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CARIBBEAN FOOD CROPS SOCIETY

51

**Fifty-first
Annual Meeting 2015**

**Paramaribo, Suriname
Volume LI**

PROCEEDINGS
OF THE
51ST ANNUAL MEETING

Caribbean Food Crops Society
51ST Annual Meeting
July 19 – July 24, 2015

Royal Ballroom Hotel Torarica,
Paramaribo, Suriname

Edited by
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Caribbean Food Crops Society

51ST Annual Meeting

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Paramaribo, Suriname

**“Food Safety, Innovation and Quality in Green Agriculture: The Way Forward to
Food Security for the Caribbean”**

TABLE OF CONTENTS	Page
2015 CFCS BOARD OF DIRECTORS AND OFFICERS	x
MESSAGES FROM OPENING CEREMONY	xi
WELCOME REMARKS Dr. Lydia Ori, Chair, Local Organizing Committee CFCS 2015	xiii
OPENING SPEECH Prof. Dr. Henry R. Ori, President CFCS 2015	xv
INAUGURATION AND REMARKS Dr. Wilfredo Colón, Chair and CEO, CFCS	xviii
REMARKS Professor Clement Sankat, Campus Principal, The University of The West Indies, Trinidad and Tobago	xx
MESSAGE Dr. Ir. Sidin, President of the Board of The Anton De Kom Universiteit Van Suriname	xxiii

SPEECH	xxv
Hon. Soeresh Algeo, Minister of Agriculture, Animal Husbandry and Fisheries	
KEYNOTE ADDRESS: THE WAY FORWARD TO FOOD AND NUTRITION SECURITY (FNS) CARIBBEAN	1
Dr. J.R. Deep Ford	
FOOD SAFETY AND FOOD SECURITY IN THE CARIBBEAN	10
FOOD SAFETY AND FOOD SECURITY ISSUES IN THE CARIBBEAN	10
L. Simeon Collins	
POLICIES TO ENHANCE FOOD SAFETY AND FOOD SECURITY IN SURINAME	14
Richard B. Kalloe	
IMPLEMENTING FOOD SAFETY PRACTICES IN VEGETABLE INDUSTRY	15
Qingren Wang	
THE SMALE-SCALE FARMER IN VEGETABLE PRODUCTION IN SURINAME	16
Wasudha Malgie, Lydia Ori, and Tom Vanwing	
AN EVALUATION OF FRESH MILK PRODUCED IN THE CARICOM; ASSURING QUALITY AND FOOD SECURITY	17
M.C. Andrews, M. D. Singh, and R. Maharaj	
CARIBBEAN BIOSECURITY CAPACITY-BUILDING TO PROTECT THE ENVIRONMENT AND PROMOTE SUSTAINABLE AGRICULTURE PRODUCTION	18
ADVANCING CARIBBEAN BIOSECURITY CAPACITY-BUILDING TO PROTECT THE ENVIRONMENT AND PROMOTE SUSTAINABLE FOOD PRODUCTION	18
José Carlos Verle Rodrigues	
NEOTROPICAL WILDLIFE PRODUCTION: PROTECTING THE ENVIRONMENT THROUGH SUSTAINABLE AGRICULTURE	19
Michele D. Singh	

EVALUATION OF BIO-AGENTS AND BOTANICAL OILS FOR MANAGEMENT OF GUNDHI BUGS, <i>LEPTOCORISA ORATORIUS</i> (FABRICIUS) AND <i>L. ACUTA</i> (THUNBERG) (HEMIPTERA: ALYDIDAE) IN RICE	22
Viviane Baharally and Sobita Simon	
INFLUENCING FOOD SAFETY AND SECURITY THROUGH TRAINING IN FRESH COTTAGE CHEESE PRODUCTION FROM GOAT'S MILK IN TRINIDAD AND TOBAGO	23
Michelle. D. Singh, L. Harrynanan and G. Rawlins	
USING LINKAGES AND FARMER TRAINING TO PROMOTE IMPROVEMENTS IN THE SMALL RUMINANT SECTOR FOR TRINIDAD AND TOBAGO	24
L. Harrynanan, M. D. Singh, E. Harry, G. Rawlins, and A. Mohammed	
NUTRITIONAL QUALITY OF A CUBAN COLLECTION OF CORN (<i>ZEA MAYS</i> L.)	25
C. Michel Martinez Cruz	
BEHAVIOUR OF TWO PAPAYA VARIETIES TO FERTILIZER REGIME AND PLANTING DATE	27
Whitney Martin, Wendy-Ann P. Isaac, Ayub Khan, and Samuel De Costa	
THE REALIZATION OF GREEN REVOLUTION THROUGH SUSTAINABLE AGRICULTURE	28
REALIZING AGRICULTURE'S TRUE REVEOLUTION FOR SUSTAINABLE DEVELOPMENT IN THE CARIBBEAN REGION: LESSONS FROM THE GREEN REVOLUTION	28
Clement Sankat	
EVALUATION OF DIFFERENT CROP MANAGEMENT SYSTEMS ON GROWTH AND PRODUCTIVITY OF THREE PUMPKIN VARIETIES	45
Ancel Balfour, Wendy-Ann Isaac, Nakisha Mark, Gaius Eudoxie, Leevun Solomon, and Majeed Mohammed	
USING THE FIFTH QUARTER SUSTAINABLY TO SUPPORT GREEN AGRICULTURE IN THE CARIBBEAN	46
Michele. D. Singh	
DESIGNING INNOVATIVE AGRICULTURAL LAND SYSTEMS IN THE CARIBBEAN: APPLICATION TO GUADELOUPE	47
Pierre Chopin, J.-M. Blazy, L. Guindé, and T. Doré	

TOWARDS ENHANCING SUSTAINABLE AGRICULTURE IN THE CARIBBEAN IN A CHANGING CLIMATE	50
Dale R. Rankine, Michael A. Taylor, Jane E. Cohen, Leslie A. Simpson, and Tannecia S. Stephenson	
A FEASIBILITY STUDY FOR A SECOND LIFE OF RICE HUSK IN SURINAME: POTENTIALS FOR RICE HUSK WASTE MANAGEMENT AND VALUE ADDED RICE PRODUCTION	51
Diana Duncan, R. Mangal-Jhari, S. Algoe, and M. Narain	
EX-ANTE EVALUATION OF INNOVATION BY QUALITY IN FOOD SECTORS AND ANALYSIS FROM AN INNOVATION SYSTEMS PERSPECTIVE	52
Carla Barlagne, J.M. Blazy, M. Le Bail, H. Ozier-Lafontaine, L.G. Soler, and A. Thomas	
THE CONTRIBUTION OF GREEN AGRICULTURE TO THE GREEN ECONOMICS	53
THE CONTRIBUTION OF GREEN AGRICULTURE TO GREEN ECONOMICS GREENING THE ECONOMY: A CASE FOR SUSTAINABILITY	53
Michel Prom	
GREATER USE OF SKELETAL MEATS AND TRIMMINGS IN TRINIDAD AND TOBAGO FOR VALUE ADDED PRODUCTS	57
Asha Morton, N. Maillard, J. Isidore, M. D. Singh, and R. Maharaj	
USE OF AQUATIC PLANTS IN WASTEWATER MANAGEMENT	58
Carlisa A. Byrne, A. Nankishore, and A. Ansari	
INNOVATIVE APPROACHES FOR RICE EXTENSION IN GUYANA	59
Ragnauth Kuldip, Bissessar Persaud, Dhirendranath Singh, and Viviane Bharally	
RESPONSE OF <i>CARICA PAPAYA</i> TO PLANTING DATE AND REDUCED FERTILIZER REGIME	60
Whitney Martin, Wendy-Ann P. Isaac, Ayub Khan, and Samuel De Costa	
THE CONTRIBUTION OF SOIL MANAGEMENT TO FOOD SECURITY	61
THE CONTRIBUTION OF SOIL MANAGEMENT TO FOOD SECURITY	61
Gerard Den Ouden	
THE ANTIMICROBIAL ACTIVITY OF VARIOUS SOLVENT TYPE EXTRACTS FROM SELECTIVE FRUITS AND EDIBLE PLANTS	68
Raymond. C. Jagessar, N. Ramchartar, and O. Spencer	

ANTHRACNOSE DISEASE ON WATER YAMS IN THE LESSER ANTILLES: PREVALENCE AND SEVERITY CONTRASTS IN THREE CARIBBEAN ISLANDS	81
Laurent Penet, Jean-Marc Blazy, Angela Alleyne, Dalila Pétro, Sébastien Guyader, and François Bussière	
GROWTH, YIELD AND POSTHARVEST QUALITY OF ELEVEN GREENHOUSE CUCUMBER CULTIVARS GROWN IN SOILLESS MEDIA	82
Candy Celestine, Christian Baksh, Jaime James, Wendy-Ann P. Isaac, Ravindra Ramnarine, Kenia Campo, Huazhong Ren, and George Legall	
EFFECT OF BIOCHAR APPLICATION ON SOIL QUALITY AND PAK-CHOI (<i>BRASSICA RAPA</i> L. VAR. <i>CHINENSIS</i>) PRODUCTION	88
Jane Jagernath, M. Narain, and Lydia Ori	
MICROBIAL INNOVATIONS AND THEIR IMPACT ON FOOD SECURITY	89
MICROBIAL INNOVATIONS AND THEIR IMPACT ON FOOD SECURITY	89
Abdullah A. Ansari	
COMPOSITION OF TRIPS SPECIES IN TOMATO AND THEIR ECONOMIC IMPACT ON COMMERCIAL TOMATO PRODUCTION IN FLORIDA	99
Dakshina R. Seal, Edward A. Evans, Mohammad Razzak, Catherine Sabines, and Christine T. Waddill	
EFFICACY OF ADSORBENTS (BENTONITE AND DIATOMACEOUS EARTH) AND TURMERIC (<i>CURCUMA LONGA</i>) TO AMELIORATE THE TOXIC EFFECTS OF AFLATOXIN IN CHICKS	100
F.R. Dos Anjos, D. R. Ledoux, G. E. Rottinghaus, and M. Chimonyo	
THE USE OF BIOTECHNOLOGY IN AGRICULTURE	101
THE USE OF BIOTECHNOLOGY IN AGRICULTURE	101
Abimbola Abiola	
EFFECT OF BIOSTIMULANTS ON THE YIELD PERFORMANCE OF ORGANICALLY-GROWN OKRA CULTIVARS IN THE U.S. VIRGIN ISLANDS	102
Dilip Nandwani, S. Dennery, V. Forbes, T. Geiger, and R. K. Sandhu	
HYBRID RICE IN SURINAME: YES OR NO? AN OBSERVATIONAL YIELD TRIAL WITH SIX HYBRID RICE VARIETIES	107
Jerry R. Tjoe Awie	

A REVIEW OF THE PROCESSING CAPACITY OF GUYANA'S RICE INDUSTRY	114
Dhirendranath Singh and J. Singh	
PROSPECTS OF AGRI-TOURISM IN LUDHIANA DISTRICT OF PUNJAB STATE	119
Bissesar Persaud and R. K. Dhaliwal	
USING LOCALLY PRODUCED MILK TO PRODUCE FRESH YOGHURT AND COTTAGE CHEESE:THE POTENTIAL FOR THE LOCAL DAIRY INDUSTRY	120
S. Farmer, M. D. Singha, and R. Maharaj	
COMPARISON OF ETHANOL PRODUCTION FROM TREATED AND UNTREATED CANE MOLASSES USING <i>SACCHAROMYCES CEREVISIAE</i> AND <i>ZYMO MONAS MOBILIS</i>	128
G. Rekha, S. Gomathinayagam, and Lydia Ori	
EFFICACY OF ANTIOXIDANTS TO REDUCE THE TOXICITY OF AFLATOXIN B1 (AF) IN WEANLING PIGS FED DIETARY TREATMENTS FOR FOUR WEEKS	129
T.A. Shannon, D. R. Ledoux, M. C. Shannon, G. E. Rottinghaus, T. J. Evans, and D. Y. Kim	
RESIDUAL LEVELS OF FURAN IN SOME CARIBBEAN FOOD AND ITS KINETIC INTERACTIONS WITH LOW MOLECULAR WEIGHT BIOLOGICAL REDUCTANTS	130
Samantha Brown-Dewar, Tara P. Dasgupta, and Paul T. Maragh	
INVASIVE PESTS: A CHALLENGE IN PLANT SECURITY	131
Maria J. Navajas	
THE USE OF <i>TRICHODERMA HARZIANUM</i> AS A BIOLOGICAL CONTROL AGENT FOR <i>SAGITTARIA GUAYANENSIS</i> (DUCKWEED) FOUND IN RICE CULTIVATION BY IN VITRO METHOD	132
S. Gomathinayagam, Prasad Mahendra, G. Rekha, and Lydia Ori	
VEGETABLE-OIL BASED PESTICIDES IN THE MANAGEMENT OF THE RUST (<i>HEMILEIA VASTATRIX</i>) AND SECONDARY PESTS IN COFFEE (<i>COFFEA ARABICA</i>)	133
Yosauri Fernández Figuereo and Colmar A. Serra	

PRODUCTION OF YARD-LONG BEAN (*VIGNA SINENSIS* VAR. SESQUIPEDALIS) USING THREE PLANT SPACINGS IN A CONVENTIONAL AND ORGANIC FARMING SYSTEM 135

S. Maniram, L. Ori, M. Narain, and E. Joemai

ASSESSING THE PROFITABILITY OF GUAVA (*PSIDIUM GUAJAVA* L.) PRODUCTION IN SOUTH FLORIDA UNDER RISK AND UNCERTAINTY 136

Edward A. Evans and S. Garcia

PHYSIOLOGICAL EFFECTS OF ARBUSCULAR MYCORRHIZAL APPLICATION ON WATER STRESS IN TOMATO SEEDLINGS 137

Shebeki Adams, Kaslyn Holder-Collins, and Diana Seecharran

FORESIGHT STUDY ON GUADELOUPEAN AGRICULTURE 138

C. Barlagne, Jean-Louis Diman, M.B. Galan, C. Hoton, O. Mora, T. Noglotte, H. Ozier-Lafontaine, and A. Vinglassalon

POSTER PRESENTATIONS

A PRELIMINARY INVESTIGATION ON THE FEASIBILITY OF AQUACULTURE IN THE INDIGENOUS COMMUNITY OF KWAMALASAMUTU, SURINAME 139

Britney Kasmiran, Jan Mol, Bruce Hoffman, and Soekirman Moeljoredjo

EFFECT OF INTERCROPPING CABBAGE WITH TOMATO FOR POTENTIAL CONTROL OF PEST OCCURRENCE ON CABBAGE (*BRASSICA OLERACEA* L. VAR. CAPITATA) 140

J. Moerahoe, L. Ori, M. Narain, and J. Joemai

EFFECT OF BIOCHAR APPLICATION ON SOIL QUALITY AND PAK-CHOI (*BRASSICA RAPA* L. VAR. CHINENSIS) PRODUCTION 141

J. Jagernath, M. Narain, and Lydia Ori

PRODUCTION OF YARD-LONG BEAN (*VIGNA SINENSIS* VAR. SESQUIPEDALIS) USING THREE PLANT SPACINGS IN A CONVENTIONAL AND ORGANIC FARMING SYSTEM 142

S. Maniram, L. Ori, M. Narain, and E. Joemai

PRELIMINARY STUDY ON THE FEASIBILITY OF DEVELOPING BAMBOO PRODUCTS WITHIN THE CONTEXT OF SOCIO-ECONOMIC AND CULTURAL REALITY IN KWAMALASAMUTU 143

V. Boejharat, L. Ori, B. Hoffman R., M. Narain, and R. Mangal

EVALUATING THE EFFECT OF THE BIOLOGICAL CONTROL AGENTS <i>TRICHODERMA</i> SP. AND <i>BURKHOLDERIA CEPACIA</i> TO CONTROL <i>FUSARIUM OXYSPORUM</i>	144
Chanderdew Kesharie, Kathleen Burke, and Subramanian Gomathinayagam	
CONTROL OF THE BROADLEAF WEEDS <i>CISSUS SICYOIDES</i> (BUN-ATI-MAMA) AND <i>MONTRICHARDIA ARBORESCENS</i> (MOKO-MOKO) WITH THE HERBICIDE GLYPHOSATE IN THE BANANA PLANTATION OF STICHTING BEHOUD BANANEN SECTOR (SBBS)	145
S. Gajadhar, K. Burke, and I. Demon	
EVALUATION OF THE BAKING PROPERTIES OF BREAD, ENRICHED WITH RICE BRAN	146
Yves F. Diran, E.T. Fung and A. Foek	
COMPARATIVE COASTAL BIRD DIVERSITY AND ABUNDANCE OF THREE ESTUARINE AREAS WITH DIFFERENT HEALTH STATUS IN SURINAME	147
Devika W. Narain	
AGRONOMIC TRAITS OF FOUR SURINAMESE CASSAVA ACCESSIONS COMPARED TO THE COLOMBIAN VARIETY CM6740-7	148
Maria Callebaut, R. Nelom, R. Chatterpal, and P. De Vroome	
THE EFFECT OF SUNATO 540FS AGAINST THE RICE WHORL MAGGOT (<i>HYDRELLIA</i> SP.)	149
Nareen Gajadin	
THE DETERMINATION OF THE LEVEL OF RESISTANCE AND TOLERANCE TO CASSAVA FROG SKIN DISEASE WITHIN SEVEN IN SURINAME COLLECTED CASSAVA ACCESSION	150
Peter De Vroome	
RESIDUAL LEVELS OF FURAN IN SOME CARIBBEAN FOOD AND ITS KINETIC INTERACTIONS WITH LOW MOLECULAR WEIGHT BIOLOGICAL REDUCTANTS	151
Samantha Brown-Dewar, Tara P. Dasgupta, and Paul T. Maragh	
IMPACTS OF AGRICULTURAL ACTIVITIES ON FISH COMMUNITIES	152
Leanna D. Kalicharan	
EFFECT OF BIOSTIMULANTS ON THE YIELD PERFORMANCE OF ORGANICALLY-GROWN OKRA CULTIVARS IN THE U.S. VIRGIN ISLANDS	153
D. Nandwani, S. Dennerly, V. Forbes, T. Geiger, and R.K. Sandhu	

DESIGN AND FABRICATION OF A BANANA FIBRE MACHINE	154
R. Murray, R. Birch, S. Jagmohan, and W. Isaac	
VACUUM FREEZE DRIED PUMPKIN POWDER	162
D. Gilchrist, S. Mujaffar, and W. Isaac	
PRELIMINARY INVESTIGATIONS INTO THE PRODUCTION OF FREEZE-DRIED PUMPKIN POWDERS	163
Saheeda Mujaffar, Deborah Gilchris, Wendy-Ann Isaac, and Majeed Mohammed	
IDENTIFICATION OF <i>PHYTOPHTHORA</i> AND EVALUATION OF ITS TOLERANCE IN CITRUS ROOTSTOCKS IN PUERTO RICO	169
Evelyn Rosa, Luis Silva, Agenol González, and Félix Román	
HIGH CAROTENE VARIETIES OF SWEET POTATO FOR PUERTO RICO	170
Carlos E. Ortiz, Jose A. Dumas, and Luis E. Rivera	
GALL FORMATION ON THE ENDANGERED CACTUS, <i>LEPTOCEREUS QUADRICOSTATUS</i> CAUSED BY THE INVASIVE MEALYBUG, <i>HYPOGEOCOCCUS PUNGENS</i> (HEMIPTERA: PSEUDOCOCCIDAE)	171
Giomara La Quay-Velázquez, Matthew Ciomperlik, and José C. Verle Rodrigues	
EFFECT OF BIO-STIMULANTS ON THE YIELD PERFORMANCE OF ORGANICALLY-GROWN EGGPLANT CULTIVARS IN THE U.S. VIRGIN ISLANDS	178
D. Nandwani, S. Dennery, V. Forbes, T. Geiger, and V. Sidhu	

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MESSAGES FROM OPENING CEREMONY

Welcome remarks

by

Dr. Lydia Ori, Chair of the Local Organizing Committee CFCS 2015

Honorable, Soeresh Algoe, Minister of Agriculture, Animal Husbandry and Fisheries
Professor Dr. Henry Ori, President CFCS 2015
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Dr. Ryan Sidin, President of the Board of the Anton the Kom University of Suriname

Distinguished Guests,
Dear Collogues,

I would like to welcome you at the 51st annual conference of the Caribbean Food Crops Society in Paramaribo, Suriname. I am pleased to notice that the invited guests are present. I would also like to thank the international institutions, government organizations, non-government organizations, and all national institutions for accepting this invitation. This conference which is hosted by the Anton de Kom University of Suriname and the Ministry of Agriculture and Husbandry is organized by the CFCS. The CFCS is a Caribbean regional forum for scientists in agriculture with 51 years of experiences. This meeting is hosted after 38 years in Suriname, and is therefore a huge challenge and privilege for the Local Organizing Committee to uphold a top-notch conference and meet the expectations of all conference participants.

The organizing committee is extremely pleased to host this prestigious event in Suriname, a beautiful country in South –America which is rich in natural resources (e.g. the amazon rain forest, water, and land), history, cultural diversity, and heritage. The Annual Meeting will consist of one main theme key note address, eight sub-theme key note presentations, and 10 sequential sessions on a variety of topics. During this conference, Caribbean scientists from all over the world will have an opportunity to meet with other scientists and present the results of their studies, as well as engage with each other in collaboration to advance Caribbean agriculture.

As an addition to the conference program, four field trips are scheduled in different agricultural parts of the country according to specific interests of the conference participants. Experimental facilities of agricultural institutions, production farms, and exhibitions will be visited with additional cultural and social programs. A farmer's forum titled: **'Adoption of knowledge and appropriate technology by small farmers and women's organizations in rural areas in Suriname'** will be also held. The goal of this program is to identify approaches for adoption of

knowledge/technology to the target groups and provide them with solutions, based on what they need.

The Theme of the conference is: **‘Food safety, Innovation and quality in a Green Agriculture: The Way forward to Caribbean Agriculture’.**

His Excellence, Distinguished Guests,
Dear Collogues,

Suriname is blessed with a lot of natural resources (tropical forest, fertile land, natural water bodies), rich culture, and biodiversity. The food production systems in the world are under increasing pressure to allow the world to meet sufficient, safe and healthy food, while at the same time their vulnerability increases. Climate change and loss of biodiversity are seen as a growing problem for decades but is not universally perceived as urgent. However, the probability of a radical, irreversible and possible disastrous change, as a result of the absence of adequate measures, is increasing. If we want to improve global and local food systems, including a focus on the availability of essential nutrients in it, it is necessary to innovate. The complex challenges that we face are asking for an integrated approach. To meet adequate, safe and healthy food does not only requires sufficient production, but also an adequate organization of the availability of food to consumers which requires a production that makes sustainable use of available natural resources and understanding the social environment and the behavior of the people who work with those processes. We need to prepare our future and provide the new generation with a green agriculture where food safety, innovation and quality are the vehicles.

This forum provides us with the opportunity for sharing our presentations with each other, and discussing important issues including Food Safety, Biotechnology, Soil management, Green revolution with each other over the next 3-4 days.

I hope that at the end of the conference we will be able to make decisions that will be useful to forward Caribbean Agricultural development.

I look forward to listen to all your presentations.
Thank you

Opening Speech at the 51st Annual Conference of the CFCS
by
Prof. Dr. Henry R. Ori, President CFCS 2015

Honourable Minister,

Distinguish guests, Ladies and Gentlemen,

Welcome and good morning

First of all I would like to thank the Minister of Agriculture for his presence to officiate the meeting. It is with great pleasure that I speak as President on behalf of the local Organizing Committee Of this Conference. It is with equal pleasure that I note the attendance of delegates from all the member countries of CFCS. This shows the importance attached to the Society by member countries and demonstrates the importance attached by you in supporting its activities through our Annual Meetings. Producing food is the primary role of farmers and the delivery of high-quality food and food traceability should be looked upon as public interest.

The challenges facing the food industry are well documented. From adapting to the effects of climate change, to feeding a growing global population with dwindling resources, it is very clear that the degree of change that is required within food and agriculture systems, and the pace with which that change needs to be delivered, compels us to adopt new ways of doing things. From an industry perspective this agricultural revolution is being determined not only by these global environmental factors, but also by the demands of Caribbean consumers. Consumers rightly expect us to deliver quality food produced to increasingly high social, environmental and ethical standards. Leading food retailers, including our own, understand this issue well. After all, for most of the Caribbean population, retailers are the public face of the food chain. It is this unique position in the supply chain – as the interface between the industry and public – which underlines the key role retailers have to play in connecting researchers, farmers, producers and manufacturers to the markets they serve.

I am delighted to represent the Anton the Kom University of Suriname and to co-chair this 51st CFCS Annual Meeting tasked with shaping this Agri-Tech Food Security Theme. The underlying goal is sustainable intensification of our agricultural sector. This is not a term we should be scared of. It is simply about getting better productivity and yields with reduced inputs and environmental impact. The Agro Industry has already shown this can be done by, for example, using GPS and precision farming techniques to ensure more targeted application of inputs. One of the challenges posed in this conference is how we translate existing research and scientific know-how so that we move the industry forward as a whole. Agricultural science and technology is rapidly becoming one of the world's fastest growing and exciting markets. It is driven by global changes: a rising population, rapid development of emerging economies with western lifestyle aspirations and growing geopolitical instability around shortages of land, water and energy. A technology revolution is also taking place. Breakthroughs in nutrition, genetics, informatics, satellite imaging, remote sensing, meteorology, precision farming and low impact agriculture mean agri-tech has huge potential for development. Supportive conditions include active and effective research, sustained community participation, state support and progressive policies, adequate investment and multi-stakeholder partnerships across scales and between sectors. Whereas these conditions

are met, agriculture-led growth generates substantial improvements to human well-being and helps meet a number of human development goals, including gender empowerment, poverty alleviation and food security.

The agri-tech sector and food supply chain in the Caribbean ranges from large research and development intensive multinational companies to small innovative SMEs, major retailers and family farms. We need to increase the agricultural production in the Caribbean. This increase in agricultural production can be brought about by bringing additional area under cultivation, extension of irrigation facilities, the use of improved high-yielding variety of seeds, better techniques evolved through agricultural research, water management, and plant protection through judicious use of fertilizers, pesticides and cropping practices. We need to develop a strong and vibrant food-processing sector with a view to create increased job opportunities in rural areas, enable the farmers to reap benefit from modern technology, create surplus for exports and stimulating demand for processed food. To strengthen support for the agri-tech subdivision in the Caribbean for a more productive and competitive sector for the reduction of food importation bills, we need more competent professionals entering the sector and train the existing labor force in clearer, more prioritized investment in skills; better co-ordination and proliferation of best practice and knowledge transfer; and a stable regulatory environment.

I am particularly concerned with the human development aspect in the Agri-tech sector. We need a (Caribbean) governing body to support investment in skills (sector skills council for agriculture) and a roadmap for action to:

- improve clarity and communication of available training and advice
- establish and communicate the future skills needs for the sector
- participate in the design and investment in courses and vocational training
- identify opportunities to support skills development and knowledge transfer
- Development programmes for small and marginal farmers.

As we look towards the future, we need to refine a long-term strategy that encourages the agrifood sector to exploit emerging opportunities, whilst minimizing red tape and burdensome costs.

Our mission is to ensure the sufficient supply of safe and sustainably produced food at a quality which our consumers expect – despite the uncertainties which farmers face, such as weather, animal disease or market prices.

This mission of delivering food security for people at home and abroad is more relevant now than ever, with rapidly increasing global population growth, evolving consumer patterns, as well as diminishing natural resources, and political instability in certain key regions. Let us therefore resolve to work together to create a coherent and ambitious vision, which reflects the best of Caribbean's agriculture:

- Let us explore the possibilities of new markets for our high-quality Caribbean product;
- Let us enhance competitiveness and productivity by giving farmers the right type of training and support, allowing them to innovate and create jobs;
- Let us inject new vitality into rural areas by increasing the diversity of opportunities available to those who live and work there;

- Let us lay the foundation for the renewal of agriculture by encouraging young farmers to get involved.
- Let us develop a knowledge-based response to the Caribbean's climate change, environmental and broader sustainability challenges.

In the coming days several oral presentation will be presented and posters will be displayed and we will discuss issues with in-depth deliberations shaping the future of the Caribbean Agro sector.

Distinguished guests, ladies and gentlemen, today's multifaceted food industry and fast changing world calls for a close partnership between countries. Globalization presents many challenges to our Region and as such we should cooperate with the aim of achieving mutual benefits. I hope this conference will highlight possible avenues for cooperation between countries and also come up with beneficial, cutting-edge resolutions, which can positively impact the agribusiness of member countries.

In closing, I wish to express my gratitude to each and all of you for your full cooperation and contribution to the 51st Annual CFCS Meeting. I take this opportunity to thank the Local Organizing Committee for organizing this meeting and for providing the necessary funding and for their diligence. The various sponsors for lunches and dinners are also thanked for their kind hospitality. I wish all the participants a very fruitful and productive meeting/conference and wish you all a good time in our country.

Thank you very much for your attention.

Inauguration and Remarks
by
Dr. Wilfredo Colón, Chair and CEO, CFCS

Good morning Excellency, ladies and gentlemen,

It is an honor and privilege to be here today, to officially inaugurate our 51st Annual Meeting of the CFCS.

First of all, I want to recognize some very important individuals who have worked diligently and energetically to make this meeting possible.

1. Prof. Henry Ori, Member of the AdeKUS Board of Directors and President of the CFCS for 2014 – 2015,
2. the Hon. Suresh Algoe, Minister of Agriculture, Animal Husbandry and Fisheries of Suriname and Joint President of the CFCS for 2014 – 2015,
3. Dr. ir. Sidin Ryan, Chairman of the Board AdeKUS,
4. Dr. Lydia Ori, Director of the Agricultural Production Department of AdeKUS and Chairwoman of the Local Organizing Committee (LOC),
5. Mrs. Ranoe Mangal-Jhari, Programme Manager, Program Support Unit, VLIR-AdeKUS and Vice-Chairwoman of the LOC,
6. Mr. Djoemadi (Didi) Kasanmoesdiran, Ministry of Agriculture and member of LOC,
7. Dr. Abimbola Abiola, Representative of the Inter-American Institute for Cooperation on Agriculture in Suriname and member of LOC,
8. Dr. Inez Demon, Director of the Center for Agricultural Research (CELOS - Agricultural Experiment Station, AdeKUS) and member of LOC,
9. Ir. Winston Ramataursing, Development Economist, PROPLAN and member of LOC,
10. Mr. Robert Tjien Foo, AdeKUS.

I also want to recognize the colleagues at the head table:

1. Dr. Lystra Fletcher-Paul, Food and Agriculture Organization (FAO) Country representative,
2. Mr. Barton Clarke, the newly appointed Executive Director of the Caribbean Agricultural and Research Development Institute, CARDI,
3. Dr. Raul Machiavelli, Dean, College of Agriculture, University of Puerto Rico,
4. Prof. Clement Sankat, Pro Vice Chancellor and Campus Principal of University of West Indies (UWI) and
5. Dr. J.R. Deep Ford, Food and Agriculture Organization (FAO), Subregional Coordinator for the Caribbean, our main keynote speaker.

In addition I want to present and recognize the Members of the Board of the CFCS. I want to start with:

1. Vice Chairman: Dr. Harry Ozier-La Fontaine, INRA, Guadeloupe,
2. Secretary: Mr. Jean-Louis Diman, INRA, Guadeloupe,
3. Treasurer: Dr. Alberto J. Beale, University of Puerto Rico,
4. President 2015: Prof. Henry Ori (Member of the Board of AdeKus) and Co-President Hon. Suresh Algoe (Minister of Agriculture).

Our Regional Representatives from:

1. English Caribbean, Mr. Kwame García, University of the Virgin Islands, Dr. Richard Harrison, Jamaica, and Mr. Barton Clarke, CARDI, Trinidad and Tobago.
2. Spanish Caribbean, Mr. Rafael Pérez Duvergé, IDIAF, Dominican Republic and Mr. Jerry Dupuy, Private Sector, Dominican Republic.
3. French Caribbean, Dr. Isabelle Jean Baptiste, AMADEPA, Martinique, Mr. Marceau Farant, INRA, Guadeloupe, and Dr. Harry Ozier-La Fontaine, INRA, Guadeloupe,
4. Dutch region, Dr. Lydia Ori, AdeKUS, Suriname,
5. President of our Advisory Committee, Dr. Edward Evans, IFAS, University of Florida, USA.

Ladies and gentlemen by the power invested in me as the Chairman of the Board and Chief Operating Officer of the Caribbean Food Crops Society, I officially declare and inaugurate our 51st Annual Meeting. Please let's give ourselves a big round of applause to convene our most sincere appreciation for our noble and generous dedication to ensure the success of this meeting.

Now please bear with me for the following remarks. The 68th United Nations General Assembly declared 2015 as the International Year of Soils. As agricultural scientists we are extremely aware that we need to secure and increase the biodiversity of our soils in order to maintain their sustainability and productivity to insure food security for our planet. Biodiversity is expressed in the rich mixture of organisms and life forms that make the soil their home. This richness translates to the soils resilience to withstand those factors associated with climate change.

Today we are meeting in a very unique country. Suriname is considered one of the most diverse countries on the planet. If we step out of these doors and listen to its citizen, we will hear over 10 languages. If we turn on the radio we will listen to a diversity of tunes. If we seek spiritual guidance, we can choose from all the major religions and indigenous faiths.

The CFCS also reflects with its actions this conviction to biodiversity and human diversity. For our 50 years we have strived to be inclusive, and tear down the cultural and political forces that separate us in the Caribbean and to create a professional platform in which we can express and share our research results to a wider audience. In this time frame the CFCS had meet in Suriname on two occasions, in 1967 and 1978. In 1967 we celebrated the 5th annual meeting with 55 representatives from 17 countries. The 15th annual meeting held in 1978 coincided with the 75th Anniversary of the Suriname Agricultural Experiment Station.

Now after almost four decades we are back in Suriname. This meeting was long overdue. During this time frame, we have maintained our mission to be an independent professional organization with interdisciplinary orientation and membership, which fosters communication between persons capable of contributing to the development of science, technology, and production of food crops and animals in the countries of the Caribbean Basin. We are all a testament to the efforts of those who came before us and carried this torch of scientific and cultural fellowship which we will enjoy during this week.

Thank you very much for your attendance and I wish you a very fruitful and pleasurable meeting.

Remarks
by
Professor Clement Sankat, Campus Principal,
The University of the West Indies, Trinidad and Tobago

Salutations

Thank You Chair, Dr. Lydia Ori

Hon. Soeresh Algoe, Minister of Agriculture, Animal Husbandry and Fisheries

Dr. Ryan Sidin, President of the Board of Anton de Kom University of Suriname

Dr. Wilfredo Colón, President of CFCS

Mr. Gerard Van Ouden of the EU-ACP Edulink Programme in Brussels

Prof. Dr. Henry Ori,- President of CFCS 2015 Suriname

Dr. Lystra Fletcher-Paul, FAO country representative

Dr. Barton Clarke, Executive Director of CARDI

Dr. Abimbola Abiola, IICA Representative in Suriname

Prof. Dr. Tom Vanwing, VUB, VLIRUOS representative

Dr. Hector Belle, CACHE Director

Other members and representatives of CFCS, Conference Sponsors

Conference participants, specially invited guests

Students of Agriculture

Farmers' Organizations

Colleagues of The UWI and other Universities

UWI Alumni

Distinguished Ladies and Gentlemen

Good morning!

It is indeed with great pleasure that I bring greetings to you all on behalf of The UWI St. Augustine Campus community and by extension the regional University of the West Indies on this special occasion – the Opening Ceremony of the 51st Caribbean Food Crops Society (CFCS) Annual Meeting!

I would like to begin by expressing my sincere thanks to the President of CFCS 2015, Professor Dr. Henry Ori and his team, together with the President of the Board of Anton de Kom University of Suriname, Dr. Ryan Sidin, and the Honourable Suresh Algoe, Minister of Agriculture, Animal Husbandry and Fisheries for inviting me, and in so doing, allowing The UWI to be a part of this annual conference! A conference which the Caribbean Food Crops Society has been hosting consistently for over 5 decades!

Congratulations to the CFCS!

Ladies and gentlemen, not only is Food indispensable to human life, but according to the World Bank, agriculture based growth is at least twice as effective in reducing poverty as GDP growth in other areas. Agriculture, food production and the business side of these elements should therefore be of utmost importance to all of us in the Caribbean if we are to treat with problems of our Caribbean States – high unemployment, high food import bills, debt, competitiveness etc. In this

regard, I wish to commend the Caribbean Food Crops Society (CFCS) for staying the course to host these conferences throughout the years which has provided a unique forum for the examination of our policies, systems and practices, and our institutions in the Caribbean region and beyond. Let me also say that these meetings have not only provided a forum for sharing of new ideas that can help to strengthen the agricultural-food chain, and especially for our young researchers from various parts of the Region. This forum has also given them a chance to know other regional researchers, to network and to know more about our Regional Agriculture - its problems and possibilities.

As an Agricultural Engineer and researcher myself (and as many of you know), I have been a longstanding member of the Caribbean Food Crops Society (CFCS) for over 30 years and have attended many of their annual meetings - some very memorable such as in St. Croix (United States Virgin Islands), Puerto Rico and Antigua. These are memories that I truly cherish. Just two years ago in 2013, the 49th Annual Caribbean Food Crop Society (CFCS) Meeting, was combined with the 30th West Indies Agricultural Economic Conference and the International Society for Horticultural Sciences (ISHS) Meeting, and this was hosted by The UWI, with the kind support of the Government of Trinidad and Tobago. Our regional University of the West Indies has always seen itself as a close partner in these efforts, especially as it relates to underscoring the importance of agriculture and food production to the countries of our Caribbean region, the world over and this through our renewed Faculty of Food and Agriculture and our Faculty of Engineering at The UWI St. Augustine Campus.

This year's overarching theme, "Food Safety, Innovation and Quality in Green Agriculture: The Way Forward to Food Security for the Caribbean" is extremely timely and relevant. It once again aptly pronounces the direction in which we in the Caribbean ought to be moving given the state of agriculture and food production in our region. I do believe that while it is important for us to focus on food security (that is, the availability of food for our people), we must not ignore:

1. The importance of Food Safety, Nutrition and Health
2. The ecological impact of our Agricultural/Food Production Systems and Sustainability;
3. The importance of utilizing technology and innovate on in food production processes and practices; and investing in R&D;
4. The socio-economic conditions of our countries of the region and the role of food and agriculture in building robust, balanced and prosperous, self-fulfilling societies.

These are all areas that I will speak about tomorrow, but notwithstanding, I want to emphasize the point that we must pay very close attention to not only how much food we produce, but how we produce this food, and the impacts of our food production practices on our environment. As we gather for the next few days to speak on Agriculture and Food, these are not issues that we must take for granted. We must learn from each other on past missteps and on new ideas, approaches and systems for food production and trade. We must remember the words of Winston Churchill who said, "Those who do not learn history are doomed to repeat it".

Ladies and gentlemen, developing a sustainable agricultural sector for the Caribbean region requires collaboration among all stakeholders – economists, agrologists, teachers, researchers, farmers, extension officers, consumers and public and private sector representatives. We must open our space in the Region for collaboration and team work, in agricultural trade, removing all

barriers to regional trade for example, in the sharing of best agricultural/food/nutrition practices and in Research and Innovation. We must work together if we are to build sustainability and resilience in our food/agri-product systems.

In closing, I say congratulations to the organizers; I recognize the hard work of Prof. Ori and his team; the support of the Government of Suriname; and to all participants who made the effort to be here. On a personal note, it is great to be in Suriname, a land of my shared ancestry! A land which when in my early youth in the Corantyne, I often opened my eyes and looked across the brown, wide Corantyne River. I asked myself many times, what is on the other side of this river and in this densely forested, green land? Well today, 50 years and more, I am still discovering this lovely, progressive land of many tongues and cultures!

Thank you for inviting the Regional University of the West Indies to CFCS 2015, and Suriname - best wishes for a successful conference!

Message
by
Dr. Ir. Sidin, President of the Board of
the Anton de Kom Universiteit van Suriname

Honourable Minister of Agriculture, Animal Husbandry and Fisheries,

Distinguished Guests, Ladies and gentlemen

Let me begin, by welcoming you all to Suriname for the 51st Annual Meeting of the Caribbean Food Crops Society, CFCS. We are delighted to have you here to participate and share knowledge in this meeting and its corollary conference on food safety. This year's theme is "Food Safety, Innovation and Quality in Green Agriculture", The Way Forward to Food Security for the Caribbean" and I am proud to say that the local organizing committee has put together effective programs which offer a wide variety of activities to address the problem at hand.

It is no accident that food security is one of Suriname's priorities in development policies in the Agribusiness. The number of people without access to sufficient, nutritious food is unacceptably high. High and unstable food prices are root causes of almost all the sociopolitical crises in the world today. Think of Tunisia, Algeria, Yemen and African countries as Egypt and, little closer to home, Haiti. Food security is crucial in achieving the hunger reduction targets of the World Food Summit and Millennium Development Goal # One.

With all the knowledge and expertise assembled at our Anton de Kom University and databases available at science institutions in countries of the Caribbean basin, we can make a difference.

Let me give you my definition of food security. Food security is about production, accessibility and nutritional value. And about ensuring that those who do not produce food have the income they need to buy it. This requires action on all fronts. Let me give a quick overview.

Farmers' response to increasing demand and higher prices has been excellent in recent years. And of course Mother Nature has helped a lot, resulting in bumper crops and full silos. Unfortunately, ever-growing demand combined with somewhat disappointing harvests – remember the droughts and fires, the floods and the relatively low production in the Southern Hemisphere – is now causing even higher food prices. Moreover, unstable and unpredictable prices at national level are preventing farmers from consolidating their investments. In fact, the insufficient buying power of farmers producing for a local market in developing countries is preventing them from investing at all.

In other words, there is work to be done. As I just said, our most important tool for progress in countries in the Caribbean is economic growth. Only growth can help people help themselves. But conditions in our countries are far from ideal for private sector development. The private sector plays a crucial role in economic growth and food security. In horticulture, dairy farming or livestock rearing, we need to build strong public-private-partnerships. But of course, local businesses, farmers in particular, are even more important for economic growth and food security in Caribbean countries.

Caribbean countries in general, have a lot of farmers many of whom however, lack market information, banking services, credit facilities and insurance, on top of which fertilizers and quality seeds are in short supply. These are all factors crucial to the contribution of success of small farm operations in our region. A good farmer needs to be a good entrepreneur.

That is why we should be helping farmers become more businesslike, by providing;

- safety production nets and social security;
- market access and sustainable production chains;
- investment in inclusive finance and infrastructure;
- knowledge on innovation and quality and
- by sharing our knowledge about markets, organizational strategies, research and development.

We should work closely with the Ministry of Infrastructure and the Environment to achieve these goals, and – even more relevant for you – with the Ministry of Economic Affairs, Agriculture and Innovation. We need to come up with a plan to streamline the efforts of local, regional and international players in the field of food security.

Now back to you. Research institutions like the Anton de Kom University should seize the opportunity to liaise with other Universities in de Caribbean and offer solutions tailored to specific, real-life problems. Solutions devised by the countries themselves.

Ladies and gentlemen,

In his book “Common Wealth: Economics for a Crowded Planet”, the well-known economist Jeffrey Sachs argues that there is more room for optimism. Firstly, because the world population is likely to stabilize in the last century. And secondly, because technical progress will probably be faster than in the past. But, says Sachs, this is no reason to sit back and relax. He wonders whether the world is organized enough and cooperative enough to meet the challenges it faces.

I agree with Sachs that there is room for improvement. So let’s start working together today. We can feed the world in a sustainable way. Even with 9 billion people in 2050. Let’s do it.

I wish you a fruitful conference and hope that visiting Suriname may inspire you.

Thank you for listening.

Speech
by
Hon. Soeresh Algoe, Minister of Agriculture, Animal Husbandry and Fisheries

Deputy Minister, Ambassadors
Honorable guest
Distinguished speakers
Ladies and Gentlemen,

Good Morning,

May I extend a special word of welcome to all of our guest from abroad and especially from the Caribbean and I wish you all an enjoyable stay in Suriname.

Ladies and Gentlemen,

I would like to start my speech with an observation that is at the core of the problems with Agricultural health and Food Safety and that is that producers break the rules on the use of pesticides and animal medicines. And I don't have to tell you what the consequences are on public health and export of agricultural produce. Scientific and technological advances are opening up new possibilities for farmers around the world (networked digital farm).

If everyone would follow the rules, and if we would all go for a greener agriculture life would be a lot easier but that is unfortunately not reality. Agricultural Health and Food safety are probably the most important conditions to guarantee food security for our countries and of course the entire region and the rest of the world. The only way to achieve this is when all parties (farmers, manufacturers, trade and consumer organizations) work together.

The free movement of safe and healthy food is an essential aspect of trading of food crops on export markets. It contributes significantly to the health and well-being of domestic as well as regional consumers. As a member country of WTO, FAO, WHO, OIE and the Codex Alimentarius and as a party to the conventions of the WTO/SPS, IPPC and OIE Suriname has committed itself to food safety. Achieving and ensuring food security for the total population of Suriname and ensuring agricultural health and food safety are the first 2 goals of the 7 strategic goals of our government's agriculture policy.

As from 2003 the Ministry of Agriculture, Animal Husbandry and Fisheries have taken a lot of measures to bring our food safety to international standards. We have to name some of them.

- Set up an Agricultural health and Food safety Unit,
- Set up a Trace back system
- Updated our pesticides law
- Establish by law a Fish Testing Institute
- And implemented Capacity building and training programs.

Ladies and Gentlemen

Agricultural Health and Food Safety are complex things to achieve and to maintain. For the development of norms, standards, rules and regulations on food safety the following aspects need to be taken into consideration:

A Chain approach. All rules and regulations should apply to all links in the chain from primary production to consumption.

- Consumer's interest. High rate of transparency and openness, and assurance of public health is necessary to ensure consumer confidence.
- Role and Responsibilities of Public and Private sector. Each producer in the chain is fully responsible for the products they produce. The government establishes the necessary pre-condition, and provides for adequate control and enforcement mechanisms
- Science based. Measures should be based on scientific findings and international norms and standards. National procedures and regulation, and the legal system should also be taken into account. In companies, government and society, decisions must be made based on proven scientific solutions that can fulfill societal needs.
- Economic interest. Increase of agricultural produce for domestic consumption as for export to foreign markets is very important to increase the economic resilience of our Countries. If the products do not comply with the food safety, and agricultural and animal health requirements of the export markets, we will risk losing our market share and export revenues, and jobs in and linked to the agricultural sector.

Ladies and Gentlemen

Next to all other wonderful technical and interesting issues that will be presented here by the distinguished speakers I would like to ask your attention for what can be considered also important in terms of implementation of food safety strategies and policies and these are:

- Communication. We need to develop a communication plan. What are the messages, who are the target groups, How, when do we communicate, what medium and technique is used. Promoting open exchange is a way of growing knowledge.
- Develop public awareness. Training programs in Food Safety, Consumers awareness programs, research and survey
- Capacity and Institutional building. Certification programs, Quality management, survey, monitoring systems, ICT, Laboratories, Setting up of necessary institutes, Updating laws.

Ladies and Gentlemen,

Complying with the international norms and standards of Food Safety is top priority for Suriname. If everything will go as planned before the end of next year 2016 all of our laboratories will be operational under an independent Agricultural health and Food Safety Institute which will inspect and monitor the whole production chain of food from cultivation to processing to ensure that the food is safe for the public health. Helping growers produce high-quality, safe and healthy food and thereby contributing to a better life.

At last I would like to mention also that Suriname has provided facilities such as housing for the Caribbean Agricultural Health and Food Safety Agency (CAHFSA).

Honorable guests, Ladies and gentlemen I would like to wish you all, a fruitful and successful annual meeting.

Thank You.

GROWTH, YIELD AND POSTHARVEST QUALITY OF ELEVEN GREENHOUSE CUCUMBER CULTIVARS GROWN IN SOILLESS MEDIA

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Abstract: Cucumber is one of the most important vegetables grown in greenhouses around the world. Finding suitable and adaptable heat tolerant greenhouse varieties is a major constraint to greenhouse producers in Trinidad. A greenhouse experiment was conducted at the University Field Station, Valsayn to evaluate eleven heat tolerant (5 gynoeocious and 6 parthenocarpic) varieties of cucumber (Marketmore 76, Decathlon, Kalima, Keish, Cherokee and 6 other Chinese varieties – Kayla, Long John, Nile, Groovy, Ethel and Spikey). The results of the study revealed significant differences ($p \leq 0.05$) among the varieties in terms of vine length, number of branches, leaf area, number of fruit per plant and total fruit weight per plant. The highest fruit yield per plant was obtained from the Chinese varieties, which consistently had higher yields than the other varieties. Postharvest evaluation conducted 8 days after storage at 10°C resulted in fruits maintaining their firmness and colour characteristics. There was also no significant difference among the eleven varieties during sensory evaluation. All varieties had ratings of 2.0 to 6.8, signifying poor to good taste. The Chinese varieties performed the best in this trial. The data should especially be valuable when evaluating yield, fruit length, colour and powdery mildew tolerance.

Keywords: Greenhouse, cucumber varieties, postharvest.

INTRODUCTION

Cucumber (*Cucumis sativus* L.) is a vegetable crop of the Cucurbitaceae family and a very popular crop for greenhouse producers in many areas of the world. Cucumber is one of the oldest cultivated crops, and thought to have originated in the northern sub-Himalayan plains of India. With several varieties ranging from dark to light green skin, the crispy, moisture-rich fleshed fruit may have small edible seeds concentrated near the core. It is a primary source of vitamins such as vitamin K, minerals and fibre for humans; but its caloric and nutritional value is very low (Keopraparl, 1997). Cucumber production is growing in popularity among greenhouse producers in Trinidad and Tobago, however, finding suitable varieties is a major problem. Gynoeocious varieties of cucumber (100% female blossoms) usually are more productive and produce fruits with smoother skins than monoecious types, having both female and male flowers (Hochmuth, 2001; Marr, 1995; Singh et al. 2005). Parthenocarpic cucumbers are seedless because the fruit is produced without being pollinated. If this type of cucumber is planted near others, pollination will occur and seeds will form. Parthenocarpic cucumbers tend to bear fruit earlier, with a more concentrated set and better yield overall. This trial was conducted to compare the performance of locally available imported varieties sold to greenhouse producers and six new Chinese varieties.

MATERIALS AND METHODS

Eleven (11) varieties from the United States of America and China (5 gynocious varieties and 6 parthenocarpic varieties) were selected for investigation. Cucumber seedlings were transplanted into coconut coir bags and arranged in a randomized complete block design (RCBD) with 4 replications. The experiment was conducted in a split arch, gable roof greenhouse, which was fully enclosed with insect screen at the University of the West Indies Field Station (UFS) located at Valsayn, Trinidad (10° 39' 0" N, 61° 25' 0" W) between February-April, 2015. Greenhouse temperatures varied between 0–45°C for the 3 months. The 15–20 day-old transplants with 2 to 3 true leaves were transplanted in 2 double rows in each plot, with 30-cm spacing between and within the rows and a 1-m walkway between the 2 double rows. The plants were irrigated using a micro-tube with emitters placed at each plant in the double row at a 30-cm distance. Plants were fertigated at least 12 times per day at 5 minute intervals with each plant receiving 2.5 litres of water per day. Plants were fertigated with the recommended soluble fertilizers throughout the trial, which included: calcium nitrate, 15:30:15, 4:4:40 and 10:52:10, magnesium sulphate, Fe chelate and micro-nutrient formulation. Plants were pruned weekly by removing “sucker vines” or horizontal vines throughout the growing period. The locally available varieties were hand pollinated once per week, using separate small brushes and transferring the pollen from the anther of the male flowers onto the stigma of the female flowers. There were no serious pests observed in the greenhouse throughout the growing period. However, the observed diseases were downy mildew and leaf spot, which occurred later at harvest. They were controlled using prophylactic treatments of Soyabean oil and Abamectin for insects and fungicides including *Bacillus subtilis* and copper with sulphur for the management of diseases. Cucumbers were harvested when the diameter of the fruit reached about 3 cm. Harvesting was initiated and terminated approximately 35 and 65 days after transplanting, respectively. Postharvest quality was evaluated on freshly harvested and stored fruit (after 8 days refrigerated at 25°C) and a sensory evaluation was conducted before and after storage to determine consumer preference using a hedonic scale (0–9). External colour was determined with a Minolta Chroma Meter CR-200. Measurements are presented as Lightness, Chroma Value, and Hue Angle. Firmness was determined with an Instron Series IX Automated Testing System 7. Rating scores of powdery mildew was determined by estimating the % of leaf area covered on upper leaves of cucumber. The 0–10 scale was designed to account for % leaf area covered by lesions. Data were analyzed by analysis of variance and means separation was by Duncan’s Multiple Range Test using SPSS analysis software.

Table 1. Cucumber cultivars used in the experiment

Variety	Production company	Origin
Cherokee	Agrinova Seeds Ltd.	Miami, Florida
Decathlon	Agrinova Seeds Ltd.	Miami, Florida
Marketmore 76	Johnny’s Selected Seeds	Maine, USA
Kalima	Agrinova Seeds Ltd.	Miami, Florida
Keish	Agrinova Seeds Ltd.	Miami, Florida
Spiky	RIJKZWAAN Seed Ltd.	China
Ethel	RIJKZWAAN Seed Ltd.	China
Groovy	RIJKZWAAN Seed Ltd.	China

Nile	Tianjin Deruit Seed Co. Ltd.	China
Long John	Tianjin Deruit Seed Co. Ltd.	China
Kayla	Tianjin Deruit Seed Co. Ltd.	China

RESULTS AND DISCUSSION

Cucumber yield and yield components

The total marketable yield ranged from 3.1–10.2 kg per plant (Table 2). Significant differences in the yield ($p \leq 0.05$) were observed among the varieties. Kalima had the lowest total marketable yield of all varieties at 3.1 kg per plant. Nile, Kayla and Long John, all Chinese varieties had total marketable yields of 7.9 kg or more per plant. Chinese varieties Spikey, Ethel as well as Long John, Nile and Kayla (all parthenocarpic varieties) had the shortest time to first fruit, ranging from 15.3–16.5 days after transplanting. Kayla produced the highest number of fruits per plant (39.1) while Cherokee produced the lowest (7.2).

Fruit size characteristics

There were significant differences in fruit width among the 11 varieties (mean diameter ranged from 0.72–2.4 cm). Fruit length ranged from 2.2–15.7 cm per fruit. Long John had the longest fruit (15.7 cm) followed by Nile (14.7 cm), Groovy (12.8 cm) and Kayla (10.1 cm). Smaller fruit of Cherokee could be attributed to the absence of pollinators and poor manual pollination in the greenhouse. As a result of poor pollination, fruit development was affected with Cherokee and others such as Kalima and Marketmore 76 (commonly used in open-field production).

Table 2. Cucumber variety characteristics

Variety	Days to 1 st fruit	Days to 1 st harvest	Fruit width (cm)	Fruit length (cm)	Avg. No. of fruits per plant	Avg. Weight (kg)	Firmness
Cherokee	18.4 ^a	26.0 ^b	0.72 ^c	2.2 ^d	7.2 ^d	3.5 ^c	189.4 ^c
Decathlon	21.3 ^a	28.5 ^a	1.6 ^b	6.8 ^{bc}	10.0 ^c	5.7 ^b	316.3 ^b
Marketmore 76	17.8 ^a	30.5 ^a	1.5 ^b	3.4 ^d	8.5 ^d	3.1 ^c	345.8 ^b
Kalima	18.9 ^a	27.0 ^{ab}	2.2 ^a	7.6 ^{bc}	12.7 ^c	6.6 ^b	400.4 ^c
Keish	17.5	32.0 ^a	1.5 ^b	5.0 ^c	7.5 ^d	4.3 ^c	193.6 ^c
Spikey	15.3 ^b	27.7 ^{ab}	2.8 ^a	9.9 ^b	32.4 ^a	6.3 ^b	176.4 ^c
Ethel	15.3 ^b	27.5 ^{ab}	2.2 ^a	9.1 ^b	21.6 ^b	7.5 ^{ab}	164.6 ^c
Groovy	17 ^a	30.0 ^a	1.6 ^b	12.8 ^a	13.4 ^c	6.8 ^b	185.5 ^c
Nile	16.1 ^b	28.7 ^a	1.3 ^b	15.7 ^a	8.5 ^d	7.9 ^{ab}	149.6 ^c
Long John	16.5 ^b	28.5 ^a	1.3 ^b	14.7 ^a	8.9 ^d	10.2 ^a	181.9 ^c
Kayla	16.0 ^b	27.2 ^a	2.4 ^a	10.1 ^{ab}	39.1 ^a	10.1 ^a	93.3 ^d

*Means within a column followed by different letters are significantly different as separated by Duncan's Multiple Range Test ($p \leq 0.05$).

Firmness

There was a significant difference between the various varieties for firmness. The firmest variety was Keish (400.4 gm/force) followed by Kalima and Decathlon (all locally available varieties).

Chinese varieties were not as firm as the locally available cucumber varieties. Sensory evaluation on these varieties however revealed that consumers preferred the firmness of Cherokee, Decathlon, Kalima, Keish and Ethel after 8 days of storage and all other varieties were considered firmer before the sensory evaluation.

Consumer Preference and Sensory Evaluation

Generally, consumers preferred Cherokee, Spikey (a pickling type variety) and Kayla (a long smooth variety) more than other varieties (Figure 1). The sensory evaluation for taste of fresh and post-storage cucumber is summarised in Figure 2. There were significant differences among the 11 varieties. All varieties had ratings of 2.0 to 6.8, signifying good to excellent taste, however, the taste scores were higher after 8 days for all varieties but Spikey. Respondents complained of bitterness in the taste of the fresh fruit. This can be attributed to the fact that cucumbers contain an organic compound, cucurbitacin which causes the bitterness. Although cucurbitacin is found mainly in vegetative parts of the plant such as the stem end and blossom end, it is more prevalent in the peel and light green area just beneath the peel. Cucumbers picked from vines growing under some type of stress, such as lack of water, are sometimes more bitter. Figure 3 shows the preference for texture for fresh and post for fruit samples.

Powdery Mildew

The locally available varieties were found to be more susceptible to powdery mildew (Table 3). Varieties with the most tolerance were the Chinese varieties such as Long John, Spikey, Ethel and Kayla.

Table 3. Powdery mildew susceptibility ratings for cucumber varieties

Variety	Rating score*
Cherokee	33
Decathlon	26
Marketmore 76	18
Kalima	43
Keish	67
Spikey	3
Ethel	7
Groovy	9
Nile	12
Long John	3
Kayla	2

*Rating scores of powdery mildew was determined by estimating the % of leaf area covered on upper leaves of cucumber. The 0–10 scale was designed to account for % leaf area covered by lesions.

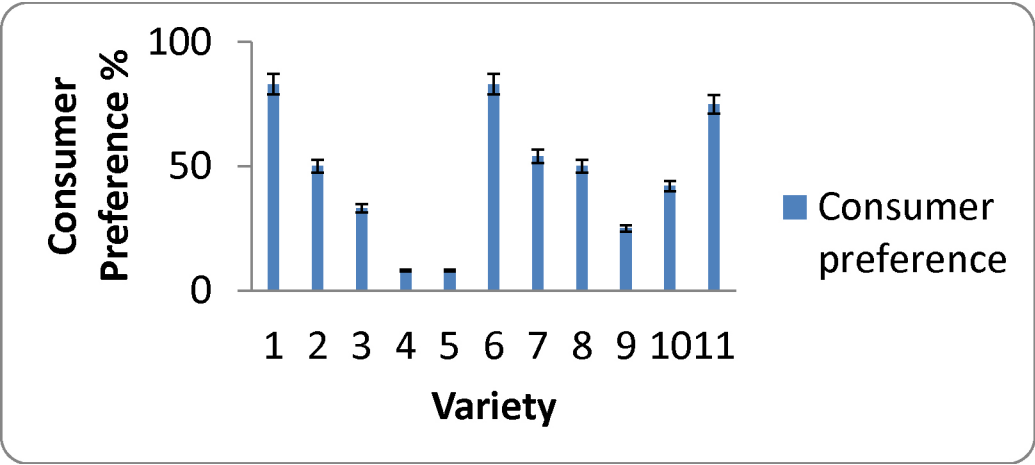


Figure 1. Overall consumer preference for market acceptability

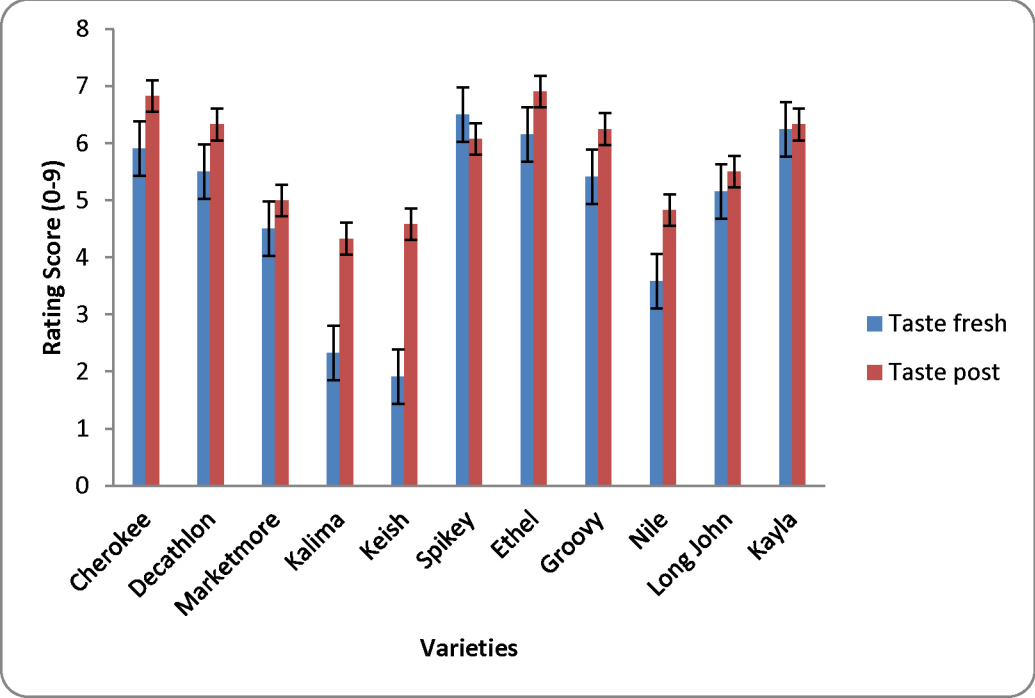


Figure 2. Taste scores for fresh and stored cucumbers

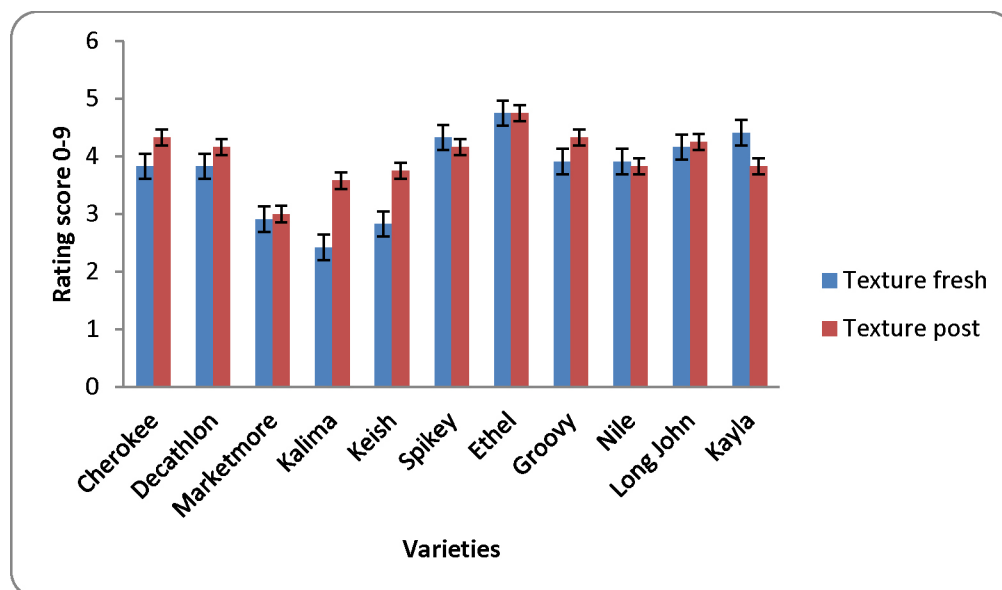


Figure 3. Texture scores for fresh and stored cucumbers

CONCLUSION

Chinese varieties Kayla and Spikey produced the highest number of fruits per plant ($p \leq 0.05$). Kayla and Nile however, produced significantly higher yields than other varieties ($p \leq 0.05$). Chinese varieties were not as firm as the locally available cucumber varieties. However, Chinese varieties were more preferred by consumers in terms of appearance, taste and texture and overall acceptability, namely Spikey and Kayla ($p \leq 0.05$). The Chinese varieties performed the best in this trial. The data presented can be used to evaluate several characteristics of greenhouse varieties. The data should especially be valuable when evaluating yield, fruit length, colour and powdery mildew tolerance in cucumber varieties.

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