Welcome to the 7th issue of TAAO Newsletter!

In this issue, you can get the information about ASEAN regional diagnostic project. Here twenty plant pest diagnosticians from all ASEAN countries gathered at the Applied Research Institute for Agricultural Quarantine (ARIAQ) in Bekasi, Indonesia, for a workshop to develop skills in the identification of fruit flies of major quarantine importance (pg no. 2-3). The tephritid scientists also can enjoy the reading on cytogenetic study on two fruit fly pests Bactrocera zonata and Zeugodacus tau in Bangladesh (pg no. 5-8).

Our colleague, Dr Sandeep Singh, TAAO SC member from India, visited Michigan State University, USA from June 6 to September 5, 2018, for 3 months advance training on “Spotted Wing Drosophila Trapping and Attract and Kill Technology” (pg no. 9). TAAO EC member, Dr. Farzana Yesmin and me participated and presented a paper in the First International Conference on Biological Control (ICBC 2018)- Approaches and Applications, held in September 27-29, Bengaluru, India (pg no. 10-11). Dr. Farzana Yesmin also delivered a lecture on the occasion of 25th Anniversary Celebration of OWSD, entitled ‘Success Stories of OWSD Fellows’ (pg no. 12-13). Besides, M.Sc. entomology student Simranpreet Kaur, Punjab Agricultural University (PAU), India was invited by China Agricultural University (CAU), Beijing, China from April 1-10, 2018 as a visiting student for doing research work on rearing of fruit flies on artificial diet (pg no. 14-15).

With very best wishes to you all.
Thank you.

M. Hasanuzzaman
TAAO EC Chair and SC Member

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On 30 October 2018, twenty plant pest diagnosticians from all ASEAN countries gathered at the Applied Research Institute for Agricultural Quarantine (ARIAQ) in Bekasi, Indonesia, for a workshop to develop skills in the identification of fruit flies of major quarantine importance. Funding for the workshop came from two sources – the ASEAN Regional Diagnostic (ARDN) Project which is supported by an Economic Cooperation Work Program associated with the ASEAN-Australia-New Zealand Free Trade Agreement, and the Standards and Trade Development Facility Pest Surveillance and Reporting Project. The workshop was organised by Dr Ian Naumann and Ms Wendy Lee of the Technical Capacity Building Section in the Australian Government Department of Agriculture and Water Resources, Canberra, and Dr Soetikno Sastroutomo, ASEANET, Malaysia.

Training in the identification of the most important, regional species of Tephritidae was provided by Dr Mark Schutze (Queensland Department of Agriculture and Fisheries, QDAF, Brisbane), Ms Jane Royer (QDAF, Brisbane) and Dr Yuvarin Boontop (Department of Agriculture, Bangkok, Thailand). Training focused on identification of adults using morphological and colour characteristics of adults. Dr Schutze and Dr Boontop provided lectures on molecular diagnostics, and Dr Boontop led a session on the use of male genitalia in performing critical diagnoses. Training was based on the recently completed manual, *The Australian Handbook for the Identification of Fruit Flies*. Version 3.1. (2018), Plant Health Australia: Canberra, ACT and an associated, interactive, Lucid key, *Fruit Fly Identification Australia*.

Workshop sessions in which participants identified specimens collected by them as part of their routine work provided the opportunity to put the new keys to the acid test. Participants were introduced to Tephritid Workers of Asia and Oceania and immediately understood the benefits of belonging to this wider information-sharing network.

Workshop participants also provided input to a survey of priorities for future collaborative research and development, capacity building and cooperation with regard to pest fruit flies in the Australasian region. This survey is part of the ARDN Project and will continue with additional responses to be sought from all ASEAN National Plant Protection Organisations and research organisations. Workshop participants perceived surveillance methodologies, quarantine inspection techniques, molecular diagnostics, area wide management and defining area freedom and areas of low pest prevalence as priorities.
Figure 1. Ms Jane Royer (QDAF, Brisbane; seated) setting up a fruit fly for examination by Dr Viengphet Vansilalom (Department of Agriculture, Vientiane, Lao PDR)

Figure 2. Ms Norkhadijah binti Haji Latip and Ms Nurul Hanisah binti Morni, Department of Agriculture and Agrifood, Brunei Darussalam, discussing some of the finer points of fruit fly identification
Bottom-up effects of different host plant resistance cultivars on ber (Ziziphus mauritiana)-fruit fly (Carpomyia vesuviana) interactions

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The fruit fly, Carpomyia vesuviana Costa (Tephritidae: Diptera) is an important pest of ber (Ziziphus mauritiana L), leading to significant losses in yield in the hot arid agro-climate of India. Variation in resource input (antixenotics and allelochemicals) to plants trigger bottom-up effects on ber-fruit fly interactions. However, variation in plant extrinsic and intrinsic traits in response to resource availability may modify the bottom-up effects. The objectives of this study were to identify and categorize sources of resistance in ber cultivars to C. vesuviana from the arid region of India. We found that: (i) three cultivars were resistant; 13 cultivars were moderately resistant; 6 cultivars were susceptible and three cultivars were highly susceptible to fruit fly infestation; (ii) the phenol, tannin and flavonoid contents had significant negative correlations with percent fruit infestation. The percent fruit infestation had significant positive correlations with fruit length, pulp: stone ratio and had significant negative correlation with pericarp thickness. Pulp texture and fruit surface were found to be hardy and rough, respectively, in resistant cultivars of ber; and (iii) flavonoid and phenols content explained (89%) of the total variation in fruit fly infestation. Two principal components (PCs) were extracted which explained the cumulative variation of 84.7% in fruit fly infestation. PC1 explained 59.9% of the variation while PC2 explained 24.9% of the variation. Growers can adopt the potential resistant cultivars of ber (Tikadi, Katha and Illaichi cultivars) with minimal financial investment to obtain higher yields. Hence, a benefit of resistance cultivars for yield potential is apparent and resistance cultivars can be used as an important component of sustainable management.

Results of this research have been published as a full article in Crop Protection 106, 2018. Available online http://https://doi.org/10.1016/j.cropro.2017.12.017

Figure 1. Different varieties/genotypes of Indian ber (Ziziphus mauritiana) resistance against C. vesuviana
Chromosome study on two fruit fly pests *Bactrocera zonata* and *Zeugodacus tau* (Diptera: Tephritidae) in Bangladesh

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Cytogenetic research on tephritid fruit flies (Peach fruit fly, *Bactrocera zonata* and Pumpkin fruit fly, *Zeugodacus tau*) has been conducted at the Institute of Food and Radiation Biology (IFRB), Atomic Energy Research Establishment (AERE), Bangladesh Atomic Energy Commission (BAEC), Savar campus, Dhaka with funding support of the World Academy of Sciences (TWAS) Research Grant (16-062RG/BIO/AS_1-FR3240293325). Chromosome preparations and their identification for salivary gland polytene chromosome were done following the methods of Zacharopoulou 1987 and Zacharopoulou et al. 2011. Both *B. zonata* and *Z. tau* have five long polytene chromosomes composed of thick and thin bands. Some swollen region (puff) and characterized banding pattern as well as the specific shape of the each chromosome tip are significant for identifying the polytene chromosome arms.

The polytene chromosomes are numbered with 2 to 6 as it is commonly done for tephritid species. The mitotic metaphase chromosomes of *B. zonata* and *Z. tau* consist of five pairs of autosomes and one pair of sex chromosome (XY/XX). The arm length ration and centromere index were calculated following the procedure of Levan et al. 1964. In *B. zonata*, chromosome 2, 5, 6 are submetacentric; chromosome 3, 4 are metacentric. For female karyotype, X chromosomes are metacentric and for male, Y chromosome seems to be dot like. In *Z. tau* chromosome 2, 3, 4 are metacentric; chromosome 5, 6 are submetacentric. Female are homozygous and X chromosome are metacentric, male are heterozygous. The construction of polytene chromosome maps and further analysis on mitotic metaphase karyotypes as well as the C-banding patterns of the two tephritid species currently is in progress under the TWAS project in Fruit Fly Laboratory of the Institute of Food and Radiation Biology (IFRB).

**Figure 1.** Salivary gland of *Bactrocera zonata* (a) and *Zeugodacus tau* (b) showing polytene cells inside the gland
Figure 2. Microphotographs showing mitotic metaphase chromosomes of *Bactrocera zonata* and *Zeugodacus tau*
Figure 3. Polytene nuclei of *B. zonata* showing different arms
Figure 4. Polytene nuclei of Zeugodacus tau
Dr. Sandeep Singh, TAAO SC member from India, Assistant Entomologist, Department of Fruit Science, Punjab Agricultural University, Ludhiana, India, visited Michigan State University (MSU), East Lansing, USA from June 6 to September 5, 2018, for 3 months advance training on “Spotted Wing Drosophila Trapping and Attract and Kill Technology”. He worked with Dr. Matthew J. Grieshop, Associate Professor of Organic Pest Management, Department of Entomology. During his stay in Michigan, Dr. Singh carried out research work on comparative trapping of spotted wing drosophila, *Drosophila suzuki* (Matsumura) (Diptera: Drosophilidae) with yeast and vine baits on apple pomace, blueberry, raspberry, strawberry, cherry and grapes. He also visited Trevor Nichols Research Centre, Fennville, Michigan, and Clarksville Research Centre, Portland Road, Michigan, for carrying on trials on management of fruit flies in cherry and borers in apple.
TAAO EC member, Dr. Farzana Yesmin and TAAO SC member and EC Chair, Dr. Md. Hasanuzzaman participated and presented a paper in the First International Conference on Biological Control (ICBC 2018)- Approaches and Applications. The conference was held in September 27-29, Bengaluru, India and it gathered scholars with a wide range of interests within the Biological Control field. It was organized jointly by the Society for Biocontrol Advancement (Bengaluru, India), ICAR- National Bureau of Agricultural Insect Resources (Bengaluru, India) and Centre for Agriculture and Bioscience International (CABI, UK).

TAAO members delivered the lecture at Session 5: Biological Control of Invasive Pests and Weeds on the second day of the conference, capturing the audience’s attention with the talk on chromosomal study of an agriculturally important fruit fly pest. The title was ‘Identification and characterization of larval salivary gland polytene chromosomes of the peach fruit fly, Bactrocera zonata (Saunders) (Diptera: Tephritidae)’ and published in the conference book, pp. 146. During the presentation they showed that how dipteran polytene chromosomes can act as major key element for the construction of genetic sexing strain (GSS) of the target insect pest and the GSS can play an important role for the autocidal control of the insect pest.

The topic of ICBC 2018 skillfully aimed to accommodate papers on the recognition and implementation of biological control approaches in the context of biodiversity, biosecurity, crop protection, increased chemical pesticide pressure, newer challenges faced in pest control, insecticide resistance in pests and pesticide residue build-up in commodities. Additionally, the conference hosted two workshops- the IOBC global working group on Biological Control and the IAPPS working group on Tuta absoluta.

Dr. Chandish R Ballal Director, NBAIR welcomed the guests. Total of 240 delegates including 43 research scientists from different countries participated and presented their research work related to biological control of insect pests and weeds under the 10 different scientific sessions. The first-day keynote lecture by Dr. Quirico Migheli, Professor of Molecular Plant Pathology, University of Sassari, Italy focused on ‘Why so many manuscripts are rejected for publication? An editorial perspective.’

The conference was held in the spirit of mutual respect and fruitful exchange of ideas and friendly discussions marked especially the last day of the conference, after a wonderful cultural event and an exciting trip to Mysore tourist places among the participants. ICBC 2018, Bengaluru, India conference tour was funded by the TWAS research grant (TWAS Ref. 16-062RG/BIO/As_IFR3240293325).

Photo. ICBC 2018 inaugurated by Dr. Trilochan Mohapatra, Secretary DARE and Director General ICAR. From left, Dr. Trilochan Mohapatra, Dr. Chandish R. Ballal (Director, NBAIR), Dr. S.K. Jalali (Organizing Secretary, ICBC 2018) and Dr. David Smith, CABI, UK
ICBC 2018 Conference Photo Gallery
TAAO EC member, Dr. Farzana Yesmin delivered a lecture on the occasion of 25th Anniversary Celebration of OWSD (Organization for Women in Science for the Developing World), 16 Oct. 2018, Atomic Energy Research Establishment (AERE), Bangladesh Atomic Energy Commission (BAEC), Savar Campus, Dhaka, Bangladesh. The title of the seminar was ‘Success Stories of OWSD Fellows’. During the talk, Dr. Yesmin focused on fruit fly research which she started as M.Sc. thesis student in 1997 at the Institute of Food and Radiation Biology (IFRB), Savar, Dhaka and keep continuing her research on fruit fly as a permanent employee in the same organization.

The seminar was chaired by Prof. Emeritus Dr. Shahida Rafique, President of OWSD Bangladesh Chapter and co-chaired by Secretary OWSD-BD, Dr. Sharmin Parveen. The Vice-President OWSD-BD and Executive board member of OWSD Asia Pacific Region, Prof. Dr. Hasin Anupama Azhari was also present in the seminar as program coordinator. The seminar was featured by the presence of Director General of Atomic Energy Research Establishment (AERE), Dr. M. Azizul Haque as chief guest of the seminar and Director BioSciences of BAEC, Dr. Shakil Ahmed Khan.

Speaking on the event Dr. Yesmin mentioned the role of OWSD (formerly TWOWS) in her academic and scientific career. In 2013, she did her PhD as OWSD Fellow on fruit fly cytogenetics at the Universiti Ke-bangsaan Malaysia (UKM). In her success story, she spoke about her achievement in obtaining FRGS (Fundamental Research Grant Scheme) Award 2010 (for 3 years) from the Ministry of Higher Education Malaysia to conduct research on tephritid fruit fly and BioVision Nxt. Award 2011 (PhD Fellow category) from the World Life Sciences Forum in partnership with the French Academy of Sciences. Later, after completion of her PhD, she has been awarded a prestigious research grant in Dec 2016 from the World Academy of Sciences (TWAS) for doing research on the fruit fly cytogenetics entitled ‘Cytogenetic analysis of peach fruit fly, *Bactrocera zonata* (Saunders) (Diptera: Tephritidae) in Bangladesh with relation to sterile insect technique (SIT) application’. For further information please follow the links below:


https://owsd.net/sites/default/files/OWSD%20Bangladesh%20Seminar%20Series%20reports_0.pdf

Enjoy the seminar photo on the next page!
25th Anniversary Celebration of OWSD by OWSD-BD

‘Success Stories of OWSD Fellows’

Speakers: Dr Farzana Yesmin, CSO, READ, IFRB
Dr Tabassum Mumtaz, PSO, MIID, IFRB

Date: 16 October, 2018 Venue: INST Auditorium, Atomic Energy Research Establishment, Ganakbari, Savar, Dhaka-1349, Bangladesh

Seminar Photo Gallery
By Simranpreet Kaur, India

M.Sc. Entomology Student Simranpreet Kaur, L-2016-A-50-M, Department of Entomology, Punjab Agricultural University (PAU), Ludhiana, Punjab (India) was invited by China Agricultural University (CAU), Beijing, China from April 1-10, 2018 as a Visiting Student for doing research work on rearing of fruit flies on artificial diet. She is doing her M.Sc. Entomology under the guidance of Dr Sandeep Singh, Assistant Entomologist, Department of Fruit Science, PAU, Ludhiana, India. During her stay in Beijing, Ms. Kaur worked with Prof. Dr. Zhihong Li, Professor of Entomology and Director, CAU Plant Quarantine Laboratory on preparation of artificial diet and how to culture fruit flies on artificial diet. Prof. Li is also a member of advisory committee of Ms. Simranpreet Kaur for M.Sc. degree. She also worked with Dr Lijun Liu, Assistant Professor from College of Plant Protection on molecular identification, wing development and population genetic structure. She delivered two invited lectures to scientists and students on various aspects of IPM of fruit flies in India and regarding research work during her M.Sc. She worked with Dr Yujia Qin on RNA interference. She visited IPM laboratories in the Department of Entomology of the University. Ms. Kaur also visited Institute of Plant Protection, Chinese Academy of Agricultural Sciences (CAAS), Beijing to attend a seminar on Development of Invasion Biology in China. She attended one Seminar on Symbiotic bacteria associated with fruit flies. She attended one lecture delivered by Dr Jianlin Jiang on CRISPR-Cas 9. During her visit, she observed different species of fruit flies in China. She also attended one lecture on dissection of fruit flies.

Figure 1. Ms. Kaur with Prof. Zhihong Li and team
Figure 2. Delivering lecture to UG students

Figure 3. Dissecting Fruit flies

Figure 4. Preparing artificial diet

Figure 5. During Visit to PPI, CAAS, Beijing

Figure 6. Delivering lecture to team
UPCOMING EVENTS AND DATES TO REMEMBER

Fourteen Session of the Commission on Phytosanitary Measures, International Plant Protection Convention, FAO, 1–5 April 2019, Rome, Italy

35th Annual Meeting of the International Society of Chemical Ecology, 2-7 June 2019, Atlanta, Georgia, USA. Conference website: http://isce2019.biosci.gatech.edu/

Fourth RCM on Dormancy Management to Enable Mass rearing and Increase Efficacy of Sterile Insects and Natural Enemies, 3–7 June 2019, Thessaloniki, Greece

FAO/IAEA Interregional Training Course on The Use of the Sterile Insect and Related Techniques for the Integrated Area-wide Management of Insect Pests (under Interregional TC Project INT5155), 10 June –5 July 2019, Metapa de Dominguez, Chiapas, Mexico and Antigua / El Pino, Guatemala

Fly School: A Course for Dipterists, 23 June-6 July 2019, Los Osos, California, USA (http://dipteracourse.com/)

Eight International Symposium on Molecular Insect Science, 7-10 July, 2019, Sitges, Barcelona, Spain

First RCM on Assessment of Simultaneous Application of SIT and MAT to Enhance Bactrocera Fruit Fly Management, 15–19 July 2019, Vienna, Austria

Insect Genetic Technologies: Theory and Practice Short Course, 21-26 July, 2019, University of Maryland, Institute for Bioscience and Biotechnology, Rockville, Maryland

FAO/IAEA Regional Training Course on Modern Taxonomy and Identification Tools of Fruit Fly Species in Africa (under Regional TC Project RAF5074), 23–27 September 2019, Cotonou, Benin

FAO/IAEA Regional Training Course on Area-wide Integrated Fruit Fly Management including Sterile Insect Technique (SIT) and Male Annihilation Technology (MAT) in Africa (under Regional TC Project RAF5074), 7 –11 October 2019, Reduit, Mauritius

First RCM on Generic Approach for the Development of Genetic Sexing Strains for SIT Applications, 7–11 October 2019, Vienna, Austria


Entomology 2019, an annual meeting of Entomological Society of America, 17-20 November, 2019, St. Louis, MO, USA

Fourth RCM on Comparing Rearing Efficiency and Competitiveness of Sterile Male Strains Produced by Genetic, Transgenic or Symbiont-based Technologies, 2–6 December 2019, Adelaide, Australia

10th Tephritid Workers of the Western Hemisphere (TWWH) Meeting, 16-20 March 2020, Bogota, Columbia

XXVI International Congress of Entomology, 19-24 July 2020, Helsinki, Finland

2nd Meeting of the Tephritid Workers of Asia, Australia and Oceania (TAAO), 17-22 August 2020, Beijing, China

4th Tephritid Workers of Europe, Africa and the Middle East (TEAM) Meeting, 4-8 October 2020, La Grande-Motte, France

11th International Symposium on Fruit Flies of Economic Importance, 15-20 May 2022, Sydney, Australia

Tephritid Workers Database (TWD)

Tephritid Workers Database link:
http://nucleus.iaea.org/sites/naipc/twd/Pages/default.aspx

Please keep your TWD profile updated to stay connected with the whole tephritid fruit fly community in the world.
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The TAAO Newsletter is produced by the TAAO editorial committee from contributions made by fruit fly workers from across the region encompassing Asia, Australia, and Oceania. While focused on this region, contributions are also welcome from tephritid workers. The newsletter is distributed electronically and free of charge to members of the TAAO mailing list. Please contact the TAAO EC Chair (mhasanuzzaman72@yahoo.com) if you wish to be added or removed from this list, or if you have a note that you would like to contribute to future issues of the Newsletter. The newsletter can be downloaded from this link: https://nucleus.iaea.org/sites/naipc/twd/Pages/Newsletters.aspx

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