is generally known about the impact of organic fertilizers.

Cytokin provoked the best vegetative response of cucumbers, but Wholesome produced the highest yield. The combination of Wholesome & I-Boost produced relatively good results. Therefore, Cytokin may be considered a better stimulant to vegetative response but not yield. Further studies should be done to test the quality of fruits produced.

KEYWORDS: Cytokin, Wholesome, I-Boost, Cucumbers, Growth Hormone, Organic Fertilizers

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Total Aflatoxin in Cassava Products and its Presence after Two Months of Storage

Joylene Hamilton

Cassava and cassava products are part of the staple diet in the indigenous communities of Guyana and not much attention has been given to microbial and toxin contamination of the raw and processed products. In this study, total aflatoxin concentration was tested in fresh and stored cassava products, after 2 months of storage to determine if these were within Codex Alimentarius regulatory limit of 20µg/ kg. Forty (40) farine samples and 20 samples of cassava bread were collected from villages in the North Rupununi District, Region 9 and 20 samples of cassava bread were also collected from Victoria village, East Coast Demerara. A total of eighty samples were ground to do the analysis. Total aflatoxin concentration was

determined by Indirect Competitive Enzyme-linked Immunosorbent Assay (ELISA) at the Guyana Livestock Development and Authority laboratory. Statistix 10 software was used test for significant difference. One sample T-test was used to compare means.

Aflatoxin was not detected in the fresh samples, but all samples had the presence of aflatoxin at a very low concentration after two months of storage at room temperature. Mean concentrations were 0.2288 µg/kg in cassava bread and 0.2954 µg/kg in farine. Aflatoxin levels in cassava bread and farine were considered acceptable and within the recommended limit set by Codex Alimentarius Commission and safe for continued use as food products, especially where storage may be required. The low levels of aflatoxin may be attributed to the fact that cassava products may not a good substrate for aflatoxin biosynthesis and its chemical composition makes it resistance to fungal invasion than crops such as maize**.** Although the moisture content of the dried products was not tested, it is assumed that low levels of moisture in the cassava products may also contribute to the low concentration of Aflatoxin. Based on the results, greater promotion of the consumption of farine and cassava bread in Guyana should be done.

Keywords: Farine, Cassava bread, Indirect Competitive Direct ELISA, Aflatoxin.

An Evaluation of Merlin and Diuron Combination for Pre-emergent Weed Control in Sugarcane *(Saccharum officinarum)*

Osbert Rodney

The sugar industry is losing millions of dollars because of weeds competing with the crops. This study seeks to evaluate the effectiveness of herbicides Merlin and Diuron for pre-emergence weed control in sugarcane. Six treatments were applied consisting of five combinations of herbicide rates of 0.164 Kg Merlin added to 1.1, 1.2, 1.3, 1.4 and 1.5 Kg Diuron, and the control where no herbicide was applied. Each treatment was replicated 4 times. Treatment 3 (0.164 Kg Merlin + 1.3 Kg Diuron) is the current weed rate application used across the sugar estates to control pre-emergent weeds. A plot size of 0.2 ha was used. The trial was set up as a Randomized Complete Block Design. A 1 m^2 quadrant was used to assess the weed density. Emergence of weeds after herbicides applications days after treatment (DAT) and weed types emerging after herbicides applications were the parameters of interest.

The experiment was conducted at Enmore Estate of the Guyana Sugar Corporation, East Coast Demerara.

Broadleaf weeds were the most dominant, followed by Sedges. Weeds such as wild clove *(Herb benedicta*), milk weed (*Asclepias syriaca)* and seed under leaf (*Phyllanthus nirari)* were the most dominant that established in this research. The development of weeds were slow at 28 DAT, while at 56 DAT to 84 DAT there was a drastic increased in the weed density. The density of the weeds increased significantly between 28 DAT to 84 DAT. The control had higher weed growth throughout the period, followed by Treatment 1 (Merlin + 1.1Kg Diuron). The most effective treatment at reducing weed density was Merlin + 1.3 Kg Diuron. Based on the results of this study, Guysuco should continue using the rate of 0.164 kg Merlin + 1.3kg Diuron, as it was proven to be the most effective treatment in reducing weeds.

KEYWORDS: Merlin, Diuron, Weed Density, Herbicide, *Saccharum officinarum*

Evaluation of Pre and Post Emergent Herbicide for Effective Weed Management in Low Irrigated Rice

Jenarine Hardat

The effectiveness of Pre and Post emergent Herbicide in weed management of rice crops was evaluated. The research was laid out in a Randomized Complete Block Design at the rice research station, Burma. Nine (9) treatments were tested: Siperus at 200 g/ha applied 1-2 days after sowing (T1), Siperus at 300 g/ha applied 1-2 days after sowing (T2), Siperus at 200 g/ha applied 5-7 days after sowing (T3), Siperus at 300 g/ha applied 5-7 days after sowing (T4), Cygal at 1.75L/ha applied 15-18 after sowing (T5), Cygal at 2.0 L/ha applied 15-18 after sowing (T6), Cygal at 2.25 L/ha applied 15-18 after sowing (T7), Nominee at 200 g/ha (T8), and the Control (T9). GRDB 12 rice variety was used in this study. Each treatment was replicated four times.

For the control of Schoonard grass, T4 was shown to be better at as a pre- emergent herbicide, and T6 was shown as more effective as a post-emergent herbicide at 28 DAS. At maturity, T3 had better effect on Schoonard as a pre- emergent herbicide, while T6 had better effect on Schoonard as a post-emergent herbicide. Nominee (T8) had better control over Wild Clove,

SoapBush, Water Sedge and Jhussiaa at 28 DAS. Both T4 (Siperus) and T8 (Nominee) showed similar effect on Cyperus while T3 and T8 (Nominee) had better effect on wild clove. Count of weeds at 28 DAS, after application of the post-emergent herbicide Nominee had better effect on Cyperus, SoapBush, and Jhussia. T6 and T8 (Nominee) showed comparable results in controlling Water Sedge. At maturity, T5 and T7 had the better control over Wild Clove. All treatments were good at controlling soap bush weeds both at 28 days and at maturity. All treatments recorded significantly higher plant height and total yields than the control/untreated plots. The untreated plots had the lowest number of tillers and lowest grain weight.

KEYWORDS: Pre-emergent Herbicide, Post-emergent Herbicide, Weed Control, Plant Height, Tiller Count

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An Investigation of the Prevalence of Babesia bigemina in Brangus, Beefmaster, Brahman or Creole Breeds of Cattle in Ebini

Martin Bridglall

Babesia bigemina is a tick-borne protozoan parasite of cattle causing a disease called bovine Babesioses. The *B. bigemina* and *B. bovis* are two major species that affects cattle. Four breeds of cattle (Brahman, Brangus, Beefmaster and the Creole) were tested serologically for the presence of *Babesia bigemina* at Ebini (10 miles off the Berbice River, Region 10). An indirect enzyme-linked Immunosorbent assay (ELISA) procedure using a *Svanovir B. bigemina* AB test kit was used to test blood serum from the subjected animal for the presence of *B. bigemina*. The antibody testing kit has a specificity of 96% and sensitivity of 97.5%.

Majority of the animals tested were within the ages of 2-3 years (n=19), years and the least being between 9-24 months (n=2). A total of forty animals were tested (9 calves, 2 heifers, 27 cows and 2 bulls). The results of the test revealed that 100 % of animals tested negative for antibodies against *B. bigemina*, indicating that these animals are not infected. It is recommended that larger sample size be used for a wider spectrum of results. Based on the results, it can be assumed that the herd health plan is working effectively.

KEYWORDS**:** *Babesia bigemina,* ELISA, Parasite, Antibodies, Cattle

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An Analysis of the Composition and Quality of the Virgin Coconut Oil, Refined Coconut Oil and Standard Cooking Oil (Soya oil).

Terrence Browne

Coconut oil (CO) has generated discussions about its possible effects on health. The research aimed to evaluate the stability of virgin coconut oil (VCO), refined coconut oil and soya oil. The products were purchased and stored at the Institute of Applied Science and Technology (I.A.S.T) Food and Drug lab. A randomized complete block design was used. There were five (5) intervals, three (3) treatments and each was replicated thrice to give a total of forty-five (45) experimental units. An organoleptic test was also done every three weeks of the experimental period. ANOVA was done using Randomized Complete Block Design and LSD procedure was used to compare treatment means. A Confidence Interval of 95% was used.

The results showed that coconut oil is more prone to rancidity. Refined coconut oil had the highest Peroxide value (PV) over the experimental period, followed by the virgin coconut oil. Increases in PV for both types of coconut oil were observed. The virgin coconut oil had the highest fatty acid value, followed by the refined coconut. Increases in Free Fatty Acids were observed for all the oils over time. The soya oil had a higher viscosity. More than half (58%) of the respondents described the virgin coconut oil as having a nutty taste. Half of the respondents indicated that the refined coconut oil had no perceivable taste and the other half indicated that the oil is slightly salty. Soya oil was perceived to have no taste by 88% of the respondents. The aroma of virgin coconut oil was described as a nutty rancid scent by majority of the respondents. Most respondents (96%) indicated that the refined coconut oil had no perceivable aroma. None of the respondents perceived the soya oil to have an aroma. Oils tested should be produced at the same point in time for accurate results.

KEYWORDS: Virgin Coconut oil, Refined Coconut Oil, Soya Oil, Peroxide Value, Free Fatty Acid, Viscosity.

Application of Beeswax & Cassava Starch to Extend the Postharvest life of Mangoes

Tandika Harry

This study evaluated the application of two coatings, under two storage conditions in extending the shelf-life of mangoes. The experimental design was Randomized Complete Block Design (RCBD) with four treatments: (1) beeswax (2) beeswax and cassava starch (3) cassava starch and (4) control; with three replicates for every treatment. The Factorial Design was used in this experiment. Fruits were stored in ambient and refrigerated conditions. Each treatment was replicated thrice. This experiment included the factors of Days, Temperature and Coatings. Over a period of 15 days fruits were analysed every three days. A panel of untrained students conducted organoleptic tests assessing the fruits for taste, flavor and texture. The study was conducted at the Faculty of Agriculture and Forestry Laboratory.

Regardless of treatment, weight loss occurred ranging between 0.5 to 24.3%. The control fruits had the highest percentage of weight loss and beeswax coated fruits had the lowest percentage loss. Overall, the ambient fruits had the greatest colour change. Fruits coated with Beeswax had the highest content of malic acid, followed by fruits coated with the combination of beeswax and cassava starch. Brix content increased for both refrigerated and ambient temperatures up to day 12 and declined by day 15. Control fruits had the highest content of sugar 7.2 to 14.9 and beeswax coated fruits the least ranging from 3.4 to 7.2. The presence of the coatings in ambient and refrigerated temperatures slowed down the physico-chemical changes that occurred during ripening. Refrigerated fruits had a longer shelf life. The beeswax and cassava starch coating extended the shelf and maintained fruit quality.

KEYWORDS: shelf life, edible coatings, beeswax, cassava starch

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Evaluation of the Rancidity of Coconut Oil (*Cocos nucifera. L*) in Quinches

Marissa Smartt

Guyana as a coconut producing country has long been troubled with the stability of coconut (*Cocos nucifera L*.) oil rancidity. The stability of the coconut oil has also reduced the quantity of coconut oil that can be produced at any one time, due to its short storage ability. This research sought to determine whether the use of Butylated hydroxytoluene (BHT) as a

synthetic food antioxidant reduces the rancidity of Coconut oil and the length of time that the rancidity of the Coconut oil in the Quinces is reduced. Laboratory analyses were done at the Faculty of Agriculture and Forestry Laboratory. A Completely Randomized Design with 3 treatments and 4 replicates was used. Three treatments were used: Treatment #1 (0.01g BHT), Treatment # 2 (0.02g BHT) and Treatment 3 (CONTROL). Products were tested every week, for one month, to assess the amount of rancidity. The amount of rancidity was tested using the Peroxide Value method and the Free Fatty Acids method. The results obtained showed that the use of BHT at 0.01% and 0.02% respectively, reduced the rancidity of the Quinches. There were no significant differences in the rancidity using the 0.01% and 0.02% of the BHT. Mean Peroxide Value (mEq) was highest in Treatment 2 (4.5833), followed by Treatment 1(4.2940) and Control (4.000). There was an increase in Free Fatty Acid for all treatments over time. The control had significantly higher mean fatty acid (4.5775), than Treatment 2 (2.6603) and Treatment 1 (1.8667). Therefore, we can conclude that the use of BHT can be used to reduce the rate of rancidity in the coconut oil in the Quinches. This was observed since the first 2 weeks of testing showed a slow but gradual increase in Free fatty acid values.

KEYWORDS: Butylated hydroxytoluene, Coconut Oil. Free Fatty Acid, Rancidity, Peroxide Value

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A Comparative Study on the Effects of Silicon Application on Sugarcane Resistance to *Diatraea spp.*

Joel Patterson

Applications of silicon have been shown to enhance resistance of sugarcane against stalk borers. This study was conducted to determine the effects of silicon application on the sugarcane cultivar (D 9017) and its resistance to *Diatraea spp*. The study was conducted at the Guyana Sugar Corporation Rose Hall Estate East Canje. A Complete Randomised Design (CRD) was used with four treatments each replicated four times. Three rates of Sodium silicate at rates of 20, 25, and 30 fluid ounces/acre were used respectively. Leaf samples from the Top Visible Dewlap (T.V.D) were analysed for silicone content. The number of joints on each stalk and the number of joints showing *Diatraea* borings were counted

The extent of damage by pest did not differ significantly by treatment (P value= 0.3541). The control treatment had a mean damage of 1.8 %, however there were lower levels of damage for the other treatments. Percentage fibre content were similar among treatments (P= 0.1503). Treatment 1 (control) recorded the lowest fibre content of 16.92% whereas treatment 3 recorded the highest fibre content 17.90%. The fibre percent was within the acceptable range of 17-18 percent. Linear Regression Analysis found no relationship between silicon content and fibre (R= 0.000, P value= 0.9872), nor between silicone content and insect damage (R=0.000, P value= 0.7864). During the period of study heavy rainfall may have impacted negatively on the survival of *Diatraea spp*. The results demonstrated that there are no significant differences in the intensity of *Diatraea* holes with changes in Si application rates or in the fibre content of cane stalks. Further research during drier periods should be conducted.

KEYWORDS: Silicon, *Diatraea spp*, Sugarcane, Stalk Borers, Cane Stalks

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Comparing the Efficacy of Different Herbicides in the Control of *Antidesma Ghaesembilla* (Gaertn).

Roy Porter

Antidesma ghesaembilla (Gaertn) an exotic plant which was introduced into Guyana around the late 19th century, is a common weed of sugarcane fields. Chemical control has been shown most successful in reducing Antidesma populations, but only temporarily. This experiment was conducted to determine the effectiveness of two herbicide treatments in the control of Antidesma. The two herbicides used were Ally + 2, 4 - D and Tordon, along with a Control treatment (Untreated plot) against the factors of different timings of application. This research work was conducted at Hope-West field 24 on the East Demerara Estate, East Coast Demerara. A factorial treatment arranged in a Randomized Complete Block Design (RCBD) was used to carry out this experiment. This experiment consisted of a total of thirty-six (36) plots. The variety being grown in the field was DB 7869. Herbicide Applications were carried out AT weeks 2, 4 and 6. Observations was carried out at 7, 14, 21, 28, 35, 42 and 49 days after treatment (DAT) respectively. Phytotoxic effects were identified using visual

assessments, and the efficacy was determined using a European based efficacy scale or system of weed control and evaluation.

All the treatments, except the untreated control had phytotoxic effects on the Antidesma shoot tips. The Antidesma plants in the control plots had an average height of 85.3 cm after 49 days. Plant height in T2 was 33.3 cm and T3 was 35.2 cm. Statistically, there was no significant differences among the treatments. Both treatments showed the highest efficacy, 35 days after herbicide application. Total phytotoxic effects on the stems and, shoot tips and leaves were observed until about 42 days after treatment. At 49 days after treatment side shooting and root suckering were observed on some of the weeds. It was deduced that both the herbicide treatments resulted in at least 80% overall control. The Tordon treatments were marginally more effective than the 2,4-D + Ally treatments and more effective, with a cost 50% less than Tordon. It was observed that the earlier application of herbicide may more likely result in greater sugarcane yields.

KEYWORDS: *Antidesma ghesaembilla,* Phytotoxic, Herbicide*,* Tordon, Ally, 2,4-D

Cattle Production in Regions Five and Six: A Situational Analysis of Production Practices and Farmers Adoption of Services Offered by the Guyana Livestock Development Authority.

Denel Hamilton

This study was conducted in Mahaica-Berbice (Region Five) and East Berbice-Corentyne (Region Six) to assess cattle farmers' awareness and use of improved services offered by the Guyana Livestock Development Authority (G.L.D.A.). Information was collected through on-site interviews and questionnaires. Forty-two (42) farmers from Region Five and Sixty (53) from Region Six were surveyed. Response rate was over 90% percent.

There were more male respondents in each Region 5 and Region 6 (90% and 77%, respectively). In both regions, farmers aged 51-60 years were the largest group of respondents closely followed by farmers 61 and over. Region's Five highest educational level was primary and Region's Six at the secondary level. Record keeping by farmers is deficient in both Regions with only 65% in Region 5 and 85% in Region 6 engaging in record keeping.

Over 60% of cattle farmers were aware of the services, except for the Quarantine service. The highest level of awareness was for Artificial Insemination followed by Animal Registration. In Region 6 not many farmers were aware of Farmer Cooperatives, and in Region 5 the lowest awareness was for Quarantine Inspection. The most common services used were Artificial Insemination and Inspection of live animals and Slaughter facility. Over 80% of farmers in Region 5 have already used the AI Service, compared to only 55% in Region 6. The least used services were Quarantine Treatment and issuance of Inter-Regional Health Certificate and Formation of Farmer Cooperatives and Development of Farm Plans/Proposals. More farmer indicated that they were extremely likely to utilize any future services GLDA may offer. Based on findings, some farmers do not utilize GLDA's services due to personal choice, lack of knowledge/awareness, bad experiences with GLDA. There is need for improvement of the level of services offered, increased awareness of services offered, as well as record keeping.

KEYWORDS: GLDA, Extension, Awareness, Farmer Education, Knowledge

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Evaluation of Plant Extracts versus Synthetic Fungicides against *Fusarium Oxysporum F. Sp. Lycopersici,* Wilt Pathogen of Tomatoes

Kwame Goodluck

Fusarium wilt is an important disease of the tomato crop which causes significant reduction in yield. *In vitro* tests of aqueous extracts of three plants and two synthetic chemicals were done using the poisoned food technique. Treatments used were Breadfruit (*Astocarpus altilis*), Neem (*Azadirachta indica*), Pear (*Pyrus*), Serenade, Bellis and Control. Six treatments were replicated 3 times *(in vitro)* at three percentage concentrations of 4.16, 8.33, and 12.5. Empirical observations (24 plants) were made of one replica each at percentage concentrations of 10, 15, 20 and 25. *Fusarium oxysporum f. sp*. *lycopersici* was isolated from the infected roots of wilted tomato plants showing fungal wilt symptoms. The measurement of disease intensity was taken after 21 days. The disease severity was recorded by using a 0-4 scale, with 0 representing no severity, and 4 representing complete severity.

All the extracts inhibited mycellial growth at various levels in the *in vitro* test at different concentrations. Fresh neem and breadfruit leaf extracts inhibited mycelial growth at all

concentrations (10%, 15%, 20%, 25%) in pots. An inhibition of 82.67 % was recorded for plates in which neem was added. Breadfruit recorded a 78.63% inhibition. It is assumed that the high rate of growth inhibition may be due to the milky latex contained in Breadfruit, which has significant anti-fungal properties. During the empirical study it was observed that neem and breadfruit had zero severity at all concentrations. Pear recorded zero severity at 20 and 25 percent relative concentrations while serenade recorded the same at 25 percent only. Bellis 10% concentration showed the highest severity rating, followed by Serenade at 10% concentration and Bellis at 15% concentration. Serenade inhibited mycelial growth by 76%. Bellis at its recommended dosage had a range 68-70% healthy plants. Inhibition increased as relative concentration increased in the *in vitro* test. Preliminary results show that plant extracts are good at inhibiting growth of Fusarium wilt in the short-term in vitro trials. However, further trials which should run for the life cycle of the crop should be done.

KEYWORDS: Fusarium wilt, mycelial, *In- vitro*, *Astocarpus altilis, Azadirachta indica, Pyrus,* Breadfruit, Neem

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A Situational Analysis of Sheep and Goat Production in Region # 5

Corwin D'anjou

The situational analysis of sheep and goat production in Guyana is very important to the development and progression of the sheep and goat industry. A survey was conducted using structured questionnaires of small ruminant farmers in the West Berbice Area. Farmers were randomly selected, and the survey was completed in the form of an on-farm interview. The questionnaire comprised of four sections that collected information on (1) farmers' profile, (2) production parameters and issues, (3) marketing and related issues & (4) sector analysis. A total of eighty-five (85) questionnaires were completed.

Most farmers were unable in accessing open pastures for grazing their animals. Only 21% farmers have access to pastures. Animals are allowed to graze unsupervised on the natural swards, along dams and roadways creating the problem of rustling/ larceny of animals. Symptoms of foot rot were evident on 19% of the farms and was a problem affecting 53% of farmers. This condition prevailed mostly during the inclement weather period. Formalin, and screw worm spray, and Jeyes fluid and waste oil were commonly used treatments to control

foot rot, while a very small number of framers use veterinary services. Majority of farmers (95%) practice deworming of animals on a quarterly period, or once every 3 months. Twenty (20) respondents said that the marketing sector for small ruminants was now developing, while a small number (4) felt that the small ruminant sector lacked the necessary markets. Sixteen (16) respondents were satisfied with the sector and its progression. Even though many of the farmers complain that they need services, thirty (30) were not able to identify specific needs. The GLDA can use this information to plan strategies for their work programme especially for their farmer field school training activities.

KEYWORDS: Small Ruminants, Foot Rot, Husbandry Practices, Disease Management, Sheep, Goat

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A Preliminary Investigation of Triple Doses of Aged and Double Doses of Fresh Semen on Conception Rates, Farrowing Rates and Litter Sizes in Artificially Inseminated Gilts

Jamila Morgan

The study compared reproductive performance of gilts inseminated with aged semen to gilts double inseminated with fresh semen. The study was conducted at the Swine Association of Guyana Farm, East Coast Demerara. Forty Topig-40 gilts were synchronized and thirty of these were chosen for the research. Gilts were synchronized by using Matrix^{TM} (Altrenogest) at 6.8 ml/gilt/day for 14 days. Semen imported from Suriname Pig Farm was evaluated upon arrival and daily using the Sperm Vision Production software, to monitor the progressive motility as the semen aged. Gilts detected in estrus 4 -6 days after synchronization were inseminated thrice with aged semen (4 – 6 day old semen), while those detected in estrus 6-9 days after synchronization were inseminated twice with fresh semen (2 - 3 day old semen).

The conception rate, farrowing rate and litter size for the gilts inseminated thrice with aged semen did not significantly differ from those inseminated twice with aged semen (*P*= 0.4744, *P*= 0.6309 and *P*= 0.7279, respectively). There was a significant reduction in the progressive motility of the semen as the storage period increased (P= 0.0020). Longer storage time decrease progressive motility of the semen (r^2=-0.9858), and lowered conception rate (r^2= -0.6510). Farrowing rates declined as the semen aged. This may be largely due to abortions, since 18% of the animals which conceived had aborted. Average birth weight declined with

litter size. The study proved that that double insemination with fresh semen and triple insemination with aged semen of gilts would yield statistically similar results for the reproductive parameters, however, better results were obtained with fresh semen.

KEYWORDS: Aged semen, Conception rate, Double insemination, Triple insemination, Estrus, Farrowing rate, Fresh semen, Litter size, Progressive motility, Synchronization, Semen age.

The Prospects for Adoption of Information Communication Technology (ICT) Methods for Improved Rice Production in Guyana: A Survey of Region Five Rice Farmers

Ravindra Singh

The aim of the study was to ascertain the possibility for the adoption of Information Communication Technology (ICT) methods for improved rice production in Guyana. A survey of rice farmers in Region 5 was conducted. Three hundred questionnaires (300) were completed by randomly selected farmers in Region 5. The survey identified the frequency and timeliness in which rice farmers received agricultural information, their information sources, and their preferred means of transmitting agricultural information. Inquiries were also made to determine whether farmers were up to date with the present communication technologies.

The research revealed information received by farmers were untimely. Most farmers received information through extension staff visits, followed by information shared by other farmers and most of the farmers still preferred to obtain information through extension staff visits. A fair amount of the farmers in the younger age group between the ages of 20-39 years and a few farmers between the age group of 40-59 years are prepared to utilize ICT methods for the dissemination of agricultural information. A small number of farmers over 60 years were prepared to adopt ICT methods. The younger generation farmers between the age groups of 20-39 years and 40-59 years were up to date with the present communication technologies. The major constraint that farmers faced was the knowledge on use of modern-day technology. Based on the findings of the research, it is recommended that the different age groups of farmers should be taken into consideration if ICT is to be implemented. To get more farmers to adopt ICT methods, farmers need to see the methods in use and its results to become aware of the role ICT can play in improving their farming system.

KEYWORDS: ICT methods, Communication, Technology, Dissemination, Agriculture Extension

The Response of Tomato (*Lycopersicon esculentum*) to Organic and Inorganic Farming Practices

Adriana Wellington

This study was conducted in Guyana at the National Agriculture Research and Extension Institute and compared the response of tomato (*Lycopersicon esculentum* var Mongol F1) to organic (Inno- Care, I- Surge, I-Boost, Wholesome and Grow-care) and inorganic (N.P.K 10:20:20, Nurish, Carbendazim, Caprid, Abamectin) Farming Practices. The experimental treatments consisted of the inorganic (T_1), organic (T_2) and control (T_3) which was replicated three (3) times, laid out in a Completely Randomized Design (CRD). Data from the experiment were collected on days to 50% flowering, the height of plants at flowering stage, number of flowers, number of lateral branches and effective pest control. The data were analyzed using the analysis of variance at a 95% confidence interval to compare the significant means among the treatments.

The inorganic treatment had better results when compared to the organic treatment. Average days to 50% flowering were significantly shorter with the inorganic fertilizers (27 days) compared to the organic fertilizer which took 33 days and control which took 41 days (P=0.0000). Plants in the inorganic fertilizer treatment were taller at flowering stage (87 cm), followed by the organic fertilizers (72 cm). The number of lateral branches were significantly higher for inorganic fertilizer. The organic fertilizer and the control had similar results for branch production. The fertilizer treatments showed similar flowering capability. The inorganic fertilizer had the significantly greater effectiveness in pest control, while the organic fertilizer and control treatment had similar effect on pest control. The inorganic treatment had a better vegetative performance and was more effective in controlling pest in comparison to the organic treatment.

KEYWORDS: Organic Farming, Inorganic Farming, Tomato

Oil Extraction from *Morinda Citrifolia* (Noni) Seed and its Application in the Production of Soap

Patricia Haynes

Noni (*Morinda citrifolia*) is grown in the tropics and the flesh is extracted for making medicines, dyes and cosmetics. In this study, oil was extracted from the fruit seeds via the solvent extraction process with the main aim of producing soap. Statistix 10 Software was used in data analysis. ANOVA was used to compare treatment means at a 95% Confidence Interval. This project was conducted at the University of Guyana Faculty of Agriculture and Forestry Laboratory.

The solvent extraction method recovered almost all the oils, leaving behind only about 0.5% to 0.7% residual oil in raw materials. In the case of mechanical pressing the residual oil left on the oil cake may be anywhere from 6% to 14%**.** An oil yield of 32g was produced and later added to a soap synthesis procedure. The safety of the soap was assessed by conducting an antimicrobial analysis using disc diffusion antibiotic sensitivity testing. The organisms tested against different soap concentrations were *E. coli, S. aureus* and *K. puemoniae*. Among the three (3) bacteria, *K. puemoniae* was less sensitive to the soap solution at the various concentrations. *E. coli* was the second most sensitive bacteria. However, *S. aureus* growth inhibition on the soap concentration was the most sensitive. There were no significant differences among concentrations of the three organisms (P = 0.000). Some physical characteristics of the soap were examined such as the Potential Hydrogen (pH) value which was determined at 10 after the soap synthesis procedure was completed to ensure the product is safe on the skin and up to marketing standards. This study showed that Noni soap was successfully produced from Noni seed oil, and proven to have antimicrobial properties and is safe to use on the skin since it is slightly alkaline.

KEYWORDS: Noni *Morinda citrifolia*, medicines, cosmetics, antimicrobial analyses.

A Comparative Analyses of Two Micro Propagation Protocols for The Rapid Regeneration of Sweet Potato (*Ipomoea batatas* (L.) Lam.) Accessions *in vitro*

Kimanda Pilgrim

A study was conducted to compare two protocols for sterilization of sweet potato clonal material for rapid regeneration (in vitro). The National Agriculture Research Extension Institute (NAREI) and University of Arkansas Pine-bluff (UAPB) protocols were utilized in this study. These protocols consisted of different preparation techniques such as preparation of material, percentage of sucrose and sodium hypochlorite solution concentrations, number of rinses and media composition. Nodal culture of six potato accessions namely Amjad, Strongman, and Voila which were local accession and exotic accessions namely PB18, PB19 and PB21 were all utilized in both protocols. Parameters of interest such as level of contamination, types of contamination, survival rate, number of roots, number of shoots, plant height, number of nodes (Rapid Regeneration) and number of leaves were measured.

The UAPB protocol resulted in higher levels of contamination (39%) compared to the NAREI protocol (33.3%). Major contaminates found were fungi strains of Aspergillus *flavus* and *Pencillium myotoxins* and bacterial strains of *Bacillus cerus* and *Chrysogenum*. NAREI protocol registered a higher number of nodes (n= 8.3, P=0.0057). Though not significant, the UAPB protocol produced a higher number of mean shoots (P=0.2899). Amjad and PB18 had the highest number of shoots with 16 shoots with the NAREI protocol. The UAPB protocol had the higher mean plant height of 6.8 cm compared to NAREI protocol with 5.2 cm, though not significantly different. The number of roots were slightly higher in the UAPB protocol, as a result of the higher levels of auxins. Strongman produced the highest number of roots from the UAPB protocol and viola produced the lowest with the NAREI protocol. In addition, results revealed that the NAREI protocol showed higher ratio of rapid regeneration. Higher regeneration from the NAREI can be attributed to the multiple processes of sterilization techniques used in this protocol. Therefore, the NAREI protocol should be used for the regeneration of both local and exotic sweet potato explants. The UAPB protocol performed comparably to the local protocol and can be adopted locally with amendments.

KEYWORDS: Sterilization, Sweet Potato, Clonal Material, Protocol, Rapid Regeneration

Evaluation of the Morphological Characteristics of Local Sweet Potato Landraces from Region #2, Essequibo Coast

Marvin Ragunauth

Sweet Potato "*Ipomoea batats*" is a widely cultivated food plant native to tropical America. It is the world's seventh food crop because of its versatility. Sweet potatoes are being cultivated on the Essequibo Coast in very moderate to low quantity. As such, there is expected to be low diversity. This research entailed the collection of ten (10) accessions of sweet potatoes from the Essequibo Coast for the evaluation of their morphology and diversity. The experimental layout was a Completely Randomized Experiment with 10 accessions and five replications. Slips each of the accessions were prepared and planted at the National Agricultural Research and Extension Institute Farm. The soil type was loamy clay. Each slip was planted 0.3 m apart. Three replications per accession were evaluated. Twenty-three (23) morphological characteristics were evaluated using the CIP descriptor list. The CIP scores for all the parameters of interest were organized and entered into the cladistics software to produce a strict consensus tree which identify accessions that are similar and those that may be diverse. From the strict consensus tree generated, it was founded that there were duplicates among the accessions. The branches were formed by different nodes that grouped the characters. Accessions 1,2,4,5 and 9 were considered distinct. Two groups of duplicates among accessions were observed. Accessions 3, 6 and 7 were duplicates of one group, while Accessions 8 and 10 were duplicates of another group. Accessions 1,2 and 4 had shorter growing periods and higher yield. However, further agronomic analysis should be done on all accessions.

KEYWORDS: Morphological Characteristics, Sweet Potatoes Diversity, Cladistics, Consensus Tree, GP Descriptors

A Comparison of the Growth Parameters, Dry Matter Content and Yield of Five Local Sweet Potato Accessions

Joshua Ferreira

A field experiment was conducted to compare growth, dry matter content and yields of five sweet potato accessions collected from various farmers along the Coast of Guyana. Slips of accessions were planted at the National Agricultural Research and Extension Institute Farm. The soil type was loamy clay. The experiment was laid out using the Completely Randomized Design (CRD) with slips of five sweet potato accessions replicated three times. Five plants per replicate were used. The three inner plants of every replicate were to obtain data. Forty-five plants were utilized for data collection. Eighteen growth parameters were measured. Four (4) of the growth characteristics were found to be similar. Ground cover, immature leaf colour, tuber shape, and tuber surface defects were found to be similar. Plant Type A was significantly longer than Plant Type C. Tubers of Accession 1 were significantly longer (P=0.0099). Accessions 2 and 5 had significantly smaller mature leaf sizes. Accession 1 had larger vine internode diameter, while Accession 2 and 5 had significantly shorter Petiole length (P<0.0000). Tuber diameters of Accessions 4 and 5 were significantly smaller than the other Accessions (P=0.0152). The number of tubers were significantly higher in Accessions 1 and 4 compared to the other Accessions. Accession 4 produced that largest yield with a total weight of tuber at 3.6lbs and weight of marketable tubers of 0.8lbs. Dry matter content was highest in Accession 1 (36%) followed by Accession 2 (31%), Accession 4 (29%), Accession 3 (27%) and Accession 5 (26%). There were significant differences in growth parameters, dry matter content and yields of the five accessions. Immature leaf colours were green with a purple edge, tuber shapes and surface defects were long irregular or curved and horizontal restrictions respectively.

KEYWORDS: Growth Parameters, Dry Matter Content, Yields, Sweet Potato, Descriptors, Accessions

An Evaluation of Organic Soil Amendments for the Enhancement of Productivity of the Kairuni Loamy Sands

Orwin Hermanstein

Biochar, produced from waste biomass can be used as a soil amendment. Vinasse, a by-product alcohol and sugar production is used to improve soil and substitutes for inorganic phosphorus and potassium fertilizers. This pot study evaluated the use of vinasse, biochar and an inorganic fertilizer and combinations to enhance infertile soils for tomato production. The study was conducted at the Faculty of Agriculture and Forestry Research Station, University of Guyana. Biochar was made from greenheart wood (*Chlorocardium rodiei*). NPK 10-20-20 fertilizer was the selected inorganic fertilizer used in this study. Seven (7) treatments were used with three (3) replicates, with each replicate having five (5) plants. The treatments were Vinasse at 0.5 L/day every other day, Biochar at 150g/plant, 10-20-20 fertilizer at 400kg/ha, Biochar (150g/plant) and inorganic fertilizer (400kg/ha), vinasse (0.5 L/plant) and inorganic fertilizer (400kg/ha), vinasse (0.5 L/plant) and biochar (150g/plant). The experiment used Kairuni Loamy Sand. Biochar was applied at a rate of 150 g/ha and the Vinasse at 0.5 L every other day. Biochar and the inorganic fertilizer were applied prior to transplanting.

The incorporation of biochar in soil had a positive effect compared to the inorganic fertilizer and vinasse. The treatment with vinasse and biochar combined showed the best improvement by significantly decreasing the number of days to 50% flowering and fruiting to 39 days (P=0.0000). Days to 50% fruiting decreased by 9 days for the biochar and vinasse treatment compared to the vinasse alone. Vinasse and the control treatment showed similarities in days to 50% fruiting and the average number of flowers produced. Biochar and vinasee combined increased soil P, Ca, Mg. The pH did not differ among the other treatments. All plants treated with a combination of vinasse and inorganic fertilizer died. Therefore, this study could be repeated to consider the application of vinasse in combination with inorganic fertilizer as a top dressing in the growing of crops. Results of this study are limited to pot applications.

KEYWORDS: Biochar, Vinasse, Fertilizer, Soil Amendment

The Effect of Two Fungicides on the Control of *Alternaria solani* in Boulanger (*Solanum melongena*)

Andre Burke

This study sought to obtain information on early identification of blight along with the effect of using two fungicide to control *Alternaria solani* in crops of the Solanaceae family. The experiment utilized Bellis and Carbendazim at different rates applied to the crops. The experiment used seven treatments replicated three times using the Completely Randomized Design (CRD). Ten (10) plants were used per treatment and seventy (70) plants per replicate. The Pink and White Variety of Boulanger was used. Bellis was used at rates of 0.5, 1.0, and 1.5g/L, while Carbendazim was applied at rates of 2.0ml/3.8L, 3.0ml/3.8L and 4.0ml/3.8L. The rates used were at the rates recommended for the fungicide, above the recommended rates and below the recommended rates of application. The control consisted of no application of fungicide. The research was conducted in Central Mahaicony River, East Coast Demerara (Region 5), where the soil is predominantly clay.

The results varied across the weeks with regards to average number of infected leaves per plant. Plants treated with the Bellis at 0.5g/L and the Carbendazim at 4.0ml/3.8L had lower number of leaves after three (3) weeks (p=0.0981). All other treatments had an average of 8.5 leaves per plant. At week four (4) Bellis applied at 1.0g/L performed the best. At week five (5), Bellis at rates of 1.0 and 0.5 g/L showed similar performance, in that it reduced the number of infected leaves (n=31) compared to the other treatments. At week six (6) the Bellis applied at rates of 1.0g/L and 1.5g/L performed better in terms of effectiveness in controlling the fungus on the plants and fruit yield. The results of this study showed that all treatments, except the control treatment showed effectiveness in controlling the fungus on the fruit. Bellis at 1.0g/L and 1.5g/L on average performed better in reducing early blight, as well as in yield. The use of Bellis can therefore be recommended over Carbendazim to treat and control early blight.

KEYWORDS: Bellis, Carbedazim, *Alternaria solani*, *Solanum melongena*, Fungicide

Evaluation of Reproductive Parameters of Does Artificially Inseminated with Differently Processed Semen

Zena DeFreitas

An appropriate method of semen preparation is essential for the increased and sustainable performance in Artificial Insemination of goats. The processing of frozen/thawed semen is expensive, therefore alternative methods must be implemented for the substitution of the frozen/thawed semen method to overcome the problems associated with conception rates and number of does giving birth.

As a result, an experiment was conducted to find a suitable method of semen preparation which is efficient and could give an acceptable conception rate and number of does giving birth. This experiment was done using heat synchronized does and three treatments were used. The treatments were as followings; (T1): The control which is freshly diluted semen, (T2): diluted, cool and stored semen and (T3): frozen/thawed semen. The conception rate at 21 and 60 days were observed in the treatments. Evaluations were done by monitoring the weight gains, conception rates and kidding percentages.

The results showed that the freshly diluted semen gave the highest performance for all the evaluated reproductive parameters. The effect of using differently processed semen to artificially inseminate does was statistically significant ($P>0.05$). The freshly diluted semen gave the highest conception rate at days 21 and 60, followed by the diluted, cooled and stored method. Frozen/thawed semen performed poorly with a conception rate @ day 21 of 50%, conception rate @ day 60 of 40%. Frozen/thawed semen had a kidding rate of 40%. Using freshly diluted semen may be considered as a good method of semen preparation in relation to conception rates and number of does giving birth. Therefore, the use of freshly diluted semen for the purpose of artificial insemination in goats is encouraged. Further, there is a need for further research into the different semen methods that can be used to enhance reproductive and productive parameters.

KEYWORDS: Artificial Insemination, Semen, Does, Conception Rate, Kidding Rate, Semen Preparation

An Investigation of the Effects of Organic Substrates (Garlic & Pepper Extract) on the Control of Diamondback Moth in Cabbage

Leroy Bobb

The aim was to compare two botanical extracts with a commercial insecticide in controlling diamondback moth in cabbage. This insect tends to build up resistance to pesticides causing farmers to overuse pesticides which can lead to environmental contamination. Diamondback Moth has been cited as problematic in Ruby Area, Region 3 area where cabbage is cultivated, and pesticide use is heavy. The experiment used four treatments and three replicates using the Completely Randomized Design. Treatments were Control, Chemical [Movento], garlic and pepper. Inorganic mixed fertiliser was used at the rate of 2.4g/plant, at one and four weeks after planting. Rates of extract for the garlic and pepper were 1 extract: 2 water, and 1 extract: 14 water, respectively. This field experiment was conducted in Ruby Backdam, Essequibo Island West Demerara.

There were no significant differences among the treatments for the number of diamondback larva before and after spraying, and the number of plants damaged ($P>0.05$). The control and garlic treatments had the highest number of larvae, while Chemical (Movento) had the lowest. While the control treatment had the highest number of damaged plants, and pepper had the lowest number of plants damaged there were no significant differences in the number of plants damaged per treatment. In Movento and Control plants that were infected were much higher when compared to the organic extracts (garlic & pepper) which had the least amount damage. There was heavy rainfall during the period of the experiment, the effect of these treatments may have been influenced by the weather. This study should be repeated during drier conditions.

KEYWORDS: Movento, Organic Extracts, Cabbage, Diamondback Moth, Garlic Extract, Pepper Extract

An Evaluation of Aquaponics Systems Utilizing the Effluent Water from Fish Tank to Grow Lettuce

Fred Roches

This research evaluated the growth of lettuce (*L. sativa* cv. Minotte) using effluent water from fish tank stocked at different densities in an aquaponics system. Four treatments representing different stocking densities of tilapia were used. The stocking densities of fish were (T1) 25, (T2) 50, (T3) 75 and (T4) 100. Fish were fed tilapia diet manufactured by the Trinidad National Flour Mills Ltd. The experiment utilized a biological trickling filtration unit. Ammonium, nitrite and nitrate levels were monitored twice weekly. Data was collected over a four-week period.

Average pH values for all treatments ranged between 7.3 to 7.6 in week 1 and 7.1 to 7.4 in week 4. The highest stocking density (T4), which had the highest pH values for most of the period pH decreased over time. Dissolved oxygen was highest in the tank with the lowest stocking density (T1). Overall, fish growth was highest in T2 and lowest in T4. Except for T1, which showed a steep increase in growth, all other treatment showed steady growth. Ammonia level was significantly higher in the treatment with the highest stocking density (T4) which indicated more waste being produced. Nitrate levels were similar among treatments. Significant differences were found among treatments for leaf wet weight (P=0.0006) and leaf dry weight (P=0.0343), with T4, having the highest wet and dry leaf weight. All other treatments were similar. Number of leaves was highest in T4 followed by T3. Leaf length was similar in T1 and T4. Overall, the treatment with the highest stocking density performed superior compared to the other treatments in the production of lettuce, but not in growth of fish.

KEYWORDS: *L. sativa* cv. Minotte, Tilapia, Stocking Density, Nitrate, Ammonia

An Assessment of the Different Concentrations of Botanical Extracts for the Management of Red Palm Mite (RPM) *(Raoiella Indica* Hirst) on Coconut Palms (*Cocos Nucifera* L) Under Laboratory Conditions

Andrea Charles

Coconut industry has been deemed as a national priority but it's being plagued by Red Palm Mite *(Raoiella indica* Hirst). The use of botanicals offers promise for the control of Red Palm Mite (RPM), however, the determination of their efficacy by using different concentrations is necessary. In this study, a laboratory experiment was conducted to assess the effectiveness of extracts of soyabean oil, castor oil, aloe vera, crab oil and Tulsi, at different concentrations (6%, 9% & 12%) in a 3 x 6 factorial experiment for the management of RPM. In each treatment, there was one control group. The experiment was conducted at the National Agriculture Research and Extension Institute, Mon Repos East Coast Demerara. Pieces of leaves 8 cm in size were placed in the different concentrations of botanical extracts for 5 minutes, placed on a petri dish and afterwards inoculated with 30 female mites. Red palm mites (RPM) were obtained from the National Agriculture Research and Extension Institute crop farm.

Red palm mite mortality was recorded at 24 hours, 48 hours & 72 hours intervals. All the treatments did well in comparison to the control. *Aloe vera* and crab oil reduced RPM by 91% and 90%, respectively. Soybean oil and Tulsi acquired the lowest mortality rate. The highest mortality was achieved at concentration of 12% for all botanical treatments, however, this was not statistically different from the 9% concentration. Soybean oil and *Aloe vera* oil at 9 % concentrations did acceptably well. It was observed that the greatest mortality was observed at 48 hours and 72 hours. The botanicals also showed repellent activity on RPM, as well. Field trials should be further undertaken to authenticate the results of this laboratory trial.

KEYWORDS: Botanicals, Red palm mite, Crab oil, Aloe vera, botanical concentration

Response of Three Rice Varieties to Slow-release and Conventional Nitrogen Fertilizer

Gangadai Dindayal

This study assessed the growth and yield response of three local rice varieties to a slow release N fertilizer (coated urea) and conventional N fertilizer. The treatments used were Conventional Urea applied at rates of 50, 75, 100 KgN/ha at 18-21 Days after Sowing, and Coated Urea applied at rates of 50, 75, 100 KgN/ha at 18-21 Days after Sowing. Each treatment had a control treatment where no nitrogen was applied. Data were collected on growth and yield parameters. This research used a Split-Plot Experimental Design where the main plot comprised of three rice varieties (GRDB 14, GRDB 10 and FG12-49) and the sub plot comprised of conventional and coated urea at three rates. These treatments were laid out on a plot size of 5m × 4m.

The fertilizers did not significantly influence the growth parameters and the yield parameters of filled and unfilled grains, 1000-grain weight, harvest index and the milling yield parameters. In relation to the grain yield obtained, there were significant differences among the varieties and N rates and sources. At a rate of 100 Kg N/ha conventional urea the highest yield (7443.20 Kg ha^{-1}) was obtained, and this was similar to the treatment of 75 Kg N/ha conventional urea with a yield of 7239.30 Kg ha^{-1}. For the slow-release nitrogen fertilizer (SRNF), 100 Kg N/ha was the highest yielding (6945.70 Kg ha^{-1}), which was on par with the yield of the 50 Kg N/ha conventional urea treatment (7082.70 Kg ha^{-1}). The highest yielding variety was GRDB 14 and the lowest was GRDB 10. In relation to the N levels and sources, the lowest yield was obtained from the 50 Kg N ha^{-1} SRNF treatment. The fertilizer applications influenced chalkiness of the rice varieties, but highest percent chalkiness obtained (1.6) was acceptable. The urea treatments produced better yield as compared to the SRNF treatments. In conclusion, SRNF does not result in a significant enough increase in the overall yield to compensate for its overall increase in cost.

KEYWORDS: Slow Release Nitrogen, Plant height, Panicle, Tillers, Grain Yield

Investigating the Antioxidant Content of Sweet Pepper (*Capsicum annuum* L) in Response to Fertilizers

Taseka Blair

A pot experiment was conducted to compare the vegetative performance, yield performance and antioxidant content of *Capsicum Annuum* L. (Sweet pepper) in response to organic, inorganic and bio-organic fertilisers. The three fertilizers were cow manure compost (5% N: 3% P2O5:1% K2O), inorganic (NPK; 12% N, 24%P, 12%K) and Inno-care bio-organic fertilizer (50% *Lactobacillus acidophilus* and 50% *Saccharomyces cerevisiae*). A control treatment was used. The treatments were set up in a completely randomized design, with four (4) treatments, each having three (3) replicates. Inorganic fertilizers were applied by the basal application method at weeks two (2), four (4) and six (6) after transplanting at equivalent rates of 221 kg/ha. Cow manure compost was mixed thoroughly incorporated two (2) weeks before transplanting at the rate of 0.28 kg per each replicate. Bio-organic fertilizer (Inno-care) Inno-care bio-fertilizer solution was applied to the roots of seedlings using a root dipped method, at transplanting, then once after two (2), five (5) and eight (8) weeks after transplanting at the level of 10ml /plant at concentration 109 cell/ml.

The green mature sweet peppers were harvested from the respective treatments and were tested for the different secondary metabolites. Days to flowering was significantly shorter with the Inorganic fertilizers (29 days) than the other treatments. The Control took the longest time to flowering (70 days). Plant heights were significantly different among treatments (P=0.000), but similarities with the Organic fertilizer (36.88 cm) and Bio-fertilizer (42.11 cm) were observed. Total yields were similar among fertilizer treatments with the Inorganic fertilizer giving highest total yield (55.24 g), followed by the Bio-fertilizer (51 g) and the organic fertilizer (42.50 g). Total Flavanoid content was highest in the organic fertilizer treatment (29.02 mgQE/100gFW). Total Phenolic content was significantly different among the treatments. Organic fertilizer produced the highest total Phenolic content (60.49 mg/GAF/100g). Total Cartenoid was lowest in the Inorganic fertilizers tretament (0.003 mg/g) and highest in the organic fertilizer treatment (0.04 mg/g).

The Inorganic fertilizer treatment gave better results for all growth and reproductive performances compared to the other treatments. Total carotenoid content (TCC), total

flavonoid content (TFC) and total phenolic content (TPC) were higher as a result of the organic fertilizer treatment. The results indicated that there is an excellent potential of enhancing antioxidant compounds of sweet pepper for economic production using organic fertilization, for these two treatments resulted in increased antioxidant constituents.

KEYWORDS: Phenolic, Flavonoids, Carotenoids, Bio fertilizer, Antioxidant, Metabolites

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Efficacy of *Saccharomyces Cerevisiae* Cell Walls (SCIW) In Reducing the Toxic Effects of Aflatoxin B_1 in Broilers Fed Dietary Treatments from Hatch to Day Twenty-One

Madainey Humphrey

The aim of the present study was to evaluate the efficacy of *Saccharomyces cerevisiae* cell walls (SCIW) at dietary concentrations of 0, 0.1%, and 0.15 % in ameliorating the deleterious effects of 2 mg aflatoxin B_1 (AFB_1) /kg of feed in broilers fed dietary treatments from hatch to day 21. The SCIW was obtained from ICC Brazil, a yeast by-product manufacturing company) in Brazil which utilized the yeast extracts from local sugarcane processing. A total of one hundred and twenty Ross broilers five days old were purchased from a commercial hatchery, wing-banded, weighed (individually), and placed into chick batteries in a temperature and humidity-controlled room, and allowed *adlibitum* access to feed and water. A Completely Randomized Design (CRD) was used, comprising five (5) dietary treatments (each with 5 birds per replicate, and 5 replicates per treatment). Dietary treatments were assigned as follows: T1) Basal Diet (BD) – containing no SCIW or AFB_1, which was the positive control (PC); T2) BD plus 0.15% SCIW and 0 AFB_1; T3) BD plus 2 mg AFB_1 /kg of feed and 0% SICW, which was the negative control (NC); T4) BD plus 0.1 % SCIW and 2 mg AFB_1 /kg of feed; and T5) BD plus 0.15 % SCIW and 2 mg AFB_1 /kg of feed.

Mortalities were recorded and necropsied as they occurred. On day 22, birds were weighed by pen, feed intake determined by pen, and feed conversion calculated. Following weighing, birds were anesthetized with carbon dioxide, killed by cervical dislocation, and bled via cardiac puncture to collect blood samples for serum biochemistry analysis. Livers were removed from 3 birds per pen and weighed. Toe samples (middle toes from both feet) were also collected from each bird for determination of toe ash. Liver samples were also grossly evaluated, and sub samples of livers were collected for histopathology analysis. There were

no significant differences among treatments for body weight gain (BWG), feed intake (FI) or feed conversion (FC) (P> 0.05). Aspartate amino transferase in birds fed 0.1% SCIW +AFB_1 increased. There was a decrease from elevated values back to values observed for the PC diet in birds fed 0.15% SCIW+ AFB_1 (P< 0.05). Increased liver size decreased in birds fed 0.1% SCIW+ AFB_1 when compared to the NC diet, indicating a strong binding affinity of SCIW to AFB_1(P< 0.05). Treatments 4 and 5 however, restored these decreased values by 98.56% and 98.68% respectively indicating that SCIW is an excellent feed additive that could be used to ameliorate the effects of aflatoxicosis in poultry production.

KEYWORDS: Saccharomyces cerevisiae; AFB_1; Broilers

An Investigation of the Drying Methods and Their Effects on Milling Quality of Rice in Regions 5 And 6

Roderick R. Somrah

Rice is a major crop produced in Guyana. It involves several post-harvest operations i.e harvesting, cleaning, drying, milling, storage and marketing. These operations influences the value of the final product. In this study, the method (s) use for drying rough rice and their effects on milling quality was evaluated in Mahaica/Berbice – Region 5 and East Berbice Corentyne – Region 6. Operable mills within these Regions were selected to facilitate the research. A questionnaire was developed to collect information on the various practices involved in the drying of rough rice. During the harvesting season, interviews were done at 17 operable mills. Paddy samples were taken to Guyana Rice Development Board (GRDB) central laboratory for milling analysis. Moisture content assessed using a Kett portable moisture meter.

Mills use the sun method and mechanical method for drying paddy (47.1% and 52.9%, respectively). In Region 5, 22.2% mills utilized a combination of Fluidized flatbed + Inclined bed and Column + Inclined bed dryers, while 33.3% mills utilized the inclined bed dryer and 22.2% of mills utilized column dryers. Region 6 was recorded as using only the column dryer. Drying time varied based on the type of dryer used and can be within a range of 1-5 hours with column dryers. Combination dryers can take up to 21-25 hours. Solar drying of paddy is practiced by 62.5% of mills in Region 6 compared to 37.5% of mills in Region 5. Sun drying

method takes 6, 8 and 12 hours to dry paddy. Milling analysis indicated that fissured kernels correlate with the head rice recovery (HRR); however, there was no significant difference in mean fissured kernels (P= 0.07) and head rice recovery (P= 0.06) of rice that were mechanically and sun-dried. Significant differences in the mean of the fissured kernel and head rice recovery among samples that were dried via the two methods to the final moisture of 10, 11, 12, 13 and 14% were observed. Additionally, there were significant differences in the average final moisture content, fissured kernels and head rice recovery among samples that were sun-dried at various thicknesses with 3-4cm achieving the highest head rice recovery, the lowest fissured kernels and final moisture.

KEYWORDS: Rough rice, drying, drying methods, fissured kernels, head rice recovery and final moisture content.

An Assessment of the Reproductive Performance of Dairy Cows at Saint Stanislaus College and Guyana School of Agriculture Farms

Candace Ronette Wharton

A study was carried out to assess the reproductive performance of dairy cows over a five (5) year period (2013- 2017) at St Stanislaus College and Guyana School of Agriculture (GSA) Farms. A total of 22 and 17 dairy cows at GSA and St Stanislaus respectively were included for this study. Information concerning the animals' reproductive performance was extracted from logbooks and/or cow cards, and a structured questionnaire was used to examine management, nutritional and reproductive programme undertaken by the farm.

In general, the overall observed reproductive performance of dairy cows at both farms were unexpected since these farms are considered the ideal model for cattle farmers in Guyana. The average age of heifers at first service over a five (5) year period (2013- 2017) at St Stanislaus was 30 months with the average age at first calving at 39.1 months. At GSA the average age of heifers at first service and first calving was 34.7 months and 43.9 months respectively. The average number of services per conception of dairy cows was 1.3 and 2.1 at St Stanislaus and GSA, respectively. The average calving interval and days open at GSA is higher when compared to St Stanislaus. Long open days is associated with a longer calving interval and therefore would decrease the number of calves being born per year. Dairy

animals at both farms depend on pasture as a significant source of dry matter intake and are given 8 hours access daily after milking. The method of conception utilized by both farms differ with GSA only utilizing Artificial Insemination. Both farms practice supplemental feeding which is done during milking of animals twice daily. The results of the poor reproductive performance of the animals could be due to the differences in management systems, supplemental feeding and the reproductive programme.

KEYWORDS: Reproductive performance, Age at first service, age at first calving, calving interval, days open and services per conception

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An Evaluation of the Physical and Chemical Properties of Animal Waste and Plant Waste Amended with Chitin

Clennel Petty

Utilization of organic amendments, such as chitin, is one of the most economical and practical options for improving soil and substrate quality. Chitin is a cationic linear polysaccharide composed of β-(1–4)-linked N-acetyl-D-glucosamine monomers. This study examined the effect of chitin added to organic waste, as soil ameliorants on selected physical and chemical properties. The study consisted of four treatments (1) animal waste, (2) animal waste + 254 g of chitin, (3) grass clippings and leaves, and (4) grass clippings and leaves + 254 g of chitin. The effect on animal and plant compost varied. The addition of chitin had a significant impact on the pH of plant compost. The animal compost with chitin had a pH ranging from 8.29 to 8.42. The pH range of the plant compost with the chitin was 4.58 to 5.10. Water holding capacity of compost with chitin did not differ significantly. Chitin improved the bulk density of the animal compost while the bulk density of the plant compost fell within the ideal range of plant compost. Chitin, when added to animal and plant waste increased nitrogen %, phosphorus, potassium, and organic carbon. Therefore, chitin is a good amendment to animal and plant compost. A small amount of chitin was shown to affect the pH of plant compost and bulk density of animal compost. A much larger amount of chitin will be needed to have significant effects on the moisture content of plant compost. As it relates to the pH of animal compost, chitin will not be of any importance, since the compost has a pH value that is greater than 7.

KEYWORDS: Animal waste, Grass Clippings, Chitin, Compost

Evaluation of Different Methods of *Trichoderma Harzianum* Application for the Control of Fusarium Wilt in Tomato

Sydicia Sutherland

This research evaluated the most effective application method of *T. harzianum* to control the Fusarium wilt disease in tomato. Seed bio-priming, seedling root dip inoculation and soil drench method of application were evaluated to determine which was the most effective in controlling tomato wilt. Treatments were Seed biopriming and dusting of seeds with *T. harzianum* powder at 2g powder/g of seed (T1), Root dipping of 30-day old seedlings in a spore suspension (1000 spores to 10 ml water) of *T. harzianum* powder for an hour at 2g/10 ml water (T2), Soil application of *T. harzianum* 2 days after seedling transplanting at 2g/50 ml of distilled water (T3), and 30-day old untreated seedlings transplanted in pathogen infected pots. This research was conducted at the National Agricultural Research and Extension Institute (NAREI). A Complete Randomize Design (CRD) with four (4) treatments and three (3) replications per treatment with two plants per pot was assigned to the experimental plot.

All the treatments proved significantly superior over control. Among them, the lowest disease incidence was recorded in bioprimed seeds (16.7%), followed by soil drench application method (25%). Root-dip inoculation and the control were least effective in managing the wilt. A significantly higher disease control was recorded in bio-primed seeds (66.6%) followed by soil treatment with *T. harzianum* powder formulation (50%). Maximum seed germination (93.7%) and disease control (66.6%) were observed in seed application. In terms of the reproductive characteristics of the tomato plants, soil application method had 48% higher fruit weight and 150% more fruits than the control treatment. The seed biopriming method was more successful in controlling the Fusarium wilt disease, but the soil drench application method significantly impacted the growth and yield parameters. Therefore, the application of *T. harzianum* using the seed bio-priming and soil drench application methods has great potential to reduce Fusarium wilt in tomatoes and increase growth and yield of this crop.

KEYWORDS: *Trichoderma harzianum*, Fusarium wilt, Bio-priming, Root Dip Inoculation, Tomato.

A Preliminary Study on Direct Seeded Vs Transplanted Onion

Oslyn Williams

Determining the effectiveness of direct seeded and translating method of crop establishment of onion production in Guyana is very important to the now new developing onion industry (PROPEL 2017). One of the major advantages of determining which method is better to use is cost saving. This study sought to determine the effect of direct seeding and transplanting on growth and vegetative characteristics of onion. Differences in the bulb size (weight), Differences in plant height, difference in number of leaves and days to 80% of maturity were four parameters of interest. The study was carried out was 43 Wills Street, Buxton, East Coast Demerara in open field condition. A Completely Randomized Design (CRD) with two (2) treatments and three (3) replications.

Significant difference in the average mean fresh weight of bulbs between the two treatments were found (P=0.0000). Mean fresh weight of the bulbs in the direct seeded method was approximately 58 grams with the heavier onion bulb weighting 175 grams, while transplants had a mean fresh weight of approximately 97 grams, with the lighter onion bulb weighting 36 grams. Average number of leaves direct seeded method was significantly at 3.6 leaves compared to transplants with an average of 4.7 leaves (P=0.005). Lower average plant height was achieved with the direct seeded method with height reaching 42 cm while transplants had the higher average plant height at 43 cm. However, the difference was not significant (P=0.962). At 80% maturity, direct seeded matured at 111 days while transplants matured at 120 days. The preliminary results showed transplanting of F1 hybrid onions is better than direct seeding even though the cost of production is much higher.

KEYWORDS: Direct seeding, Transplanting, Bulb Size, Bulb Weight, Onions

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Evaluation of the Morphological Characteristics, Dry matter, and Starch content of Local Cassava Varieties

Candacia Jacobs

A field study was conducted to evaluate the distinguishing morphological traits of the nine (9) local cassava (*Manihot esculenta* Crantz) varieties and to determine their dry matter and

starch content. The cassava cultivars Uncle Mack, Red Stem, Three months, Butterstick, Green tip (GT2), White stem (WS13), Kairuni stick (KA12), Tall Purple Petiole (TTP 1) and Brown stick (BS11) were collected from six main production farms in Regions 3 and 4 of Guyana. The morphological traits evaluated and quantitative characterization for their Arial traits and storage root traits parameter was done using the cassava descriptors manual. For the Arial traits 5 characters along with 13 descriptions were identified and for the storage root traits 6 characters along with 16 descriptions were identified. The Cladistics software was used to analyze the data.

The strict consensus tree generated from the analysis revealed that there was discrimination of the characters among the varieties. This indicates that there are similar characters such as root shape and flesh colour between the Butter stick and Green tip varieties. The Majority tree showed no discrimination among the characters of arial and root traits. Therefore, the storage root traits are better to discriminate the characters group than the vegetative traits. Dry matter content ranged between 24% and 41% with Red stem and Green tip with the highest percentage. The starch content varied from 4.66% -37.80%. Uncle Mack had the highest mean percentage and Kairuni stick had the lowest. Dark green was the most dominant leaf colour, while the most dominant storage root shape was cylindrical. Secondary skin colours white and cream were more common among the varieties pink and purple. Most varieties had white flesh. Cortex was generally thin. Based on the results of this study, the Uncle Mack variety is recommended for large scale production. Further studies should be done on root morphological characteristics, dry matter and starch content of other local varieties.

KEYWORDS: Cassava, Morphological, Dry Matter, Cladistics Software, Consensus tree

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An evaluation of Some Agronomic Characteristics and Yield Potential of Local Sweet Potato Advance Lines

Kadesha Need

A collaborative project between the University of Arkansas at Pine Bluff (UAPB), University of Guyana Faculty of Agriculture and Forestry (UAF) and the National Agriculture Research and

Extension Institute (NARIE), which initiated a sweet potato project in support of the Agricultural Diversification Project (ADP) has identified sweet potato as a major crop for improvements in the quality and yield. As such, the project aims to introduce exotic accessions from the UAPB which can be used along with the local accessions/ cultivars of Guyana for crop improvement and breeding which will be aimed at quality sweet potato seed production. Fifteen (15) sweet potato accession from clonal generation one (CG1) were utilized in three replications of five (5) plants per replicate, giving a total of two hundred and twenty (225) experimental units.

The aim of this study was to evaluate the agronomic characters and yield potential of different local sweet potato accessions using the sweet potato descriptors manual which provides a list of the different phonotypic characteristics of sweet potato and the Munsell colour chart which was used to evaluate the different colour characters. Five (5) accession were categorized as erect in architecture, nine (9) were classified as semi-erect and one (1) appeared to be spreading. Length varied from 50 to 178 cm. Six (6) accessions had low ground cover. Only one accession (AC_{11}) had significantly high ground cover, making it suitable for protecting soil and inhibiting weed growth. Storage root shape was long, irregular/curved shaped. Dominant storage skin colour was pink and brownish orange. The predominant flesh colour was cream and pale orange. Deep longitudinal grooves were observed in the skin throughout all accessions. AC_5 had the highest potential yield with approximately 8t/ha and AC_8 having the lowest yield. No significant differences were found between accession in terms of yield potential (P=0.08). Four (4) of the advanced lines were selected based on their tuber flesh colour and tuber formation for further trials.

KEYWORDS: Sweet Potato, Accessions, Yield Potential, Tuber

An Evaluation of the Morphological Characteristics of Mango

Wendell Joseph

Guyana has the potential to become the Caribbean's leading mango producer since we have suitable climate, soil type and land space. In 2006, mango germplasm bank was established in Ebini to start works for the development of mango in Guyana. This venture was unsuccessful due to bad management practices. To restart working on mango, this first step

was taken to characterize the mango accessions growing within the National Agriculture Research Extension Institution (NAREI) Compound Mon Repos based on morphological characters. An evaluation of 21 mango accessions and an out-group avocado was conducted. A total of forty-one (41) morphological characteristics were evaluated using the International Plant Genetic Research Institution (IGPRI) guidelines. These include crown shape, leaf blade shape, leaf blade width, fruit size, density of lenticels, pulp texture and type of embryo. The data was evaluated using the analyses of new technology (TNT) software, a strict consensus tree which was a summary of the forty-nine (49) trees retained indicated that the varieties were not genetically identical. In some cases, common ancestors were shared with variations in different traits. There were nine (9) monophyletic group created. The most dominant flower size was small. All accessions at node 20 had a flower shape of a pyramid and density of dense flowering. Majority of accessions had a leaf altitude which was horizontal. Wavy leaf margin was most dominant. Fruits were predominantly round. Two additional varieties were identified: Van Dyke and Kent. The Kent and Van dyke mango were two varieties which were unknown but was identified using their morphological characteristics The evaluation of flower, leaf and fruit traits independently revealed little diversification among varieties, however, with a complete analysis of all morphological characters there were significant diversification among varieties, highlighting that more characters utilized in the analyses the would provide more diverse results. This was seen by the number of monophyletic groups which were created. Therefore, this research showed that a combination of morphological characterization can be used to improve identification of mango accessions. Further studies should be done using accessions from different locations.

KEYWORDS: Mango accessions, Diversification, morphological characters, Mango germplasm

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An Investigation into the Efficiency of Four Rodenticides in Sugarcane Cultivation

Rondy McPherson

Rodent management is an important issue affecting productivity and profitability in sugarcane production in GuySuCo. This research carried out a rodenticide screening trial designed to evaluate fresh stalk damage and the percentage bait uptake in sugarcane fields. Four rodenticides were evaluated in a second ratoon block for their effects on fresh stalk damage and their percentage of uptake by rodents. The Completely Randomized Design (CRD)

was used. The study was conducted at Blairmont Estate, West Bank Berbice at the Campbell section in fields 5 to 24. The variety used was D7661. Five treatments were used, replicated four times, which included untreated areas as control. Fifteen (15) grams of bait were placed at each baiting point. Baiting points were fifteen (15) metres apart on dam-beds of fields. The treatments were Klerat, Raticate, Brigand, Storm, and Untreated.

There were no statistical differences in percentage of fresh stalk damage among treatments before rodenticide application. Fresh stalk damage was above the economic threshold of 0.5%. Four days after treatment, all rodenticide treatments showed significant reduction in stalk damage compared to the control treatment (P=0.0001), but no significant differences were observed among rodenticide treatments. This was also observed at 11 and 18 days after baiting. The untreated areas showed increase in fresh stalk damage. At 18 days, no fresh stalk damage was observed among the rodenticide treatments, and all rodenticides were considered to have similar effectiveness in reducing fresh stalk damage. Of the rodenticides investigated, Klerat had the highest percentage of uptake, but was not statistically different from rodenticides Raticate, Brigand and Storm. Klerat continues to perform well in sugarcane fields and is the predominant rodenticide used. The rodenticides can be used by GuySuCo to reduce the chances of rodents developing resistance or bait shyness to a particular rodenticide. Similar trials should be conducted at different estates to compare performance of the various rodenticides under different conditions.

KEYWORDS: Rodenticide, Fresh Stalk Damage, Bait, Bait Uptake, Rodent Management

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An Evaluation of the Effectiveness of a *Lactobacillus spp* as an Inhibitor of *Fusarium oxysporum* (*in vitro*)

Wattisha Mattis

The aim of this project was to isolate a *Lactobacillus sp*. and test its ability to inhibit the mycelial growth of *Fusarium oxysporum*. Two experiments were conducted. In Experiment one, the poison food technique, with live bacterial cells was used. In Experiment two, the poison food technique with cell-free supernatant was used. The experiment was conducted at the Faculty of Agriculture and Forestry Laboratory. A Completely Randomized Design was

used with three (3) replicates per treatment, and three (3) plates per replicate. Experiment #1 consisted of 6 treatments and experiment # 2 consisted of 5 treatments.

In experiment 1 inhibition occurred at 0.5 and 1v/v% during the early stage of the experiment, but quickly changed after day 7. When mycelium from the treatments showed no sign of spore formation at day 7. The results of both experiments showed that the isolated *Lactobacillus sp*. did not inhibit mycelial growth *in vitro*, but the ability to produce reproductive *conidia* was inhibited. However, results may be obtained in field trials. Resources were not available to confirm the species of *lactobacillus* isolated, thus confirmation results were presumptive.

KEYWORDS: Mycelium, *Fusarium oxysporum*, *Lactobacillus spp*, Mycelial Growth.

Characterization of Local Coconut Palm Accessions Using Morphological Data

Hamani Tinnie

The steady rise in global market demands for "non-traditional" coconut products such as virgin coconut oil, coconut water and coconut sugar have fuelled industry revival policies in Guyana. But current productions capabilities lag far behind these demands. This study assessed 42 characters in 18 local accessions according to internal Plant Genetic Research Institute (IPGRI) standards and analyzed the data using Tree Network Technology statistical programming. The cladograms produced provided evidence of the existence of Malayan Green Dwarves, Malayan Yellow Dwarves, Brown dwarves and other potentially useful accession that remained uncharacterized within the sample group. The study was carried out at the National Agricultural Research and Extension Institute compound, National Agricultural Research and Extension Institute commercial farm, and Block E Sophia (Farmer's Group Sophia). The cladograms generated in this study showed significant morphological variations among accessions. There was consistent dissociation between dwarf and non-dwarf accessions from vegetative, combined and to a lesser extent fruit character. When analyzing vegetative or inflorescence characters individually, groups of related accessions could be identified based on similar morphological characteristics. The results of the study showed that dwarf varieties differed from non-dwarf varieties in lower stem measurements, height and lacked bowls.

This study demonstrated the potential usefulness of morphological markers in conjunction with cladistics analyses for future diversity studies. Similar studies using larger sample group and additional characters are needed as these may facilitate clearer clade formation thus helping to identify and characterize more accessions.

KEYWORDS: Coconut Accessions, Cladogram, Morphological Characterization

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Isolation and Identification of *Trichoderma spp.* from Hydraquent Soil under Different Land Use Patterns

Akeem Primo

Trichoderma spp. is free living, ubiquitous fungi that are isolated from soil easily. It is a mycoparasite and known for parasitizing several plant pathogenic fungi. It is of great agricultural importance because it protects against fungal diseases and lead to increased crop yields. A survey was done in hydraquent soils located along the coastline of Regions 4 to 5, Guyana to identify and quantify the presence of *Trichoderma* in the soil type with the use of culture media. Three samples were taken from 15 sites, each classified according to land use patterns. Land use patterns were Animal farms, Residential Areas, Crop Farms, Recreational Farms and Mangrove Forests. Soil was baited using the baiting method developed by the National Agricultural Research and Extension Institute to isolate *Trichoderma* and its incidence and morphological identifications were recorded.

Characters of five (5) species were identified namely *Trichoderma lonibratum, Trichoderma harzianum, Trichoderma viride, Trichoderma longiplie and Trichoderma psuedokonigii.* Fifty-three (53) percent of 45 samples exhibited presence of *Trichoderma*. The fungi was recovered from all three sites considered to be Residential land. *Trichoderma harzianum* had the highest presence among all land uses, except crop farms. The same species was well distributed in Animal Farms and Mangrove Forest. *Trichoderma viride* was present in all land use patterns except for animal farms with a stronger presence being noted in recreational areas and crop farms. Greater diversities were found in recreational areas, crop farms, and mangrove forests. No presence of *Trichoderma* was found in areas where there were high amounts of organic matter from animal waste. This may indicate that these fungi did not have a preference to

soils with high organic matter content, a situation unlike what other studies have shown. However, it is recognized that the method used for baiting has been developed locally and has not been proven successful in use. Another factor that may contribute to these results is the high incidence of rain during the time of sampling. A need for correlation of presence and factors other than soil organic matter content was observed.

KEYWORDS: *Trichoderma,* Microbiology, Fungi, Agriculture, Mycology, Hydraquent, Soil

An Assessment of the Quality of Leather Produced from Sheep and Goat Skins Using Four Plant Tanning Materials

Mitzie Barker Smith

This research was aimed at studying leather quality produced from sheep and twelve goats' skins using plant tannin materials from *Eperua falcata*, *Mimosa pigra, Acacia mangium* and *R. mangle,* which was used as the control. Twenty- four (24) salted skins were used in this research, with each of the skins divided into four parts along the medial and lateral planes. The study used Split Plot Design, with two main plots, four sub plots, four treatments and three replicates. The tearing strength, tensile strength, and percentage elongation break were measured using the PASCO Material Testing Machine.

The research found that there were no significant differences among the treatments for tearing and tensile strengths. Goat skin showed a higher tearing strength when compared to sheep, but the difference was not significant (P=0.9336). *E. falcata* had higher tearing strength than *A. mangium*. With respect to percent elongation break, *E. falcata* was inferior to *R. mangle*, but similar to the other tannins. Goat skin had significantly higher percent elongation break compared to sheep skin. Even though there were no significant differences in the tearing and tensile strengths of the leather produced by the four (4) plant tanning materials, the quality seems to be superior to the minimum standards, with tearing strength >20N and tensile >12N/mm^2. Therefore, the four (4) plant tanning materials can be used in the tanning process with acceptable results.

KEYWORDS: Tannins, Tensile Strength, Tearing Strength, Percent Elongation Break, Animal Skin, Leather

An Analysis of Sheep Housing in Region 5

Trishanna Alleyne

Sixty five percent (65%) of Guyana's sheep population is in Region #5. Large and small flocks are managed with minimal inputs. Consequently, morbidity and mortality rates are high, and production is low. Much emphasis is not placed on housing which is seen as merely a protection from larceny and predation. A study was carried out to analyze the current sheep housing situation in Region #5 and its impact on productive performance and health. Sixty (60) farmers from Mahaicony to Ithaca were surveyed with the use of a questionnaire, which comprised of five (5) sections: famer profile, herd inventory, housing, health and wellbeing, productive performance. Farmers were randomly selected.

The results showed that 96% of the farmer utilize semi-intensive production systems and provided housing for their flocks. Majority of farmers (57.6%) thought that housing was moderately important. Basic construction is done with wooden frames with zinc roofs and earthen floors to minimize cost. Most variation in terms of the housing were in pen orientation and ventilation. More farmers (54.2%) had pens oriented East to West. Ventilation was mainly through either mesh or open sides. Many farmers (78%) do not provide a separate area for sick animals which is an important factor in the control of spread of diseases. Few farmers had frequent occurrences (6.8%) of foot rot on their farms, while (37.3%) indicated seldom occurrences. Low levels of mortality were reported for adult sheep, weaners and lamb by majority of farmers; however, a small percentage do experience high mortality of weaner and lambs. Productivity was estimated at two (2) lambs per ewe per year, which is slightly lower than the standard set by the Guyana Livestock Development Authority (GLDA). Birth weight was significantly lower, under five (5) pounds compared to that attained at the GLDA. Market coefficients (age and weights) were also lower than the standards set by GLDA. No relationship was found between standard of housing and productive performance and health and well- being.

KEYWORDS: Housing, Sheep, Weaners, Lamb, Semi-intensive Production, Ventilation, Birth Weights, Market Coefficients

A Comparative Analysis of Different Concentrations of Growth Hormones on the Rapid Regeneration of Local Cassava Accessions *in vitro*

Latchman Bissoondyal

Cassava (*Manihot esculenta* Crantz), a perennial vegetative propagated shrub was isolated via single nodal cutting and cultured on semi solid culture media containing MurashigeSkoog (MS) medium with different concentrations of growth hormones Benzyl-aminopurine (BAP), Naphthaleneacetic Acid (NAA) and Gibberellic Acid (GA3). This experiment utilized three local cassava accessions: White Stem (WS13), Uncle Mac and Sweet William (SW). The Factorial Completely Randomized Design was adopted and consisted of the following treatments: (T1)- the control (full strength MS, with no growth hormones), (T2) – Media 1 (half strength MS, 0.25mg/l NAA, 1.0mg/l BAP), (T3)- Media 2 (full strength MS, 0.20mg/l NAA, 0.10mg/L BAP), (T4)- Media 3 (full strength MS 0.05 mg/l NAA, 0.3mg/l BAP), and (T5)- Media 4 (half strength MS, 0.01 mg/l NAA, 0.5 mg/l BAP, 1.0mg/l GA3).

Treatment 3 and Treatment 4 resulted in the highest average number of nodes and leaves per culture vessel (3 nodes and 3 leaves per culture vessel). This was followed by Treatment 5 which produced an average pf two (2) nodes per culture vessel. On the contrary, Treatment 1 and Treatment 2 did not facilitate effective regeneration, producing an average of one (1) node per culture vessel. The evaluation of the various media towards root formation resulted in Treatment 1, Treatment 3 and Treatment 5 facilitating an average of two (2) roots per culture vessel. Highest average height of three (3) cm was obtained by explants under Treatment 3. This was followed by Treatment 4 with an average height of two (2) cm per explant. In light of the results obtained, the evaluation of cassava accessions grown on media supplemented with full strength MS, 0.20mg/l NAA, 0.10mg/L BAP and full-strength MS 0.05 mg/l NAA, 0.3mg/l BAP was the most effective in cassava regeneration.

KEYWORDS: Growth Hormones, Growth Media, Benzyl-aminopurine (BAP), Naphthaleneacetic Acid (NAA), Gibberellic Acid (GA3), MurashigeSkoog (MS), White Stem, Uncle Maca, Sweet William, Cassava

An Investigation into the Performance on Three Onion Varieties

Lashawn Knights

Bulb size and maturity are key characteristics of an onion crop but the onset of bulbing is the most important of these. A field trial was conducted at KIRBY Youth Farm Plot at Plantation Yeovil, West Coast Berbice, Region #5, Guyana to investigate the performance of three onion varieties. The trial was laid out in a Completely Randomized Block Design (CRBD) with three treatments and three replicates. The three varieties were Texas Early Grano (T1), Mercedes (T2) and Tanto (T3). The varieties were all short-day cultivars.

The performance of the weight of each treatment was highly significant at P=0.000. Mercedes variety gave the highest average weight of 102.07g. The lowest average weight was obtained with Tanto Variety which had an average weight of 58.42g. These results may be due to the differences in the general characteristics between each variety, nutrient absorption and environmental conditions under which the treatments were carried out. The varieties did not differ significantly in bulb diameter. Mercedes had the largest mean bulb diameter (5.71cm) followed by Texas Early Grano with an average mean diameter of 5.41cm. Tanto was the first variety to reach 50% bulbing at sixty-seven days (67), followed by Mercedes with seventy-two days (72). Tanto obtained 50% maturity within the shortest time (110 days) while Mercedes and Early Texas Grano both took 114 days to mature, respectively. Mercedes had a higher yield and more uniform bulbs. The results show that the three varieties cab be grown during the months of February to June, but it is recommended to keep track of the time of planting to avoid reaching maturity during the rainy season which can cause bulb rot. The three varieties should be further tested under different environmental conditions.

KEYWORDS: Mercedes, Texas Early Grano, Tanto, Bulb Diameter, Varieties, Cultivars

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An Evaluation of Different Concentrations of Growth Hormones for the Optimization of Plantain Micropropagation in vitro

Keisha Kewley

M. acuminate is a staple food crop for millions of people in developing countries. Development of plantlet materials is hampered by pest and disease infestation and lack of

efficient tissue culture media. This study was conducted to compare the effects of various concentrations of growth hormones on plantain clonal material for rapid regeneration *in vitro*. Two auxins (Indole-3-Acetic Acid (IAA) and Naphthalene Acetic Acid (NAA)) and Cytokinin (BAP) were used in culture media to culture two varieties of plantain accessions: Philadelphia (exotic-V1) and Creole (local-V2). A factorial experiment using the Completely Randomized Design was conducted at the National Agricultural Research and Extension Institute (NAREI) biotechnology lab. Five concentrations of growth hormones were supplemented in culture media: T1- (Control-5.0 mg/l BAP + 1.0mg/l IAA), T2- (6.0 mg/l BAP + 1.0mg/l IAA), T3- (5.0 mg/l BAP + 2.0mg/l NAA), T4- (5.0 mg/l BAP) and T5-(5.0 mg/l BAP + 1.0mg/l NAA).

The results indicated that there were no significant differences in the mean number of buds between the two varieties (F=0.05, P=0.83). Both produced a mean number of 10 buds over the 4-6 weeks period. Mean number of buds were significantly between treatments (F=3.62, P=0.012). The control and T4 had a significantly greater number of buds than T5. Overall, the results showed significant differences in the number of leaves among the treatments, with the Philadelphia variety producing the greater number of leaves. T5 produced the least number of leaves than the other treatments. Heights of shoot were significantly different between variety (F=12.64, P=0.0006). The Philadelphia variety had higher shoot height (1.10 cm) compared to Creole Variety (0.7640 cm), indicating that the hormonal composition of the culture media must vary to improve performance. There were significant differences in terms of Bud/Shoot proliferation and number of leaves, but not among treatments. The Control treatment maintained better performance than T5 and should be continued as the preferred treatment.

KEYWORDS: *Musa spp*., Culture Media, Growth Hormone, Explants

Pot evaluation of botanicals for the control of *Fusarium oxysporum f. sp. lycopersici,* wilt pathogen of *Lycopersicon esculentum*.

Kevin Seetram

Fusarium wilt (*Fusarium oxysporum f. sp. lycopersici*) is a fungus which causes significant reduction in crop yield. This study investigated the performance of different botanicals to control fusarium wilt in tomato crops compared to synthetic fungicide. The aqueous extracts used were neem, breadfruit, and pear leaves. The study was carried out at the Agriculture Research Station, University of Guyana. A completely randomized design was used with five (5) treatments, three (3) replicates and a total of five (5) plants per treatment. The aqueous extract treatments were neem leaf extract, pear leaf extract and breadfruit aqueous extract, each at 40% relative concentration. The synthetic fungicide was Serenade. Plants in the control treatment were not inoculated with fusarium wilt.

Plants that were not inoculated were significantly taller, had higher number of leaves and the lowest number of yellow of leaves. A decrease in plant height was observed in the first two weeks of treatment for the botanicals. Neem had the best effect of increasing plant height. Height continued to decline with the pear treatment. This treatment also had the lowest number of leaves, and lowest heights. An increase in the number of leaves was observed for all treatments after the second application, but a noticeable increase was observed in the plants with the neem treatment after the third application. Yellowing of leaves declined with all botanical treatments. Both neem treatment and seranade had lower mean number of yellow leaves compared to pear and breadfruit treatments. The botanical treatments had similar mean effect on fusarium wilt when compared to the synthetic fungicide. The pear treatment performed the poorest. Prophylactic application as another application method of botanicals should be explored.

KEYWORDS: Fusarium wilt, Botanicals, Fungicide, Yellowing, Aqueous

Optimization of Nitrogen Scheduling for Aromatic Rice Variety

Anthony Ramsahoi

This field study was done to investigate the optimization of Nitrogen scheduling for Aromatic rice variety. Field trials were done at the Guyana Rice Development Board (G.R.D.B) research station. The experimental design was a split plot with three (3) replicates using three different nitrogen levels, 75 kg ha, 100 kg ha and 125 kg ha. In this experiment there were five (5) scheduling splits, 2 equal splits at T and P, ¾ at 21 Day after sowing and ¼ at 42 Days after sowing, 3 equal splits at T, PI & Fl, 3 splits (¼+ ½ +¼ at T, PI & Fl) and 4 equal splits at T, MT, PI & Fl. The trial was sown using pre- germinated seeds at a seed rate of 135 kg ha^{-1} (324 g per plot) on a plot size of 24 m^2.

The increase in Nitrogen rates showed significant differences in grain yield and milling yield percentage while the split and timing of application recorded differences in grain yields, plant Height, Tillers and Milling Yield %. The highest grain yield (5148 Kg ha^{-1}) was observed with the application of nitrogen at 125 kg ha^{-1} (N_3), and the lowest (4384 Kg ha^{-1}) with the application of nitrogen at 75Kg ha^{-1}(N_1). The highest milling yield percentage (56.8) was recorded with the application of nitrogen applied at 125Kg ha^{-1} while the lowest (52.9) with the application of nitrogen at 100Kgha^{-1}. The nitrogen application rate at 100 Kg ha^{-1} had the shortest plants. In the case of optimum rate and timing of nitrogen fertilizer via split application it was observed that applications made at ¾ @ 21 DAS and ¼ at 42 DAS, and ¼ each @ tillering, mid tillering, PI and flowering produced the best yields. Application of nitrogen rate at 125kg ha-1 produced the best yield, but only 3 % more over the application rate at 100 kg ha-1, so it would not be economically feasible to apply nitrogen at 125 kg ha-1. Therefore, no adjustment should be made to the current rate.

KEYWORDS: Aromatic Rice Variety, Optimization, Nitrogen fertilizer, Grain Yield, Milling Yield

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Screening of Sweet Potato Accessions for Tolernace to Low pH Soils

Renee Nero

This research was done to assess the survival rates among sweet potato accessions and determine growth characteristics among sweet potato accessions in low pH soils in Linden,

Region #9. The results of this study can be used to recommend tolerant cultivars for planting in such soils in Guyana's Interior to generate income and provide food to hinterland communities. Ten treatments (sweet potato cultivars) were used and replicated three times using the Completely Randomized Design (CRD). Slips were planted 30cm apart in single rows with 100cm between rows. Each experimental plot was 300 cm long. Soil samples were collected at 0-6cm and 6-15 cm depths for soil pH analysis.

At 0-6 cm, the soil pH was 4.6 indicating that the soil was acidic. At 6-15 cm the soil pH was 3.9. Accession 1 had better overall lateral root growth than the other nine accessions. There were significant differences between accession 1 and all other accessions. The length of the lateral roots was greater than that of the main root which may be due to decreasing soil pH along the soil profile. The main root extended approximately 4cm into the soil. Lateral roots were near the soil surface within the first 2cm. Several explanations for this behaviour are the development of a mechanism to obtain water from dew dampened upper soil layer or nutrient which may be available in the first 2cm layer of the soil, or in response to low pH and aluminium toxicity.

Accessions showed different rates of tuber initiation and development. All ten accessions showed tolerance to the existing pH but mortalities were only observed in accessions 3 and 8. Accessions 1, 2, 7 and 10 performed better respect to vegetative growth. Accessions 3, 5, 8 and 9 performed relatively poorly, while 4 and 6 can be regarded to be moderate. Longer term field trials should be conducted using accessions 1, 2, 4, 6, 7 and 10. Yield data obtained from such trials may be used to make more definitive recommendations.

KEYWORDS: Accession, Soil Acidity, Aluminium Toxicity, Sweet Potato, Mortality, Tolerance

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An evaluation of the Morphological Characteristics and Yield Potential of Sweet Potato Breeding lines (CG 1)

Travis Prasad

A collaborative project between the University of Arkansas at Pine Bluff (UAPB), the National Agriculture Research and Extension Institute (NAREI), Partners of the Americas and the University of Guyana Faculty of Agriculture and Forestry lead to the initiation of a sweet potato project in support of the agriculture diversification project (ADP) which identified

sweet potato as a major crop for improvements in the quality and yield. The project aimed to introduce exotic accessions from the UAPB which can be used along with the local accessions/ cultivars of Guyana for crop improvement and breeding which will be aimed at quality sweet potato seed production. The aim of this study was to evaluate the morphological characteristics and yield potential of different local and exotic sweet potato accessions using the sweet potato descriptors manual which provides a list of the different phenotypic characteristics of sweet potato and the Munsell colour chart which was used to evaluate the different colour characters. Five (5) different accessions were used in the field trial for this project. The Completely Randomized Design was used. Five (5) sweet potato accessions from clonal generation one were utilized in three replications of ten (10) plants per replicate, giving a total of one hundred and fifty (150) experimental units.

Accessions 3 and 5 had longer vine length and were classified as spreading in architecture, while the other three accessions had a semi-erect architecture. Accessions with erect architecture are preferred as tuber tend to grow in clusters or bulk making harvesting simpler. Three accessions (1, 2 and 4) had an average tuber weight of 130g or lower. Two accessions had on average less than one (1) tuber per plant. Only one accession had >2 tubers per plant. The most dominated storage roots were long irregular/curved shaped and less flavoured. Tuber were predominantly pink and brownish-orange. The most common flesh colour was cream and pale orange. Some accessions exhibited cortex thickness of <1mm while other had cortex that were between 1-2mm thick. All accessions had latex and oxidation. Accession 5 had an estimated yield potential of approximately 15.6 t/ha, while accession 2 had the lowest with an estimated 3.03t/ha. Yield potentials were significantly different (P=0.004). Results revealed that Accession 3, 4 and 5 of the clonal generation one lines were selected based on their tuber flesh colour and tuber formation for further trials.

KEYWORDS: Sweet Potatoes, Accessions, Morphological Characteristics, Yield Potential

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Characterization of lettuce producers under shade house conditions in Region 4

Anastacia Powers

This research characterized producers cultivating lettuce under shade house conditions in Region 4, Guyana. It aimed to determine the number of producers cultivating lettuce under

shade house conditions, as well as production levels of lettuce grown under shade house conditions. This research was conducted in in areas such as Mahaicony on the East Coast of Soesdyke on the East Bank. This research was conducted using a survey method. The target group was obtained from a list of shade house producers sourced from three agricultural organization in Guyana namely Partners of the Americas, National Agriculture research and Extension Institute (NAREI) and Inter-American Institute for Cooperation on Agriculture (IICA). Questionnaires were used in this census to collect needed data.

This research found that the original number of lettuce producers which was fifty (59) but only twelve producers were currently in operation. The highest number of inactive producers were observed from the list sourced from Partners of the Americas. This may have resulted from the culmination of the shade house programme organized by this organization. While production ranged from 25-95 heads of lettuce per month, majority of farmers (n=8) produce 95 heads of lettuce monthly. It was also found that the approximate size of shade houses ranged from 5.5-7.3 metres and above in length. Depending on the size, production can range between 20 to >90 heads of lettuce per month. Most farmers are relatively new to this type of production. Some farmers produced one variety, while others produced multiple varieties. Some of the challenges with this type of production is lack of maintenance of structures, lack of willingness to invest their own monies into production, and lack of access to loans/capital. This research concluded that Region 4 producers are small scale in production with a monthly production of approximately 995 heads of lettuce and annual production of 11,940 heads.

KEYWORDS: Lettuce**,** Protected Agriculture, Shade House, Climate Change

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The Effect of Horizontal and Vertical Planting of Sweet Potato Plant Development and Yield

Orwin Emanuel

This aim of this study was to establish the proper planting orientation, so as to enhance constant reliable yields among sweet potato producing farmers in Guyana. This study compared vine lengths and determined root yield for four sweet potato accessions using the horizontal and vertical planting orientation. The four local accessions were Viola, Rupee, White, and Cogle. A Complete Randomized Design (CRD) with four replications per treatment

was used. Treatments were horizontal and vertical planting orientation. Vine length was measured at week 3, week 6, week 9 and week 12 after planting and root yields were measured after harvesting. The research was conducted at the Faculty of Agriculture and Forestry Research Centre, Turkeyen Campus, Greater Georgetown.

The results showed significant differences in the mean vine length (P=0.00) with the horizontal planting orientation producing longer vine length. Reduced vine growth in vertical planting may be attributed to the fact that vertical planting tends to produce roots which grow closer together, creating limitations to the area from which water and nutrients are accessed. Hence, greater competition for resources. Accession 1 had higher growth in vine length throughout the growth period, while the other accession showed similar growth pattern. For the mean yield weight there was no significant difference between the horizontal and vertical planting orientation (P=0.829). Horizontal planting orientation may be recommended for longer vine lengths and better yields. Further research work should be done on different soil types and during the drier season.

KEY WORDS: Planting Orientation, Sweet Potato, Vine Length, Yields

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The Effect of Black Pepper (*Piper nigrum*) and Turmeric (*Curcuma longa*) on Growth Performance of Broiler Chickens

Makeba Jacobs

An experiment was conducted to determine the effect of black pepper (*Piper nigrum*) and turmeric (*Curucuma longa*) on the growth performance of boiler chickens when added to feed. There was a total of four treatments, namely: T1 – 1% black pepper, T2 – 1% turmeric, T3 – 0.5% black pepper and 0.5% turmeric, and T4 – a basal diet containing antibiotics fed at both starter and grower phases. A total of 100-day old broiler chicks were randomly assigned to each treatment. The chicks were given freshwater and were fed ad libitum each day. The parameter of interest for this experiment were feed intake, body wight gain, feed conversion ratio, and final live weight. The experiment used the Completely Randomized Design (CRD), with each treatment replicated three times. Each experimental unit had either eight or nine chicks with a total of 100 chicks for the experiment.

There was an observed decrease in feed intake from weeks 1- 6 for Treatments 1-3. Feed intake for treatment 4 remained relatively constant and represented the treatment with significantly higher intake. In week 1, weight gain increased across all treatments with Treatment 4 producing weight gain that was significantly higher (P=0.0033). Treatment 4 maintained the highest weight gain. It was observed that the feed conversion ratio had no significant differences among treatments. This may be an indication that the ration did not cause the hindrance in feed intake and growth and any difference may be from the palatability and acceptability of the ration where feed additives were added. Based on results it can be concluded that black pepper and turmeric did not show growth-promoting effects, but showed significant effect compared to the control. It is recommended that a follow up on this project should use lower percentages (%) of turmeric and black pepper within the ration that will be given. The use of molasses with the feed additives may improve the palatability/acceptability of the ration which may improve feed intake and body weight gain.

KEYWORDS: *Piper nigrum, Curucuma longa,* Boiler Chickens, Weight Gain, Feed Intake, FCR

Evaluation of Exotic Sweet Potato (Ipomoea batatas) Accessions for the Detection of Virus

Reiaz Azim

Production of sweet potato (*Ipomoea batatas* L.) despite its high potential for export, is constrained by viruses which reduce yield by up to 90%. It is therefore important to detect the type of viruses that affect the plant. In this study, visual symptomatology revealed virus associated symptoms including vein clearing, interveinal chlorosis, chlorotic spots, leaf curling, leaf narrowing and distortion, chlorosis and death of premature leaves among the seven exotic sweet potato accessions. Disease Incidence (DI) was 100% in all the accessions. There were five (5) exotic accessions in which cuttings were grafted onto indicator plants (*I. setosa*). This project was conducted at the University of Guyana, Faculty of Agriculture & Forestry Research Station and Laboratory and at NAREI's Biotechnology and Tissue Culture Laboratory.

Based on the viral associated symptoms, five possible sweet potato virus diseases were identified to be present within the exotic accessions, namely, Sweet Potato Feathery Mottle

Virus (SPFMV), Sweet Potato Virus Disease complex (SPVD), Sweet Potato Virus G (SPVG), Sweet Potato Leaf Curl Virus (SPLCV) and Sweet Potato Collusive Virus (SPCV) & Begomovirus complex. By the eighth day, all seven (7) exotic sweet potato accessions showed varied degrees of visual symptoms associated with virus disease infection such as vein clearing, chlorotic spots, chlorosis, leaf curling, leaf narrowing, leaf cupping, leaf distortion, necrotic spots and premature death of leaves. Symptoms of vein clearing, and chlorotic spots were exhibited by all six grafted sweet potato exotic accessions. The results showed that all of the exotic sweet potato accessions were susceptible to virus infection. It is recommended that other methods/techniques of detection of viruses such as ELISA kit, Real-time PCR be used along in conjunction with virus indexing, to better verify the presence of a specific strain of sweet potato virus within the mentioned exotic varieties mentioned above to allow for much faster identification. Further studies should be conducted in virus indexing with local varieties.

KEYWORDS: Virus Indexing, Ipomoea etosa, Visual Symptomatology, Sweet Potato Virus Diseases

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An Evaluation of Different Planting Densities on Sugarcane Performance at Uitvlugt Sugar Estate

Levina Henry

A field experiment was carried out at the Uitvlugt/Leonora sugar estate (Guyana) to determine the effects of three planting densities on sugar cane performance (Variety D9824) on clay soil type with the aim of determining which of the three planting densities is best suited to the Uitvlugt sugar estate. The three planting densities were 50 bud-eyes per rod=135,000 bud-eyes per ha (T1), 39 bud-eyes per rod (traditional) = 105,405 bud-eyes per ha (T2), 26 bud-eyes per rod = 70,270 bud-eyes per ha (T3). The parameters of interest were height and girth, stalks density, percent germination and potential yield. The experimental design was a Randomized Complete Block Design (RCBD).

After 8 weeks, germination was significantly higher in T3 (73%), compared to T1 (61%) and T2 (64%). At 30 weeks, T2 had the largest girth (194.5 cm) followed by T3 which produced a mean girth of 188.5cm. Treatment 1 produced the shortest stalks. T1 and T2 performed comparably in terms of mean stalk population, while T3 produced the lowest stalk density. However,

when extrapolated, T3 was shown to have the highest mean potential of 101.5 tc/ha, followed by T2 (99 tc/ha), and T1 (92.25 tc/ha. Although T1 utilized more bud-eyes per rod than the other densities this treatment may not be the best in terms of potential yield. Based on the results, the Uitvlugt Sugar Estate should consider Treatment 3 with the planting density of 26 bud-eyes per rod (T3) to allow for a greater number millable canes. Although the results obtained showed that there were no significant differences among the treatments in relation to sugarcane performance, further studies should be carried out in a more ideal weather condition that is optimum for sugarcane growth and it should be conducted on the other sugar estates in the country.

KEYWORDS: Sugar Cane, Planting Densities, Performance, Potential Yield, Bud Eyes

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An Evaluation of Moddus®- (Trinexapac-ethyl) as a Possible Replacement for Roundup (Glysophate) Within the Local Sugar Industry.

Dirk Ryan Ford

Trinexapac-ethyl (Moddus®), a new chemical ripener has been tested in some countries. There has been no published report regarding the testing the effect of Moddus® in Guyana. This study compared effect of Moddus® in local varieties of sugarcane plants compared to the current industry standard Glyphosate (Roundup®). The study was conducted at the Guyana Sugar Corporation's Blairmount Sugar Estate. The experiment was laid out in a Split-plot design-pairwise using five treatments, each treatment replicated four times. Treatments comprised of untreated control, Roundup® applied at 0. 705 liters/ha^{-1}, and Trinexapac-ethyl Moddus® applied at 1.0, 1.5, and 2.0 liters/ha^{-}1, respectively.

Tonnes of cane harvested /ha^{-1} (TCH) were significantly greater for canes treated with Roundup (68.56 TCH) and Moddus @ 2.0 liters/ha^{-1} (63.16 TCH). Poorest TCH yield was obtained from areas treated with Moddus @ 1.0 liter/ha^{-1}, which yielded 41.50 TCH. Moddus @ 1.5 liters/ha^{-1} yielded the highest tonnes of sugar (5.49 t/ha^{-1}) using just 10.13 tonnes of cane to produce one tonne of sugar, compared to the Roundup and control treatments that took 12.69 tonnes and 12.46 tones, respectively. Canes treated with Moddus @ 1.5 liters/ha^{-1}. The Moddus treatments had higher juice sucrose concentration compared to Roundup @ 0.705 liters/ha^{-1}. These initial results indicate that Moddus® is as effective a ripener as

Roundup® and could increase estimated recoverable crystal yields. However, continuous testing across all estate locations and on various locally grown sugarcane varieties at different crop cycles should be further explored.

KEYWORDS: Trinexapac-ethyl Moddus®, Roundup, Sugar Cane, Ripener, Yield

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A Comparative Analysis of Three Sources of Organic Matter in the Production of "Bullnose" Peppers on Mined-out Soil

Renee Alexis Deodat

A comparison was done to determine the effect of three soil amendments on vegetative growth and yield performance of "Bullnose" pepper, and on the chemical properties of mined out soil. This research was conducted in the Kara Kara Mined-out site in Region 10, where soils have been mined for bauxite. Four treatments were replicated four times using the Completely Randomized Design (CRD). Five (5) pots per replicate were used. In three treatments, 5 kg of mined soils were mixed with 50 g poultry manure (T1), 50 g sawdust (T3) and 50 g biochar (T4). The control (T2) consisted of 5kg of mined soils only. Plant heights were recorded at 8 weeks and soil testing carried out. Treatment means were compared using ANOVA for CRD at the 95% Confidence Interval.

The plants under the poultry manure treatment were taller (14.78 cm), followed by the control (12.60 cm), biochar treatment (11.77cm) and sawdust (10.60 cm). Plants height by treatments were not significantly different ($p>0.005$). The plants under the poultry manure treatment had a significantly higher yield of fruits (n=27) than the biochar treatment (n=15) and control treatment (n=2). Plants under the sawdust treatment did not fruit. Average fruit weight was 0.5 kg each for the poultry and biochar treatments, and 0.01 kg for the control treatment. No significant differences were found in the average weight of fruits under the treatments. Both poultry and biochar amendment lowered the levels of acidity of the soil from a pH of 4.7 to 7.2 and 7.7 respectively. Soil with poultry manure had more than 3 times the organic content than the control treatment, while sawdust increased it by 2 times. The poultry manure treatment had performed the best compared to the other treatments. Biochar did not perform as expected although research elsewhere has shown that it had high

performance. It is recommended that higher rates of soil ameliorants be tested using the same crop as well as other crops to determine efficacy.

KEYWORDS: Poultry Manure, Biochar, Sawdust, Soil Amendment, Mining

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Performance of Black Jersey Giant Fowl Fed on Two Commercial Diets 2019

Shinella Persaud

The Jersey Giant chicken is dual purpose breed specifically bred for its meat and eggs within rural communities. It was introduced in Guyana and given out to members of rural communities because they can subsist on low quality feeds and forage. However, not much information is available on its performance based on a diet of feedstock in Guyana. This research was conducted to determine the performance of Black Jersey Giant fowls fed with two commercial diets at three age ranges (1 day old, 1 month old, and 2 months old). A Completely Randomized Design was used. The experimental unit consisted of three (3) replicates, five (5) chickens per replicate in a deep litter housing system. A total of ninety (90) chickens were dived into three (3) trials according to the birds' age. The chickens were fed Bounty Starter (20% CP) and Kaituk Starter (22% CP). The chickens were fed for three (3) weeks. Observations recorded were percent mortality, weight gain, and the feed Conversion Ratio. The research was conducted at the Guyana livestock Authority Farm, Mon Repos, East Coast Demerara, Region #4.

The results of this study indicate that there were no significant differences between FCR ($P<0.05$). Body weight gain did not differ significantly among treatments ($P<0.05$). The chickens reached an equivalent market weight of broiler birds after 11 weeks. The FCR (2.12) of the Jersey Black Giant birds were equivalent to the broiler birds after 2 months. Further work is needed to determine its performance using forage and local materials. Mortality of 8.8% occurred due to predation of birds.

KEYWORDS: Black Jersey Giants Chicks, Commercial Starter, Weight Gain, Feed Conversion Ratio.

An Evaluation of Selected Morphological Characteristics and Yield Potential of Advanced Sweet Potato Breeding Lines.

Kianna Batson

This research sought to evaluate selected morphological characteristics and yield potential of five local sweet potato accessions using the sweet potato descriptors manual which provides a list of the different phenotypic characteristics of sweet potato. This project was carried out at the University of Guyana, Faculty of Agriculture and Forestry Research Centre, Turkeyen Campus. The soil type was heavy clay. This aimed at identifying tuber skin color, tuber shape, to assess flesh color of the tuber, cortex thickness, latex production in the storage roots, types of insect pest damage, defects of the storage roots and to assess yield potential of the accessions. The experiment was laid out in a Completely Randomized Design (CRD) with three replications. Five (5) accessions from clonal generation one was utilized in three (3) replications of the (10) plants per replicate.

Of the five (5) accessions three (3) had dark purple skin color and one (1) had purple red skin color. One (1) accession had undeveloped tubers. All the accessions had cream flesh color. Curved, round and long irregular storage roots were the three dominant shapes observed. Accession 3 was found with growth crack defect and was affected by wire worm borrows. Cortex thickness ranged between 0.4mm and 0.9mm. There were significant differences in yield potential among the accessions (P=0.0000). Accession 2 produced the highest yield (136.42g/plant) and is estimated to produce a yield of 5.5 t/h, which is well below yield values reported in the literature. Accession 1 had the lowest yield (1.18g/plant). Yield of Accessions 5 were not statistically different from Accession 2 and 4. Heavy clay tends to give low yields. Accessions 2, 4 and 5 were selected as elite material based on tuber characteristics. Further evaluations should be done on these accessions.

KEYWORDS: Sweet Potato, Yield Potential, Accessions, Tuber Skin Color, Cortex Thickness

Evaluation of Sweet Potato Seeding Lines for Germination Percentage and Tuber Characteristics

Latoya Jack

The research evaluated germination percentage and tuber characteristics of local and exotic sweet potato seeding lines. The specific objectives were to determine germination percentage, tuber bearing lines, storage root characteristics and to short list seeding lines for further evaluation. This research was conducted in the Research Centre of the Faculty of Agriculture and Forestry, University of Guyana. A total of three hundred and thirty (330) seeds were obtained from eight (8) accessions (six local and two exotic) within the polycross block. The seeding lines collected were Amjad pumpkin 18, Cogle 71, Strongman 28, Beauregard 27, Zebra 78, Vanilla 50, PB12 and PB21 20 seeds.

Of the three hundred and thirty (330) sweet potato seeding lines evaluated, one hundred and fourteen (114) germinated representing 35%. Amjad Pumpkin had 100% germination while none of PB21 seeds germinated. All other accession had under 25% germination. Of the germinated seeds a total of fifty-six (56) seedlings were established to evaluate tuber development. Thirty-four (34) lines developed tubers. Dominant skin colour was pink (16). The most dominant flesh colour was cream (12) and least dominant was orange. Just over half had uniformity in flesh. Latex was found in twelve (12) lines and no latex was found in 10 lines. This is not a desirable characteristic as it reduces marketability and gives the sweet potato a bitter taste. Only twelve (12) were shortlisted with desirable characteristics such as storage root flesh colour, skin colour and minimal latex present. Further evaluation should be done on the shortlisted lines.

KEYWORDS: Accession, Germination, Seedling Lines, Sweet Potato, Storage Root, Tuber, Polycross

An Evaluation of the Status of the Seafood Processing Plants within Georgetown, Guyana with a View to Make Recommendations

Ariel Robertson

Local seafood processing plants are producing large volumes of waste from various seafood species annually. Thus, the industry has a great potential to invest into a new industry that can utilize such waste and generate further income for later development. This research sought to evaluate the status of seafood processing plants within Georgetown with focus on the species being processed and the methods of waste disposal. Questionnaires were administered to identified managers and personnel. Four of the seven seafood processors in Georgetown responded to the questionnaires.

Female respondents made up a larger percentage of responses (75%). Fifty percent (50%) of the respondents were between the ages of 31-40 years, while those within ages of 21-30 years and 40-50 accounted for 25% of the respondents, respectively. Years of operations were 16, 19 and 20 years. Three quarters of the respondents were from Large/Scale operations. Species such as Banga Mary, Butterfish, Catfish, Jack, Prawns, Snook and Tarpon were processed throughout the year. Export volume can be as much as 40% of production for some processors. Processing activities entails sorting, cutting, filleting, washing, deboning and cutting. These activities produce waste which is disposed of by dumping at garbage disposal sites, dumping at sea and or selling locally and not all respondents treat the waste before disposal. While the amount of seafood produced and the waste generated has not been determined, there exists potential for this waste to be utilized into useful products such as fish meal, fertilizer from the seabob, and fish oil from the internal organs. Some interest has been indicated in making secondary products using the waste. However, the specific species, the parts discarded, and the quantities required to produce by-products need to be investigated further.

KEYWORDS: Seafood Waste, Seafood Processing Plants, 3R Principles

An Evaluation of Organic Wastes for the Multiplication of *Trichoderma harzianum rifai* for Possible Commercial Applications

John Forde

Trichoderma harzianum rifai is known for its capability to function as a bio-control agent against many fungal pathogens and is increasingly becoming of interest in the agricultural industry. This research focused on identifying the organic substrates that are conducive to initiate and maintain the proliferation of the fungus. This study was carried out at the Faculty of Agriculture and Forestry Laboratory at its Turkeyen Campus. Four substrates were used and replicated three times using the Completely Randomized Design. The growth response of *Trichoderma harzianum rifai* on the different substrates was observed and recorded for twenty-eight days. The treatments are 200 grams each of Broken Rice, Vermicompost, Sugarcane Bagasse, Tea Waste. To each substrate, 2ml of spore suspension was added.

The Bagasse maintained the highest CFU/g throughout the period of evaluation. At 21 days, the mean colonies for all substrates increased. After 28 days, mean colony fungal units per gram was still highest for Bagasse substrate (9.52 CFU/g) followed by Tea bag (8.52 CFU/g). Broken Rice and Vermicompost had similar CFU/g with 5.43 and 5.59, respectively. At days 14 and 21, the fungus on the broken rice substrate increased but subsequently decreased at day 28. The CFU/g on Bagasse were observed to be similar at first two measurements but increased at week 3 before declining slightly at week 4. This may be because the fungus fully colonized the substrate and there was little or no nutrient to maintain the proliferation. Nutrition of fungi is readily dependent upon the presence of insoluble carbohydrates and proteins. However, the mean colonies were not significantly different ($P<0.05$). The ability of the fungus to proliferate on the substrates may be because the substrates were of similar nutrient compositions.

KEYWORDS: *Trichoderma harzianum rifai,* Substrates, Proliferation, Fungus, Colonizing Fungal Units

The Effectiveness of Fungicides against the Anthracnose fungus (*Colletotrichum spp.*) in Laboratory Trials

Joel Greene

An *in vitro* study was carried out to determine the efficacy of the recommended concentration of three fungicides (Pyraclostrobin, Carbendazim and Chlorothalonil) against *Colletotrichum spp.* which is responsible for an increase of Anthracnose in Region #4 during 2017. The experiment was conducted using the Completely Randomized Design (CRD) with four treatments, replicated four times. Chlorothalonil was used at a rate of 0.005ml, Carbendazim was used at a rate of 0.2ml and Pyraclostrobin at the rate of 0.003g, each per 200ml of Agar. The research was carried out at the National Agricultural Research and Extension Institute, Mon Repos, East Coast Demerara, Region #4.

The response of *Colletotrichum spp.* against the recommended concentrations of the three fungicides were significantly different. In the Poison Food technique 3, 6 and 9 days after incubation at 27^{o}C, all treatments with fungicides reduced mycelial growth of the fungus as compared to the control. Pyraclostrobin was found to greatly affect the mycelial growth of *Colletotrichum spp.*, with this treatment having the lowest mean diameter of the fungal colony, while Carbendazim and Chlorothalonil showed the least fungal inhibition. Therefore, the active ingredient being available in various fungicide can be utilized in the management of Anthracnose.

KEYWORDS: *Colletotrichum spp,* Anthracnose, Pyraclostrobin, Carbendazim, Chlorothalonil, Fungal Inhibition, Mycelial Growth

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An Assessment of Weight Gain, feed Conversion Ratio and Cost Associated with Locally Formulated Feed Ration Fed to Fattening Pigs

Shevonne Amara Bryne

Pig production can in one sense be thought of as the process by which the nutrients contained in feed of a low value are converted into a high value product which is pig meat. This is

particularly true in tropical countries where the usefulness of the pig often lies in its ability to make use of cheap material to formulate locally made feedstuff. This research compared the various locally available feed material to a commercialized feedstuff for pigs. The experimental design used was the Randomized Completely Block Design with two treatments replicated two times. Blocking was done according to litter per sow. The treatments were (1) Locally formulated diet (LFD) and (2) Bounty Farm Diet (BFD). The locally formulated diet comprised of Cassava Root Meal (CRM); Coconut Meat Meal (CMM), Fishmeal (FM), Broken Rice (BR), *Moringa Oleifera* Leaf powder (MOLP), and Salt (S). Animals were fed 0.907kg of feed daily for a period of six (6) weeks. The weight of each animal was collected once weekly for the period of the study. This research was conducted at the Guyana Livestock Development Authority (GLDA) farm at Mon Repos, East Coast Demerara.

The results showed that total weight gain per animal fed the locally formulated ration were lower (13.79 Kg) than the commercial diet (15.20 Kg), but their performances were comparable (T= 1.09, P=0.27). Decline in weekly weight gain was observed at weeks 3 and 5. However, a sharper decline was observed at week 5 with the local feed. Feed Conversion Ratio was significantly different (T=0.2, P=0.8452). The cost of manufacturing 39.9 Kg of local feedstuff was $5,700, which was comparable to that of the Commercial feed stuff which cost $6,300. This research found that the local feedstuff was comparable in terms of weight gain, FCR and cost to commercially formulated ration. Therefore, locally available feed material can be utilized for feeding pigs and can also be substituted once a scientific formulation and experiment is done.

KEYWORDS: Locally Formulated Diet, Bounty Farm Diet, Pigs, Feedstuff, *Moringa Oleifera*

Evaluation of Biochar Produced from Rice Hulls for the Amelioration of a Sandy Soil

Tatyana Moore

This research evaluated the production of biochar from rice hulls for the purpose of amelioration in Tiwiwid Sands, which are low fertile and acidic. This was done by determining the vegetative and yield parameters of eggplants as a test crop grown on the soils using four

(4) treatments. The Randomized Complete Block Design (RCBD) was used to test the effects of rice hulls biochar applied at 11 t/ha alone (T2) and Biochar in combination with 12-12-12-2 fertilizer applied at 400kg/ha (T4) against treatments where fertilizer only was applied (T3) and where no fertilizer nor soil amendment was added (T1). The research was conducted at Mainstay/ Wayaka in Region #2.

Statistical analysis revealed no significant differences among growth and vegetative characteristics and soil pH among treatments. The biochar + fertilizer treatments showed the least mean number of days to flowering (45.66) compared to the other treatments. This may indicate that the combination treatment allowed for the nutrient to be held stable in the soil. The fertilizer treatment and Biochar +fertilizer treatment both produced taller plants. The biochar + fertilizer treatment produced the highest mean number of fruits per plant/treatment (4.6 fruits/plant) and the highest mean weight of fruit per plant (0.40 kg/plant). The positive effect of biochar+ fertilizer was observed in yield with this treatment producing a yield of 47407 kg/ha. The superiority of the biochar combination treatment over the fertilizer only treatment can be explained by the fact that inorganic fertilizers, while available immediately to plants are subject to leaching. There was a significant interaction between the soil and biochar and soil and biochar combination treatment, with the treatments having an alkalizing effect on the soil. This is relevant because soil acidity reduces crop yields. In evaluating the use of rice hulls biochar for amelioration, when combined with fertilizer showed superiority for most yield and vegetative characteristics of eggplants.

KEYWORDS: Biochar, Fertilizer, Vegetative Growth, Yield, Rice Hulls, Tiwiwid Sands, Low fertility, Acidic

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Micropropagation in Plantains

Eron Alonzo

This research done was on micropropagation of plantains (*Musa spp.)* for the evaluation of a healthier planting medium, cutting technique and growth hormone 6-Benzylaminopurine (BAP) application rate. This study was done at the University of Guyana, Faculty of Agriculture

and Forestry Research Centre, Turkeyen Campus. The research was laid out in a split plot design with the main plots being two substrates (sawdust and rice hulls) and subplots being two cutting techniques (meristematic cut and crosscut), and the sub-sub plots being two hormonal treatments (with BAP at 3.0 ml/l and without BAP). Each treatment was replicated three times, with 4 corms per plot with a total of 12 plots. ANOVA was performed using Statistix 10 Software with a 95% CI. Least Significant Differences (LSD) test was done to separate means where differences were found.

The results revealed that the corm which produced the most plantlets (n=11) was crosscut, soaked in BAP and cultivated on sawdust. Sawdust performed better of the two substrates in the average number of plantlets produced, plant height, average root length, and average leaf length. The BAP produced plantlets with shorter root length and leaf length, and plant height. The treatment with and without BAP produced the same average number of plantlets ($P>0.05$). The cutting technique was not found to be of influence for production of plantain plantlets using macropropogation as it had no significant effect on the vegetative characteristics ($P=0.6091$), however, the crosscut performed better than the meristematic cutting technique. Sawdust was proven to be a better medium for plantlets production because of its higher water retention capacity over rice hull. This research shows that farmers can apply this farm friendly technique to increase their production of planting material of plantain using cheap and widely available substrate. Further studies using higher concentrations of BAP should be considered.

KEYWORDS: Plantlets, Macropropogation, BAP, Cutting Techniques

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An Evaluation of Two Cover Crops in Improving Soil Health of Tiwiwid Sand

Diana Bruce

The use of cover crops has been deemed as a suitable conservation practice in improving soil health. This research was conducted to determine the effects of *Brachiaria humidicola* (UF717) and *Macroptilium laythroides* (Phasey bean) as cover crops on Tiwiwid Sand. This soil is acidic, sandy and infertile, but represents a principal soil resource in Guyana's Hinterland.

In this study, three treatments (*B. humidicola*, *M. laythroides* and Control) replicated three times were laid out in a Randomized Complete Block Design (RCBD). Soil samples were collected from a depth of 0-15cm after three months and analyzed for organic matter content (OMC), and pH. Above ground biomass (AGB) of cover crops was also assessed. Fresh samples of AGB were obtained using a 12inch x 12-inch quadrat. The research was conducted at Robert Davis Farm at Yarrowkabra, Soesdyke/Linden Highway, Region #4.

The results showed that there were significant differences between AGB for the treatments (P=0.0040). *B. humidicola* yielded significantly higher mean AGB (9.6733 g/m^2) followed by *M. laythroides* (2.4933 g/m^2) and the control (1.7833 g/m^2). *B. humidicola* is a warm season perennial grass that was introduced into Guyana to control soil erosion and as a forage material for ruminants. It is a prostrate, fast growing stoloniferous grass which is known to dominate or suppress other weeds. The control plot was covered with an unidentified species of grass, growing in clumps. Initial OMC ranged between 0.8% to a little above 1% but increased to a range of 1.5% to less than 1.6%. However, OMC increased the most with the *B. humidicola*, but was not significantly different from the other treatments. Plots with *M. laythroides* had a greater increase in soil pH while *B. humidicola* had the lowest increase in soil pH. The results showed that planting cover crops on Tiwiwid Sand did not significantly improve soil pH or OMC. Further assessment of the potential effects of the cover crops should be done for a longer period. The combination of legume and grass crops should be explored.

KEYWORDS: *Brachiaria humidicola*, *Macroptilium laythroides,* Aboveground Biomass, Organic Matter, pH, Cover Crop, Tiwiwid sand

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An Evaluation of Organic Manures and Biofertilizer on Growth and Yield of Sweet pepper (*Capsicum annuum*)

Dwayne Gangoo

A pot experiment was carried out to evaluate the effects of Organic manures and Biofertilizer on the growth and yield of sweet pepper *(Capsicum annuum)* grown in Ithaca sandy loam. The experimental design was a Completely Randomized Design with seven (7) treatment replicated three (3) times. The treatments were: (T_1) Soil, and Poultry manure, (T_2) Soil, and

Heart of Palm, (T_3) Soil, and Innocare Bio-fertilizer, (T_4) Soil, Heart of palm and Innocare Biofertilizer, (T_5) Soil, Poultry manure and Innocare Biofertilizer, (T_6) Soil, Heart of palm and Poultry manure and (T_7) Soil, Heart of Palm, Poultry manure and Innocare Biofertilizer. The Bulls Horn sweet pepper variety was used for this experiment. Soil material used was Ithaca sandy loam. This project was carried out at the University of Guyana Faculty of Agriculture and Forestry, Research Station, Turkeyen Campus.

Significant differences were found among treatments for plant height at maturity, days to 50% flowering, average weights and total weights ($P<0.0000$). Plants treated with poultry manure performed best amongst the treatments in relation to plant height at maturity with height ranging from 76.417- 86.833 cm. Soil & Innocare showed poorest performance with average plants heights of 35.633 cm. Plants treated with heart of palm waste performed best in relation to days to 50% flowering. In relation to average and total weight of fruit the heart of palm waste in combination with the poultry manure performed best with average fruit weight of 11.640 g and a total weight of 102.30g. Soil & Innocare and Soil, Heart of Palm & Innocare performed the poorest in average fruit weight and total weight. The initial pH of the soil was 6.3 being slightly acidic but became alkaline after the application of organic manures. Organic matter content increased in all treatments. Treatments with Heart of Palm had higher organic matter content. Further studies be carried on heart of palm waste as a soil amendment for crop production on other soil types.

KEYWORDS: Bio-fertilizer, Innocare, Heart of Palm, organic manure, poultry manure

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An Evaluation of Oil Eating Microbes in the Remediation of Oil Spills on Land

Richelle Ellis

Oil spills were simulated on three soil textural classes – sand, loam and clay in a pot experiment carried out at the University of Guyana Turkeyen Campus. A commercial preparation of Oil Eating Microbes (oleophilic bacteria) was added after three weeks, and this was monitored to determine changes in pH and organic matter content. The experiment utilized a Randomized Complete Block Design (Factorial Approach). Soil types were sand, loam and clay. Spill category was classified as Heavy (25% of the soil volume), Medium (15% of the soil volume) and Light (5% of the soil volume). Bacteria was diluted at 1.0g of OEM in 1 Litre

of water. Soil samples from each experimental unit were subsequently analyzed to determine pH and organic carbon content. Petroleum (waste oil) was obtained from a local auto repair shop and used as a replacement because of difficulty of gaining crude oil from Exxon Mobil. Bacteria were added at one standard rate of 25 ml aliquot dispensed to each pot. Soil analysis was done at the Guyana Sugar Corporation's Lab in La Bonne Intention.

The results showed that there were significant differences observed in pH and Organic matter % among treatments for each of the soil types ($P<0.05$). Soil pH fluctuated among the three textural classes and the there was no definitive trend for this parameter. The original soil pH was highest in sandy soil. The bacterial treatment increased pH level in medium and heavy spill category on clay soil. On loamy soil, pH increased with the addition of waste oil, but after bacterial treatment a consistent trend of decrease in pH level was observed across treatments. In the sandy soil, no consistency trend in the rising and falling pH levels was seen. pH levels decreased in the heavy spill category. Adding waste oil reduced organic matter % in clay soils only in the light and heavy treatments but on sandy soil, a slight increase was observed in the light treatment. There is evidence that the bacteria reduced the hydrocarbons in the soil in some treatments. This trial represents a simulation and may not truly reflect the effects of oil spills.

KEYWORDS: Oleophilic Bacteria, Soil Textural Classes, Organic Matter, Oil Spill

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An Evaluation of Sulphur Coated Urea Fertilizer on Sugarcane Production at Blairmont Sugar Estate

Dillon Adrian Weekes

Sugar cane urea fertilizer application at the Blairmont Sugar Estate is surfaced broadcasted, which results in nitrogen losses. This experiment sought to evaluate Sulphur Coated urea fertilizer as a possible solution for improving the vegetative growth and yield performance of sugarcane, cultivated at the Blairmont Sugar Estate, for a period of 30 weeks. The experimental design was a Randomized Complete Block Design RCBD, with four blocks and four treatments. The treatments were: T1- Sulphate of Ammonia (SA) (50kg/ha N) + Uncoated Urea (27 kg/ha N) + DAP (11 kg/ha N), T2 - Uncoated urea (77 kg/Ha N) + DAP (11 kg/ha N), T3 - Sulphur coated Urea (77 kg/Ha N) + DAP (11 kg/ha N), T4 - Control –No nitrogen. In

addition, all treatments received a uniform application of Potassium and Phosphorus. 41 series (Onverwagt Clay). Soil samples were taken at 0-6 and 6-12 inch depths.

Sulphur coated urea (SCU) fertilizer recorded the maximum mean stalk height of 113.07cm, while the control recorded the lowest mean stalk height of 82.6 cm. Sulphur coated urea fertilizer and urea fertilizer treatment recorded highest meant stalk girth of 8.75 and 8.48 cm respectively and were significantly higher than the other treatments (P=0.0015). There was no significant difference in mean stalk population between coated and uncoated urea fertilizer treatments. Uncoated urea fertilizer had the highest mean TC/Ha (72.60). Sulphur coated urea fertilizer maintained a positive soil nitrogen level throughout the experiment. The uncoated nitrogen fertilizer treatments recorded the highest leaf N concentration at month 3 and the highest leaf and fiber concentration at month 6. The mean brix and % Pol recorded no significant difference for the treatments at week 30. This study showed that sulphur coated urea fertilizers could significantly improve sugarcane yields and maintain a positive soil nitrogen concentration. Further experiments should be conducted on other soil types, sugar cane varieties and crop cycles. It would be interesting to investigate the effect of continuous application of SCU on the soil N reserve.

KEYWORDS: Sulphur Coated Urea, Sugar Cane, Uncoated Nitrogen Fertilizer, Stalk Height, Stalk Girth, Soil Nitrogen, Vegetative Growth, Yield

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The Challenges of Exporting Non- Traditional Crops

Priscilla Brummell

This study assessed the level of awareness of farmers of exporting policies and the exporting challenges that farmers face in Region #4. It also sought to understand the marketing choices of farmers using behavioral theories. This study was conducted in Demerara- Mahaica with farmers located in Garden of Eden and on the Soesdyke/Linden Highway. The target population comprised of farmers who cultivated pineapple, lime and eddoes. Using a cluster sampling approach and questionnaires and structured interviews, data was collected from one hundred and twenty-one (121) farmers.

This research found that farmers are more aware of the exporting policies of the New Guyana Marketing Corporation (82%) and least aware of polices of National Plant Protection

Organization and Guyana National Bureau of standards (39% and 42% respectively). It was also found that numerous exporting challenges do exist as 100% of farmers requested to have more information. Of the total, 42% experienced land ownership issues among other challenges. The conclusions are that there is awareness of agricultural export policies among farmers, however the level of awareness vary. Despite challenges and lack of opportunities farmers are making a calculated choice whether to export or not based on cost and profits or preferences. Targeted interventions are necessary that focuses on both awareness and exporting challenges of non-traditional crops. Farmers who are not aware should be sensitized by the various agencies about their export polices. Those that are aware and do not want to access the export market, grants and subsidies can be used as incentives. It is recommended that similar studies be replicated as exporting challenges may vary with location and crop type.

KEYWORDS: Exporting, Non- Traditional Crops, Behavioural Theories, Challenges, Awareness

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The Efficacies of Four Organic Pesticides to Manage Diamondback Moth

Carlisa Adridge

Effective control of the Diamond Back Moth (*Plutella xylostella* L.) in the cultivation of cabbage (*Brassica oleraceae*) has proven to be an elusive goal of cabbage and vegetable producers in most regions of Guyana. The insect has been observed to have developed resistance to several chemical insecticides. As such alternative measures to control the insect is considered. A field experiment was conducted at Parika, East Bank Essequibo to test the efficacy of four biological control methods on Diamond Back Moth. The Complete Randomized Block Design (CRBD) was used. The treatments were neem oil 2%, Pest Out 2%, *Beauveria bassiana* at 30ml, *Bacillus thuringienesis* at 30ml and 80ml of Match which is considered a selective insect growth inhibitor for long lasting control by interrupting the life cycle of caterpillars. Each treatment was replicated five times.

DBM larvae were found on each sample plants in all the treatments. This pest appeared throughout the different stages of growth of the plant. However, there were no significant differences in DBM incidence among the five treatments (P=0.3116). Plants treated with Neem oil and match have recorded less presence of DBM larvae. Match was the more

effective treatment. Neem oil was the second-best treatment in controlling DBM larvae. Neem oil treatment was associated with the highest yield in this experiment but was not significantly different from yields obtained from Pest out and Match. There was a higher marketable weight of cabbage treated with neem oil. Since Neem oil of all the biological controls showed the most effective results, farmers can utilize it as an alternative method of control for the insect pest DBM. It must be noted, that during the experiment heavy rainfall was recorded from week five until harvesting. This may have affected the ability to some of the treatments to remain on the plant surfaces. This study should be replicated during the dry season.

KEYWORDS: Biological control, Diamond Back Moth, *Beauveria bassiana, Bacillus thuringienesis*

The Effects of *Lactobacillus plantarum* on the Fermentation Process of Grass and Rice Straw Silage

Omario J. Gooding

This experiment was conducted to assess the effects of lactic acid bacteria, *Lactobacillus plantarum* on the fermentation process of grass and rice straw silage. A factorial approach using the Completely Randomized Design (CRD) was used for this study. There were 6 experimental units and 3 replicates, giving a total of 18 experimental units. Two factors were used, the first factor was the microbial inoculant, which had two levels: (a) inoculant present and (b) inoculant absent. The second factor consisted of the substrates: (a) antelope grass only, (b) rice straw only and (c) antelope grass + rice straw.

The results of this study indicated that adding *L. plantarum* to the fermentation process of grass and rice straw silage had no significant effect on treatments or factors in relation to pH, crude protein, and crude fibre content ($P>0.05$). Nonetheless, the colour of silage and its acceptability when fed to dairy cows were improved when *L. plantarum* was added to the fermentation process. The addition of *L. plantarum* did not yield similar improvements for the presence of moulding, and the aroma of the silage, but rice straw silage had significantly less mould present than antelope grass silage. Silage made from rice straw alone had a consistently pleasant aroma whether inoculated with *L. plantarum* or not. The addition of a

non-protein nitrogen (NPN) compound such as urea to the forage when ensiling should be explored to see its effect as NPN may improve fiber digestibility, reduce the breakdown of protein in the silo and increase the crude protein (CP) content in the form of soluble protein (SIP).

KEYWORDS: *Lactobacillus plantarum*, Silage, Lactic Acid Bacteria, Inoculant

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The Effects of Different N.P.K 12:12:17:2 Fertilizer Application Rates on the Growth and Yield of the Onion Variety F1 Granex

Acqusie Moses

In 2018, pilot trials for onion production were conducted by the World University Service of Canada in Regions # 2, 5, and 6. The fertilizer used in the trials were donated by Massey Company Limited. After the conclusion of the trials, farmers who were interested in onion production would source their fertilizers from the said company at a high cost. The availability of a fertilizer which is less costly can encourage more farmers to start onion cultivation. This research evaluated the performance of four fertilizer applications which included the mixed fertilizer 12:12:17:2 at rates of 40 kg ha $^{-1}$, 80kg ha $^{-1}$, 120 kg ha $^{-1}$ and Evergreen (control) on growth and yield of onion. A Randomized Complete Block Design (RCBD) was used with 4 treatments and 3 replicates which resulted in a total of 12 experimental units. The field experiment was carried out at Mocha Arcadia Village, East Bank Demerara, Guyana.

The results showed that Evergreen gave the highest average weight of 37.3g, followed by the 80 kg ha^{-1} 12:12:17:2 treatment with an average weight of 36.5g and the 120kg ha^{-1} treatment with an average weight of 32.8g. The lowest average weight was observed in the 40 kg ha^{-1} treatment at 28.3g. Bulb diameter ranged from 3.9 cm to 4.24 cm. The 80kg ha^{-1} had the largest overall diameter followed by the evergreen with a mean diameter of 4.18cm. Evergreen had the highest leaves per plant, followed by the 80kg ha^{-1} treatment while the 120kg ha^{-1} rate had the third lowest, followed by the 40 kg ha^{-1} treatment. The results show that 12:12:17:2 fertilizer can give similar production yield values to that of the evergreen fertilizer. Based on the results of this research, the 80kg ha^{-1} treatment is recommended because it was the most effective of the inorganic fertilizer treatments. However, from a cost perspective, since the results were not significantly different between fertilizer treatments,

the 40 kg ha^{-1} treatment would be the most cost effective, as it produced similar results to that of the higher application rates.

KEYWORDS: Bulb Weight, Bulb Diameter, Evergreen, Onion

An Analysis of Rice Farmers Adaptation to Climate Smart Agricultural Practices on the Front Land Clays of Region #5

Ozay Roberts

This study was done to gain knowledge on rice farmers' awareness and adaptation to climate smart Agricultural practices on the front land clays of Region # 5. A cluster sampling technique was utilized with a 25% representation from each of the following cluster: Perth-Supply, Spooner-No. 10, Strath Campbell-Chance/Hamlet, Mortice-Wash Clothes A total of 40 farmers were gathered from the clusters.

Based on the acreage of lands cultivated, 40% of the farmers cultivated 1-10 acres of land, while 32.5% cultivated 11-20 acres of land, 17.5% of the cultivated 21-30 acres of land while the remaining 10% cultivated 31 acres and above. The results revealed that 47.5% of the farmers received their information from extension officers, 25% of them received their information from other farmers and 27.5% of them received their information from other sources. All the farmers used treated seeds, eco-friendly chemicals, pesticides, fertilizer, levelled rice lands and used of improved varieties. Some (57.5%) incorporated rice straws into the soil and 15 % use biological methods to control insect pests. The results for the extent to which climate change affects rice yields revealed that 52% of the farmers were affected highly, 37% were affected moderately while 11% of them were least affected. Based on the results it can be concluded farmers in Region #5 are aware of climate change and are already using climate smart adaptive strategies to combat the effects of climate change. It is recommended that further research be conducted in different regions of Guyana.

KEYWORDS: Climate Change, Climate Smart Agriculture, Awareness, Adaptation

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Rice Farmers Perceptions and Possible Adaptation Strategies to Climate Change Effects on the Essequibo Coast (Charity-Supenaam)

Floyd P. Gilkes

Climate change is recognized as one of the leading challenges affecting the performance of agriculture and the livelihood of people. Farmers are the hardest hit as they have to continuously respond to climatic variations. In order to understand rice farmers' perceptions of climate change, its impacts and to identify farmers' adaptation needs, personal interviews were done using structured questionnaires with farmers from the villages of Charity to La Recourse on the Essequibo Coast. In addition, analysis of meteorological data was done to see if farmers' perceptions match with the reality. A list of 140 registered farmers was collected from the Guyana Rice Development Board (GRDB) and a systematic randomization sampling technique was done using 25% representation of the list.

Most of the rice farmers interviewed were above the age of 45 and possessed a sound secondary education. Most farmers perceived that temperature is increasing (33%) and that rainfall is decreasing (22%). Farmers perceptions on rainfall compared to the climate data collected from the Guyana Hydrometeorological centre matched but their perceptions on temperature did not. Most farmers perceived that climate change will impact their household income rather than their food security. The most common perceived problem due to high temperatures was disease outbreaks (n=24). Majority (n=32) perceived that high presence of weeds would result from increased rainfall and that flooding would result in high presence of weeds (n=26). Most farmers (n=33) perceived water shortages would result from drought. Adaptation were already employed by most farmers to mitigate climate change effects such altering the varieties of rice planted, use of fertilizers, agrochemicals and the use of water pumps. Some options proposed by most farmers for support were more government subsidies, more training and more climate tolerant varieties. The research revealed the need for greater support to smallholder farmers by institutions and government in the areas of efficient use of water resources and more development and dissemination of agricultural technologies.

KEYWORDS: Adaptation, Climate Change Effects, Perception, Rice, Problems, Impacts

Evaluation of Diammonium Phosphate Fertilizer on variety DB9633 in 2nd ratoon of Sugarcane (Saccharum officinarum)

Navindra Sagadaya

This trial was aimed at improving GuySuCo's fertilization regime for variety DB 9633 in 2nd ratoon by comparing GuySuCo's standard ratoon fertilization regime with and without phosphorus. A field experiment was conducted with treatments consisting of: T_1 –470kg SA+118kg Urea + 88kg MOP/ha (GuySuCo Standard fertilization regime) and T_2 – 412kg SA + 118kg Urea + 59kg Diammonium Phosphate (DAP) + 88kg Mop/ha. The trial was conducted at Uitvlugt Estate Cultivation, West Coast Demerara, Region #3. The Randomized Pair Plot Design was used for this trial. Treatments were replicated four times. Each plot was 2.38 hectares each. Soil samples were taken at 0-15 cm and 15-30 cm depths for analyses of pH and phosphorus.

A change in both soil pH and P was observed, thought these were not significant. Phosphorus increased at week 12 and decreased at week 24 for both depths. Phosphorus levels in the tissues were within standard range of 0.2% - 0.1% for leaf and stem respectively. There were no significant differences in the various growth parameters between treatments. In contrast, yield variance was greater in T2 but not significantly different when compared to T1. Yield estimate (t/ha) at week 50 was 61.5 for T1 and 64.0 for T2. Brix % decreased while Purity % and fibre content increased at week 38, though not significantly. There were no significant differences between treatments for sucrose at week 50 with T1 giving an average of 4.9t/ha and T2 giving an average of 5.1t/ha (P=0.5392). A 0.2 % variance in TS/Ha will yield 95.96 tonnes more of sugar for the same unit area and an increase in revenue of $6.8 million Guyana dollars. During this study environmental conditions were not ideal due to extended periods of dryness and low moisture levels. This affects the uptake of nutrients in the early stages of the sugarcane plant which was revealed in the first leaf analysis. The results of this study may not be applicable to other areas because of soil variation, pH and salinity.

KEYWORDS: Diammonium Phosphate, Sugar Cane, Brix %, Yield Estimate, Sucrose

An Overview of Guyana's Tambaqui (*Colossoma macropomum*) sector: Current Status and Challenges

Laushana Massiah

Due to the importance of aquaculture in Guyana and the high potential of tambaqui (*Colossoma macropomum*), a survey was conducted to determine the status of the sector and the issues plaguing it. Seven farms in six administrative regions across Guyana was done. The Areas of this study were Hampton Court and Anna Regina, Mainstay (Region 2), Canal # 1 (Region 3), Agriculture Road, Mon Repos (Region 4), Bushy Park, Mahaicony (Region 5), Marysburg, #19 Road, Lower Corentyne (Region 6), and Annai (Region 9). The survey consisted of questionnaires and interviews.

The owners of the farms have secondary or tertiary level education with 71% of them being involved in production due to it being a business opportunity. Farmers are trained either by Government or the private sector. It was observed that the two farmers that received private training are exceeding in production than the other farmers that received government training. The total acreage under tambaqui cultivation is 298.5 acres. Only two farms use the entire farm area for production. The largest farm has a total 746 acres and produces a daily estimate of 15,000 lbs of fish. If the farmers were to produce to full capacity, a total of 2, 174 tonnes of fish would be produced annually. Sourcing markets and affordable, quality feed were the main constraints being faced by the farmers. The research highlighted the need for manufacturing of feed locally and the creation of new marketing opportunities. These measures can be spearheaded by the farmers themselves with support from the government.

KEYWORDS: *Colossoma macropomum*, Fish Production, Aquaculture, Freshwater Fish, Tambaqui

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The Effects of *Samanea saman* Seed Meal on Water Quality and Growth Performance of Tilapia

Melisa Baskh

seed meal on water quality and growth performance of Nile tilapia fingerlings. One hundred and eighty fingerlings were stocked in 12 concrete tanks. Four treatment diets were

formulated containing fish meal (28.5%), rice meal (40%) soybean meal (25%), vitamins and mineral premix (1.5) and fish oil (5) and S. *saman* inclusion at 0%, 25%, 30% and 35%, respectively. The feed was pelleted. Diets, coded A (0%), B (23%), C (30%), and D (35%) were assigned to tanks using the Completely Randomized Design. Fingerlings were hand fed at 7% body weight three times per day, for 60 days. This research was conducted at the Satyadeow Sawh Aquaculture Station, Mon Repos, East Coast Demerara.

The results obtained showed no significant differences among water quality parameters tested. The water in the fish tank with the 30% *S. saman* inclusion had the highest values obtained for ammonia (0.11mg/l), nitrite (0.27mg/l) and nitrate (1.78mg/l), as well as the lowest dissolved oxygen (2.38mg/l). These values are considered undesirable for tilapia. Although not significantly different, the *S. saman* diets performed slightly better than the control (0% *S. saman* inclusion), with Diet B having the highest significant mean final weight gain (34.92g), mean daily weight gain (0.49g) and specific growth rate (3.02). Fish were in good physical condition, with values ranging from 1.8 (Diet C) to 2.06 (Diets B and D). Survival rate, hepatosomatic and viscerosomatic indices were highest in fish fed Diet B and lowest in fish fed Diet C. High mortality and reduced performance of fish fed Diet C may have been due to poor water quality, which created an unfavourable environment. These results suggest that *S. saman* meal may be used as a possible replacement of soybean meal in feed production.

KEYWORDS: *Samanea saman,* Water Quality, Fish feed, Aquaculture, Tilapia, Fingerlings

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Farmers' Perception of ICT in St. Kitts

Shaquimha Hanley

The purpose of this project was to assess farmers' perceptions of ICT in St. Kitts. There was a need to venture into this project because of the hasty advancement of technology in today's world and while the other sectors on the island are already advancing in technology the agriculture sector is lagging. The project was executed firstly by communicating with the ICT Center and the Ministry of Agriculture to find out where the sector is now. Then the Department of Agriculture assisted by providing the listing of all the registered crop farmers on the island. The list was used to select farmers at random and interviews were conducted

with 10% of farmers from amongst 3 clusters. The overall total of farmers was 30 where 5 farmers were from cluster 1 and 9 farmers each were from clusters 2 and 3.

Most farmers interviewed were over 50 years and have been farming for over 25 years. Most of the farmers are small scale farmers. The results showed that farmers are knowledgeable about ICT and had a positive attitude towards ICT. The most commonly used ICT device was a smartphone. Most of the farmers saw the importance and benefit of ICT and most disagreed about the challenges and disadvantages of ICT. Most farmers agreed that there has been advancement and improvement in their business since using ICT. However, despite the level of awareness and positive attitude towards ICT, farmers on the island do know about ICT and many of them still are not using it entirely in their businesses. However, they recommended that the ministry should develop user-friendly software and assist financially to purchase devices and provide more training and awareness on ICT.

KEYWORDS: ICT, Farmers' perceptions, Awareness, Technology, Software

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Berbice

An Evaluation of Coated Urea on Sugarcane

Mohamed Y. Razack

This research evaluated coated urea on sugarcane performance. A field experiment was conducted with three nitrogen treatments and a control (no nitrogen). The research was conducted at Guysuco's Albion Estate, Corentyne, Berbice ELH Fields 13, 14, 15 and 16). The sugarcane variety used was D15841) on soil type 37. The Randomized Complete Block Design (RCBD) experimental design was used, with four treatments and four replicates. Treatments were standard plant cane fertilizer at rate of 235Kg SA + 59Kg Urea + 59Kg DAP+ 88Kg MOP (T1), 167Kg uncoated urea + 59Kg DAP +88 Kg MOP (T2), 167Kg coated urea + 59Kg DAP +88 Kg MOP (T3), and No Nitrogen + 88Kg MOP (Control). Treatments were applied 6 weeks after planting.

The results revealed that there were no significant differences in the various growth parameters. Treatments 2 and 3 recorded better height and girth growth. Significant differences in the yield parameters were observed where the uncoated and the coated fertilizers showed better yields than the standard treatment by an average of 12% while the coated urea had a 9% improvement in yield. The uncoated urea treatment produced significantly higher yield. Therefore, there can be an improvement in sugarcane yield when coated urea is used compared to the standard fertilizer treatment. There were no significant differences in Brix across treatments. A cost analysis indicated that both coated and uncoated urea may be more viable in terms of cost and yield. It is recommended that actual harvest data be analyzed to provide more accurate performance data, since yield data was acquired through yield estimations. Further research should be considered for other ratoons, and types and forms of coated fertilizers. More in-depth cost analysis should also be considered.

KEYWORDS: Uncoated Urea, Coated Urea, Yield Estimate, Growth Parameter, Sugarcane, Nitrogen

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Esherichia coli Contamination of Lettuce (_Lactuca sativa_ L.) in the Farm-to-Market Continuum in Region Six

Tiffany Jordan

Vegetables, especially those that are consumed raw, have been recognized as important vehicles for the transmission of pathogens that can cause server illnesses. This research investigated *Esherichia* coli contamination of lettuce (*Lactuca sativa* L.) in the farm-to-market continuum in Region 6, Guyana. A total of ninety-six lettuce samples were purchased from eight registered farmers and eight vendors at markets within Region 6. The total number of *Esherichia coli* colonies was determined for each lettuce sample. Samples were cultured on the MacConkey agar and the indole spot test was conducted to confirm the presence of *E coli.*

The average numbers of *E. coli* colonies among farmers were 5.98 $logCFUg^{-1}$ and 4.97$logCFUg^{-1}$ among vendors. *E. coli* levels were below the satisfactory levels of the Public Health Laboratory Services Guidelines and there were no significant differences in the average amount of *E. coli* colony forming units between five farmers and vendors. Manure and proximity of animals near to produce is important and these can be a source of

contamination. Half of the fields were located next to livestock farms and 12% near poultry farms and roadways. Many farmers applied manure to their crops. Animal grazing was carried out at 62.5% of the fields used for lettuce cultivation. Handling, cleaning and other practices can contribute to spread of food borne pathogens. The practices of vendors in terms of the handling, display, and cleaning varied, with majority displaying produce on tables openly. Cleaning is done by washing once in the same water or sprinkling water onto the produce. Customers can touch produce. The result of this research identified factors which may contribute to spread of food born pathogen *E. coli* but is limited to lettuce produced and sold within Region 6. There should be further studies conducted with increased sample sizes to investigate contamination among more farms and markets across this region. There is need for investigation of handling practices by farmers and vendors. Other vegetables should be tested for presence of other food borne pathogens such as *Shigella spp.*

KEYWORDS: *Esherichia coli*, Contamination, Lettuce

An Evaluation of Sugarcane Growth Performance Using Granular and Crystalline Sulphate of Ammonium Fertilizers

Adrian Singh

In the sugarcane cultivation, fertilizers are required in large quantities, mostly nitrogen fertilizers. Fertilizer costs approximately 50-55% of total cost of production, of which nitrogen fertilizers account for 50-70%. Nitrogen fertilizers has been reported to influence higher productivity when added to sugarcane fields. As such, it is important to ensure that the fertilizer regime used on sugarcane cultivations are efficient and effective. This research was aimed at evaluating granular sulphate of ammonium fertilizers on sugarcane growth performance. In this research, a field experiment was conducted with three nitrogen treatments (granular and crystalline fertilizers) and a control (no nitrogen). The research was conducted at Guysuco's Albion Estate, Corentyne, Berbice (Expansion 'B' Section, Fields 26, 27 and 28). The sugarcane variety used was DB9633 on Molson Loam Type (13 Series). The Randomized Complete Block Design (RCBD) experimental design was used, with four treatments and three replicates. Treatments were Granular Sulphate of Ammonia at a rate of 364Kg/Ha (T1), Granular Sulphate of Ammonia at a rate of 235Kg/Ha (T2), Crystalline Sulphate of Ammonia rates of 235Kg/Ha (T3) and Control (No nitrogen). Basal application treatments

were Diammonium phosphate +Muriate of Potash at rates of 59 and 88 Kg/ha respectively (T1), Urea + Diammonium phosphate +Muriate of Potash at rates of 59, 59 and 88 Kg/ha respectively (T2), Urea + Diammonium phosphate +Muriate of Potash at rates of 59, 59 and 88 Kg/ha respectively (T3), Muriate of Potash at a rate of 88Kg/Ha.

Empirical data from this research revealed that there were no significant differences in the various growth parameters nor yield parameters. All treatments yielded similar stalk height and girth at 84, 98, 112, 126, 140 and 156 days. Yield for the treatments were 53t/ha, 59t/ha, 56t/ha and 49t/ha for T1, T2, T3 and T4 respectively. Treatments 2 and 3 produced higher yields. Tissue analysis showed that there were no significant differences between treatments, however, higher percentage of nitrogen was observed in leaf tissues. Nitrogen in soil displayed heterogeneity. The results gathered from this trial showed poor performance and were inconclusive which may have resulted from an error in the treatment structure. Therefore, this trial should be repeated with correction to the treatment design, and there should be continuation of this trial for other ratoons. Cost and benefit analysis should also be to determine the most economically viable fertilizer that will produce better yields.

KEYWORDS: Granular Sulphate of Ammonium Fertilizers, Nitrogen, Sugarcane, Crystalline Fertilizers

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An Evolution of the Yield Performance of Sweet Potato (*Ipomoea Batatas*) Grown from Four Different Lengths of Plant Materials in Guyana

Kishan Ramesh

Ipomoea batatas also known as sweet potatoes, is the second most important of the root and tuber crop grown in Guyana after cassava. One of the major constraints to sweet potato production is the availability of superior quality, high yielding plant material. A field experiment was done during the period of November 2017 to April 2018 in Crabwood Creek following a Completely Randomized Design. The experiment used three different lengths of rooted planting material of 5 cm, 10 cm and 15 cm propagules along with the conventional planting material, 30.5cm unrooted vine.

The results showed that the conventional planting material produced significantly higher number of sweet potato tuber, total yield and marketable yield per plant. The presence of a

greater number of nodes in the conventional planting materials may have contributed to better performance. Production of coiled roots in the rooted propagules and transplanting shock may have contributed to lower performance compared to the conventional method. The number of sweet potato tuber, total yield and marketable yield per plant were not significantly different between the 5 cm, 10 cm and 15 cm propagules. However, the 10 cm propagules performed the best in terms of mean yield per plant, mean marketable yield per plant, mean number of marketable tubers per plant. More research should be done to investigate the cause of coiled roots and measures to prevent this. More research is recommended using different sections of the vine as planting materials, soil types and other varieties.

KEYWORDS: Sweet Potatoes, Rooted Propagules, Unrooted Vine, Marketable Tuber

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An Evaluation of the Efficacy of Siperus (Pyrazosulfuron-ethyl 10 WP) as a Post Emergent Herbicide in Sugarcane Cultivation

Vishernauth Dhanpat

2, 4 – Dichlorophenoxy acetic acid is a major herbicide used for controlling broadleaf weeds and sedges in GuySUCO. It is used in combination with Metsulfuron (Ally) to create a synergetic effect and individually at higher rates in the absence of Metsulfuron. Since 2, 4-D is categorized as moderately hazardous (Class II) by the WHO and a possible carcinogen to humans, the need arises for a herbicide that is considered less hazardous and can yield satisfactory results. A field experiment was conducted to evaluate the efficacy of Siperus (Pyrazosulfuron-ethyl) as a possible replacement for 2, 4-D to control broadleaf weeds and sedges in sugarcane at Albion estate, East Canje, Berbice, Guyana. The experiment was laid out in a Randomized Complete Block Design consisting of five treatments and three replicates. Blocks comprised of 50, 65 and 28 percent weed density which were grouped separately under sedges, broadleaf and vines. Treatments comprised of Siperus at 250.0 g/ha, 275.0 g/ha, 300 g/ha, 2, 4-D + Ally at standard rate (1.5 lt/ha + 60 g/ha) and an untreated area (control). Results from the experiment revealed that Siperus and 2, 4-D + Ally were equally effective in the control of *Cyperus rotundis* at 14, 21, 28 and 35 days after application. For Broadleaf weeds and vines the Siperus proved to be less effective compared to 2, 4-D + Ally. In terms of overall control, 2, 4-D + Ally resulted in a 79% reduction in weeds while Siperus at

250, 275 and 300 g/ha, respectively resulted in 28.6%, 28.65 and 31.6% weed reduction. 2, 4-D + Ally combination recorded the highest incremental growth 56 days after application with an average of 41.4 cm resulting in 0.74 cm per day compared to Siperus at the three rates which had an average of 26 cm, similar to that of untreated areas. Although Siperus was not successful in gaining an acceptable control level, it can still be incorporated in GUYSUCO's chemical weed control program to control *C. rotundus*. However, GUYSUCO should continue to seek and evaluate other alternatives A similar trial should be conducted on early post emergent weeds of higher density. Similar trials can be done using higher rates of Siperus.

KEYWORDS: Efficacy, Carcinogenic, Resistant, Incremental Growth, Weed Density, Siperus, Pyrazosulfuron-ethyl

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A Varietal Evaluation of Onions in Open Field Condition on Ithaca Sandy Loam

Joshua Lyte

In 2015 alone, Guyana imported approximately 4395.8 tons of onions, both chilled and fresh at a cost of approximately US$1,459,765. This large import bill prompted research to be conducted using three varieties of onions by directly seeding in sandy loam. The specific objectives were to determine the vegetative growth characteristics of the Texas Early Grano 502, Red Creole and Yellow F1 Granex and the differences in yield in open field production. The research was conducted at a farm in Phillipi located in Corentyne, Berbice, Region #6, where the topography of the land was relatively flat with a sandy loam texture.

A Completely Randomized Design (CRD) was used with a total of three treatments. The plots measured 11 m x 7 m and accommodated a total of 1134 plants at a spacing of 15 cm x 10 cm. Results from the study showed that the Red Creole had the most leaves compared to the Early Texs Grano and Yellow F1 Granex. However, Yellow F1 Granes had better plant height, bulb weight, bulb diameter and matured earliest. Further testing is recommended in different environments and soil types throughout Guyana. Observations of weather patterns is necessary to time the planting of onions to avoid heavy rainfall, which can influence the plant in its later stages. There is a need to look at disease tolerant varieties suited to rainy periods so as to give farmers options in planting periods.

KEYWORDS: *Allium cepa*, Red Creole, Texas Grano, Yellow F1 Granex, production

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A Comparative Assessment of Two Fishing Methods (Trap versus Hook and Line) Used in Marine Fisheries in Guyana

Abiola Simpson

The study was carried out in 2018 from February to May and investigated the efficiency of trap versus hook and line method of fishing used in marine fisheries sector in Guyana. The work was conducted in collaboration with the Guyana Fisheries Limited (GFL) and the Single Seafood wharves in Port Georgetown. The data required for the study were collected weekly using questionnaires. The results showed that the hook a line method caught fish of an average length of 30.4 cm and the trap method about 28 cm in length (p=0.3648). Traps were more effective, providing an average catch of 1890.2kg per trip. However, close to twice the time is spent at sea when using the trap methods compared to the hook line method. Average cost per trip was higher for the hook and line method, but not significantly different from the trap method. Average labour cost per catch per trip for the trap method was significantly higher, accounting for almost 50% of costs (p=0.000). This higher cost of the trap method can be attributed to differences in licencing requirements for the two methods. In addition, the trap gear method was found to be more efficient of bycatch fishes. The hook and line method had a significantly higher efficiency catching target fish species. Based on the performance of the hook and line method in terms of all other parameters, except labour cost, it is recommended greater emphasis be place on encouraging greater adoption of the hook and line method. However, to achieve there is need to educate the sector on the advantages of using the hook and line method as well as the techniques associated with this method.

KEYWORDS: Traps, Hook and Line, Bycatch, Fish, Marine, Fisheries

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An Evaluation of Three Different Potting Media (Coco Peat, Rotted Sawdust and Rotted Paddy Hull) for Onion Seedling Production

Phillip John

An evaluation of three different potting media (coco peat, rotted sawdust and rotted paddy hull) for onion seedling production was investigated. The experimental design was a Complete Randomized Design with four treatments, each being replicated thrice. The treatments were:

Pro-mix (T1/Control), Coco-peat (T2), Rotted Paddy Hull (T3) and Rotted Sawdust (T4). All of the parameters, except germination percentage was taken after six (6) weeks.

The results demonstrated that mean Germination Percentages were not significantly different among treatments (p=0.7504). Germination percentage was highest with Pro-mix (69.88%) and lowest with paddy hull (50.79%) but were marginally different for cocopeat and paddy hull. All treatments performed similarly for the mean number of leaves (P=0.0678). Plant height was lowest for saw dust, with a mean height of 10.43cm. Paddy hull had a greater effect on root biomass, producing the highest dry weight of roots. Sawdust and Pro-mix showed same performance in this parameter. The comparable performance of sawdust indicates that wood residues may contain minor elements essential for plant growth of vegetative parameters, but not for sustained growth performance. Overall, the three organic treatments have proven to be just as effective as Pro-mix in achieving germination, and vegetative growth. Therefore, locally available rooted organic matter can be used as possible medium for growing onions, and farmers and commercial applications should be explored. Trials should be done with other locally available growth material.

KEYWORDS: Coco Peat, Sawdust, Paddy Hull, Onion Seedling, Production, Germination Percentage, Vegetative Parameters

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An Assessment of the Effects of Moringa (*Moringa oleifera)* and Black pepper (*Piper nigrum*) as Feed Additives in a Broiler Diet

Verlyn Huntley

The effects of *Moringa oleifera* and *Piper nigrum* as feed additives on the growth performance and feed efficacy of broiler chicken were investigated. Ninety, day-old, broiler chicks were randomly allotted to three (3) experimental diets namely: positive control with antibiotic (AGP Salinomycin), 1% moringa leaf meal in feed, and 1% black pepper in feed, in a Completely Randomized Design. Each treatment contained 30 birds (three replicates of 10 birds each). Feed consumption, body weight gain and feed conversion ratio were recorded and calculated weekly. The birds were slaughtered, and carcasses evaluated at week six.

Significant differences of growth performance and feed efficacy of broiler chicken, supplemented with moringa and black pepper were observed (P<0.05). Mean feed intake was

highest in the control (4.12 kg/bird) and lowest for black pepper (1.21kg/bird). Final mean body weight was highest in the control treatment (2.4kg), followed by the Moringa treatment (1.07kg) and Black pepper treatment (0.42kg). Though not significantly different, both moringa and black pepper treatments showed better feed conversion ratio. Adding black pepper and moringa reduced feed intake but marginally improved feed conversion ratio. There was a negative effect on weight gain over time in these two treatments. It is assumed that poor performance of chickens fed with black pepper was due to poor nitrogen free extract digestibility and energy. However, moringa leaf extract and black pepper can be utilized in poultry diets as a natural and healthy feed replacement. Follow up studies should be done for meat quality.

KEYWORDS: Broiler Chicken, Moringa, Black Pepper, Antibiotic Growth Promoters, AGP Salinomycin

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Optimizing Aircraft Utilization for Herbicide Application by an Evaluation of Herbicide Spray Drift

Chablall Ramphal

The Guyana Sugar Corporation (GuySuCo) controls weeds and ripens canes by aerial herbicide application. The corporation instituted 750 metres buffer zones, which affected the optimization of aircraft use in these applications. This study sought to test the utility of the 750 metres buffer zone at Rose Hall, Albion and Blairmont Sugar estates. Actual drift distances were determined between 06:00 to 09:00 hours for 9 herbicide applications. Drift patterns at three 1-hour time periods (06:00 -07:00 hours, 07:00-08:00 hours and 08:00-09:00 hours) were correlated with prevailing weather conditions to determine optimal flying periods.

A positive relationship was observed between time and temperature (r=0.8290) while time and relative humidity were negatively correlated (r=-0.7037). For the three 1-hour periods, average wind speeds were 9.6, 12 and 15kmh respectively, while drift reached 480, 510 and 510 meters respectively. Concentrations of 0.6, 0.3 droplets and 6 droplets per sensitive paper were recorded, respectively. Drift patterns varied with wind direction, however, a NNE to SSW wind direction was predominant. Prevailing wind direction, coupled with increased temperature, wind speed and reduced relative humidity may have caused higher drift to

travel further. Critical concentrations were found between 30 to 420 meters southward of the target area, where mean concentrations exceeded 30 droplets per cm^2 on the sensitive paper. Between 450 meters and 510 meters droplet concentrations were less likely to affect off target organisms. More trials, supported by the results of this study can lead to the proposition to reduce the 750-meter buffer zones by a maximum of 240 meters with a 32% reduction in no-fly zones to allow for optimization of applications. Further investigations should be done at other estates, exploring different nozzle types, droplet sizes, herbicide dilutions and formulations, aircraft flying heights and patterns.

KEYWORDS: Herbicide Droplets, Aircraft, Drift, Buffer Zones, Wind Speed, Sensitive Paper, Syngenta, Cane Ripening

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An Assessment of the Heart of Palm Waste as an Organic Fertilizer

Parsram Singh

Over 5000 tons of manicole palm (*Euterpe oleracea*) or heart of palm waste is being produced annually. Only about 20% of this waste is being utilized since many farmers are not aware of its use as an organic fertilizer. This experiment was conducted at the Johns Science Centre, University of Guyana, Berbice Campus to assess the use of the Heart of Palm waste as an organic fertilizer on bell pepper production. This research was laid out in a Completely Randomized Design (CRD) with five treatments, three replicates and each replicate having three plants each. These treatments included a control where nothing was added to the soil (Treatment 1), heart of palm waste (Treatment 2), cow manure (Treatment 3), poultry manure (Treatment 4) and 12:24:12 compound fertilizer (Treatment 5). The organic amendments were assessed at the equivalent rate of 10,000 kg per hectare. Treatments were applied to Ithaca sandy loam.

Although not significantly different from the inorganic fertilizer and control treatments, shorter lengths of time to flowering were recorded for the organic manure treatments. The periods to flowering were comparable in the organic manure treatments. Both the poultry and cow manures were estimated to produce slightly higher fruit yield per hectare compared to the heart of palm waste. Fruit weight among the three organic manure treatments were statistically similar, but much lower than the inorganic fertilizer and control treatments. Heart

of palm waste performed just as well as the cow manure and poultry manure and was proven to be superior to the 12:24:12 compound fertilizer in terms of reproductive performance. While this data may be limited this type of study, its application under field conditions should be explored. Further investigations on different application rates are recommended.

KEYWORDS: Manicole Palm (*Euterpe oleracea*), Organic Manures, Organic Waste, Bell Pepper

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APPENDIX A

LIST OF RESEARCH IN FORESTRY

#	NAME OF STUDENT	RESEARCH TITLE	SUPERVISOR(S)
		2015	
1	Ojasvi Kandhi	An Assessment of Differences of Density Among Three Major Mangrove Species on the Seacoast of Guyana.	Ms. Donna Ramdial Mr. Owen Bovell
2	Renrick Robert Ramgobin	The Importation of Pinewood Products and the Effects on LUS	Mr. Gregory Hodge
3	Ongel Fummeelyo Hamlet	An Investigation into the Level of Awareness and Knowledge of Low Carbon Development Strategy (LCDS) Among Three (3) Communities in Region # (4) Guyana.	Ms. Susy Lewis
4	Sayeed Anwar Allishaw	An Assessment of Crab Population in Natural, Restored and Degraded Mangrove Forests Along the Coasts of Regions 4,5 & 6, Guyana.	Ms. Donna Ramdial Ms. Jewel Liddel*
5	Anecia Pookraj	An Investigation on the Level of Awareness and Importance of the Reduced Emission from Deforestation and Degradation (REDD+) and the Low Carbon Development Strategy (LCDS) Among Students in Three (3) Post-Secondary Institutions In Region 4.	Ms. Susy Lewis
6	Varsha Gopal	Analysis of Fuel Characteristics of Woody Biomass of *Goupia Glabra* (Kabukalli) and *Catostemma Fragrans* (Sand Baromalli).	Ms. Donna Ramdial Mr. Patrick Ketwaroo*

#	NAME OF STUDENT	RESEARCH TITLE	SUPERVISOR(S)
7	Vishnu Khemraj	An Investigation of The Influence of Sea Surface Temperature (SST) on Coastal Mangroves.	Ms. Susy Lewis Mr. Haimwant Persaud*
8	Tenisha Deally	An Analysis of the Spatial Distribution of Pine Doors and its Potential Impacts on the Utilization of Doors Made from Lesser Used Species (LUS).	Ms. Susy Lewis Mr. Haimwant Persaud*
9	Sevestri Rajcoomar	Growth, Biomass and Carbon Sequestration in Black Mangrove Saplings Along the East Coast of Demerara. Guyana.	Mr. Gregory Hodge
10	Sherry Ann Charles	Assessment of the Marketing Potential of Korokororo (*Ormosia Coutinhoi*) Seeds as a Potential Non-Timber Forest Product.	Mr. Ewart Smith
11	Kenford Leon Fraser	An Investigation of the Potential for Large Scale Commercial Utilization of Five Lesser Used Species (LUS).	Mr. Ewart Smith
12	Safraz Samad	An Assessment of NTFP Based Activities in Two Amerindian Communities in Region # 2, Guyana	Ms. Donna Ramdial
13	Steven Jones	Inventory of Two-Toed Sloth (*Choloeus Didactyles*) in Four Selected Areas in Guyana	Mr. Owen Bovell Ms. Carmen Bacchus
		2016	
14	Kaneesha Garraway	An Investigation of The Disparities of Acai Berry (Euterpe Oleracea) Beverage Production in Siriki (Upper Pomeroon River) Guyana	Mr. Ewart Smith
15	Luan Gooding	An Assessment of Abiotic Factors at Potential Planting Sites Along the Seacoast of Demerara	Mr. Ewart Smith

#	NAME OF STUDENT	RESEARCH TITLE	SUPERVISOR(S)
16	Loris Vangenderen	An Assessment of Termite Attack on Four (4) Lesser Used Timber Species (LUS)	Mr. Owen Bovell
17	Devika Gurucharran	An Investigation of The Habitat Preference of Kufa (*Clusia Grandiflora* & *C. Palmicida*) And Nibbi (*Heteropsis Flexuosa*) In A Mixed Forest. A Case Study of Kairuni Silvehill Concession	Ms. Susy Lewis
18	Kisheba Higgins	An Assessment of The Differences in Levels of Satisfaction of Benefits, And Severity of Challenges in The Mainstay and Capoey Community Forestry Organizations, Region #2.	Ms. Donna Ramdial
19	Tenisha Jordan	An Investigation into The Sustainability of the Plywood Industry in Guyana: A Perspective of *Catostemma* Species Use	Mr. Gregory Hodge
20	Donnica Thornhill	An Assessment of the Current Assets of the Botanical Garden and Its Maintenance	Ms. Susy Lewis
21	Jermaine Hunte	An Assessment of the Harvesting of *Eperua Falcata*: The Impact on Its Seedling and Sapling Regeneration at Linden Soesdyke Highway.	Mr. Ewart Smith
22	Felix Braithwaite	Urban Forestry: Identification and Mapping of Tree Species on The University of Guyana Campus (Turkeyen)	Mr. Owen Bovell
23	Adiola Walcott	An Assessment of the Mycorrhizal Association with Dominant Plant Species in Mined Out Bauxite Sites in Linden	Mr. Gregory Hodge Ms. Dillon Husbands
24	Royston Peters	An Examination of the Change in Species Composition of Seedlings and Saplings, With the Change in Elevation on The Secondary White Sand Forest Along Soesdyke/Linden Highway	Mr. Ewart Smith

#	NAME OF STUDENT	RESEARCH TITLE	SUPERVISOR(S)
25	Edwin Moore	An Assessment of the Differences of Host Perceptions of the Social Impacts of Tourism Within and Between Two Rural Communities	Ms. Donna Ramdial
26	Tracy Clarke	The Relationship Between Soil Textural Classes and Mangrove Population Densities Along the Demerara Mahaica Foreshore	Mr. Gregory Hodge
		2017	
27	Surjpaul Singh	Community Involvement/Participation in the Management of Mangroves	Mr. Owen Bovell
28	Stacy Amanda Robertson	A Comparison of the Quality of Charcoal Produced Using the Traditional Pit Method and The Double Barrel Biochar Kilns in Charcoal Production.	Ms. Susy Lewis Mr. Courtney Bullen
29	Rene Sandy	An Investigation of the Production Chain of Kufa and Nibbi Furniture	Mr. Ewart Smith Ms. Susy Lewis
30	Troy van Rossum	An Assessment of the Growth Performance of *Acacia Mangium* in the Pruned & Unpruned Treatments at Mahdia and The Recruitment of Native Species Within the Pruned & Unpruned Treatments.	Mr. Lawrence Lewis
31	Tyronne Austin	An Investigation into the Incidence of Sapstain and Wood Decay Fungal Infestation on the Surface of Lumber at Lumberyards in Georgetown	Mr. Ewart Smith
32	Royquinn Federicks	An Investigation of the Habitat Preference of Kufa (*Clusia Grandiflora* and *C. Palmicida*) And Nibbi (*Heteropsis Flexosa*) In A Primary Forest in Manaka	Mr. Gregory Hodge
33	Toyce De Cunnha	An Investigation into The Conformity of Sawmillers Within Demerara Division to Lumber (GR04) Specifications as Set Out in The Timber Grading Rules of Guyana.	Mr. Gregory Hodge

#	NAME OF STUDENT	RESEARCH TITLE	SUPERVISOR(S)
34	Lisa Martin	An Assessment of the Seedling Population of Common Baromalli and Sand Baromalli in a Primary Forest Located in Manaka	
35	Rhoda Persaud	Assessment of Impacts of Mangroves Resulting from Human Induced Stressors in Regions # 3 And 4	Mr. Owen Bovell
36	Keola Wilkinson	A Determination of Phytoremediation by Native Species in Mined Out Areas	Mr. Lawrence Lewis
37	Alex Stewart	An Evaluation of the Influence of Sawdust and Wood Shaving on the Production Of (Sawdust-Cement) And (Wood Shaving-Cement) Blocks to Used in Construction.	Mr. Ewart Smith
		2018	
38	Randy Belgrave	An Assessment of *Carapa* Species Response to Logging in the Pibiri Forest Reserve in Central Guyana After Two Decades of Selective Logging	Mr. Ewart Smith
39	Carla Thomas-Payne	An Investigation of Waste Disposal Practices in Sawmills Along the Soesdyke/Linden Highway	Mr. Owen Bovell
40	Devon George	Assessing the Rate of Germination of *Carapa Guianensis* (Crabwood) Seeds After Pre-Sowing Treatments	Mr. Ewart Smith Ms. Susy Lewis
41	Renetta Lim	Determination of the Volume of Tree Residues for the Production of Value-Added Niche Market Products of Three Timber Species; Shibidan (*Aspidosperma Spp*.), Purpleheart (*Peltogyne Venosa*) and Soft Wallaba (*Eperua Falcate*).	Dr. Lawrence Lewis Ms. Susy Lewis
42	Tressana Headley	An Assessment of Seedling Density of *Catostemma Commune* (Common Baromalli) and *Catostemma Fragrans* (Sand Baromalli) in Three (3) Plots Subjected to Three Logging	Susy Lewis

#	NAME OF STUDENT	RESEARCH TITLE	SUPERVISOR(S)
		Intensities at the Pibiri Forest Reserve in Central Guyana After Two Decades of Selective Logging.	
43	Mark Austin	Sawdust, Wood Shaving and Cement Composite Blocks; An Investigation of Ethanol Treatment and Paint and Varnish Application on Durability	Mr. Ewart Smith
44	Shenika Duncan	A Comparative Analysis of Residents' Perception of Social Impacts of Tourism in Rockstone and Coomacka Mines Communities	Ms. Donna Ramdial
45	Leroy Wilson	The Preservation and Seasoning of *Quassia Simarouba* (Simarupa) Limber Using Boric Acid to Reduce Fungal Proliferation	Ewart Smith Dr. Lawrence Lewis
46	Rebecca Brehaspat	A Determination of Heavy Metals in Mined Out Bauxite Soils at Linden, and the Use of Native Species for Phytoremediation.	Dr. Lawrence Lewis
47	Alex Stewart	An Evaluation of the Influence of Sawdust and Wood Shaving on the Production of (Sawdust Cement) And (Wood Shaving-Cement) Blocks to Use in Construction.	Mr. Ewart Smith
48	Stephen Charles	An Investigation into the Influence of Soil Parameters on the Growth and Survival of Black Mangroves in the Demerara Mahaica Region	Mr. Owen Bovell
		2019	
49	Mahendra Sahadeo	An Investigation of the Current Use of Geographical Information System (GIS) by Natural Resource Management Agencies in Guyana.	Ms. Donna Ramdial
50	Rajendra Singh	A Field Survey of Street Trees in Georgetown	Mr. Owen Bovell

#	NAME OF STUDENT	RESEARCH TITLE	SUPERVISOR(S)
51	Nickie Hamilton	Assessing Land Use Changes Along Rockstone, Mabura Junction Using Images Classification Techniques	Mr. Gregory Hodge
52	Ronnel Lewis	Mapping Coastline Changes and Assessing Vegetation Changes at Almond Beach, Using GIS And Remote Sensing Techniques	Mr. Gregory Hodge
53	Koyel Reid	To Determine the Effects of Thinning on The Regeneration of Coppice from Kabukalli (*Goupia Glabra*) Stumps.	Mr. Ewart Smith
54	Ronnika Holder	Soil Characterization and Reclamation of a Borrow Pit at Karouni Mines Guyana	Dr. Lawrence Lewis Dr. Elroy Charles Mr. Courtney Bullen

APPENDIX B

LIST OF RESEARCH IN AGRICULTURE

#	STUDENT NAME	RESEARCH TITLE	SUPERVISORS
1	Kishan Kevin Narine	An Investigation of the Reproductive Parameters and Market Age and Weight of Cattle in Region # 2	Ms. Carmen Bacchus
2	Kenisha Odessa Gordon	An Investigation into the Effects of Using Different Syrup Concentrations on the Shelf Life of Passion Fruit in Syrup	Ms. Samantha Providence-Forrester
3	Damian Jairam Validum	The Effects of Varying Levels of Blackstrap Molasses on Shelf-Life of Silage	Dr. Mohammed Sadik Ms. Carmen Bacchus
4	Tiffanna Jonelle Ross	An Evaluation of Two Treatment Protocols Against the Conventional Treatment Protocol to Control/Reduce the Incidence of Black Sigatoka (*Mycosphaerella Fijiensis)* in Plantain Production (*Musa. Ssp*)	Dr. Elroy Charles
5	Rebecca Romona Prabhulall	Investigating the Effects of Hydrogen Peroxide (H2O2) On Seed Germination and Seedling Quality of Two Solanaceous Crops; *Capsicum Frutescens* (Pepper) And *Solanum Melongena* (Boulanger)	Ms. Kaye McAllister Mr. Lambert Chester

#	STUDENT NAME	RESEARCH TITLE	SUPERVISORS
6	Clevand Andrew Kellawan	The Control of Red Palm Mite (*Raoiella Indic*a Hirst) of Cocoa Nucifera Using Chemical Treatment	Dr. Elroy Charles Ms. Kaye Mc Allister
7	Althea Amanda Melville	To Evaluate the Effects of Pre-Soaking Seeds in Ethephon And Hydrogen Peroxide on Germination of Red Peas (Minica 4)	Dr. Elroy Charles Mr. Courtney Bullen
8	Naomi Claudette Me Kenzie	The Effects of Innovative Eco Care Products on Commercial Broiler Production Under Local Conditions	Ms. Carmen Bacchus Mr. Courtney Bullen
9	Steve Eon Ricardo Razack	A Comparative Analysis of the Growth and Amount of Biogas Produced from the Manure of Pigs Fed on Duckweed Enriched Formulated Feed and Those Fed with Formula Feed Alone	Ms. Carmen Bacchus
10	Christine Lois Evans	Evaluating the Effects of Plant Growth Hormone (Ethephon) on the Growth and Yield Parameters of Cucumbers.	Dr. Elroy Charles
11	Phibian Andrew Joseph	An Investigation of The Effects of Limestone on Ph, Fruit Yield and The Presence of Bacterial and Fungal Disease in Pepper (*Capsicum Annum* L.) Production	Dr. Elroy Charles
12	Anika Alexander	An Investigation into the Post-Harvest Losses in Pineapple on the Linden Highway.	Ms. Kaye Mc Allister
		2016	2016
13	Mahendra Persaud	Comparing the Effectiveness Wood Shaving Mulch (Organic) and Plastic Mulch (Inorganic) on the Cultivation of Bullnose Peppers	Dr. Mohammed Sadik
14	Satyanand Ramdowar	Potting Soil: Evaluating the Growth of Tomato Seedlings Using Cow, Poultry and Sheep Manure as Part of the Potting Soil	Dr. Mohammed Sadik

#	STUDENT NAME	RESEARCH TITLE	SUPERVISORS
15	Jason Paul Persaud	A Comparative Analysis of the Efficacy of Biochar on The Tiwiwid Sands for the Production of Peppers	Mr Courtney Bullen Dr. Elroy Charles
16	Leelawatie Manohar	The Efficacy of Liming for the Control of Fusarium Wilt Affecting Boulanger	Mr. Courtney Bullen
17	Saskia Tiffany Tull	An Investigation into the Reproductive Parameters, Age and Weight at Which Cattle Are Marketed in Region#4 (Georgetown to Mahaica)	Ms. Carmen Bacchus Mr. Michael Welch*
18	Shanelli Jerome	An Investigation into the Effects of Using Different Packaging Materials on the Shelf Life Of "Queso De Mano" and to Evaluate the Sensory Attributes of Cheese and Whey	Dr. Patsy Francis
19	Purnan Vijay Ramnarine	Effect of Timing of NPK Fertilizer on Growth and Yield of Sweet Pepper (*Capsicum Annum* L.)	Dr. Mohammed Sadik
20	Anthony Jones	An Investigation of the Response of Sweet Corn (*Zea Mays* L.) To Organic Manure and An Inorganic Fertilizer	Mr. Lambert Chester
21	Wilton Ozay Fordyce	An Investigation into the Reproductive Parameters and Market Age and Weight of Cattle in East Canje and Central Corentyne, Region #6	Ms. Carmen Bacchus
22	Vishan Persaud	A Comparison of Poultry Manure and A Mixed Fertilizer (12:12:17:2) On the Growth, Yield and Economics of Scotch Bonnet Pepper	Dr. Mohammed Sadik Mr. R. Rhagunauth*
23	Colvin Alfred	An Investigation into The Reproductive Parameters of Cattle from Mahaica - Mahaicony, Region #5, Guyana	Ms. Carmen Bacchus & Dr. R Austin
24	David Ivan Pusselwhyte	The Effects of Varying Phosphorus Application Rates and Placements on the Growth and Yield of Cherry Peppers	Mr. Courtney Bullen

#	STUDENT NAME	RESEARCH TITLE	SUPERVISORS
25	Dexter Osase Touissaint Van-Veen	An Evaluation of Various Foliar Fertilizer Applications on the Growth and Production of Tomato Plants	Dr. Elroy Charles
26	Jewel Nicole Anna Todd	A Determination of the Efficacy of Two Commercial Mycorrhizal Preparations in Improving Phosphorus Nutrition in Tiwiwid Sand	Mr. Courtney Bullen
27	Shanicia Bellamy	A Comparison of Vermicompost and Poultry Litter to Determine Optimum Planting Times After Application.	Mr. Courtney Bullen
28	Teressa Lynessa Jacobs	An Investigation into the Effects of Three Chemicals on Blossom End Rot on Tomato Production	Mr. Lambert Chester
		2017	
29	Stephon Paul	Detection of Viruses in Exotic Sweet Potato (*Ipomoea Batatas*) Accessions Using Visual Symptomology	Mr. Lambert Chester Mr. Jason Persaud*
30	Travis Dexter Pilgrim	The Response of Rice (*Oryza Sativa*) to Three Levels of Potassium in Single and Split Applications.	Mr. Lambert Chester Dr. Ghansham Payman
31	Jamaine Jermaine Samuels	Assessing the Impact of Organic Fertilizers and a Growth Hormone on the Performance of Cucumbers	Mr. Courtney Bullen
32	Joylene Hamilton	Total Aflatoxin in Cassava Products and Its Presence After Two Months of Storage	Ms Coretta Samuels
33	Osbert Lawrence Rodney	An Evaluation of Merlin and Diuron Combination for Pre-Emergent Weed Control in Sugarcane (*Saccharum Officinarum*)	Mr. Lambert Chester Mr. Ravindra Persaud

#	STUDENT NAME	RESEARCH TITLE	SUPERVISORS
34	Jenarine Hardat	Evaluation of Pre and Post Emergent Herbicide for Effective Weed Management in Low Irrigated Rice	Mr. Lambert Chester Dr. Ghansham Payman
35	Martin Annil Bridglall	An Investigation of the Prevalence of *Babesia Bigemina* in Brangus, Beefmaster, Brahman or Creole Breeds of Cattle in Ebini	Dr. Mohammed Sadik Mr. Selwyn Anthony*
36	Terrence Desmond Browne	An Analysis of the Composition and Quality of The Virgin Coconut Oil, Refined Coconut Oil and Standard Cooking Oil (Soya Oil).	Dr. Mohamad Sadik Professor Raymond C. Jagessar*
37	Tandika Samantha Harry	Application 0f Beeswax & Cassava Starch to Extend the Postharvest Life of Mangoes	Ms Donna Morrison
38	Marissa Smartt	Evaluation of the Rancidity of Coconut Oil (*Cocos Nucifera.* L) in Quinches	Dr. Patsy Francis Mr. Gary Mendonca
39	Joel Alexander Patterson	A Comparative Study on the Effects of Silicon Application on Sugarcane Resistance to *Diatraea Spp.*	Mr. Courtney Bullen Ms. Claudette Haynes*
40	Roy Orin Porter	Comparing the Efficacy of Different Herbicides in The Control of *Antidesma Ghaesembilla* (Gaertn).	Mr Lambert Chester Mr. R. Persaud*
41	Denel Hamilton	Cattle Production in Regions Five and Six: A Situational Analysis of Production Practices and Farmers Adoption of Services Offered by the Guyana Livestock Development Authority	Dr. Mohammed Sadik Mr. Selwyn Anthony*

#	STUDENT NAME	RESEARCH TITLE	SUPERVISORS
42	Kwame Ortega Goodluck	Evaluation of Plant Extracts Versus Synthetic Fungicides against *Fusarium Oxysporum F. Sp. Lycopersici,* Wilt Pathogen of Tomatoes	Ms. Kaye Mc Allister Professor Raymond C. Jagessar*
43	Corwin Elroy D'Anjou	A Situational Analysis of Sheep and Goat Production In Region # 5	Dr. Mohammed Sadik Mr. Arnold DeMendonca*
44	Jamila Oceanna Morgan	The Prospects for Adoption of Information Communication Technology (ICT) Methods for Improved Rice Production in Guyana: A Survey of Region Five Rice Farmers	Dr Mohammed Sadik Dr. Dwight Walrond*
45	Ravindra Singh	Technology (ICT) Methods for Improved Rice Production in Guyana: A Survey of Region Five Rice Farmers	Mr. Lambert Chester Dr. Ghansham Payman
46	Adrianna Vanessa Wellington	The Response of Tomato (Lycopersicon Esculentum) to Organic and Inorganic Farming Practices	Dr. Mohammed Sadik
47	Patricia Iona Haynes	Oil Extraction from *Morinda Citrifolia* (Noni) Seed and its Application in the Production of Soap.	Ms Donna Morrison Professor Raymond C. Jagessar *
48	Kimande Alexis Pilgrim	A Comparative Analyses of Two Micro–Propagation Protocols for the Rapid Regeneration of Sweet Potato (*Ipomoea Batatas* (L.) Lam.) Accessions *In Vitro*	Ms Kaye Mc Allister

49	Marvin Ragunauth	Evaluation of the Morphological Characteristics of Local Sweet Potato Landraces from Region #2, Essequibo Coast	Ms. Kaye Mc Allister
#	**STUDENT NAME**	**RESEARCH TITLE**	**SUPERVISORS**
50	Joshua Samuel Ferreira	A Comparison of the Growth Parameters, Dry Matter Content and Yield of Five Local Sweet Potato Accessions	Ms Kaye Mc Allister
51	Orwin Mark Hermanstein	An Evaluation of Organic Soil Amendments for The Enhancement of Productivity of the Kairuni Laomy Sands	Mr. Bullen
52	Andre Nimrod Burke	The Effect of Two Fungicides on The Control of *Alternaria Solani* in Boulanger (*Solanum Melongena*)	Mr. Lambert Chester Mr. Carlyle Nunes*
53	Zena DeFreitas	Evaluation of Reproductive Parameters of Does Artificially Inseminated with Differently Processed Semen	Dr. Mohammed Sadik
54	Leroy Anthony Bobb	An Investigation of The Effects of Organic Substrates (Garlic & Pepper Extract) On the Control of Diamondback Moth in Cabbage	Mr Lambert Chester
55	Fred Roches	An Evaluation of Aquaponics Systems Utilizing the Effluent Water from Fish Tank to Grow Lettuce	Dr. Patsy Francis Mr. Lambert Chester
		2018	
56	Andrea Charles	An Assessment of the Different Concentrations of Botanical Extracts for the Management of Red Palm Mite (RPM) *(Raoiella Indica* Hirst) on Coconut Palms (*Cocos Nucifera* L) Under Laboratory Conditions	Dr. Elroy Charles

57	Gangadai Dindayal	Response of Three Rice Varieties to Slow-Release and Conventional Nitrogen Fertilizer	Mr. Lambert Chester Dr. Ghansham Payman
#	**STUDENT NAME**	**RESEARCH TITLE**	**SUPERVISORS**
58	Taseka Rushanna Blair	Investigating the Antioxidant Content of Sweet Pepper (*Capsicum Annuum* L) In Response to Fertilizers	Mr. Lambert Chester Professor Raymond C. Jagessar*
59	Madainey Fitzmichael Humphrey	Efficacy of *Saccharomyces Cerevisiae* Cell Walls (SCIW) In Reducing the Toxic Effects of Aflatoxin B_1 in Broilers Fed Dietary Treatments from Hatch to Day Twenty-One	Dr. P. Francis
60	Roderick Richard Somrah	An Investigation of the Drying Methods and Their Effects on Milling Quality of Rice in Regions 5 And 6	Mr. Lambert Chester Ms Narita Singh*
61	Candace Ronette Wharton	An Assessment of the Reproductive Performance of Dairy Cows at Saint Stanislaus College and Guyana School of Agriculture Farms	Dr. Patsy Francis
62	Clennell Amunike Petty	An Evaluation of the Physical and Chemical Properties of Animal Waste and Plant Waste Amended with Chitin	Ms. Donna Morrison
63	Sydicia Latika Sutherland	Evaluation of Different Methods of *Trichoderma Harzianum* Application for the Control of Fusarium Wilt in Tomato.	Dr Elroy Charles Miss Oceana O'Dean*
64	Oslyn Omar Williams	A Preliminary Study on Direct Seeded Vs Transplanted Onion	Mr. Lambert Chester Mr. Jason Persaud*

65	Candacia Jacobs	Evaluation of the Morphological Characteristics, Dry Matter and Starch Content of Local Cassava Varieties	Ms. Kaye Mc Allister
66	Kadesha Shawyanna Nedd	An Evaluation of Some Agronomic Characteristics and Yield Potential of Local Sweet Potato Advance Lines	Ms. Kaye Mc Allister
#	**STUDENT NAME**	**RESEARCH TITLE**	**SUPERVISORS**
67	Wendell Joseph	An Evaluation of The Morphological Characteristics of Mango	Dr. Elroy Charles Mr. Roberto Pilgrim*
68	Rondy McPherson	An Investigation into the Efficiency of Four Rodenticides in Sugarcane Cultivation.	Dr. Grayson Halley Mr. Courtney Bullen Mr. Dharmadeo Singh Mr. Ravindra Persaud
69	Wattisha Ann Mattis	An Evaluation of the Effectiveness of a *Lactobacillus Spp* as an Inhibitor of *Fusarium Oxysporum* (*In Vitro*)	Dr. Patsy Francis
70	Hamani Mamadi Tinnie	Characterization of Local Coconut Palm Accessions Using Morphological Data	Dr. Elroy Charles Mr. Roberto Mendez-Pelegrin*
71	Akeem Travis Rodell Primo	Isolation and Identification of *Trichoderma Spp*. From Hydraquent Soil Under Different Land Use Patterns	Dr Elroy Charles Ms. Kaye Mc Allister

72	Mitzie Suzanna Smith-Barker	An Assessment of the Quality of Leather Produced from Sheep and Goat Skins Using Four Plant Tannin Materials	Ms. Carmen Bacchus, Mr. Samuel Lee* Mr. Michael Welch*
73	Trishanna Kadijah Alleyne	An Analysis of Sheep Housing in Region 5	Dr. Mohammed Sadik Dr. Dwight Walrond*
#	**STUDENT NAME**	**RESEARCH TITLE**	**SUPERVISORS**
74	Latchman Bissoondyal	A Comparative Analysis of Different Concentrations of Growth Hormones on the Rapid Regeneration of Local Cassava Accessions *In Vitro*	Dr. Elroy Charles Ms. Samantha Brotherson*
75	Keisha Latoya Kewley	An Evaluation of Different Concentrations of Growth Hormones for the Optimization of Plantain Micropropagation *In Vitro*	Dr. Elroy Charles Ms. Samantha Brotherson*
		2019	
76	Kevin Seetram	Pot Evaluation of Botanicals for the Control of *Fusarium Oxysporum F. Sp. Lycopersici,* Wilt Pathogen of *Lycopersicon Esculentum*.	Dr. Elroy Charles
77	Anthony Ramsahoi	Optimization of Nitrogen Scheduling for Aromatic Variety (Rice)	Mr. Lambert Chester Dr. Ghansham Payman
78	Nero Renee	Screening of Sweet Potato Accessions for Tolerance to Low Ph Soils	Ms. Kaye Mc Allister Mr. Courtney Bullen
79	Travis Prasad	An Evaluation of The Morphological Characteristics and Yield Potential of Sweet Potato Breeding Lines (CG1-2018)	Ms. Kaye McAllister Mr. Stephon Paul

80	Anastacia Powers	Characterization of Lettuce Producers Under Shade House Conditions in Region #4	Ms. Coretta Samuels Dr. Jean David
81	Orwin Emanuel	The Effect of Horizontal and Vertical Planting of Sweet Potato Plant Development and Yield	Ms. Kaye McAllister
82	Makeba Jacobs	The Effect of Black Pepper (*Piper Nigrum*) And Turmeric (*Curcuma Longa*) on Growth Performance of Broiler Chickens	Dr M. Sadik Ms. Carmen Bacchus
#	**STUDENT NAME**	**RESEARCH TITLE**	**SUPERVISORS**
83	Reiaz Azim	Evaluation of Sweet Potato Clonal Accession for Viral Indexing	Ms. Kaye McAllister
84	Levina Henry	Evaluation of the Effect of Different Planting Densities for Sugarcane Performance at Uitvlugt	Mr. Courtney Bullen
85	Dirk Ford	Evaluation of Moddus (Trimexapc-Ethyl) As A Suitable Replacement for Glyphosate Within Local Sugarcane Industry	Mr. Courtney Bullen Mr. Lambert Chester
86	Renee Deodat	A Comparative Analysis of Three Sources of Organic Matter in the Production Of "Bullnose" Peppers on Mined-Out Soil	Mr. Lambert Chester
87	Shinella Persaud	Performance of Black Jersey Giant Fowl Fed on Two Commercial Diets	Dr. Renard Overton Dr. Elroy Charles
88	Kianna Batson	An Evaluation of the Clonal Generation of Advanced Sweet Potato Breeding Lines	Ms. Kaye McAllister
89	Latoya Jack	Evaluation of Sweet Potato Seeding Lines for Germination Percentage and Tuber Characteristics	Ms. Kaye McAllister Mr. Stephon Paul

90	Ariel Robertson	An Evaluation of the Status of the Seafood Processing Plants Within Georgetown, Guyana with A View to Make Recommendations	Ms. S. Providence-Forrester
91	John Forde	An Evaluation of Organic Wastes for the Multiplication of *Trichoderma Harzianum Rifai* for Possible Commercial Applications	Ms. Kaye McAllister Dr. Elroy Charles
92	Joel Greene	The Effectiveness of Three Fungicides Against the Anthracnose in Laboratory Trials	Mr. Dharamdeo Singh Ms. S. DeSouza*
#	**STUDENT NAME**	**RESEARCH TITLE**	**SUPERVISORS**
93	Shevonne Bryne	An Assessment of Weight Gain, Feed Conversion Ratio and Cost Associated with Locally Formulated Feed Ration Fed to Fattening Pigs	Ms Carmen Bacchus Ms. Alicia Fyffe* Ms. Jamila Bisram*
94	Tatyana Moore	Evaluation of Biochar Produced from Rice Hulls for the Amelioraton of a Sandy Soil	Mr Courtney Bullen
95	Eron Alonzo	Micropropagation in Plantains	Dr. Elroy Charles Ms. Samantha Brotherson*
96	Diana Bruce	An Evaluation of Two Cover Crops in Improving Soil Health of Tiwiwid Sand	Mr. Courtney Bullen Mr. Lambert Chester
97	Dwayne Gangoo	An Evaluation of Organic Manures and Biofertilizer on Growth and Yield of Sweet Pepper (*Capsicum Annuum* L.)	Mr. Lambert Chester
98	Richelle Ellis	An Evaluation of Oil Eating Microbes in the Remediation of Oil Spills on Land.	Mr. Courtney Bullen

99	Dillon Weekes	Evaluation of Sulphur Coated Urea on Sugarcane Yield and Growth in Guysuco	Mr. Courtney Bullen Mr. Lambert Chester Mr. Ashley Adams*
100	Priscilla Brummell	National Agriculture Policies on Rural Farmers Development	Ms. Coretta Samuels Dr. Jean David
101	Carlisa Adridge	The Efficacies of Four Organic Pesticides to Manage Diamondback Moth	Dr. Elroy Charles Mr. Howard London*
#	**STUDENT NAME**	**RESEARCH TITLE**	**SUPERVISORS**
102	Omario Gooding	The Effects of *Lactobacillus Plantarum* on the Fermentation Process of Grass and Rice Straw Silage	Ms. Carmen Bacchus
103	Acqusie Moses	The Effects of Different N.P.K 12:12:17:2 Fertilizer Application Rates on the Growth and Yield of the Onion Variety F1 Granex	Mr. Lambert Chester
104	Ozay Roberts	An Analysis of Rice Farmers Adaptation to Climate Smart Agricultural Practices on the Front Land Clays of Region #5	Mr. Lambert Chester
105	Floyd Gilkes	Rice Farmer Perceptions and Possible Adaptations Strategies to Climate Change Effects on Essequibo Coast (Charity-Le Resource)	Mr. Dharamdeo Singh
106	Navindra Sagadaya	The Response of Sugarcane Variety DB9633 With and Without P Fertilizer In 16 Series Soil on Uitvlugt Sugar Estate	Mr. Lambert Chester Mr. Ashley Adams

107	Laushana Massiah	An Overview of Guyana's Tambaqui (*Colossoma Macropomum*) Sector: Current Status and Challenges	Ms. Samantha Providence Dr. Devon Dublin*
108	Melisa Baskh	The Effects of *Samanea saman* Seed Meal on Water Quality and Growth Performance of Tilapia	Ms. Kaye Mc Allister
109	Shaquimha Hanley	Farmers' Perception of ICT In St. Kitts	Mr. Dharamdeo Singh
		Berbice	
110	Mohamed Y Razack	An Evaluation of Coated Urea on Sugarcane	Mr. Courtney Bullen Dr. Harold Davis* Mr. Ashley Adams*
#	**STUDENT NAME**	**RESEARCH TITLE**	**SUPERVISORS**
111	Tiffany Jordan	*Esherichia Coli* Contamination of Lettuce (*Lactuca Sativa* L.) in the Farm-To-Market Continuum in Region Six	Mr. Dharamdeo Singh
112	Adrian Singh	An Evaluation of Sugarcane Growth Performance Using Granular and Crystalline Sulphate of Ammonium Fertilizers.	Dr. Grayson Halley Mr. Ashley Adams*
113	Kishan Ramesh	An Evolution of the Yield Performance of Sweet Potato (*Ipomoea Batatas*) Grown from Four Different Lengths of Plant Materials in Guyana.	Mr. Dharamdeo Singh
114	Vishernauth Dhanpat	An Evaluation of the Efficacy of Siperus (Pyrazosulfuron-Ethyl 10 WP) as a Post Emergent Herbicide in Sugarcane Cultivation	Mr. Courtney Bullen Mr. Ravindra Persaud*
115	Joshua Lyte	A Varietal Evaluation of Onions in Open Field Condition on Ithaca Sandy Loam	Ms. Sherena Persaud Mr Kelvin George*

116	Abiola Simpson	A Comparative Assessment of Two Fishing Methods (Trap Versus Hook and Line) Used in Marine Fisheries in Guyana	Dr. Grayson Halley Mr. Brian Dey*
117	Phillip John	An Evaluation of Three Different Potting Media (Coco Peat, Rotted Sawdust and Rotted Paddy Hull) for Onion Seedling Production	Ms. Carmen Bacchus
118	Verlyn Huntley	An Assessment of the Effects of Moringa (*Moringa Oleifera) a*nd Black Pepper (*Piper Nigrum*) as Feed Additives in a Broiler Diet	Ms. Carmen Bacchus
119	Chablall Rampal	Optimizing Aircraft Utilization for Herbicide Application by an Evaluation of Herbicide Spray Drift	Mr. Courtney Bullen Mr. Ravindra Persaud*
120	Parsram Singh	An Assessment of The Heart of Palm Waste as an Organic Fertilizer	Ms. Zinesha Phillips

APPENDIX C

THEMATIC RESEARCH AREAS IN FORESTRY

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
	FORESTRY		
	ECOLOGY		
1	An Assessment of Differences of Density Among Three Major Mangrove Species on the Seacoast of Guyana.	Ojasvi Kandhi	2015

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
2	Growth, Biomass and Carbon Sequestration in Black Mangrove Saplings Along the East Coast of Demerara. Guyana.	Sevestri Rajcoomar	2015
3	The Relationship Between Soil Textural Classes and Mangrove Population Densities Along the Demerara Mahaica Foreshore	Tracy Clarke	2016
4	An Assessment of Abiotic Factors at Potential Planting Sites Along the Seacoast of Demerara	Luan Gooding	2016
5	An Investigation of the Habitat Preference of Kufa (*Clusia Grandiflora* & *C. Palmicida*) and Nibbi (*Heteropsis Flexuosa*) In A Mixed Forest. A Case Study of Kairuni Silvehill Concession	Devika Gurucharran	2016
6	An Assessment of the Harvesting of *Eperua Falcata*: The Impact on its Seedling and Sapling Regeneration at Linden Soesdyke Highway.	Jermaine Hunte	2016
7	An Examination of the Change in Species Composition of Seedlings and Saplings, with the Change in Elevation on The Secondary White Sand Forest Along Soesdyke/Linden Highway	Royston Peters	2016
8	An Assessment of The Mycorrhizal Association with Dominant Plant Species in Mined Out Bauxite Sites in Linden	Adiola Walcott	2016
9	A Determination of Phytoremediation by Native Species in Mined Out Areas	Keola Wilkinson	2017
10	An Investigation of the Habitat Preference of Kufa (*Clusia Grandiflora* and *C. Palmicida*) And Nibbi (*Heteropsis Flexosa*) In A Primary Forest in Manaka	Royquinn Federicks	2017
11	An Assessment of *Carapa* Species Response to Logging in the Pibiri Forest Reserve in Central Guyana After Two Decades of Selective Logging	Randy Belgrave	2018

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
12	Assessing the Rate of Germination of Carapa Guianensis (Crabwood) Seeds After Pre-Sowing Treatments	Devon George	2018
13	An Assessment of Seedling Density of *Catostemma Commune* (Common Baromalli) and *Catostemma Fragrans* (Sand Baromalli) in Three (3) Plots Subjected to Three Logging Intensities at the Pibiri Forest Reserve in Central Guyana After Two Decades of Selective Logging.	Tressana Headley	2018
14	An Examination of the Change in Species Composition of Seedlings and Saplings, with the Change in Elevation on the Secondary White Sand Forest	Royston Peters	2018
15	An Investigation into the Influence of Soil Parameters on the Growth and Survival of Black Mangroves in the Demerara Mahaica Region	Stephen Charles	2018
16	Mapping Coastline Changes and Assessing Vegetation Changes at Almond Beach, Using GIS and Remote Sensing Techniques	Ronnel Lewis	2019
17	Assessing Land Use Changes Along Rockstone, Mabura Junction Using Images Classification Techniques	Nickie Hamilton	2019
	UTILIZATION		
1	An Assessment of NTFP Based Activities in Two Amerindian Communities in Region # 2, Guyana	Safraz Samad	2015
2	An Analysis of the Spatial Distribution of Pine Doors and Its Potential Impacts on the Utilization of Doors Made from Lesser Used Species (LUS)	Tenisha Deally	2015
3	An Investigation of the Potential for Large Scale Commercial Utilization of Five Lesser Used Species (LUS)	Kenford Leon Fraser	2015
4	The Importation of Pinewood Products and The Effects On LUS	Renrick Robert Ramgobin	2015

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
5	Assessment of the Marketing Potential of Korokororo (*Ormosia Coutinhoi*) Seeds as a Potential Non-Timber Forest Product.	Sherry Ann Charles	2015
6	An Investigation of the Disparities of Acai Berry (Euterpe Oleracea) Beverage Production in Siriki (Upper Pomeroon River) Guyana	Kaneesha Garraway	2016
7	An Investigation into the Sustainability of the Plywood Industry in Guyana: A Perspective of Catostemma Species Use	Tenisha Jordan	2016
8	Determination of the Volume of Tree Residues for the Production of Value-Added Niche Market Products of Three Timber Species; Shibidan (*Aspidosperma Spp.*), Purpleheart (*Peltogyne Venosa)* and Soft Wallaba (*Eperua Falcate*).	Renetta Lim	2018
9	An Evaluation of the Influence of Sawdust and Wood Shaving on the Production of (Sawdust Cement) and (Wood Shaving-Cement) Blocks to Use in Construction.	Alex Stewart	2018
	LESSER USED SPECIES		
1	An Assessment of Differences of Density Among Three Major Mangrove Species on the Seacoast of Guyana.	Ojasvi Kandhi	2015
2	An Analysis of the Spatial Distribution of Pine Doors and Its Potential Impacts on the Utilization of Doors Made from Lesser Used Species (LUS).	Tenisha Deally	2015
3	An Investigation of the Potential for Large Scale Commercial Utilization of Five Lesser Used Species (LUS).	Kenford Leon Fraser	2015
4	Analysis of Fuel Characteristics of Woody Biomass of *Goupia Glabra* (Kabukalli) And *Catostemma Fragrans* (Sand Baromalli).	Varsha Gopal	2015

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
5	The Importation of Pinewood Products and the Effects On LUS	Renrick Robert Ramgobin	2015
6	An Assessment of Termite Attack on Four (4) Lesser Used Timber Species (LUS)	Loris Vangenderen	2016
	WOOD PRESERVATION		
1	An Investigation into the Incidence of Sapstain and Wood Decay Fungal Infestation on the Surface of Lumber at Lumberyards in Georgetown	Tyronne Austin	2017
2	Sawdust, Wood Shaving and Cement Composite Blocks; An Investigation of Ethanol Treatment and Paint and Varnish Application on Durability	Mark Austin	2018
3	The Preservation and Seasoning of *Quassia Simarouba* (Simarupa) Limber Using Boric Acid to Reduce Fungal Proliferation	Leroy Wilson	2018
	MANGROVES		
1	An Assessment of Differences of Density Among Three Major Mangrove Species on The Seacoast of Guyana	Ojasvi Kandhi	2015
2	Growth, Biomass and Carbon Sequestration in Black Mangrove Saplings Along the East Coast of Demerara. Guyana.	Sevestri Rajcoomar	2015
3	An Assessment of Crab Population in Natural, Restored and Degraded Mangrove Forests Along the Coasts of Regions 4,5 & 6, Guyana.	Sayeed Anwar Allishaw	2015
4	An Investigation of the Influence of Sea Surface Temperature (SST) on Coastal Mangroves.	Vishnu Khemraj	2015

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
5	The Relationship Between Soil Textural Classes and Mangrove Population Densities Along the Demerara Mahaica Foreshore	Tracy Clarke	2016
6	An Assessment of Abiotic Factors at Potential Planting Sites Along the Seacoast of Demerara	Luan Gooding	2016
7	An Assessment of the Differences in Levels of Satisfaction of Benefits, and Severity of Challenges in the Mainstay and Capoey Community Forestry Organizations, Region #2.	Kisheba Higgins	2016
8	The Relationship Between Soil Textural Classes and Mangrove Population Densities Along the Demerara Mahaica Foreshore	Tracy Clarke	2017
9	Assessment of Impacts of Mangroves Resulting from Human Induced Stressors in Regions # 3 And 4	Rhoda Persaud	2017
10	An Investigation into the Influence of Soil Parameters on The Growth and Survival of Black Mangroves in the Demerara Mahaica Region	Stephen Charles	2018
11	Mapping Coastline Changes and Assessing Vegetation Changes at Almond Beach, Using GIS and Remote Sensing Techniques	Ronnel Lewis	2019
	TOURISM		
1	An Assessment of the Current Assets of the Botanical Garden and Its Maintenance	Donnica Thornhill	2016
2	An Assessment of The Differences of Host Perceptions of the Social Impacts of Tourism Within and Between Two Rural Communities	Edwin Moore	2017
3	A Comparative Analysis of Residents' Perception of Social Impacts of Tourism in Rockstone and Coomacka Mines Communities	Shenika Duncan	2018

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
4	An Investigation of tThe Current Use of Geographical Information System (GIS) By Natural Resource Management Agencies in Guyana.	Mahendra Sahadeo	2019
5	A Field Survey of Street Trees in Georgetown	Rajendra Singh	2019
	URBAN FORESTRY		
1	Urban Forestry: Identification and Mapping of Tree Species on The University of Guyana Campus (Turkeyen)	Felix Braithwaite	2016
2	A Field Survey of Street Trees in Georgetown	Rajendra Singh	2019
3	**SOIL AND SOIL MANAGEMENT**		
4	The Relationship Between Soil Textural Classes and Mangrove Population Densities Along the Demerara Mahaica Foreshore	Tracy Clarke	2016
5	An Assessment of The Mycorrhizal Association with Dominant Plant Species in Mined Out Bauxite Sites in Linden	Adiola Walcott	2016
6	A Determination of Phytoremediation by Native Species in Mined Out Areas	Keola Wilkinson	2017
7	A Determination of Heavy Metals in Mined Out Bauxite Soils at Linden, And the Use of Native Species for Phytoremediation.	Rebecca Brehaspat	2018
8	An Evaluation of the Influence of Sawdust and Wood Shaving on the Production Of (Sawdust Cement) And (Wood Shaving-Cement) Blocks to Use in Construction.	Alex Stewart	2018
9	An Investigation into the Influence of Soil Parameters on the Growth and Survival of Black Mangroves in the Demerara Mahaica Region	Stephen Charles	2018

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
10	Soil Characterization and Reclamation of a Borrow Pit at Karouni Mines Guyana	Ronnika Holder	2019
	BIOFUEL		
1	Analysis of Fuel Characteristics of Woody Biomass of *Goupia Glabra* (Kabukalli) and *Catostemma Fragrans* (Sand Baromalli).	Varsha Gopal	2015
2	A Comparison of the Quality of Charcoal Produced Using the Traditional Pit Method and the Double Barrel Biochar Kilns in Charcoal Production.	Stacy Amanda Robertson	2017
3	**HARVESTING**		
4	An Assessment of the Harvesting of *Eperua Falcata*: The Impact on Its Seedling and Sapling Regeneration at Linden Soesdyke Highway.	Jermaine Hunte	2016
5	An Examination of the Change in Species Composition of Seedlings and Saplings, with the Change in Elevation on The Secondary White Sand Forest Along Soesdyke/Linden Highway	Royston Peters	2016
6	An Assessment of Seedling Density of *Catostemma Commune* (Common Baromalli) And *Catostemma Fragrans* (Sand Baromalli) in Three (3) Plots Subjected to Three Logging Intensities at The Pibiri Forest Reserve in Central Guyana After Two Decades of Selective Logging.	Tressana Headley	2018
	FAUNAL DIVERSITY		
1	An Assessment of Crab Population in Natural, Restored and Degraded Mangrove Forests Along the Coasts of Regions 4,5 & 6, Guyana.	Sayeed Anwar Allishaw	2015
2	Inventory of Two-Toed Sloth (*Choloeus Didactyles*) In Four Selected Areas in Guyana	Steven Jones	2015
	BIOMASS AND CARBON		

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
1	Analysis of Fuel Characteristics of Woody Biomass of *Gopia Glabra* (Kabukalli) And *Catostemma Fragrans* (Sand Baromalli).	Varsha Gopal	2015
2	Growth, Biomass and Carbon Sequestration in Black Mangrove Saplings Along the East Coast of Demerara, Guyana.	Sevestri Rajcoomar	2015
3	Determination of the Volume of Tree Residues for the Production of Value-Added Niche Market Products of Three Timber Species; Shibidan (*Aspidosperma Spp*.), Purpleheart (Peltogyne Venosa) and Soft Wallaba (*Eperua Falcate*).	Renetta Lim	2018
4	To Determine the Effects of Thinning on The Regeneration of Coppice from Kabukalli (*Goupia Glabra*) Stumps.	Koyel Reid	2019
	WOOD WASTE		
1	A Comparison of the Quality of Charcoal Produced Using the Traditional Pit Method and the Double Barrel Biochar Kilns in Charcoal Production.	Stacy Amanda Robertson	2017
2	An Investigation of Waste Disposal Practices in Sawmills Along the Soesdyke/Linden Highway	CarlaThomas-Payne	2018
3	Determination of the Volume of Tree Residues for the Production of Value-Added Niche Market Products of Three Timber Species; Shibidan (*Aspidosperma Spp*.), Purpleheart (*Peltogyne Venosa*) and Soft Wallaba (*Eperua Falcate*).	Renetta Lim	2018
	STAKEHOLDER AWARENESS, PERCEPTION, CONFORMITY		
1	An Investigation into the Level of Awareness and Knowledge of Low Carbon Development Strategy (LCDS) Among Three (3) Communities in Region # (4) Guyana.	Ongel Fummeelyo Hamlet	2015

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
2	An Investigation on the Level of Awareness and Importance of The Reduced Emission from Deforestation and Degradation (REDD+) and The Low Carbon Development Strategy (LCDS) Among Students in Three (3) Post-Secondary Institutions in Region 4.	Anecia Pookraj	2015
3	Community Involvement/Participation in The Management of Mangroves	Surjpaul Singh	2017
4	The Relationship Between Soil Textural Classes and Mangrove Population Densities Along the Demerara Mahaica Foreshore	Tracy Clarke	2017
5	An Investigation into the Conformity of Sawmillers Within Demerara Division to Lumber (GR04) Specifications as Set Out in The Timber Grading Rules of Guyana.	ToyceDe Cunnha	2017
	GIS AND TECHNOLOGIES		
1	An Analysis of The Spatial Distribution of Pine Doors and Its Potential Impacts on the Utilization of Doors Made from Lesser Used Species (LUS).	Tenisha Deally	2015
2	An Investigation of the Influence of Sea Surface Temperature (SST) On Coastal Mangroves.	Vishnu Khemraj	2015
3	Urban Forestry: Identification and Mapping of Tree Species on The University of Guyana Campus (Turkeyen)	Felix Braithwaite	2016
4	An Assessment of *Carapa* Species Response to Logging in The Pibiri Forest Reserve in Central Guyana After Two Decades of Selective Logging	Randy Belgrave	2018
5	An Assessment of Seedling Density of *Catostemma Commune* (Common Baromalli) And *Catostemma Fragrans* (Sand Baromalli) In Three (3) Plots Subjected to Three Logging Intensities at The Pibiri Forest Reserve in Central Guyana After Two Decades of Selective Logging.	Tressana Headley	2018

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
6	An Investigation of The Current Use of Geographical Information System (GIS) By Natural Resource Management Agencies in Guyana.	Mahendra Sahadeo	2019
7	A Field Survey of Street Trees in Georgetown	Rajendra Singh	2019
8	Mapping Coastline Changes and Assessing Vegetation Changes at Almond Beach, Using GIS And Remote Sensing Techniques	Ronnel Lewis	2019
9	Assessing Land Use Changes Along Rockstone, Mabura Junction Using Images Classification Techniques	Nickie Hamilton	2019
	REGENERATION		
1	An Assessment of Differences of Density Among Three Major Mangrove Species on The Seacoast of Guyana.	Ojasvi Kandhi	2015
2	Growth, Biomass and Carbon Sequestration in Black Mangrove Saplings Along the East Coast of Demerara. Guyana.	Sevestri Rajcoomar	2015
3	The Relationship Between Soil Textural Classes and Mangrove Population Densities Along the Demerara Mahaica Foreshore	Tracy Clarke	2016
4	An Assessment of The Harvesting of *Eperua Falcata*: The Impact On Its Seedling And Sapling Regeneration At Linden Soesdyke Highway.	Jermaine Hunte	2016
5	An Examination of The Change in Species Composition of Seedlings and Saplings, With the Change in Elevation on the Secondary White Sand Forest Along Soesdyke/Linden Highway	Royston Peters	2016
6	An Assessment of The Mycorrhizal Association with Dominant Plant Species in Mined Out Bauxite Sites in Linden	Adiola Walcott	2016

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
7	An Assessmenttof Seedling Density of *Catostemma Commune* (Common Baromalli) And *Catostemma Fragrans* (Sand Baromalli) In Three (3) Plots Subjected to Three Logging Intensities at The Pibiri Forest Reserve in Central Guyana After Two Decades of Selective Logging.	Tressana Headley	2018
8	An Examination of The Change in Species Composition of Seedlings and Saplings, With the Change in Elevation on The Secondary White Sand Forest	Royston Peters	2018
9	To Determine the Effects of Thinning on The Regeneration of Coppice from Kabukalli (*Goupia Glabra*) Stumps.	Koyel Reid	2019
	WOOD DEGRADATION		
1	An Assessment of Termite Attack on Four (4) Lesser Used Timber Species (LUS)	Loris Vangenderen	2016
2	An Investigation into The Incidence of Sapstain And Wood Decay Fungal Infestation on the Surface of Lumber at Lumberyards in Georgetown	Tyronne Austin	2017
3	An Assessment of The Growth Performance of *Acacia Mangium* in the Pruned & Unpruned Treatments at Mahdia And the Recruitment of Native Species Within the Pruned & Unpruned Treatments.	TroyVan Rossum	2017
4	To Determine the Effects of Thinning on The Regeneration of Coppice from Kabukalli (*Goupia Glabra*) Stumps.	Koyel Reid	2019
	PRODUCTION CHAIN AND MARKETING		
1	An Investigation of The Disparities of Acai Berry (*Euterpe Oleracea*) Beverage Production in Siriki (Upper Pomeroon River) Guyana	Kaneesha Garraway	2016
2	An Investigation of The Production Chain of Kufa And Nibbi Furniture	Rene Sandy	2017

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
3	Determination of The Volume of Tree Residues for The Production of Value-Added Niche Market Products of Three Timber Species; Shibidan (*Aspidosperma Spp.*), Purpleheart (*Peltogyne Venosa*) And Soft Wallaba (*Eperua Falcate*).	Renetta Lim	2018
	COMMUNITY FORESTRY		
1	An Assessment of NTFP Based Activities in Two Amerindian Communities in Region # 2, Guyana	Safraz Samad	2015
2	An Assessment of The Differences in Levels of Satisfaction of Benefits, And Severity of Challenges in The Mainstay and Capoey Community Forestry Organizations, Region #2.	Kisheba Higgins	2016
3	Community Involvement/Participation in The Management of Mangroves	Surjpaul Singh	2017
4	Assessment of Impacts of Mangroves Resulting from Human Induced Stressors in Regions # 3 And 4	Rhoda Persaud	2017
5	An Assessment of The Differences of Host Perceptions of The Social Impacts of Tourism Within and Between Two Rural Communities	Edwin Moore	2017

APPENDIX D

THEMATIC RESEARCH AREAS IN AGRICULTURE

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
	AGRICULTURE		
	AGRONOMY		
1	An Investigation into the Performance on Three Onion Varieties	Lashawn Knights	2018
4	A Preliminary Study on Direct Seeded Vs Transplanted Onion	Oslyn Omar Williams	2018
6	Optimization of Nitrogen Scheduling for Aromatic Variety (Rice)	Anthony Ramsahoi	2019
9	An evaluation of two cover crops in improving soil health of Tiwiwid sand	Diana Bruce	2019
15	The Effects of Different N.P.K 12:12:17:2 Fertilizer Application Rates on the Growth and Yield of the Onion Variety F1 Granex	Acqusie Moses	2019
16	Micropropagation in Plantains	Eron Alonzo	2019
17	A Comparative Analysis of Three Sources of Organic Matter in the Production of “Bullnose” Peppers on Mined-out Soil	Renee Deodat	2019

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
18	The effect of horizontal and vertical planting of sweet potato plant development and yield	Orwin Emanuel	2019
19	An Evaluation of Organic Manures and Biofertilizer on Growth and Yield of Sweet pepper (Capsicum annuum)	Dwayne Gangoo	2019
20	Evaluation of the effect of different planting densities for Sugarcane Performance at Uitvlugt	Levina Henry	2019
21	The response of sugarcane variety DB9633 with and without P fertilizer in 16 series soil on Uitvlugt Sugar Estate	Navindra Sagadaya	2019
22	Evaluation of sulphur coated urea on sugarcane yield and growth in Guysuco	Dillon Weekes	2019
	FIELD CROPS		
1	An investigation of the response of sweet corn (*Zea mays* L.) to organic manure and an inorganic fertilizer	Anthony Jones	2016
2	Evaluation of Pre and Post emergent Herbicide for Effective Weed Management in Low Irrigated Rice	Jenarine Hardat	2017
3	An Evaluation of Merlin and Diuron combination for pre-emergent weed control in sugarcane (*Saccharum officinarum*)	Osbert Lawrence Rodney	2017
4	Evaluation of the Morphological Characteristics, Dry matter and Starch content of Local Cassava Varieties	Candacia Jacobs	2018
5	An Investigation into the Efficiency of Four Rodenticides in Sugarcane Cultivation.	Rondy McPherson	2018
6	Optimization of Nitrogen Scheduling for Aromatic Variety (Rice)	Anthony Ramsahoi	2019
7	National Agriculture Policies on Rural Farmers Development	Priscilla Brummell	2019

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
8	Evaluation of Moddus (Trimexapc-ethyl) as a suitable replacement for glyphosate within local sugarcane industry	Dirk Ford	2019
9	Evaluation of the effect of different planting densities for Sugarcane Performance at Uitvlugt	Levina Henry	2019
10	The response of sugarcane variety DB9633 with and without P fertilizer in 16 series soil on Uitvlugt Sugar Estate	Navindra Sagadaya	2019
11	Evaluation of sulphur coated urea on sugarcane yield and growth in Guysuco	Dillon Weekes	2019
12	Micropropagation in Plantains	Eron Alonzo	2019
13	The effect of horizontal and vertical planting of sweet potato plant development and yield	Orwin Emanuel	2019
14	An evaluation of coated urea on sugarcane	Mohamed Y Razack	N/A
15	An evaluation of sugarcane growth performance using granular and crystalline sulphate of ammonium fertilizers.	Adrian Singh	N/A
16	An Evolution of the yield performance of sweet potato (Ipomoea batatas) grown from four different lengths of plant materials in Guyana.	Kishan Ramesh	N/A
17	An evaluation of the efficacy of Siperus (Pyrazosulfuron-ethyl 10 WP) as a post emergent herbicide in sugarcane cultivation	Vishernauth Dhanpat	N/A
	VEGETABLE CROPS		

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
1	To Evaluate the Effects of Pre-Soaking Seeds in Ethephon and Hydrogen Peroxide on Germination of Red Peas (Minica 4)	Althea Amanda Melville	2015
2	An Investigation into the Post-Harvest losses in Pineapple on the Linden Highway.	Anika Alexander	2015
3	Evaluating the effects of plant growth hormone (Ethephon) on the growth and yield parameters of cucumbers.	Christine Lois Evans	2015
4	Investigating the effects of hydrogen peroxide (H2O2) on seed germination and seedling quality of two solanaceous crops; *Capsicum Frutescens* (Pepper) and *Solanum Melongena* (Boulanger)	Rebecca Romona Prabhulall	2015
5	An Investigation of the Effects of Limestone on Ph, fruit yield and the presence of Bacterial and Fungal Disease in Pepper (*Capsicum annum* L.) Production	Phibian Andrew Jospeh	2015
7	The Efficacy of Liming for the Control of Fusarium Wilt Affecting Boulanger	Leelawatie Manohar	2016
8	A comparative analysis of the efficacy of biochar on the Tiwiwid Sands for the production of peppers	Jason Paul Persaud	2016
9	The effects of varying phosphorus application rates and placements on the growth and yield of cherry peppers	David Ivan Pusselwhyte	2016
10	A Determination of The Efficacy of Two Commercial Mycorrhizal Preparations in Improving Phosphorus Nutrition in Tiwiwid Sand	Jewel Nicole Anna Todd	2016
11	Comparing the effectiveness wood shaving mulch (organic) and plastic mulch (inorganic) on the cultivation of Bullnose peppers	Mahendra Persaud	2016
12	A Comparison of Poultry Manure and a Mixed Fertilizer (12:12:17:2) on the Growth, Yield and Economics of Scotch Bonnet Pepper	Vishan Persaud	2016

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
13	Effect of timing of NPK fertilizer on growth and yield of Sweet Pepper (*Capsicum annum* L.)	Purnan Vijay Ramnarine	2016
14	An evaluation of various foliar fertilizer applications on the growth and production of tomato plants	Dexter Osase Touissaint Van-Veen	2016
15	An Investigation into the Effects of Three Chemicals on Blossom End Rot on Tomato Production	Teressa Lynessa Jacobs	2016
16	Assessing the Impact of Organic Fertilizers and a Growth Hormone on the Performance of Cucumbers	Jamaine Jermaine Samuels	2017
17	The Response of Tomato (*Lycopersicon esculentum*) to Organic and Inorganic Farming Practices	Adrianna Vanessa Wellington	2017
18	The Effect of Two Fungicides on the Control of *Alternaria solani* in Boulanger (*Solanum melongena*)	Andre Nimrod Burke	2017
19	An Evaluation of Organic Soil Amendments for the enhancement of Productivity of the Kairuni Laomy Sands	Orwin Mark Hermanstein	2017
20	Evaluation of different methods of *Trichoderma harzianum* application for the control of Fusarium wilt in tomato.	Sydicia Latika Sutherland	2018
21	Investigating the Antioxidant content of Sweet Pepper (*Capsicum annuum* L) in response to fertilizers	Taseka Rushanna Blair	2018
22	An Investigation into the Performance on Three Onion Varieties	Lashawn Knights	2018
23	A Preliminary Study on Direct Seeded Vs Transplanted Onion	Oslyn Omar Williams	2018

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
24	An Investigation into the Efficiency of Four Rodenticides in Sugarcane Cultivation	Rondy McPherson	2018
25	The Effects of Different N.P.K 12:12:17:2 Fertilizer Application Rates on the Growth and Yield of the Onion Variety F1 Granex	Acqusie Moses	2019
26	A Comparative Analysis of Three Sources of Organic Matter in the Production of "Bullnose" Peppers on Mined-out Soil	Renee Deodat	2019
27	An Evaluation of Organic Manures and Biofertilizer on Growth and Yield of Sweet pepper (*Capsicum annuum*)	Dwayne Gangoo	2019
28	A varietal evaluation of onions in open field condition on Ithaca sandy loam	Joshua Lyte	N/A
29	An evaluation of three different potting media (coco peat, rotted sawdust and rotted paddy hull) for onion seedling production	Phillip John	N/A
	FISHERIES		
1	An evaluation of the status of the seafood processing plants within Georgetown, Guyana with a view to make recommendations	Ariel Robertson	2019
2	A Comparative Assessment of two fishing methods (Trap versus Hook and Line) used in Marine Fisheries in Guyana	Abiola Simpson	N/A
	QUALITY CONTROL		

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
1	An Investigation into the Effects of Using Different Syrup Concentrations on the Shelf Life of Passion Fruit in Syrup	Kenisha Odessa Gordon	2015
2	An investigation into the effects of using different packaging materials on the shelf life of "Queso de Mano" and to evaluate the sensory attributes of Cheese and Whey	Shanelli Jerome	2016
3	An Analysis of the Composition and Quality of the Virgin Coconut Oil, Refined Coconut Oil and Standard Cooking Oil (Soya oil).	Terrence Desmond Browne	2017
4	Total aflatoxin in cassava products and its presence after two months of storage	Joylene Hamilton	2017
5	Evaluation of the Rancidity of Coconut Oil (*Cocos nucifera*. L) in Quinches	Marissa Smartt	2017
	UTILIZATION		
1	An Analysis of the Composition and Quality of the Virgin Coconut Oil, Refined Coconut Oil and Standard Cooking Oil (Soya oil).	Terrence Desmond Browne	2017
2	Oil Extraction from *Morinda Citrifolia* (Noni) Seed and its Application in the Production of Soap.	Partina Iona Haynes	2017
3	An Assessment of the Quality of Leather Produced from Sheep and Goat Skins using Four Plant Tannin Materials	Mitzie Suzanna Smith-Barker	2018
	ICT		
1	The prospects for adoption of Information Communication Technology (ICT) methods for improved rice production in Guyana: a survey of region five rice farmers	Jamila Oceanna Morgan	2017
2	Technology (ICT) methods for improved rice production in Guyana: a survey of region five rice farmers	Ravindra Singh	2017
3	Farmers' Perception of ICT in St. Kitts	Shaquimha Hanley	2019

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
	ENTOMOLOGY		
1	The Control of Red Palm Mite (*Raoiella indica* Hirst) of Cocoa nucifera using Chemical Treatment	Clevand AndrewKellawan	2015
2	A Comparative Study on the Effects of Silicon Application on Sugarcane Resistance to *Diatraea spp.*	Joel Alexander Patterson	2017
3	An investigation of the effects of organic substrates (garlic & pepper extract) on the control of Diamondback Moth in cabbage	Leroy Anthony Bobb	2017
4	An assessment of the different concentrations of botanical extracts for the management of Red Palm Mite (RPM) *(Raoiella indica* Hirst) on Coconut Palms (*Cocos nucifera* L) under laboratory conditions	Andrea Charles	2018
5	The Efficacies of four Organic Pesticides to manage Diamondback Moth	Carlisa Adridge	2019
6	An Evaluation of Organic Wastes for the multiplication of *Trichoderma harzianum rifai* for possible commercial applications	John Forde	2019
	PATHOGENS, BIOAGENTS AND DISEASES		
1	An evaluation of two treatment protocols against the conventional treatment protocol to control/reduce the incidence of Black Sigatoka (*Mycosphaerella fijiensis*) in Plantain Production (*Musa. spp*)	Tiffanna Jonelle Ross	2015
2	An Investigation into the Effects of Three Chemicals on Blossom End Rot on Tomato Production	Teressa Lynessa Jacobs	2016
3	The Efficacy of Liming for the Control of Fusarium Wilt Affecting Boulanger	Leelawatie Manohar	2016

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
4	Total aflatoxin in cassava products and its presence after two months of storage	Joylene Hamilton	2017
5	Detection of viruses in exotic sweet potato (Ipomoea batatas) accessions using visual symptomology	Stephon Paul	2017
6	The Effect of Two Fungicides on the Conrol of *Alternaria solani* in Boulanger (*Solanum melongena*)	Andre Nimrod Burke	2017
8	Evaluation of plant extracts versus synthetic fungicides against *Fusarium oxysporum f. Sp. Lycopersici,* wilt pathogen of tomatoes	Kwame Ortega Goodluck	2017
9	Efficacy of *Saccharomyces cerevisiae* cell walls (SCIW) in reducing the toxic effects of aflatoxin B_1 in broilers fed dietary treatments from hatch to day twenty-one	Madainey Fitzmichael Humphrey	2018
11	Isolation and Identification of *Trichoderma spp*. From hydraquent soil under different land use patterns	Akeem Travis Rodell Primo	2018
12	Evaluation of different methods of *Trichoderma harzianum* application for the control of Fusarium wilt in tomato.	Sydicia Latika Sutherland	2018
13	An Evaluation of the Effectiveness of a *Lactobacillus spp* as an Inhibitor of *Fusarium oxysporum* (*in vitro*)	Wattisha Ann Mattis	2018
14	Pot evaluation of botanicals for the control of *Fusarium oxysporum f. sp. lycopersici,* wilt pathogen of *Lycopersicon esculentum*.	Kevin Seetram	2019
15	The effectiveness of three fungicides against the anthracnose in laboratory trials	Joel Greene	2019
16	An Evaluation of Organic Wastes for the multiplication of *Trichoderma harzianum rifai* for possible commercial applications	John Forde	2019

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
17	The Effects of *Lactobacillus plantarum* on the Fermentation Process of Grass and Rice Straw Silage	Omario Gooding	2019
18	Evaluation of sweet potato clonal accession for viral indexing	Reiaz Azim	2019
19	Esherichia coli contamination of lettuce (*Lactuca sativa* L.) in the farm-to-market continuum in Region Six	Tiffany Jordan	N/A
	ECONOMICS		
1	A Comparison of Poultry Manure and a Mixed Fertilizer (12:12:17:2) on the Growth, Yield and Economics of Scotch Bonnet Pepper	Vishan Persaud	2016
2	An Assessment of Weight Gain, feed Conversion Ratio and Cost Associated with Locally Formulated Feed Ration Fed to Fattening Pigs	Shevonne Bryne	2019
	POST HARVEST		
1	An Investigation into the Effects of Using Different Syrup Concentrations on the Shelf Life of Passion Fruit in Syrup	Kenisha OdessaGordon	2015
2	The Effects of Varying Levels of Blackstrap Molasses on Shelf-Life of Silage	Damian Jairam Validum	2015
3	An Investigation into the Post-Harvest losses in Pineapple on the Linden Highway.	Anika Alexander	2015
4	An investigation into the effects of using different packaging materials on the shelf life of “Queso de Mano” and to evaluate the sensory attributes of Cheese and Whey	Shanelli Jerome	2016
5	An Analysis of the Composition and Quality of the Virgin Coconut Oil, Refined Coconut Oil and Standard Cooking Oil (Soya oil).	Terrence Desmond Browne	2017

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
6	Application of Beeswax & Cassava Starch to Extend the Postharvest life of Mangoes	Tandika Samantha Harry	2017
7	Evaluation of the Rancidity of Coconut Oil (*Cocos nucifera*. L) in Quinches	Marissa Smartt	2017
8	An Assessment of the Quality of Leather Produced from Sheep and Goat Skins using Four Plant Tannin Materials	Mitzie Suzanna Smith-Barker	2018
9	An investigation of the drying methods and their effects on milling quality of Rice in Regions 5 and 6	Roderick Richard Somrah	2018
11	*Esherichia coli* contamination of lettuce (*Lactuca sativa* L.) in the farm-to-market continuum in Region Six	Tiffany Jordan	
	SOIL FERTILITY AND MANAGEMENT	**Name of Student**	**Year**
1	A comparative analysis of the efficacy of biochar on the Tiwiwid Sands for the production of peppers	Jason Paul Persaud	2016
2	A Determination of The Efficacy of Two Commercial Mycorrhizal Preparations in Improving Phosphorus Nutrition in Tiwiwid Sand	Jewel Nicole Anna Todd	2016
3	Comparing the effectiveness wood shaving mulch (organic) and plastic mulch (inorganic) on the cultivation of Bullnose peppers	Mahendra Persaud	2016
4	Potting soil: Evaluating the growth of tomato seedlings using cow, poultry and sheep manure as part of the potting soil	Satyanand Ramdowar	2016
5	A comparison of vermicompost and poultry litter to determine optimum planting times after application.	Shanicia Bellamy	2016

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
6	An Evaluation of Organic Soil Amendments for the enhancement of Productivity of the Kairuni Laomy Sands	Orwin Mark Hermanstein	2017
7	An Assessment of the Quality of Leather Produced from Sheep and Goat Skins using Four Plant Tannin Materials	Mitzie Suzanna Smith-Barker	2018
8	An evaluation of two cover crops in improving soil health of Tiwiwid sand	Diana Bruce	2019
9	An evaluation of Oil Eating Microbes in the remediation of Oil spills on land.	Richelle Ellis	2019
10	Evaluation of Biochar Produced from Rice Hulls for the Amelioration of a Sandy Soil	Tatyana Moore	2019
11	An evaluation of sugarcane growth performance using granular and crystalline sulphate of ammonium fertilizers.	Adrian Singh	N/A
12	An Evolution of the yield performance of sweet potato (*Ipomoea batatas*) grown from four different lengths of plant materials in Guyana.	Kishan Ramesh	N/A
13	An evaluation of three different potting media (coco peat, rotted sawdust and rotted paddy hull) for onion seedling production	Phillip John	N/A
14	An assessment of the Heart of Palm waste as an organic fertilizer	Parsram Singh	N/A
	GROWTH, YIELD AND PRODUCTION		
1	An investigation of the reproductive parameters and market age and weight of cattle in region # 2	Kishan Kevin Narine	2015
2	Evaluating the effects of plant growth hormone (Ethephon) on the growth and yield parameters of cucumbers.	Christine Lois Evans	2015

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
3	A comparative analysis of the growth and amount of biogas produced from the manure of pigs fed on duckweed enriched formulated feed and those fed with formula feed alone	Steve Eon Ricardo Razack	2015
4	A comparative analysis of the efficacy of biochar on the Tiwiwid Sands for the production of peppers	Jason Paul Persaud	2016
5	The effects of varying phosphorus application rates and placements on the growth and yield of cherry peppers	David Ivan Pusselwhyte	2016
6	Comparing the effectiveness wood shaving mulch (organic) and plastic mulch (inorganic) on the cultivation of Bullnose peppers	Mahendra Persaud	2016
7	A Comparison of Poultry Manure and a Mixed Fertilizer (12:12:17:2) on the Growth, Yield and Economics of Scotch Bonnet Pepper	Vishan Persaud	2016
8	Potting soil: Evaluating the growth of tomato seedlings using cow, poultry and sheep manure as part of the potting soil	Satyanand Ramdowar	2016
9	Effect of timing of NPK fertilizer on growth and yield of Sweet Pepper (*Capsicum annum* L.)	Purnan Vijay Ramnarine	2016
10	An evaluation of various foliar fertilizer applications on the growth and production of tomato plants	Dexter Osase TouissaintVan-Veen	2016
11	An Investigation into the Reproductive Parameters of Cattle from Mahaica -Mahaicony, Region #5, Guyana	Colvin Alfred	2016
12	An Investigation into the Reproductive Parameters and Market Age and Weight of Cattle in East Canje And Central Corentyne, Region #6	Wilton Ozay Fordyce	2016

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
13	An Investigation into the Effects of Three Chemicals on Blossom End Rot on Tomato Production	Teressa LynessaJacobs	2016
14	An investigation of the response of sweet corn (*Zea mays* L.) to organic manure and an inorganic fertilizer	Anthony Jones	2016
15	A Comparison of the Growth Parameters, Dry Matter Content and Yield of Five Local Sweet Potato Accessions	Joshua Samuel Ferreira	2017
16	Assessing the Impact of Organic Fertilizers and a Growth Hormone on the Performance of Cucumbers	Jamaine Jermaine Samuels	2017
17	The Response of Tomato (*Lycopersicon esculentum*) to Organic and Inorganic Farming Practices	Adrianna Vanessa Wellington	2017
18	The response of rice (*Oryza sativa*) to three levels of potassium in single and split applications.	Travis Dexter Pilgrim	2017
19	Response of Three Rice Varieties to Slow-release and Conventional Nitrogen Fertilizer	Gangadai Dindayal	2018
20	An Investigation into the Performance on Three Onion Varieties	Lashawn Knights	2018
21	An Assessment of the Reproductive Performance of Dairy Cows at Saint Stanislaus College and Guyana School of Agriculture Farms	Candace Ronette Wharton	2018
22	A Preliminary Study on Direct Seeded Vs Transplanted Onion	Oslyn Omar Williams	2018
23	The Effects of Different N.P.K 12:12:17:2 Fertilizer Application Rates on the Growth and Yield of the Onion Variety F1 Granex	Acqusie Moses	2019

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
24	An Assessment of Weight Gain, feed Conversion Ratio and Cost Associated with Locally Formulated Feed Ration Fed to Fattening Pigs	Shevonne Bryne	2019
25	A Comparative Analysis of Three Sources of Organic Matter in the Production of "Bullnose" Peppers on Mined-out Soil	Renee Deodat	2019
26	The effect of horizontal and vertical planting of sweet potato plant development and yield	Orwin Emanuel	2019
27	An Evaluation of Organic Manures and Biofertilizer on Growth and Yield of Sweet pepper (*Capsicum annuum* L.)	Dwayne Gangoo	2019
28	Evaluation of the effect of different planting densities for Sugarcane Performance at Uitvlugt	Levina Henry	2019
29	The effect of black pepper (*Piper nigrum*) and tumeric (*Curcuma longa*) on growth performance of broiler chickens	MakebaJacobs	2019
30	Performance of Black Jersey Giant Fowl Fed on Two Commercial Diets	Shinella Persaud	2019
31	The response of sugarcane variety DB9633 with and without P fertilizer in 16 series soil on Uitvlugt Sugar Estate	Navindra Sagadaya	2019
32	Evaluation of sulphur coated urea on sugarcane yield and growth in Guysuco	Dillon Weekes	2019
33	An evaluation of coated urea on sugarcane	Mohamed Y Razack	N/A
34	An evaluation of sugarcane growth performance using granular and crystalline sulphate of ammonium fertilizers.	Adrian Singh	N/A
35	An Evolution of the yield performance of sweet potato (Ipomoea batatas) grown from four different lengths of plant materials in Guyana.	Kishan Ramesh	N/A

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
36	A varietal evaluation of onions in open field condition on Ithaca sandy loam	Joshua Lyte	N/A
37	An evaluation of three different potting media (coco peat, rotted sawdust and rotted paddy hull) for onion seedling production	Phillip John	N/A
	FERTILIZER		
1	The effects of varying phosphorus application rates and placements on the growth and yield of cherry peppers	David Ivan Pusselwhyte	2016
2	Comparing the effectiveness wood shaving mulch (organic) and plastic mulch (inorganic) on the cultivation of Bullnose peppers	Mahendra Persaud	2016
3	A Comparison of Poultry Manure and a Mixed Fertilizer (12:12:17:2) on the Growth, Yield and Economics of Scotch Bonnet Pepper	Vishan Persaud	2016
4	Effect of timing of NPK fertilizer on growth and yield of Sweet Pepper (Capsicum annum L.)	Purnan Vijay Ramnarine	2016
5	An evaluation of various foliar fertilizer applications on the growth and production of tomato plants	Dexter Osase Touissaint Van-Veen	2016
6	An investigation of the response of sweet corn (*Zea mays* L.) to organic manure and an inorganic fertilizer	Anthony Jones	2016
7	A comparison of vermicompost and poultry litter to determine optimum planting times after application.	Shanicia Bellamy	2016

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
8	Assessing the Impact of Organic Fertilizers and a Growth Hormone on the Performance of Cucumbers	Jamaine Jermaine Samuels	2017
9	An Evaluation of Organic Soil Amendments for the enhancement of Productivity of the Kairuni Laomy Sands	Orwin Mark Hermanstein	2017
10	Response of Three Rice Varieties to Slow-release and Conventional Nitrogen Fertilizer	Gangadai Dindayal	2018
11	Investigating the Antioxidant content of Sweet Pepper (Capsicum annuum L) in response to fertilizers	Taseka RushannaBlair	2018
12 13	Optimization of Nitrogen Scheduling for Aromatic Variety (Rice)	Anthony Ramsahoi	2019
	The Effects of Different N.P.K 12:12:17:2 Fertilizer Application Rates on the Growth and Yield of the Onion Variety F1 Granex	Acqusie Moses	2019
14	An Evaluation of Organic Manures and Biofertilizer on Growth and Yield of Sweet pepper (*Capsicum annuum*)	Dwayne Gangoo	2019
15	Evaluation of Biochar Produced from Rice Hulls for the Amelioration of a Sandy Soil	Tatyana Moore	2019
16	The response of sugarcane variety DB9633 with and without P fertilizer in 16 series soil on Uitvlugt Sugar Estate	Navindra Sagadaya	2019
17	Evaluation of sulphur coated urea on sugarcane yield and growth in Guysuco	Dillon Weekes	2019
18	An evaluation of coated urea on sugarcane	Mohamed Y Razack	N/A

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
19	An evaluation of sugarcane growth performance using granular and crystalline sulphate of ammonium fertilizers	Adrian Singh	N/A
21	An assessment of the Heart of Palm waste as an organic fertilizer	Parsram Singh	N/A
	CROP PESTS, DISEASES, VIRUSES		
1	Detection of viruses in exotic sweet potato (*Ipomoea batatas*) accessions using visual symptomology	Stephon Paul	2017
2	An Investigation into the Efficiency of Four Rodenticides in Sugarcane Cultivation.	Rondy McPherson	2018
3	The effectiveness of three fungicides against anthracnose in laboratory trials	JoelGreene	2019
4	Evaluation of sweet potato clonal accession for viral indexing	Reiaz Azim	2019
5	The Efficacies of four Organic Pesticides to manage Diamondback Moth	Carlisa Adridge	2019
	WEED MANAGEMENT		
1	Comparing the Efficacy of Different Herbicides in the Control of *Antidesma Ghaesembilla* (Gaertn).	Roy Orin Porter	2017
2	Evaluation of Pre and Post emergent Herbicide for Effective Weed Management in Low Irrigated Rice	Jenarine Hardat	2017
3	An Evaluation of Merlin and Diuron combination for pre-emergent weed control in sugarcane (*Saccharum officinarum*)	Osbert Lawrence Rodney	2017
4	Evaluation of Moddus (Trimexapc-ethyl) as a suitable replacement for glyphosate within local sugarcane industry	Dirk Ford	2019
5	An evaluation of the efficacy of Siperus (Pyrazosulfuron-ethyl 10 WP) as a post emergent herbicide in sugarcane cultivation	Vishernauth Dhanpat	N/A

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
	GROWTH HORMONES AND BIOSTIMULANT		
1	The Effects of Innovative Eco Care products on commercial broiler production under local conditions	Naomi Claudette Me Kenzie	2015
2	To Evaluate the Effects of Pre-Soaking Seeds in Ethephon and Hydrogen Peroxide on Germination of Red Peas (Minica 4)	Althea Amanda Melville	2015
3	Evaluating the effects of plant growth hormone (Ethephon) on the growth and yield parameters of cucumbers. Christine Evans	Christine Lois Evans	2015
4	Assessing the Impact of Organic Fertilizers and a Growth Hormone on the Performance of Cucumbers	Jamaine Jermaine Samuels	2017
5	An Evaluation of Different Concentrations of Growth Hormones for the Optimization of Plantain Micropropagation *in vitro*	Keisha Latoya Kewley	2018
6	An evaluation of some Agronomic Characteristics and Yield Potential of local Sweet Potato Advance lines	Kadeshe Shawyanna Nedd	2018
7	A Comparative Analysis of Different Concentrations of Growth Hormones on the Rapid Regeneration of Local Cassava Accessions *in vitro*	Latchman Bissoondyal	2018
8	An Evaluation of Organic Manures and Biofertilizer on Growth and Yield of Sweet pepper (*Capsicum annuum* L.)	Dwayne Gangoo	2019
	NON-RUMINANT LIVESTOCK		

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
1	A comparative analysis of the growth and amount of biogas produced from the manure of pigs fed on duckweed enriched formulated feed and those fed with formula feed alone	Steve Eon Ricardo Razack	2015
2	Evaluation of reproductive parameters of does artificially inseminated with differently processed semen	Zena DeFreitas	2017
3	An Assessment of Weight Gain, feed Conversion Ratio and Cost Associated with Locally Formulated Feed Ration Fed to Fattening Pigs	Shevonne Bryne	2019
4	The effect of black pepper (*Piper nigrum*) and turmeric (*Curcuma longa*) on growth performance of broiler chickens	Makeba Jacobs	2019
5	Performance of Black Jersey Giant Fowl Fed on Two Commercial Diets	Shinella Persaud	2019
	RUMINANT LIVESTOCK		
1	An investigation of the reproductive parameters and market age and weight of cattle in region # 2	Kishan Kevin Narine	2015
2	An Investigation into the Reproductive Parameters of Cattle from Mahaica -Mahaicony, Region #5, Guyana	Colvin Alfred	2016
3	An Investigation into The Reproductive Parameters and Market Age and Weight of Cattle in East Canje and Central Corentyne, Region #6	Wilton Ozay Fordyce	2016
4	An Investigation into The Reproductive Parameters, Age and Weight at Which Cattle Are Marketed in Region#4 (Georgetown to Mahaica)	Saskia Tiffany Tull	2016
5	An investigation of the prevalence of *Babesia bigemina* in Brangus, Beefmaster, Brahman or Creole breeds of cattle in Ebini	Martin Annil Bridglall	2017

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
6	Cattle Production in Regions Five and Six: A Situational Analysis of Production Practices and Farmers Adoption of Services Offered by the Guyana Livestock Development Authority	Denel Hamilton	2017
7	A Situational Analysis of Sheep and Goat Production in Region # 5	Corwin Elroy D'Anjou	2017
8	An Analysis of Sheep Housing in Region 5	Trishanna Kadijah Alleyne	2018
9	An Assessment of the Reproductive Performance of Dairy Cows at Saint Stanislaus College and Guyana School of Agriculture Farms	Candace Ronette Wharton	2018
	AQUACULTURE AND AQUAPONICS		
1	An Evaluation of Aquaponics Systems Utilizing the Effluent Water from Fish Tank to Grow Lettuce	Fred Roches	2017
2	An Overview of Guyana's Tambaqui (*Colossoma macropomum*) sector: Current Status and Challenges	Laushana Massiah	2019
	FEEDS AND FEEDING SYSTEMS		
1	An Assessment of Weight Gain, feed Conversion Ratio and Cost Associated with Locally Formulated Feed Ration Fed to Fattening Pigs	Shevonne Bryne	2019
2	Performance of Black Jersey Giant Fowl Fed on Two Commercial Diets	Shinella Persaud	2019
3	An assessment of the effects of Moringa (*Moringa oleifera)* and Black pepper (*Piper nigrum*) as feed additives in a broiler diet	Verlyn Huntley	N/A
	ORGANIC AND INORGANIC MANURES		

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
1	A comparative analysis of the efficacy of biochar on the Tiwiwid Sands for the production of peppers	Jason Paul Persaud	2016
2	A Determination of The Efficacy of Two Commercial Mycorrhizal Preparations in Improving Phosphorus Nutrition in Tiwiwid Sand	Jewel Nicole Anna Todd	2016
3	Comparing the effectiveness wood shaving mulch (organic) and plastic mulch (inorganic) on the cultivation of Bullnose peppers	Mahendra Persaud	2016
4	A Comparison of Poultry Manure and a Mixed Fertilizer (12:12:17:2) on the Growth, Yield and Economics of Scotch Bonnet Pepper	Vishan Persaud	2016
5	Potting soil: Evaluating the growth of tomato seedlings using cow, poultry and sheep manure as part of the potting soil	Satyanand Ramdowar	2016
6	An investigation of the response of sweet corn (*Zea mays* L.) to organic manure and an inorganic fertilizer	Anthony Jones	2016
7	A comparison of vermicompost and poultry litter to determine optimum planting times after application.	Shanicia Bellamy	2016
8	Assessing the Impact of Organic Fertilizers and a Growth Hormone on the Performance of Cucumbers	Jamaine Jermaine Samuels	2017
9	The Response of Tomato (*Lycopersicon esculentum*) to Organic and Inorganic Farming Practices	Adrianna Vanessa Wellington	2017
10	An Evaluation of Organic Soil Amendments for the enhancement of Productivity of the Kairuni Laomy Sands	Orwin Mark Hermanstein	2017

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
11	An Evaluation of the Physical and Chemical Properties of Animal Waste and Plant Waste Amended with Chitin	Clennell Amunike Petty	2018
12	Investigating the Antioxidant content of Sweet Pepper (*Capsicum annuum* L.) in response to fertilizers	Taseka Rushanna Blair	2018
13	A Comparative Analysis of Three Sources of Organic Matter in the Production of "Bullnose" Peppers on Mined-out Soil	Renee Deodat	2019
14	An evaluation of Oil Eating Microbes in the remediation of Oil spills on land.	Richelle Ellis	2019
15	An Evaluation of Organic Wastes for the multiplication of *Trichoderma harzianum rifai* for possible commercial applications	John Forde	2019
16	An Evaluation of Organic Manures and Biofertilizer on Growth and Yield of Sweet pepper (*Capsicum annuum* L.*)*	Dwayne Gangoo	2019
17	Evaluation of Biochar Produced from Rice Hulls for the Amelioration of a Sandy Soil	Tatyana Moore	2019
18	An evaluation of three different potting media (coco peat, rotted sawdust and rotted paddy hull) for onion seedling production	Phillip John	N/A
19	An assessment of the Heart of Palm waste as an organic fertilizer	Parsram Singh	N/A
	MICROPROPAGATION		
1	A Comparative Analyses of Two micro–Propagation Protocols for The Rapid Regeneration of Sweet Potato (*Ipomoea batatas* (L.) Lam.) Accessions *in vitro*	Kimande Alexis Pilgrim	2017

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
2	An Evaluation of Different Concentrations of Growth Hormones for the Optimization of Plantain Micropropagation *in vitro*	Keisha Latoya Kewley	2018
3	Evaluation of Sweet potato Seeding Lines for Germination Percentage and Tuber Characteristics	Latoya Jack	2019
4	Micropropagation in Plantains	Eron Alonzo	2019
5	An evaluation of the clonal generation of advanced sweet potato breeding lines	Kianna Batson	2019
6	Evaluation of sweet potato clonal accession for viral indexing	Reiaz Azim	2019
7	An Evolution of the yield performance of sweet potato (*Ipomoea batatas*) grown from four different lengths of plant materials in Guyana.	Kishan Ramesh	N/A
	CLIMATE SMART AGRICULTURE		
1	The prospects for adoption of Information Communication Technology (ICT) methods for improved rice production in Guyana: a survey of region five rice farmers	Jamila Oceanna Morgan	2017
2	An Evaluation of Aquaponics Systems Utilizing the Effluent Water from Fish Tank to Grow Lettuce	Fred Roches	2017
3	Technology (ICT) methods for improved rice production in Guyana: a survey of region five rice farmers	Ravindra Singh	2017
4	Characterization of lettuce producers under shade house conditions in Region #4	Anastacia Powers	2019
5	Rice farmer perceptions and possible adaptations strategies to climate change effects on Essequibo Coasts (Charity-Le Resource)	Floyd Gilkes	2019
6	An analysis of rice farmers adaptation to climate smart Agricultural practices on the front land clays of Region #5	Ozay Roberts	2019
7	National Agriculture Policies on Rural Farmers Development	Priscilla Brummell	2019

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
8	The effect of horizontal and vertical planting of sweet potato plant development and yield	Orwin Emanuel	2019
	MORPHOLOGY		
1	Evaluation of the Morphological Characteristics of Local Sweet Potato Landraces from Region #2, Essequibo Coast	Marvin Ragunauth	2017
2	Evaluation of the Rancidity of Coconut Oil (*Cocos nucifera*. L) in Quinches	Marissa Smartt	2017
3	Characterization of Local Coconut Palm Accessions Using Morphological Data	Hamani Mamadi Tinnie	2018
4	An Evaluation of the Morphological Characteristics of Mango	Wendell Joseph	2018
5	An Evaluation of Different Concentrations of Growth Hormones for the Optimization of Plantain Micropropagation *in vitro*	Keisha Latoya Kewley	2018
6	An evaluation of some Agronomic Characteristics and Yield Potential of local Sweet Potato Advance lines	Kadeshe Shawyanna Nedd	2018
7	Evaluation of the Morphological Characteristics, Dry matter and Starch content of Local Cassava Varieties	Candacia Jacobs	2018
8	Screening of Sweet Potato Accessions for Tolerance to Low pH Soils	Nero Renee	2019
9	An evaluation of the morphological characteristics and yield potential of sweet potato breeding lines (CG1-2018)	Travis Prasad	2019
10	Evaluation of Sweet potato Seeding Lines for Germination Percentage and Tuber Characteristics	Latoya Jack	2019
11	An evaluation of the clonal generation of advanced sweet potato breeding lines	Kianna Batson	2019

	RESEARCH TITLE AND THEMATIC AREA	NAME OF STUDENT	YEAR
12	Evaluation of sweet potato clonal accession for viral indexing	Reiaz Azim	2019
	BIOGAS		
1	A comparative analysis of the growth and amount of biogas produced from the manure of pigs fed on duckweed enriched formulated feed and those fed with formula feed alone	Steve Eon Ricardo Razack	2015
2	Evaluation of Biochar Produced from Rice Hulls for the Amelioration of a Sandy Soil	Tatyana Moore	2019
	SEEDLING AND SEEDLING BIOLOGY		
1	To Evaluate the Effects of Pre-Soaking Seeds in Ethephon and Hydrogen Peroxide on Germination of Red Peas (Minica 4)	Althea Amanda Melville	2015
2	Investigating the effects of hydrogen peroxide (H2O2) on seed germination and seedling quality of two solanaceous crops; *Capsicum Frutescens* (Pepper) and *Solanum Melongena* (Boulanger)	Rebecca Romona Prabhulall	2015
3	Potting soil: Evaluating the growth of tomato seedlings using cow, poultry and sheep manure as part of the potting soil	Satyanand Ramdowar	2016
4	A Preliminary Study on Direct Seeded Vs Transplanted Onion	Oslyn Omar Williams	2018
5	An evaluation of three different potting media (coco peat, rotted sawdust and rotted paddy hull) for onion seedling production	Phillip John	N/A

APPENDIX E

NUMBER OF RESEARCH ABSTRACTS BY YEAR AT TURKEYEN CAMPUS (2009-2015) AND NUMBER OF RESEARCH ABTSRACTS COMPILED FOR BERBICE CAMPUS

YEAR	NUMBER OF ABSTRACTS (Agriculture Department)	NUMBER OF ABSTRACTS (Forestry Department)
2015	12	13
2016	16	13
2017	27	11
2018	20	11
2019	34	6
Sub-total	109	54
Number from Berbice Campus	11	0

Total	**120**	**54**