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SPECIAL SYMPOSIUM ON PLANT PROTECTION SCIENCES

Under scope of the title "Impacts of Rapid Climate Changes on Agricultural Production", a special symposium on plant protection was held in Tokyo, Japan on December 2, 2009. The symposium was organized by the newly established domestic organization, the Plant Protection Science Confederation (tentative name), which is composed of five plant protection related scientific societies in Japan, i.e., Japanese Society of Applied Entomology & Zoology, Phytopathological Society of Japan, Pesticide Science Society of Japan, Weed Science Society of Japan and Japanese Society for Chemical Regulation of Plants. A total of six lectures were given, and about 120 participants listened in rapt attention. A summary of three key presentations related to climate change effect on pests is given below.

Impact of Global Warming on Insects, by Kenji Fujisaki (Kyoto Univ.)
To elucidate the influence of the global warming on insects the southern green stink bug, *Nezara viridula*, was selected as a model insect. It cannot survive in the areas where the average January temperature is below 5°C. Comparing with the habitat region investigated in 1963, this stink bug is now (in 2009) found at about 85 km higher latitude. To investigate the detailed mechanisms involved it the adaptation to higher temperatures, the stink bug was kept in a temperature controlled chamber which simulated global warming. Egg masses exposed to hot summer conditions could not develop normally, suggesting that global warming might not always benefit such tropical insects. Global warming will have a significant impact on biological diversity, especially on insects having a narrow temperature adaptation ability.

Strategy to Prevent the Expansion of Citrus Greening due to Global Warming, by Toru Iwanami (National Institute of Fruit Tree Science)
The causative agent of this plant disease is a motile bacterium, *Candidatus Liberibacter* spp., and transmission occurs by Asian citrus psyllids. In Japan, this disease is currently found only in the southern islands. But recently, the vector insect was found in Kyushu islands, and expansion of the infected area of this disease to the north will surely occur if proper countermeasures will not be taken. To block the invasion northward the following three measures are currently being taken; 1) Establish a method of early detection of infested trees, especially the development of the PCR method, 2) Completely eradicate the citrus greening disease from Kikaijima Island which is the current northernmost geographical occurrence of this disease in Japan and 3) To develop citrus greening disease resistant citrus varieties.

Plant Hormone Technologies to Cope with Rapid Climatic Changes, by Shigeo Yoshida

(RIKEN, Plant Science Center)
Although it was generally recognized that the cause of global environment change is influenced by the activities of human civilization, it has become clear by recent studies that global climate change is also a phenomenon occurring throughout the history of earth. The plant is no doubt a key component, not only for supplying dietary material, but also for transforming carbon dioxide to oxygen. To cope with the rapid climatic change, further development of phytohormone research will become indispensable.

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THREE ALIEN INVASIVE MEALYBUGS ARE ON THE MARCH IN ASIA

Recently, mealybugs of New World origin, namely, the papaya mealybug (*Paracoccus marginatus*), the solenopsis mealybug (*Phenacoccus solenopsis*) and the cassava mealybug (*Phenacoccus manihoti*), have been observed spreading in Asia. The first two mealybugs are polyphagous, feeding on several fruit, vegetable, ornamental and weed hosts, and the third one is fairly specific to cassava. However, papaya for *P. marginatus*, and cotton for *P. solenopsis* are the favoured hosts, and they respectively cause severe damage to these crops.

Papaya mealybug, *Paracoccus marginatus* on brinjal (eggplant) fruit, Tamil Nadu, India.
Photo by E. A. Heinrichs

Papaya mealybug is a native of Mexico, and spread to Central American, Caribbean and tropical South American countries in the 1990s and early 2000. It then spread to Pacific islands of Guam, Palau, Tinian and Hawaii in early 2000, and since 2008 has spread to Indonesia, India, Bangladesh, Sri Lanka, the Maldives, Malaysia, Thailand and Cambodia in Asia, Ghana in Africa, and Reunion island in the Arabian Sea. In 1999, the USDA ARS identified the parasitoids of papaya mealybug, *Acerophagous papayae*, *Anagyrus loecki* and *Pseudleptomastix mexicana* in Mexico. These were introduced to Florida, all the Central American, Caribbean and South American countries, islands in the Pacific, and Sri Lanka, wherein this mealybug became established. Introduction of these parasitoids has given effective control of the mealybug, thus requiring no further remedial measures.
The cassava mealybug was accidentally introduced into the Congo from South America in the early 1970s, and by 2000, it had spread throughout Africa. The International Institute of Tropical Agriculture (IITA) undertook exploration, identification, importation and release of the parasitoid *Anagyrus lopezi* in Africa and controlled the mealybug. In 2009, the mealybug invaded Thailand, and reached Cambodia by 2010. A shipment of the parasitoid *A. lopezi* was imported to Thailand from IITA-Benin in 2009, mass reared and then field-released. Cambodia is

also planning on introducing this parasitoid in the near future.
Solenopsis mealybug was first recorded in 1898 on weeds in New Mexico. In 1991, it was reported on cotton in Texas, and later in Central American and Caribbean countries, Ecuador and Hawaii. In early-2000, it was reported on vegetable crops from Chile and Brazil, by mid-2000, it was reported from some of the African countries, Israel, Pakistan, India and Australia, and by late-2000 in Thailand and Cambodia. In Pakistan and India, it caused serious crop losses of cotton and these countries were desperate to find a method to control the pest. Fortunately for India, the population of a parasitoid that has come with the mealybug has built up and parasitized over 60% of the mealybug population. A scientist in India has described this parasitoid as *Aenasius bambawalei*. It is possible that this parasitoid is moving with the mealybug into the newly invaded countries.
Since first finding the papaya mealybug in Indonesia in 2008, it has already been recorded in seven different countries in Asia. Similarly, we expect that the two other mealybugs will spread throughout Asia in the next few years. Once the establishment of one of these mealybugs in a country is recognized, it would be prudent for the country to explore all possible means of management instead of waiting and incurring unnecessary crop losses. At least for these three mealybugs, natural enemies have already been identified, and for two of them, their parasitoids have been tested internationally.

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IAPPS Mission: to provide a global forum for the purpose of identifying, evaluating, integrating, and promoting plant protection concepts, technologies, and policies that are economically, environmentally, and socially acceptable.

It seeks to provide a global umbrella for the plant protection sciences to facilitate and promote the application of the Integrated Pest Management (IPM) approach to the world's crop and forest ecosystems.

Membership Information: IAPPS has four classes of membership (individual, affiliate, associate, and corporate) which are described in the IAPPS Web Site www.plantprotection.org.

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