INTERNATIONAL SOCIETY FOR HORTICULURE SCIENCE

Section Tropical and Subtropical Fruits

Newsletter No 10 January 2014

Dear Colleagues,

Wish you all a Happy, Health and Prosperous New Year 2014.

I have received very good comments and contributions from the members of the section for the Newsletter for which I am thankful to all of you. Many of us are now eagerly looking forward to meet at Brisbane, Australia for IHC2014. (please visit www.ihc2014.org for details) in August 2014. The Section has many activities in this congress. We will organize the IV International Symposium on Papaya, VIII International Pineapple Symposium, International Symposium on Tropical Fruit and International Symposium on Mango during IHC2014. I am also organizing an evening workshop on "Quality Planting Materials" during the congress. All the congress participants are requested to attend the workshop. Please consider to register yourself by 17 February 2014 to get the benefit of early bird registration at a reduced rate.

I believe you will enjoy reading the e-Newsletter. Your comments and suggestions for improving its utility will be highly appreciated.

With regards,

Professor Sisir Mitra
Chair
Section Tropical and Subtropical Fruits
International Society for Horticultural Science

Strategies for promoting tropical and subtropical fruits

There are two geographic markets for tropical and subtropical fruits, the export one targeting the temperate countries, also the most industrialized ones; and the home consumption market, in the (sub)-tropics and often the least developed countries. For many years, most attention has been placed to the export markets in most national policies and international trade regulations, since these markets generated high finance flows and profits. At present however, lessons from the global trade (strong and changing standards, costly certifications, financial and transport crises between 2008 and 2011) and from trends of world population growth need to be learned. The urban consumers need fresh, safe and affordable fruits, and it would be silly to neglect this growing market in the tropics, whereas “temperate market” is rather erratic and ever more competitive.

Considering health and economic values of tropical and subtropical fruits, it is high time to promote their consumption by the nationals and the regional populations. Isn’t it amazing that Africa can produce any kind of fruits all along the year, due to its diversity of latitudes and climates! Strategies for home consumption of tropical and subtropical fruits could go in two directions: health and income. In both strategies however, good production practices are highly requested. Impossible to encourage parents let their kids eat more fruits if these fruits are contaminated by pesticides, heavy metals or pathogenic micro-organisms. And farmers will not envisage more intensive production if their final income is lower than before. In tropical and subtropical fruits as in many other crops, using the agro-ecological approach seems to offer the most reliable opportunities (meets consumers’ demand) and the highest sustainability, thus answering both strategies.

It is already accepted that these two strategies are based on a well-distributed role between public and private actors of the food chain, although such a distribution remains an issue. It supposes an integrated collaboration between several public sectors like agriculture, health, trade and environment at least, in order to work in synergy and consolidate the budget of cross cutting programs like school feeding, securing urban land tenures or integrated pest management at a landscape scale. It also recognizes the role of the agro-industry in crop improvement and technology dissemination as well as in its capacity to invest in innovations. The role of the public sector shall remain to enable the environment for more and better production, and for more and improved consumption. Policy makers can use regulations and incentives to create this enabling environment, but cannot play the investing role of the private sector.

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Promoting fruits shall use the synergy between **consumers** demand for food sovereignty, local production and short chain food system, **policy makers** for more and sustainable employment, for health improvement through food safety and good nutrition (cheaper than drug imports and more reliable), and **agro-business** (including farmers) for easier market access, avenues for small processing, packing and storing activities, diversifying and securing incomes among households. One additional chance for tropical and subtropical fruits is the timely agenda on climate change and agro-ecology: fruit agro-forestry is right at the adaptation-mitigation place of most agricultural solutions whereas it cannot be blamed for pollution with greenhouse gas emission. This concept is named "Climate Smart Agriculture" and is recently organized in an international alliance ([1]) to be present at the world negotiations on the Climate. Fruit agro-forestry is mainly a family farming activity and shall benefit the 2014 United Nations International Year of Family Farming ([1]). Using these opportunities should give a prominent place to knowledge on fruits: indigenous knowledge from small scale farmers and local communities to identify, characterize and make value of the local resources, genetic materials or traditional practices; and also to the knowledge gained by research, experimenting technical or organizational innovations in a new agro-ecological approach. In a parallel integrating and scaling-up trend, scientists shall now consider fruits in people's diet and fruit trees in farmers' landscape. Health and income, I told you!

Remi Kahane
CIRAD, France

[1] http://www.fao.org/docrep/018/i3325e/i3325e.pdf

Genetic markers suggest medfly is highly mobile in South Africa

The Mediterranean fruit fly is a highly invasive species throughout the world and considered as one of the most devastating global pests. In South Africa, crop production loss and control of the Mediterranean fruit fly annually exceeds R18 million. In the Western Cape various control strategies have been implemented to control this pest's populations including insecticides which are not only harmful to the environment, but also makes trade with certain countries more difficult. Environmentally-friendly techniques are therefore preferred, such as the Sterile Insect Technique (SIT). The Sterile Insect Technique releases laboratory-reared flies into the wild where they mate with wild individuals and produce no or infertile offspring, thereby reducing the population density of the pest. However, the success of this technique can be strongly influenced by the movement of flies in the agricultural landscape. Surprisingly, though, the movement of fruit flies among agricultural regions within South Africa is poorly understood.

Research done by Minette Karsten during her Masters Degree at Stellenbosch University aimed to examine this question using molecular genetic approaches. This research funded by HortgroScience and the South African National Research Foundation, recently published in the international journal PLoS One, produced significant insights

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into this issue. By sampling flies from different geographic locations across South Africa and documenting the genetic variation within and among populations, and identifying the amount of gene flow between populations of *Ceratitis capitata* (Mediterranean fruit fly), Miss Karsten has shown that these flies are far more genetically homogeneous than expected even at large spatial scales. Miss Karsten stated "*it was pretty surprising to see the results. These fly populations are much more homogenous than we expected, especially given that populations which have been separated in space and time would typically be expected to differ from each other*".

The results of this study show that *Ceratitis capitata* populations in South Africa are characterized by high levels of genetic diversity and little or weak population differentiation. In other words, populations are not distinct from each other using the genetic markers that were examined. Furthermore, the results of this work also show that sufficient numbers of individuals move between different pest-occupied sites to maintain the lack of population structure. Prof. Terblanche said that "*these results have critical implications for understanding pest movement in agricultural landscapes, and should fundamentally change the way pest management of this species is undertaken in South Africa since it suggests that flies are moving far more than previous work indicated based on direct observation of flight distances. If management and control efforts are to succeed, we will need to limit these highly mobile individuals. One possible way to do this is by, for example, screening fruit moved around within the country and limiting fly-infested fruit movement*".

The high levels of gene flow observed suggest that the movement patterns of these fruit flies in South Africa are most likely aided by human-mediated dispersal, possibly linked to the movement of fresh produce within South Africa. This study provides valuable insights into area-wide pest management strategies and the data from this work are crucial for developing effective long-term pest control strategies and ensuring international market access of South African fruit.

Miss Karsten was supervised during this work by Prof. John S. Terblanche (Department of Conservation Ecology and Entomology) and Prof. Bettine Jansen van Vuuren (now at University of Johannesburg), and is presently undertaking a PhD under the supervision of Dr. Pia Addison, Profs. Terblanche and van Vuuren to further examine agricultural pest genetics and rapid molecular identification. Profs. Terblanche and van Vuuren are both core team members of the Centre of Invasion Biology.

Population genetics of *Ceratitis capitata* in South Africa: implications for dispersal and pest management. Karsten M., Jansen van Vuuren B., Barnaud A. and Terblanche J.S. PLoS ONE 8(1): e54281. doi:10.1371/journal.pone.0054281

For more information see the Applied Physiology and Ecology lab webpage as well as Miss Karsten's personal webpage.

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Current status, existing challenges and future outlook of litchi industry in China

There are more than 400 accessions of wild and cultivated litchi being collected and planted in National Litchi Germplasm Repository located in Guangzhou, which include diversified fruit traits, such as parthenocarpy, big fruit size, seedless, extremely early-maturing or late-maturing, and so on. Currently, more than ten varieties have been planted for commercially trading in China. According to the maturity, the main cultivars are divided into early maturing (Sanyuehong, Feizixiao, Dazao, etc.), medium (Heiye, Baila, Baitangying, Lanzhu and Shuangjianyuhebao, etc.) and late maturing varieties (Guiwei, Nuomici, Zengchengualu, Shuijingqiu and Huaizhi, etc.). The period of market supply for fresh litchi fruit lasts usually from April to August due to diverse litchi varieties of different maturity grown in different production regions with different latitude, altitude and climate.

In recent years the areas of varieties with good quality have been greatly increased using high grafting cultivation technology, which is that new varieties with good agricultural characters were grafted on the adult trees to replace the original varieties of general characters. Of them, the fastest increase rate was cv ‘Feizixiao’. Until 2012, the planting area of cv ‘Feizixiao’ had been more than 6000 hectares in China, and more than 70 percent were distributed in Hainan and Guangdong province. The planting areas of varieties with bad or general quality (such as Heiye and Huaizhi) were significantly reduced by high-position grafting using good quality varieties. Recently, a number of new selected and bred varieties such as 'Fengshanhongdenglong', 'Lingfengnuo' and 'Jingganghongnuo' with good quality as ‘Nuomici’, and high production as ‘Huaizhi’ can effectively solve the traditional problem such as varieties with good quality but no high yield or varieties with high yield but no good quality. Therefore, they also have a highly extending value in the future.

In the past ten years, although litchi cultivation areas in China have been relatively stable, and to 2011 which remained at 0.6226 million hectares, the yield and economic benefit are steadily increasing. According to incomplete statistics data, in 2011 the total production was 1.9108 millon tons, and the output value reached 9.96 billion yuan. In 2012, the yield decreased by about 40% due to abnormal climate factors. However, in 2013, the yield rebound, and the date of phenological transit and harvesting time were 15-20 days earlier than normal years due to the temperature in early spring rising too fast.

Cultivar ‘Guiwei’

Cultivar ‘Feizixiao’

Cultivar ‘Baitangying’

Cultivar ‘Nuomici’

Two important cultivation technologies play a decisive role in the litchi industry in China. At first, instable floral bud formation is always a big problem that litchi industries have been faced with. Flower bud formation for most of Cultivars requires strict low temperature conditions (The highest temperature is below 20℃ for one month). However, at the same time litchi is also sensitive to the low temperature and when the temperature is close to 0℃, chilling injury occurs. The lower fruit set rate and even only bloom but no fruit is the second technical problem in the production. For example, cv 'Feizixiao' is basically no harvest if we don't conduct flower thinning and detruncate inflorescence length. Therefore, we have developed some cultivation technology using physical or chemical regulatory method to enhance flower bud formation and fruit set rate. In addition, on the whole, the litchi industry mechanization level is not high and mainly relies on manpower. But with the rapid economic development labor cost is increased which will result in investment increase and decreased industry profits. It is the mainly non-technology problem for litchi industry.

To solve above technological problems in litchi cultivation, researchers in this field mainly focus on the physiological mechanism of flower differentiation and fruit formation. Although the molecular mechanism for litchi fruit abscission had been characterized by transcriptome analysis of high-throughput RNA sequencing (RNA-seq) and digital transcript abundance (DTA) profiling, but much more physiological mechanism related to the control of flower and fruit formation needs to be elucidated. After almost three years efforts of litchi-genome-team in China, the litchi whole genome has been sequenced, assembled and annotated, and relevant information will be published in the future.

This study by revealing the genetic diversity and relationships among litchi varieties make it possible for the intricate mechanism be elucidated, which will complement classical morphological and physiological analyses, and finally help to overcome the unstable yielding. The comparative genomics of litchi varieties by providing a dataset of genetic variation and functional genes will surely facilitate the in-depth molecular analyses and functional gene findings. Right now, based on de novo transcriptome analysis, genome sequencing and resequening, we detected and developed plenty of molecular markers including single-nucleotide polymorphisms (SNPs) and SSRs. These markers are successfully used in litchi genetic research and breeding, such as genetic linkage map construction, core collection development, genetic diversity analysis and hybrid identification etc. which will benefit its genetic improvement.

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New cultivar 'Hongxiuqiu'

New cultivar 'Jingganhongnuo'

New cultivar 'Yujinqiu'

New cultivar 'Hongdenglong'

Managing postharvest anthracnose in fruits

What is Anthracnose?

Anthracnose is a disease caused by the fungus *Collectotrichum* species. It is recorded widely as both pre-harvest and postharvest cause of crop loss. In postharvest, it occurs on a wide range of fruits. For example mango, strawberry, avocado, banana, star fruit, dragon fruit, papaya, tomatoes etc. Postharvest problems caused by *Collectotrichum* species are particularly prevalent in the tropics and sub-tropics. It can affect the export quality and economic value of the produce and in severe case complete loss of fruit. Postharvest anthracnose exhibit the phenomenon of quiescence in which the symptoms do not develop until the produce ripens. Several strains of *Collectotrichum* sp have been identified and associated to postharvest anthracnose of fruit and vegetables during the value chain. However, *Collectotrichum musae* and *Collectotrichum gloesporiodes* are by far the most economic important pathogens as they greatly affect high value but perishable fruit (banana, mango, avocado, papaya, and dragon fruit). This has resulted in the fight to salvage the situation and reduce their infection to the barest minimum.

Common symptoms of anthracnose occurs as peel blemish, black or brown sunken spots of various sizes in banana; black, slightly sunken lesions of irregular shape as well as fruit staining and fruit rot in mango; reddish hard lesions with chlorotic haloes in dragon fruit; light to dark brown sunken lesions on strawberry fruit. Symptoms may occur as a result of poor pre-harvest and postharvest techniques along the value chain. Postharvest problems may result due to unfavorable storage conditions (very high or low temperature, relative humidity), improper pretreatment of fruit on-farm before cold storage and during road or sea transport for export or local consumption.

Managing anthracnose

Synthetic fungicides are used to control postharvest anthracnose. Fungicides such as thiabendazole, prochloraz, imazili, ancozeb, benomyl, calcium chloride to mention but a few are used. However consumer concern about the chemical residues on food and its toxicological effect to human health, build-up of fungal resistance to these chemicals and the environmental impact such as poisoning the soil system, has necessitated the need to find alternative non-chemical approach to control the disease. At CEPB, in The University of Nottingham Malaysia Campus (UNMC), researchers headed by Dr. Asgar Ali Warsi are using state of the art equipment to develop a novel postharvest technology to preserve stored and fresh-cut fruit especially of tropical and subtropical origin. These approaches are non-chemical and they significantly prolong the shelf life, helps in the production of inducible compounds by enhancing the phenolic contentof fruits, reduce disease incidence severity, slow down the activity of cell wall degrading enzymes an finally maintain the biochemical and physiological responses of fruits. Among these novel approaches are;

The use of submicron chitosan dispersions at 1.0% with 600 nm droplet size and using 0.5% ethanolic extract of propolis has shown and been reported by the centre to significantly controlpostharvest anthracnose and maintain the quality of dragon fruit during 28 days storage at 10 ± 2^{0}C and 20 ± 2^{0}C respectively at 80±5% RH. In addition only chitosan at 1.5% and 2.0% has also shown a significant control of postharvest decay in papaya and enhanced total phenolic compounds. Other methods include using cinnamon oil at 0.3% to extend the shelf life and maintain the physico-chemical properties of banana stored at 13±1°C, 80-90 RH for 28 days. The useof edible composite coating (incorporating 10% Arabic gum with 1.0% chitosan as a biofungicide has also showed to significantly control anthracnose in banana and maintained it postharvest qualities. In addition to edible coatings, the centre has experimented with the use of ozone fumigation in postharvest control of anthracnose in papaya which has shown significant enhancement in phenolic compounds and other physico-chemical properties of the fruits.

Our centre focuses and proposes the use of edible composite coatings and/or the use of natural plant extracts as a means of postharvest control of diseases because they are eco-friendly, biodegradable and non-toxic to human, regarded as safe and also very cheap.

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Centre of Excellence for Postharvest Biotechnology (CEPB)
The University of Nottingham Malaysia Campus (UNMC)

Forthcoming events

Symposia Scheduled

Working Group	Name of Symposium	Symposium Date	Location
Papaya	IV International Symposium on Papaya	August 2014	Brisbane Australia
Pineapple	VIII International Pineapple Symposium	August 2014	Brisbane Australia
	International Symposium on Tropical Fruit	August 2014	Brisbane Australia
Mango	International Symposium on Mango	August 2014	Brisbane Australia
	International Symposium on organic Waste to Horticultural Resource	August 2014	Brisbane Australia
Tropical Viticulture	IV International Symposium on Tropical Wines	August 2014	Brisbane Australia
Guava and other Myrtaceae	IV International Symposium on Guava and Other Myrtaceae	16-19 August 2015	Nelspruit, South Africa
Mango	XI International Mango Symposium	28 September – 2 October 2015	Darwin, Australia
	VI International Symposium on Tropical and Subtropical Fruits	26-28 September 2016	Kafr El-Sheikh, Egypt