

Saving the citrus and banana industries of Asia from disease devastation

Health management in the production and cultivation of pathogen-free citrus and banana seedlings

CITRUS AND BANANA are extremely important crops in Asia, especially for millions of the region's rural poor. However, the spread of systemic greening and virus diseases is now seriously threatening the citrus and banana industries in the region, considerably damaging fruit yield and quality, and causing tremendous economic losses.

On citrus, Huanglongbing (HLB) or citrus greening, citrus tristeza closterovirus (CTV), citrus tatter leaf capillovirus (CTLV), and citrus exocortis viroid (CEV) are the most important diseases. HLB has been devastating the citrus industry in tropical and subtropical citrus areas in Asia and South Africa. Very recently, HLB appeared in North and South America. A new CTV strain, the so-called CTV-D, is causing serious dwarfing on pummelo. Some severe CTV strains affecting sweet orange and mandarin have been causing severe stem pitting, stunting, and affecting fruit yield and quality. In Japan, several lines of Satsuma mandarin grafted on trifoliolate orange hybrids have been found to be infected by CTLV. Exocortis, a bark-scaling and tree-stunting disease, primarily affects trees grafted on trifoliolate orange and its hybrids, as well as Rangpur lime.

Meanwhile, the banana bunchy-top disease (BBTV) is the most common and destructive virus disease of banana. Banana mosaic caused by cucumber mosaic virus (CMV) caused severe outbreaks recently even with the use of tissue-cultured plantlets. Banana streak (BSD) has the potential for spreading and becoming epidemic. Banana bract mosaic (BBrMV) disease is now widespread throughout the Philippines after it was first noted in the island of Mindanao. The disease has also been found in India, Sri Lanka, Vietnam, and Western Samoa. Saba (ABB), the most important cultivar in these countries, is commonly infected.

This workshop was organized to facilitate the exchange of information on how to combat these diseases. It served as a venue for the participants to share recent technologies and experiences particularly in the cultivation of pathogen-free seedlings, management of insect vectors, and disease diagnosis, toward the complementation of control strategies among countries.

Technology on the production and indexing of pathogen-free citrus and banana seedlings

In Taiwan, integrated control measures such as the cultivation of pathogen-free seedlings, elimination of inoculum sources, and prevention of secondary spread by vector insects have been developed to combat various systemic diseases that are causing serious constraints for the citrus and banana industries. Pathogen-free stocks are obtained by shoot tip micrografting, heat therapy, and tissue culture. Various technologies on disease indexing were shared during the workshop, namely: Enzyme linked immunosorbent assay (ELISA), Polymerase chain reaction (PCR), and Reverse transcriptase (RT-PCR).

Current techniques on banana crop management in Taiwan specifically involve the shift from ratoon cropping to annual replanting system with pathogen-free tissue cultured banana plantlets. Pathogen-freedom is ascertained using sensitive detection methods developed by the National Taiwan University (NTU). Tissue-cultured (TC) plantlets have a



Dr. Hong-Ji Su, Emeritus Professor from the National Taiwan University (NTU) and FFTC Consultant on Crop Protection: (above) distributes rapid diagnostic kits for detection of Citrus tristeza closterovirus (CTV) to workshop participants; and (right) explains citrus greenhouse technology during the field tour.



survival rate of 95 percent, and a harvest of at least 85 percent of banana plants can be expected with good market quality when climate is favorable. On citrus management, it was found that the efficiency of HLB transmission is related to high vector population, percentage of psyllids carrying pathogens, and vector dispersal activity. Hence, the recommended control strategy is to prevent disease damage from exceeding the level where profit or expected yield is diminished significantly.

Integrated disease control program for citrus and banana

Citrus diseases are a major constraint in citrus production in Asia, especially citrus HLB which is severely prevalent in many areas. The risk of spreading the disease is high because seedlings are propagated by marcotting and grafting. Measures recommended include: quarantine system where the government regulates movement of live citrus plants, control of citrus psylla to prevent spread of disease; creation of a "task force for citrus HLB control" which is composed of a plan/action group, or an "investigation/research group;

indexing and felling of infected trees; and securing healthy seedling. Efforts should also be directed towards implementation of government policies on nursery accreditation and plant material certification; research on crop improvement and management, particularly integrated orchard management; and capability enhancement of both growers and nurserymen to efficiently manage their orchards and nurseries. Lastly, the establishment of pathogen-free nursery system and IPM of insect vectors are most important components of disease control program.

Banana tissue culture technology should be promoted in banana-producing countries in the region. The presence of small farms, traditional cultivation methods, and a high incidence of pests and diseases have stifled development and restricted production for domestic market in most developing countries in the region. Poor post-harvest quality and fragmented supply chains also provide challenges to production and distribution. The tissue culture technology is therefore very critical in addressing most of the problems facing the banana industry in the Asian region

Issues and recommendations

One of the issues raised during the workshop is the need for technological complementation and cooperation among countries in the region. The participants agreed that while technologies for managing citrus and banana diseases are available, one of the perceived difficulties is in extending these technologies to farmers who are often hesitant to adopt them. Technological assistance from Taiwan, specifically on disease diagnosis as well as in managing pathogen-free foundation, was requested by some of the participating countries. Meanwhile, in view of the importance of banana production in the region, which is threatened by the presence of devastating diseases, one recommendation raised is to create awareness and solicit support from the international community. There is likewise an urgent need for each country to enact a regulation on plant material certification in support to the production and cultivation of pathogen-free seedlings of citrus and banana, similar to Taiwan's citrus budwood certificate enacted in December 2004.

International Workshop on Health Management in the Production and Cultivation of Pathogen-free Citrus and Banana Seedlings

Held at FFTC, Taipei, Taiwan ROC on
December 12-16

Countries represented: 7 (Cambodia, Japan, Korea, Malaysia, Philippines, Taiwan ROC, and Vietnam)

Papers presented: 10

Participants: 30

Cosponsors: Southern Fruit Research Institute (SOFRI), Vietnam; Council of Agriculture (COA), Taiwan ROC; National Taiwan University (NTU), Taiwan ROC

List of papers

Keynote paper

1. Technology in the production and indexing of pathogen-free citrus and banana seedling
 - Hong-Ji Su, NTU, Taiwan ROC

Resource papers

2. Health management of PF-banana seedlings in the field
 - Chih-Ping Chao, Taiwan Banana Research Institute, Taiwan ROC
3. Health management of PF-citrus seedlings in Taiwan
 - Shi-Chen Hung, Chiayi Agricultural Experiment Station, Taiwan ROC

Country papers

4. Overview about citrus production and some investigation on citrus disease in Cambodia
 - Vung SETHA, Royal University of Agriculture, Cambodia
5. Health management of citrus greening and virus disease in Okinawa
 - Keijii Yasuda, Okinawa Prefecture Agricultural Experimental Station, Japan
6. Citrus virus and viroids occurrence in Jeju island and preparation of pathogen-free citrus stocks
 - Jae-Wook Hynn, National Institute of Subtropical Agriculture, RDA, Korea
7. Production and cultivation of pathogen-free citrus seedlings in the Philippines
 - Juliet M. Ochasan, Bureau of Plant Industry, Philippines
8. Rehabilitation of citrus orchard with pathogen-free seedlings in Malaysia
 - Tan Hoe Hing, Department of Agriculture, Malaysia
9. Establishment of disease free citrus nursery system and demonstration of integrated crop health management of citrus orchards
 - Ha Minh Trung, Vietnam Gardening Association, Vietnam
10. Production and cultivation of pathogen-free banana tissue culture plantlets in Vietnam
 - Le Thi Thu Hong, SOFRI, Vietnam

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