Emerging infectious diseases in food crops

The aphid-borne poleroviruses (genus *Polerovirus*, family Luteoviridae) and thrips-borne tospoviruses (genus *Tospovirus*, family Bunyaviridae) have been keeping plant pathologists busy because they are now considered as emerging threats to the production of important vegetable and fruit crops in tropical and sub-tropical Asia. A recently concluded FFTC and Tokyo University of Agriculture co-sponsored international seminar in Japan tackled these new emerging infectious diseases in food crops. (page 2)
New infectious diseases affecting vegetables in Asia

IT’S NOT ONLY HUMANS who have recently been plagued by new strains of infectious diseases. The plant world has also been recently swarmed by a host of pathogens that are affecting vegetable production in Asia. For quite some time, scientists have been baffled by the aphid-borne poleroviruses (genus *Polerovirus*, family Luteoviridae) and thrips-borne tospoviruses (genus *Tospovirus*, family *Bunyaviridae*) because they are now considered as emerging threats to the production of economically important vegetable and fruit crops in tropical and sub-tropical Asia.

**Viruses and yield losses**

In the recently concluded international seminar on “Emerging Infectious Diseases of Food Crops in Asia” sponsored by FFTC and the Tokyo University of Agriculture, Filipino plant pathologist Cherry Relevante of East West Seed Company, delivered a presentation based on a paper she co-authored with other scientists. Entitled “Emerging New Poleroviruses and Tospoviruses Affecting Vegetables in Asia and Breeding for Resistance,” Relevante told the seminar participants that to date, at least 13 different polerovirus species have been characterized. In Asia alone, the reported poleroviruses include Cucurbit aphid borne yellow virus (CABYV), Melon aphid-borne yellow virus (MABYV) and Suaka aphid-borne yellow virus (SABYV). CABYV has been found associated with the “Namamarako” or NMK disease in bittergourd in the Philippines and “Mara Ba” disorder in Thailand. Typical symptoms of “Namamarako” and “Mara Ba” in bittergourd caused by CABYV under natural field conditions include chlorotic patches on older leaves and interveinal yellowing, green vein banding, wrinkling and thickening of the younger leaves.

There is also a newly proposed recombinant strain of CABYV (CABYV-R) which has been identified in Taiwan. MABYV and SABYV have likewise been reported in China and Taiwan.

On the other hand, according to Relevante, tospoviruses, or the viruses that infect plants leading to tissue necrosis, are even more diverse in Asia, infecting a broad range of crops. In fact, of the 25 tospovirus species characterized globally, 17 species have been reported in Asia, causing significant yield losses in the region. Of the 17 species, the Tomato necrotic ringspot virus (TNRV) has been recently described as a new tospovirus species affecting tomato and pepper in the northern and central regions of Thailand. Its symptoms include yellowing and necrotic rings on leaves and fruits. No tospovirus has been reported yet in the Philippines although they have been detected in many vegetable crops such as watermelon, melon, tomato and pepper based on field surveys conducted since 2003 by East-West Seed, Co.

In the said paper, Relevante and her co-authors explained that full understanding of the biology, host range and genetic diversity including interactions between species or strains of...
poleroviruses and tospoviruses is critical in the development of effective and long-lasting management strategies for these viruses. There is also the need for regular surveys to monitor and document tospovirus and polerovirus incidence and availability of reliable and sensitive procedures for virus detection.

Breeding for virus resistance

In order to manage emerging problems of poleroviruses on cucurbit crops, scientists have relied on developing resistant cultivars. According to Relevante, several potential sources of CABYV resistance have been found in melon germplasm, mostly originating from India and Africa. In the Philippines, East-West Seed Company has started a screening of bittergourd germplasm for CABYV resistance in 2002. The screening of different bittergourd collections resulted in the identification of accession FW 1696 as a reliable source of resistance to CABYV. This line forms the basis of the company’s polerovirus resistant variety breeding program. Six years later, in 2008, the first hybrid bittergourd variety with an intermediate level of resistance to CABYV was introduced by East West Seed, Inc. Currently, breeding for resistance is underway to develop resistant hybrids for Thailand, Vietnam, India and Indonesia.

As far as tospoviruses are concerned, identification of resistant genes conferring resistance to tospovirus infection in vegetable crops in Asia stimulated more intensive studies aimed at finding sources of genetic resistance. In fact, many efforts have been directed towards the evaluation of germplasm and breeding lines which resulted in the identification of sources of resistance to Groundnut (peanut) bud necrosis virus (GBNV) in groundnut, mungbean, soybean, tomato and potato. Scientists still contend that the development of efficient and reliable methods for screening germplasm for tospovirus resistance is essential in the production of improved fruit and vegetable varieties with high level of resistance. There is also a need to further investigate correlation of resistance expression between mechanical thrips transmission and between natural field resistance in hotspots and resistance expression using controlled inoculation.

Relevante and her co-authors further added that even no chemicals exist to this day which can effectively control poleroviruses and tospoviruses; the only practical means of control is to minimize their spread. This is sometimes achieved by controlling the insect vector population in the field. Unfortunately, the occurrence of vector populations with insecticide resistance poses another challenge to the farmers who often rely on chemical pesticides for control.

This is why Relevante concluded that good breeding strategies must be developed. This requires comprehensive understanding of the virus-vector/virus host interactions as well as diversity among these viruses. Breeding for plants with virus resistance or with low vector preference, in combination with good cultural management practices, is still the most sustainable solution to date.

The whole scientific paper of Cherry Relevante and her co-authors will soon be published as an Extension Bulletin by FFTC.
IITA Director General visits FFTC

DR. NTERANYA SANGINGA, Director General (DG) of the International Institute of Tropical Agriculture (IITA) based in Nigeria, recently visited the office of the Food and Fertilizer Technology Center (FFTC) for the Asian and Pacific region in Taipei, as part of his educational trip to Taiwan where he got exposed to the country’s development of agricultural technologies. Accompanied by Dr. Dyno Keatinge, DG of the AVRDC—The World Vegetable Center in Taiwan, Dr. Sanginga met FFTC Director Dr. Yu-Tsai Huang and Deputy Director Dr. Hideo Imai. The IITA DG was given a briefing regarding the mission and functions of FFTC and its current activities.

The four scientists had a pleasant exchange of ideas regarding the updates in international agricultural research, particularly the soil fertility problems and plant diseases in Africa and Asia. They also discussed possible areas of collaboration in the future like information exchange and participation in FFTC seminar workshops.

In Taiwan, Dr. Sanginga visited and met the top officials of AVRDC—the World Vegetable Center, who acted as the principal host of his trip. He also met officials of the Ministry of Foreign Affairs, the Council of Agriculture, the Taiwan Banana Research Institute and the Pingtung Agricultural Biotechnology Park.

IITA, a member of the Consultative Group of International Agricultural Research Centers (CGIAR), is a non-profit organization founded in 1967 and works on the development of the following crops: cowpea, soybean, banana, plantain, yam, cassava and maize. It is one of the world’s leading research centers in finding solutions for hunger, malnutrition and poverty.

Dr. Nteranya Sanginga, an agronomist and soil microbiologist, assumed the leadership of IITA on November 2011. Before joining IITA, he was the Director of the Nairobi-based Centro Internacional de Agricultura-Tropical Soil Biology Fertility (CIAT-TSBF). He has more than 21 years of experience with the University of Zimbabwe, International Atomic Energy (IAEA) in Austria, and CIAT-TSBF, in agricultural research and development, particularly in the fields of microbial ecology, plant nutrition, and integrated natural resources management in Africa, Latin America, and Southeast Asia.
**FFTC welcomes two professional staff**

**DR. WAN-TIEN TSAI AND DR. CHAN IK CHUN**

are two of the professional staff who recently joined the FFTC family.

Dr. Wan-Tien Tsai, an entomologist, who finished her PhD at the Purdue University, West Lafayette, Indiana, USA and did her post-doctoral studies at the National Taiwan University, is the Center's new agricultural specialist. Her primary duty is to assist the Deputy Director in the formulation and implementation of the center's yearly programs. Dr. Tsai is also the resident coordinator who will liaise with the consultants in the implementation of FFTC's various projects and is the point person who will work with the Center's major funding agencies and regional partners.

On the other hand, Dr. Chan Ik Chun, is the returning agricultural economist, who recently replaced Mr. Ho-Kyum Lee, who resigned from the center last March. Dr. Chun worked in FFTC from 2001 to 2004, after which he returned to Korea and worked for eight years as chief research officer of the Agricultural Policy Research Division of Nonghuyp Economic Research Institute. In 2012, he was promoted as director of the same Institute. Dr. Chun got his PhD in 1992 in economics from Dongguk University in Seoul, Korea. As the new FFTC agricultural economist, Dr. Chun has been assigned to be the organizer of the workshop seminar entitled "Threats and Opportunities in Agricultural Trade Under the Free Trade Agreements in the Asian Region" to be held in Seoul on September 28-October 3, 2013. He will also be on top of the Center's latest project entitled "Asia-Pacific Information Platform on Agricultural Policy."

**Center bids goodbye to Mr. Ho-Kyum Lee**

FFTC recently hosted a farewell party for Mr. Ho-Kyum Lee, who resigned as agricultural economist last March and returned to his home country in Korea. In one of FFTC's staff meetings, Dr. Yu-Tsai Huang, the Center's Director, presented to Mr. Lee a plaque of appreciation for his outstanding work and valuable contributions to FFTC.

Mr. Lee, a highly experienced Korean agricultural economist, joined the Center in February, 2008. Prior to this, Mr. Lee was Executive Vice President and Chief Marketing Officer of the National Agricultural Cooperative Federation (NACF)-CA Asset Management Co., a joint venture of NACF Korea and Credit Agricole, France. He has extensive experiences in agricultural research, rural finance, and international cooperation for around 30 years.

For four years, Mr. Lee organized the yearly FFTC workshops held in Korea and was instrumental in the publication of the annual periodical entitled “Major Agricultural Statistics in the Asian and Pacific Region.”

FFTC Director Dr. Yu-Tsai Huang presents a plaque of appreciation to outgoing Korean agricultural economist Mr. Ho-Kyum Lee. Mr. Lee returns to Korea after five years of working in the Center.
Pineapple cakes boost Taiwan’s rural industries

THE POPULARITY OF TAIWAN’S PINEAPPLE CAKES has not only boosted agricultural tourism, it has also revived rural industries in the island. What used to be a mere traditional symbolic cake in Taiwanese wedding engagements and a festival pastry has now become a multi-billion dollar industry. In 2011 alone, the Taipei Bakery Association reported that sales of pineapple cakes in the country has reached NT25 billion (US$845 million), making it truly a product of economic significance in Taiwan.

A recent internet source on Taiwan’s food culture reported that during the early times, pineapples were one of the country’s most important cash crops. During the Japanese era, different new varieties from overseas were introduced, laying the groundwork for the pineapple-processing industry. In 1971, some 4.01 million boxes of canned pineapples were exported. This outstanding contribution earned for the country millions of dollars and fostered prosperity in Taiwan’s farming villages. Later, due to rising costs of production as well as low-cost competition from Southeast Asia, pineapple exports were hit hard. In the 1980s there was a shift from focusing on processing for exports to domestic sales of fresh fruit. In recent years, with the support of the Taiwan government, value-added pineapple products became the in thing which eventually led to the birth of a vibrant pineapple cake industry, surpassing the traditional moon cakes in terms of popularity and sales.

Today, a trip to Taiwan is incomplete without one sampling or buying the famous pineapple cakes. According to Taiwan’s Bureau of Statistics, shopping comprise around 50.6% of consumption by foreign tourists in the country. Among the local products, the top item that foreigners like to buy is pineapple cakes. One particular pineapple cake company called Sunny Hills, in Nantou County was able to cash in on its strategic location and innovative marketing tactics to become not only a part of the successful pineapple industry, but also a major factor in the revitalization of its rural area.

In the recently concluded international workshop entitled “Enhancement of Rural Community Revitalization in the Asian and Pacific Region” sponsored by FFTC, Ms. Hsiao-Lan Liu, Assistant Professor of the Graduate Institute of Hakka Political Economy at the National Central University in Taoyuan, Taiwan delivered her presentation entitled “Pineapple Can to Pineapple Cake—A Successful Case of Rural Industry in Taiwan” during the recently held international workshop on “Enhancement of Rural Community Revitalization in the Asian Pacific Region.”
different types of pineapple cakes are exhibited and sampled at the annual pineapple cake festival in Taipei, Taiwan.

Strategic location

Delivering a presentation based on her paper entitled “Pineapple Can to Pineapple Cake—A Successful Case of Rural Industry in Taiwan,” Ms. Liu reported that aside from the delicious taste and elegant packaging of pineapple cakes belonging to a company called Sunny Hills, its shop happened to be located in the Guanyin mountain scenic area, (northern part of the country) which is a good location to attract local and foreign tourists who flock the area especially during holidays. During the late 1990s, the owners and partners of Sunny Hills, which started as a family enterprise, were composed of tea farmers, cake masters, former employees of computer companies, etc. Together with the development of infrastructure in the mountains like the construction of biking trails, leisure and sports facilities, the owners decided to first conduct a free taste test of their pineapple cakes to the employees of Hsinchu scientific park, which is located near their shop.

Later, as people began to talk about those yummy Sunny Hills pineapple cakes, the owners decided to serve the product during snacks or tea time, and sell the elegantly packed pineapple pastries as souvenirs. It clicked instantly that soon, more workers were needed to meet the growing demand for more pineapple cakes. But the success didn't end there.

The power of cyberspace

As word spread regarding the good quality of Sunny Hills pineapple cakes, more orders from faraway places came. Soon, the owners decided to promote and sell their product in cyberspace, and in no time, with the construction of the Sunny Hills website (www.sunnyhills.com.tw), people from Taipei, Taichung, Kaoshiung and other remote areas bought pineapple cakes online.

According to Ms. Liu, the eventual online success of Sunny Hills pineapple cakes caught the attention of two businessmen who are in the manufacturing business. So impressed were they that a meeting was set up between them and the owners. In that meeting, the businessmen verbalized their intention to invest and become partners in the business. This new capital investment paved the way for the owners of Sunny Hills Company to dream bigger.

Today, as Sunny Hills Company enjoys brisk sales of their pineapple cakes in the domestic market, the owners and partners are far from being complacent. In fact, talks are now underway in doing trial shipments of their delicious product to Singapore, Hong Kong, Shanghai and Japan.

With more fresh pineapples used in the making of pineapple cakes, Ms. Liu reported that a challenge faced by the owners of Sunny Hills is the disposal of the pineapple peel. In her paper, she wrote about the possibility of using the pineapple peel as a potent source of biomass energy in the future.

What is instructive about the whole Sunny Hills success story, according to Ms. Liu, is the quickness in which the owners saw the opportunity to make an ordinary product soar into world-class standards. This they did by means of 1) developing their product parallel to the development of tourism in the area; 2) involving and employing the people of the community; 3) maximizing the role of cyberspace and social media to promote and sell the product; and 4) exploration of the international market to promote pineapple cakes.

In recent years, with the support of the Taiwan government, value-added pineapple products became the in thing which eventually led to the birth of a vibrant pineapple cake industry in the country, surpassing the traditional moon cakes in terms of sales and popularity.

While consumption of fresh pineapples in the local market is steadily on the upbeat, industry experts say more and more people also appreciate its value-added advantages like its being made into juice, jams, marmalade and the very popular cakes which has now become a billion dollar industry.
New publications

EXTENSION BULLETINS (EBs)

EB 638  Current Situation and Strategies for Developing Alternative Local Food System in Taiwan
- Jong-Wen Wann
EB 639  A Strategy to Strengthen the Local Food Systems in Korea: Urban Agriculture
- Hogun Chong, Tae-Gon Kim

TECHNICAL BULLETINS (TBs)

TB 186  Management Practices to Increase Efficiency or Fertilizer and Animal Nitrogen and Minimize Nitrogen Loss to the Atmosphere and Groundwater
- J.R. Freney
TB 187  Mitigation of Impact of Nitrogen Cycling Associated with Agriculture and Food Consumption on Regional Environments
- Ryusuke Hatano
TB 188  Nitrogen Fertilizer Applications as a Source of Atmospheric Ammonia
- Kentaro Hayashi

MAJOR AGRICULTURAL STATISTICS IN THE ASIAN PACIFIC REGION

The 11th periodical on “Major Agricultural Statistics in the Asian and Pacific Region,” which gives an overview of Asian agriculture through figures, is now off the press. By showing major agricultural statistics as well as economic indicators related to agriculture from selected Asian and Pacific countries, the periodical provides a lot of information, trends and indices on how agriculture and agribusiness fared over the last couple of years.

This periodical includes indicators from 21 countries—Australia, Bangladesh, Brunei, Cambodia, China, India, Indonesia, Japan, Korea/North (Dem. People's Rep), Korea/South (Rep. of), Laos, Malaysia, Mongolia, Myanmar, New Zealand, Pakistan, Philippines, Taiwan ROC, Thailand, United States and Vietnam. Some parts have been revised in order to provide more useful figures to all users.

It is hoped that through this periodical, many researchers, agriculture and agribusiness experts, people from the academia etc. will be able to find the information useful and relevant in their line of work. An electronic version of this book is available on the Center's website/publication database (www.fftc.agnet.org)

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