

ABSTRACTS OF PAPERS¹

¹Presented at the **Annual Scientific Conference of the Philippine Association of Entomologists, Inc.** held during the **47th Annual Convention of the Pest Management Council of the Philippines, Inc.**, March 8-11, 2016, Villa Caceres, Naga City

ORAL PAPERS

1. INSECTS ON RED CABBAGE (*Brassica oleracea* L.) AND LIFE CYCLE OF THE CABBAGE WORM, *Crociodolomia pavonana* (Fabricius), IN LANA DEL SUR, PHILIPPINES

Desiree Lee L. Vasquez¹ and Emma M. Sabado². ¹Cagwait, Surigao del Sur, and ²Department of Plant Science, College of Agriculture, Mindanao State University, Marawi City, Lanao del Sur.

A study was conducted in Mindanao State University, Marawi City, Lanao del Sur from October, 2014 to February, 2015 to identify the insects associated with red cabbage (*Brassica oleracea* L. var. *capitata* L. forma *rubra* L.) and study the life history of the pest causing the greatest damage. Insects on red cabbage belong to 11 families under seven orders. Red cabbage pests (herbivores) are classified under orders Lepidoptera (moths), Coleoptera (beetles), Hemiptera (aphids) and Orthoptera (grasshoppers). The cabbage worm, *Crociodolomia pavonana* (Fabricius), was the major insect pest that caused 100% yield losses to red cabbage during the study period. The minor pests were the diamondback moth [*Plutella xylostella* (L.)], cabbage moth (*Euproctis* sp.), aphids (*Myzus* sp), grasshoppers (*Ailopus* sp. and *Atractomorpha* sp). Beneficial insects associated with red cabbage belong to Diptera, Hymenoptera and Neuroptera. The mean life cycle of *C. pavonana* lasted for 25.96 days (22-31) under laboratory conditions. The mean egg incubation period was 4.42 days (4-5). Percent egg hatchability ranged from 22 to 100 with a mean of 73.90. There were four larval instars with a mean duration of 13.84 days (12-26) while the pupal stage was 7.70 days (6-9). Adult males lived up to 17.20 days (14-22) while females lived longer up to 19.80 days (13-25). The female moth laid an average of 8.50 egg clusters (5-15) containing 208.80 eggs (40-424) throughout its lifetime.

Key words: cabbage worm, *Crociodolomia pavonana*, insect pests, life cycle, red cabbage

2. EFFECT OF AGES OF MALE AND FEMALE ADULTS ON FECUNDITY AND EGG HATCHABILITY OF THE ASIAN CORN BORER, *Ostrinia furnacalis* (Guenee) (LEPIDOPTERA: CRAMBIDAE)

Marcela M. Navasero¹, Maricon N. De Panis¹, Wilson N. De Panis¹, Mario V. Navasero¹ Meiji T. Bagangao² and Merdelyn T. Caasi-Lit². ¹National Crop Protection Center-Crop Protection Cluster, College of Agriculture, University of the Philippines Los Baños (UPLB), College, 4031 Laguna; ²Entomology Laboratory, Institute of Plant Breeding, Crop Science Cluster, College of Agriculture, UPLB, College, 4031 Laguna

The mating age for successful production of viable eggs of Asian corn borer (ACB), *Ostrinia furnacalis* (Guenee), was determined using the arranged pairing test whereby day-, 2d-, 3d-, 4d-, and 5d-old males were paired with day-, 2d-, 3d-, 4d-, and 5d-old females by age group, replicated at least 30 times for a total of 1,654 ACB pairs. Results showed that females at all the ages tested laid eggs. Means of eggmasses laid were higher in younger females regardless of age of males. Conversely, old females mated by old males (5d-old male: 5d-old female) laid fewer eggs. Generally, when males of all ages were paired with younger females, the latter laid eggs comparable to those of females in younger pairs. However, hatchability of eggs was higher for those laid by younger pair combinations and lowest for 5d-old male: 5d-old female pairs.

Key words: Asian corn borer, fecundity, hatchability, mating age, mating success, *Ostrinia furnacalis*

3. LIFE HISTORY AND SEASONAL ABUNDANCE OF *Toxorhynchites splendens* (Wiedemann) (DIPTERA: CULICIDAE: TOXORHYNCHITINAE) IN MT. MAKILING, LOS BAÑOS, LAGUNA

Justine Bennette H. Millado*, Augusto C. Sumalde, Jessamyn R. Adorada and Barbara L. Caoili. Crop Protection Cluster, College of Agriculture, University of the Philippines Los Baños, College, 4031 Laguna. *e-mail: jbhmillado@uplb.edu.ph.

Toxorhynchites spp. (Diptera: Culicidae: Toxorhynchitinae), commonly known as elephant mosquitoes, are larval predators of immatures of other mosquito species including *Aedes aegypti* and *A. albopictus*. The life history of one species, *T. splendens*, collected from Mt. Makiling, was studied under laboratory conditions using different prey densities. Eggs hatched in 1-2 days ($x=1.9$) after oviposition. There are four larval instars which last for 1-6 ($x=2.4$), 1-15 ($x=3.1$), 2-16 ($x=6.6$) and 8-65 ($x=17.8$) days for the first to fourth instar, respectively. Total developmental period (TDP) from egg to adult ranges from 23 to 86 days for males ($x=33.9$) and from 25 to 90 for females ($x=37.4$). Adult longevity is 2-55 days ($x=10.4$) for males and 2-71 days ($x=16.5$) for females. On the average, respective total developmental periods (in days) per prey density for male (M) and female (F) are: 5 preys/day (M=56.8, F=61.3), 10/day (M=32.7, F=34.8), 20/day (M=29.1, F=33.4), 40/day (M=26.8, F=28.4), and 60/day (M=24.4, F=28.9). Decreasing TDPs were observed with increasing number of daily preys. In contrast, higher juvenile mortality and shorter adult longevity were observed at higher prey densities. Adults of larvae fed with 10 preys daily, on the average, lived 8.8 days longer than those at other prey densities. Males generally completed development 3.4 days earlier than females, although the former lives 6.1 days shorter. Females laid an average of 19.8 eggs with 96.6% viability over a span of 14.8 days, about 15.3 days after mating. The seasonal abundance of *T. splendens* in the wild was also observed for one year (August 2013 to July 2014). Third and fourth instar larvae were most abundant in September while the eggs peaked in April.

Key words: biocontrol agents, Culicidae, Elephant mosquito, life history, mosquito *Toxorhynchites splendens*

4. EFFECT OF *Sargassum* SEAWEED ON LARVAL DEVELOPMENT AND OVIPOSITION OF THE ASIAN CORN BORER, *Ostrinia furnacalis* (Guenee) (LEPIDOPTERA: CRAMBIDAE)

Marcela M. Navasero, Susan May F. Calumpang, Romulo G. Davide, Regine N. Candano and Jamie Casas. National Crop Protection Center-Crop Protection Cluster, College of Agriculture, University of the Philippines Los Baños, College, 4031 Laguna.

Larval development, fecundity, hatchability of eggs and longevity of adult male and female Asian corn borer (ACB), *Ostrinia furnacalis* (Guenee), with and without *Sargassum* seaweed were investigated in the laboratory. There was slight variation in the mean total larval developmental periods (14.83 days in the treatment without seaweed and 15.73d with seaweed, in the male ACB). In the female, there was also very slight variation in mean total larval periods (16.70 days in treatment without seaweed and 16.73d with seaweed). However, there was higher mortality of the larvae in the seaweed treatment (48%) and 37% in the control treatment (without seaweed). Moreover, there were more males (67.44%) than females (32.56%) in the seaweed treatment or a sex ratio of 2 males: 1 female. Conversely, in the control treatment, there were more females (56.60%) than males (43.4%) or a sex ratio of 1 male: 1.3 females. This may indicate the differential effect of seaweed on the female ACB causing its premature death which may have impact on reproduction. Females in the control treatment laid more and bigger eggmasses. Hatchability of eggs, on the average was 78.56% in the control and 72.06 in the seaweed treatment. In terms of post development of adult ACB female, particularly pre-oviposition, oviposition and post oviposition periods, there were only slight variations between the seaweed treatment and the control. Longevity of male adult ACB in the control treatment was shorter than in the seaweed treatment and this holds true with the females in the seaweed treatment. In general, results showed that *Sargassum* seaweed affected growth and development, fecundity and longevity of adult ACB.

Key words: Asian corn borer, fecundity, hatchability, longevity, *Ostrinia furnacalis*, *Sargassum*

5. COMPARISON OF THE EFFICACY OF TWO LEAF INFUSIONS AS OVIPOSITION ATTRACTANT/STIMULANT TO *Aedes aegypti* (L.) (DIPTERA: CULICIDAE)

Frances Coleen M. Laserna¹ and Pio A. Javier². ¹Museum of Natural History, University of the Philippines Los Baños (UPLB), College, 4031 Laguna and ²Crop Protection Cluster, College of Agriculture, UPLB, College, 4031 Laguna.

The performance of bamboo leaf infusion (BLI) and 'X' leaf infusion (XLI) as oviposition attractant/stimulant was evaluated against *Aedes aegypti* (L.) in the laboratory under choice and no-choice methods utilizing one pair and 25 pairs of gravid females. Under choice method, significantly, highest average

number of eggs were laid by a female alone in XLI (126.73), which correspond to 97.96% of the total eggs laid within the set up while significantly lowest number of eggs were laid in water (0.80, 0.52%) and BLI (1.67, 1.46%). The same trend in the oviposition preference of *A. aegypti* was observed when the solutions were provided to 25 gravid females except that slightly lower numbers of eggs were laid in XLI but slightly higher in water and BLI. Under no choice method, both populations laid significantly the same number of eggs whether in water, BLI or in XLI. Significantly higher average number of eggs per female was laid by a pair of adult than when 25 females were used. High number of eggs laid corresponded to high oviposition activity index (OAI) of each female in XLI with 0.97 in one-pair set up and 0.71 in 25-pair set up. Results of the study showed that XLI is a very potent oviposition attractant/stimulant to gravid female *A. aegypti*. Further study on XLI utilization for population monitoring and for attract-and-kill technology should be immediately pursued.

Key words: *Aedes aegypti*, bamboo leaf infusion, gravid female, Oviposition attractant

6. BIOLOGY OF BLACK SOLDIER FLY, *Hermetia illucens* (L.) (DIPTERA: STRATIOMYIDAE), AND ITS DEVELOPMENT AND SURVIVAL ON DIFFERENT LARVAL DIETS. [Recipient, 2016 PAE-PMCP Best Undergraduate Thesis Award in Entomology]

Raymark P. Matalog and Celia dR. Medina. Crop Protection Cluster, College of Agriculture, University of the Philippines Los Baños, College, 4031 Laguna.

The biology of the black soldier fly was studied under laboratory conditions in order to generate basic life history parameters that can be used in developing mass rearing method for the species. In a separate experiment, five kinds of larval diets were also assessed under laboratory conditions in terms of their effect on larval developmental rate, growth and survivorship of the black soldier fly. The total developmental period of black soldier fly from egg to adult ranged from 37.68 to 41.90 days with a mean of 39.79 ± 2.11 days. It passed through six larval instars over a period of 17.89 ± 0.50 days. The mean durations of its pre-pupal and pupal stages were: 7.68 ± 0.30 and 14.02 ± 0.77 days, respectively. Adult flies did not feed but the males lived for 10.17 ± 0.47 days while the females lived for 8.33 ± 0.57 days. Life history parameters showed that the black soldier fly has a high reproductive rate and could be reared easily under confinement. The different larval diets tested varied significantly in terms of the rate of development, survival, pupal weight and sex ratio of the test insects. The vegetable, chicken dung and cow manure supported successfully the growth and development of the larvae but all those that are chicken entrail-based diets had very low survival rate. The vegetable diet produced the shortest development period and relatively heavy pupae but the resulting adults had male-biased sex ratio. The cow manure was comparable to the vegetable diet in terms of developmental rate, pupal weight and had a more balanced sex ratio of the test insects. The results confirm earlier studies that black soldier flies prefer to inhabit decomposing materials of plant origin. Further studies should be done to evaluate other plant-based diets to optimize the rearing media and to assess the economic benefits if prepupae and pupae are used as animal feed.

Key words: black soldier fly, *Hermetia illucens*, life history, Stratiomyidae

7. APHELINID VERSUS ENCYRTID: FIRST RECORD OF *Marietta carnesi* (Howard) (HYMENOPTERA: APHELINIDAE) IN THE PHILIPPINES AND CONFIRMATION OF ITS HYPERPARASITISM ON *Comperiella calauanica* Barrion, Almarinez & Amalin (HYMENOPTERA: ENCYRTIDAE)

Billy Joel M. Almarinez and Divina M. Amalin. Biology Department, College of Science, De La Salle University, Manila and Biological Control Research Unit, Center for Natural Sciences and Environmental Research, De La Salle University, Manila; e-mail: billy.almarinez@dlsu.edu.ph

Marietta carnesi (Howard) is an aphelinid hyperparasite associated with other chalcidoid parasitoids of armored scale insects. Among its hosts are encyrtids of the genus *Comperiella* Howard, specifically *C. bifasciata* Howard and *C. unifasciata* Ishii. We report not only a first record of this hyperparasite's occurrence in the Philippines, but also of its new parasitization records on *C. calauanica* Barrion, Almarinez & Amalin and its diaspidid host *Aspidiotus rigidus* Reyne. *M. carnesi* was first found among samples collected from a coconut palm in Sto. Tomas, Batangas in 2014, and later in Orani, Bataan in

2015. The occurrence of this hyperparasite could have implications on the mass rearing of *C. calauanica* for conservation and augmentation, but probably not so much on the encyrtid's efficacy for biological control of *A. rigidus*.

Key words: *Aspidiotus rigidus*, *Comperiella calauanica*, hyperparasitism, *Marietta carnesi*, new record

8. FIELD EVALUATION OF BAMBOO LEAF INFUSION AS OVIPOSITION ATTRACTANT TO DENGUE MOSQUITO *Aedes aegypti* (L.) AND RELEASE OF WATER BUG *Diplonychus rusticus* F. AGAINST MOSQUITO WRIGGLERS IN SAN PABLO CITY, LAGUNA

Zenyor Zyroy T. Yambao¹, Aldrian A. Acebedo¹, Camille Joy E. Andal¹, Charisse Anne B. Balahadia¹, Shayne Marion C. Caday¹, Pio A. Javier² and Annabelle B. Albaytar². ¹Laguna College, San Pablo City, Laguna, ²Crop Protection Cluster, UP Los Banos, College, Laguna.

The efficiency of organic bamboo leaf infusion (BLI) (34 g senescent bamboo leaves soaked in 4 L water for 1 week) as oviposition attractant to gravid female dengue mosquito *Aedes aegypti* (L.) was evaluated from December 2013 to February 2014 in 10 households in Barangays Concepcion and Sto. Angel, San Pablo City, Laguna, which was previously reported to have the highest dengue incidence in Region 4A. Likewise, the effectiveness of water bug, *Diplonychus rusticus* F. as predator of dengue mosquito wrigglers that hatched from the eggs laid by gravid female *A. aegypti* in BLI, was assessed. Very high oviposition activity indices (OAI) of 0.85 and 0.89 were observed in Brgy. Concepcion and Sto. Angel, respectively, suggesting that BLI is a potent oviposition trap. In Brgy. Concepcion, a total of 10,915 eggs and 11,514 larvae were monitored in 10 households in three weeks while 31,979 eggs and 40,222 larvae in 10 households were monitored for six weeks in Brgy. Sto. Angel. About 91% of the eggs were laid in BLI and only 9% in water alone. Third instar water bug nymph, *Diplonychus rusticus* F., released in BLI almost totally consumed the developing mosquito larvae and resulted in 99% reduction in mosquito pupal development. The species of mosquitoes monitored throughout the study were *A. aegypti*. Results showed that in the presence of bamboo leaf infusion, about 92% of the gravid dengue mosquito adults are attracted to lay their eggs in this organic attractant and the subsequent release of water bug prevented pupal development by 99%. Therefore, the use of oviposition attractant and subsequent release of water bug predators could be a novel approach in directly reducing the *A. aegypti* population.

Key words: *Aedes aegypti*, bamboo leaf infusion, *Diplonychus rusticus*, oviposition activity index, oviposition attractant

9. COCONUT FELT SCALE (HEMIPTERA: COCCOIDEA: ERIOCOCCIDAE: *Sangicoccus*) POPULATIONS IN THE PHILIPPINES: NEW GEOGRAPHICAL DISTRIBUTION RECORDS AND TAXONOMIC QUESTIONS

Ireneo L. Lit, Jr.^{1,2}, Cristian C. Lucañas³, Merdelyn T. Caasi-Lit² and Whizvir O. Gustilo¹. ¹Entomology Section, Museum of Natural History and ²Institute of Biological Sciences, College of Arts and Sciences, University of the Philippines Los Baños (UPLB), College, 4031 Laguna; ³Entomology Laboratory, Institute of Plant Breeding, Crop Science Cluster, College of Agriculture, UPLB, College, 4031 Laguna

Coconut felt scales belonging to the genus *Sangicoccus* (Hemiptera: Eriococcidae) had been known as "coconut mealybugs" during a previous outbreak in Palawan, Philippines. Subsequent review and examination of mealybug-like species infesting coconut, in connection with a study of the buff coconut mealybug *Nipaeoccus nipae* (Maskell) revealed earlier records of *Sangicoccus* sp.nr. *truncatispinus* Reyne. New collections from various places in Mindanao, Basilan and Luzon expand the geographical distribution of the genus in the country. Their potential as pests, as well as interesting possibilities and taxonomic questions on Philippine populations, are discussed.

Key words: distribution records, Eriococcidae, felt scales, *Sangicoccus*, taxonomy

10. COMPARATIVE ULTRASTRUCTURE OF THE SCALE COVER OF THREE *Aspidiotus* spp. (HEMIPTERA: DIASPIDIDAE) AND THE OVIPOSITOR OF THEIR TWO PARASITOIDS USING SCANNING ELECTRON MICROSCOPY

Joeselle M. Serrana and Divina M. Amalin*. Biology Department, College of Science, De La Salle University 2401 Taft Avenue 1004, Manila, Philippines. *e-mail: divina.amalin@dlsu.edu.ph

Correct identification of both the target insect pests and their natural enemies is important in biological control management programs. In the recent coconut scale insect (CSI) outbreak in the Philippines, misidentification of the destructive pest population resulted in an unsuccessful biological control attempt. The CSI population was initially identified as *Aspidiotus destructor* Signoret but further morphological investigation and molecular analysis revealed that *Aspidiotus rigidus* Reyne was the correct pest species. Although closely-related, these CSI species vary in vulnerability against natural enemies. Specialization in structural defense against the search, attack or development of parasitoids may influence this difference. Possible variability in scale cover structure may provide evidence to explain this variation in susceptibility to natural enemies. This study will investigate the ultrastructure of the scale cover of three scale insect species present in the Philippines, the CSI - *A. destructor* Signoret and *A. rigidus* Reyne, and the oleander scale *A. nerii* (Bouche). On the other hand, interspecific variation in the structure of the ovipositor of their hymenopteran parasitoids may be related to the diversity of hosts that they attack. Hence, the ultrastructure of the ovipositor of the parasitoids directly associated with the two CSI species will be observed to examine if it influences the host specificity of these natural enemies.

Key words: *Aspidiotus destructor*, *Aspidiotus rigidus*, coconut scale insects, Diaspididae, scale cover ultrastructure

11. TAXONOMIC RECORDS AND NEW COLLECTIONS OF COCONUT-INFESTING SCALE INSECTS (HEMIPTERA: COCCOIDEA) IN THE PHILIPPINES, WITH SPECIAL FOCUS ON *Aspidiotus* spp. AND OTHER ARMORED SCALE INSECTS (DIASPIDIDAE)

Ireneo L. Lit, Jr.¹, Cristian C. Lucañas¹, Whizvir O. Gustilo¹ and Merdelyn T. Caasi-Lit². ¹Entomology Section, Museum of Natural History and Institute of Biological Sciences, College of Arts and Sciences, University of the Philippines Los Baños (UPLB), College, 4031 Laguna; ²Entomology Laboratory, Institute of Plant Breeding, Crop Science Cluster, College of Agriculture, UPLB, College, 4031 Laguna

A taxonomic review of coconut scale insects (Hemiptera: Coccoidea) is presented and gross scale characteristics and diagnostic morphological features are briefly enumerated. Probable new country and local distribution records are reported. The occurrence of *Aspidiotus rigidus* Reyne in Basilan is confirmed with brief notes on its associated parasitoid *Comperiella* sp. among coconuts that have not been subjected to chemical treatment (trunk injection). The potential of some species like those belonging to *Aonidiella*, *Fiorinia*, *Lepidosaphes*, *Pseudaulacaspis*, *Sangicoccus* etc. to reach pest status is discussed and compared with circumstances, events and characteristics pertaining to CSI (*Aspidiotus rigidus* Reyne) outbreaks.

Key words: *Aspidiotus destructor*, *Aspidiotus rigidus*, Basilan, Coccoidea, coconut scale insects, *Comperiella* sp.

12. CAVE COCKROACHES (DICTYOPTERA: BLATTODEA) FROM POLILLO ISLAND, PHILIPPINES

Cristian C. Lucañas and Ireneo L. Lit, Jr. Entomology Section, Museum of Natural History and Institute of Biological Sciences, College of Arts and Sciences, University of the Philippines Los Baños, College, 4031 Laguna

The order Blattodea is one of the understudied insect groups in the Philippines in terms of biodiversity. The emerging study of cave ecology in the country has provided a great opportunity to the study of the group in such environments. Cockroaches collected during explorations in several limestone caves in the Polillo Island, Quezon Province, mainly from the municipality of Burdeos are listed. A new species of *Nocticola* (Nocticolidae) is described. *Periplaneta banksi* Hanitsch (Blattidae) is reviewed. Adaptations of some species for cave environments are discussed.

Key words: Blattodea, cave cockroaches, *Nocticola*, *Periplaneta banksi*, Polillo Island

13. NATIVE CORN ACCESSIONS AS SOURCES OF RESISTANCE AGAINST THE ASIAN CORN BORER, *Ostrinia furnacalis* (Guenee) AND CORN WEEVIL, *Sitophilus zeamais* (Motschulsky) FOR CROP IMPROVEMENT AND PEST MANAGEMENT OPTIONS

Merdelyn T. Caasi-Lit, Bryan V. Novio and Elisa G. de Leus. Entomology Laboratory, Institute of Plant Breeding, Crop Science Cluster, College of Agriculture, University of the Philippines Los Baños, College, 4031 Laguna

Native corn germplasm accessions were screened for resistance against the Asian corn borer (ACB), *Ostrinia furnacalis* (Guenee), and the corn weevil, *Sitophilus zeamais* (Motschulsky). ACB field trials were done in IPB-UPLB for two dry seasons and one wet season from 2014 to 2015. Leaf disc bioassays at 30 days after planting (DAP) and 45 DAP (n=60) and stalk-bar bioassays (n=30) at 45, 60 and 75 DAP, were done. Weevil damage was also observed for three months. Results showed that native accessions react variedly to ACB pressure under the field and laboratory conditions. UPLB Cn108 had the lowest field damage rating and markedly reduced neonatal survival (29.34%) together with UPLB Cn40 (25.13%) and UPLB Cn24 (30.67%). Borer tunnels were shortest in UPLB Cn108, followed by F-30 < UPLB Cn82 < UPLB Cn73 < UPLB Cn98 < UPLB Cn 79 < UPLB Cn91 and UPLB Cn75 (< 1cm). UPLB Cn31 and UPLB Cn78 exhibited intermediate weevil damage resistance (2.00 ± 0.41 and 2.00 ± 0.00 , respectively). These results suggested that ACB and weevil resistance may be available in native corn. Screening of more varieties and insect resistance mechanism studies are underway. Data will be used to develop corn breeding populations with ACB and weevil resistance in the tropics.

Key words: insect bioassays, insect resistance, native corn, *Ostrinia furnacalis*, *Sitophilus zeamais*

14. UPDATES ON THE UPLB BEE PROGRAM'S SMALL HIVE BEETLE MONITORING ACTIVITIES

Aimee Lynn A. Barrion-Dupo, Cleofas R. Cervancia, Lita M. Colting, Elmer A. Polintan, Anna A. Locsin, Epifanio C. Loyola Jr., Lilia I. de Guzman and Ace Kevin S. Amarga. UPLB Bee Program c/o Institute of Biological Sciences, College of Arts and Sciences, University of the Philippines Los Baños, College, 4031 Laguna

Continuous monitoring of the small hive beetle *Aethina tumida* Murray has been conducted since its reported occurrence in Mindanao in November 2014. Heavy infestation in Davao Oriental and General Santos City has led to several *Apis mellifera* colonies to crash, leaving significant losses to beekeepers. This paper also reports on the spread of SHB in other parts of the country and the effect of SHB on native bee species.

Key words: *Aethina tumida*, *Apis mellifera*, small hive beetle

15. TRENDS IN COCONUT LEAF BEETLE, *Brontispa longissima* (Gestro), INFESTATION AND ITS CAUSAL ENVIRONMENTAL FACTORS IN THE PHILIPPINES

Ivorie J. dela Torre^{1,2} and Carmelita P. Martinez². ¹Integrated Crop Protection Division, Philippine Coconut Authority-Davao Research Center, Bago Oshiro, Davao City; e-mail: ivorie_dela_torre@yahoo.com.ph; ²University of Southeastern Philippines, Obrero, Davao City

The widespread infestation of coconut leaf beetle, *Brontispa longissima* (Gestro) (Coleoptera: Chrysomelidae) in the Philippines was investigated. This invasive species is a serious threat to the coconut industry if infestation will not be contained. Hence, sustainable pest management program is necessary to prevent economic damage and to protect the welfare of the coconut farmers. The regional trend of infestation, the influence of the environmental factors, and long-term prediction of incidence, were evaluated in the study. Results indicated that the trend in infestation across provinces in the Philippines is influenced by rainfall and temperature. The causality of *B. longissima* infestation and climatic condition are positively associated with rainfall. Data revealed increase in the rate of infestation when rainfall is high while increase in temperature decreases the infestation incidence. The 2007-2013 trends of infestation ranges from 0.01 to 12.45 percent relative to the total coconut trees planted. In Luzon, the areas with highest level of infestations were in Regions I-IVB; in the Visayan islands, infestations were severe in Region VIII, and in Mindanao, Region IX was the most affected. As illustrated in the area-specific maps, the magnitude of infestation of the pest scaled up to a significant level in 2008-2011 that seriously affected coconut areas of various provinces in the Visayas. The forecasted incidence between 2014 and 2020 disclosed lower levels of infestation. Incidences of *B. longissima* in some areas in the Philippines are predicted in the coming years. Projection shows that most of the areas are predicted to have less than 1.0% incidence. This would give an idea to farmers and local authorities that they should strengthen their efforts in controlling the said insect pest to avoid likelihood of significant damage in the future.

Key words: *Brontispa longissima*, causality, forecasting, incidence, trends of infestation

16. WHERE HAVE ALL THE BORERS GONE? - PART 2. THE CONTINUING CHALLENGES OF OPVS ON THE ACB'S "BORING" LIFE, AND THE IMPACTS OF Bt CORN AND CURRENT POLICY ISSUES

Merdelyn T. Caasi-Lit. Entomology Laboratory, Institute of Plant Breeding, Crop Science Cluster, College of Agriculture, University of the Philippines Los Baños, College, 4031 Laguna

Pesticide use has obviously been reduced in corn production for the control of the number one insect pest, the Asian corn borer (ACB), *Ostrinia furnacalis* (Guenee). With Bt corn technology, ACB population has been effectively managed. After only a decade of Bt corn farming, the number of hectares and the volume of production have dramatically increased along with the income of corn farmers, giving a big boost to the corn and animal feeds industries. With this scenario, people ask, "where have all the borers gone?" This paper continues to discuss the significance of Bt corn introduction in the country and its effect on the life of the ACB. With the same general question, it attempts to focus also on hypotheses associated with the suppression of local ACB populations. Interestingly, field observations revealed that ACB continues to be a serious pest among open-pollinated corn varieties (OPVs) and hence, this continuing saga (ACB vs. non-Bt corn). For all these developments, where will it take us especially as we are confronted with current policy issues (e.g. Philippine Supreme Court rulings) on genetically modified organisms.

Key words: Asian corn borer, Bt-corn, Open-pollinated corn varieties, *Ostrinia furnacalis*

17. EFFECTIVENESS OF SUDAN RED 7B AS MARKER FOR DISPERSAL STUDIES OF *Ostrinia furnacalis* (Guenee) (LEPIDOPTERA: CRAMBIDAE)

Merdelyn T. Caasi-Lit., Meijei T. Bagangao, Mark Bryan T. Lontoc, Elisa G. De Leus, Charisse Yvonne A. Hon and Nerissa Joyce V. Hadjinulla. Entomology Laboratory, Institute of Plant Breeding, Crop Science Cluster, College of Agriculture, University of the Philippines Los Baños, College, 4031 Laguna

Pesticide use has obviously been reduced in corn production for the control of the number one insect pest, the Asian corn borer (ACB), *Ostrinia furnacalis* (Guenee). With Bt corn technology, ACB population has been effectively managed. After only a decade of Bt corn farming, the number of hectares and the volume of production have dramatically increased along with the income of corn farmers, giving a big boost to the corn and animal feeds industries. With this scenario, people ask, "where have all the borers gone?" This paper continues to discuss the significance of Bt corn introduction in the country and its effect on the life of the ACB. With the same general question, it attempts to focus also on hypotheses associated with the suppression of local ACB populations. Interestingly, field observations revealed that ACB continues to be a serious pest among open-pollinated corn varieties (OPVs) and hence, this continuing saga (ACB vs. non-Bt corn). For all these developments, where will it take us especially as we are confronted with current policy issues (e.g. Philippine Supreme Court rulings) on genetically modified organisms.

Key words: Asian corn borer, Bt-corn, Open-pollinated corn varieties, *Ostrinia furnacalis*

18. OVIPOSITIONAL PREFERENCE OF THE ASIAN CORN BORER, *Ostrinia furnacalis* (Guenee), FOR DIFFERENT STAGES OF CORN AND NON-CORN PLANTS

Merdelyn T. Caasi-Lit, Jessica B. Baroga, Nole B. Javier, Arlene R. Silvestre, Daisy E. Mallson and Francisco J. Navarro. Entomology Laboratory, Institute of Plant Breeding, Crop Science Cluster, College of Agriculture, University of the Philippines Los Baños Laguna, 4031

The ovipositional behavior and preference of the Asian corn borer (ACB) for corn and non-corn plants were determined under semi-field conditions at IPB-BL2 Screenhouse and under greenhouse conditions in a smaller steel cage at IPB-Sampaloc Area. Several trials were conducted in both sites from August to December 2015. There were nine plots in each site which represented the five treatments [2 T1 (30 DAP corn plants), 2 T2 (40 DAP corn plants), 2 T3 (natural weeds), 2 T4 (alternate host plants), and 1 T5 (40 DAP corn plants; infestation and release point)]. Fourth instar ACB larvae were introduced on corn plants at T5 for feeding and adult emergence. The sites were covered with mosquito net and with flysheet to keep the test insects away from predators, prevent them from escaping, and protect them from strong rains. After 15-18 days, the net at T5 was removed to let the adult ACBs find their place

to mate and lay eggs. Observation and collection of eggmasses were performed for 5-7 days after the removal of net. Most ACB eggmasses were gathered from T2 (40 DAP) corn plants, although there were some collected from T1 (30 DAP), napier and paragis of T4 (alternate hosts). Based on the results of several trials, adult ACB females prefer to lay eggs corn plants at the reproductive stage.

Key words: alternate host, Asian corn borer, eggmasses, natural-occurring weeds, *Ostrinia furnacalis*, oviposition

19. AGE-SPECIFIC LARVAL SURVIVAL OF LAGUNA AND ISABELA ASIAN CORN BORER POPULATIONS ON BT AND NON-BT CORN

Merdelyn T. Caasi-Lit and Ericka A. Suyat. Entomology Laboratory, Institute of Plant Breeding, Crop Science Cluster, College of Agriculture, University of the Philippines Los Baños Laguna, 4031

The efficacy of corn hybrid MON89034 against Asian Corn Borer from Laguna and Isabela was determined using forced larval transfer technique desired specific instars. Possible resistance and survival of the pupal stage of specific larval instars on this double Bt line that expresses both Cry2Ab2 and Cry1A.105 proteins were studied. The experiment used leaf squares and stalks of 30 DAP whole plants of Bt and non-Bt varieties grown in staggered manner in the screenhouse. Larvae were reared and fed on NK603 until they were transferred to MON89034 upon reaching the different specific instars. Bt leaves and stalks were contained in Ballā jars and Petri dishes with 30 replicates each. Mortality and damage ratings were recorded daily. Based on the initial results, older larvae infested onto Bt corn leaves and stalks survived longer than younger larvae. Furthermore, results showed that greater damage was caused by the older as compared to younger larvae as shown by the scrapes and shot holes on the leaves and bores on the stalks. Results may provide insights on the pattern of behavior of the insects for the succeeding generations. Possible reasons for the development of ACB resistance against Bt toxins may be explained through the study.

Key words: Age-specific larval survival, Asian corn borer, instars, MON89034, *Ostrinia furnacalis*

20. DIRECTIONAL AND RANDOM DISPERSAL OF ADULT ASIAN CORN BORER (ACB), *Ostrinia furnacalis* (GUENEE) (LEPIDOPTERA: CRAMBIDAE)

Mario V. Navasero¹, Wilson N. De Panis¹, Meiji T. Bagangao², Marcela M. Navasero¹ and Merdelyn T. Caasi-Lit². National Crop Protection Center-Crop Protection Cluster, College of Agriculture, University of the Philippines Los Baños (UPLB), College, Laguna, 4031; ²Entomology Laboratory, Institute of Plant Breeding, Crop Science Cluster, College of Agriculture, UPLB, College, 4031 Laguna

Study on adult dispersal behavior of ACB using mark-recapture method was conducted in Brgy. Rang-ay, Banga, South Cotabato from September to October 2015. Results showed that the number of recaptured marked adult ACB in 36 designated sampling points (44 individuals) was much lower compared to that in only 19 sampling points (103 individuals) from weedy areas. This suggests directional rather than random flight dispersal in majority of adult ACB onto weedy areas. However, those that remained in corn are still of significant proportion. Marked ACB were recaptured from as near as 10-20 meters from the release point. This has implications in the deployment of non-Bt corn refuge. The recommended structured refuge planted 100 m apart was probably based on random flight dispersal and may not be sufficient to address mating among potentially resistant short range fliers and susceptible ACB away from the non-Bt refuge.

Key words: adult dispersal behavior, Asian corn borer, refuge, *Ostrinia furnacalis*

21. HOSTS OF *Aspidiotus rigidus* Reyne (HEMIPTERA: DIASPIDIDAE): IMPLICATIONS ON THE APPLICATION OF QUARANTINE MEASURES IN THE PHILIPPINES

Bonifacio F. Cayabyab, Mario V. Navasero, Marcela M. Navasero, Randolph N. Candano, Wilson N. De Panis and Don Serville R. Reynoso. National Crop Protection Center-Crop Protection Cluster, College of Agriculture, University of the Philippines Los Baños, College, 4031 Laguna.

A total of 25 species of plants, mainly from CALABARZON Region and Bataan Province, were documented as host plants of *Aspidiotus rigidus* Reyne. Fifteen species belong to the Arecaceae, one under Clusiaceae,

two under Annonaceae, two under Musaceae, two under Araceae and three under Pandanaceae. List of plants, except for mangosteen, considered for quarantine are hosts of *Aspidiotus destructor* Signoret. This has resulted in interception of non-host plants of *A. rigidus* like mango seedlings while other plant hosts particularly those belonging to families Araceae and Pandanaceae, which are non-hosts of *A. destructor*, might be allowed to pass through checkpoints.

Key words: *Aspidiotus destructor*, *Aspidiotus rigidus*, coconut scale insects, host plants.

22. COMPARATIVE ABUNDANCES, MIXING AND HOST PLANT RESPONSES AMONG COCONUT SCALE INSECTS (HEMIPTERA: DIASPIDIDAE: *Aspidiotus* spp.) AND OTHER COCONUT-INFESTING COCCOIDEA IN BASILAN AND ZAMBOANGA

Merdelyn T. Caasi-Lit¹, Whizvir O. Gustilo², Ireneo L. Lit, Jr.^{2,3}, Cristian C. Lucañas², Ronel M. Danila² and Russel C. Larona³.
¹Entomology Laboratory, Institute of Plant Breeding, Crop Science Cluster, College of Agriculture, University of the Philippines Los Baños (UPLB), College, 4031 Laguna; ²Entomology Section, Museum of Natural History, and ³Institute of Biological Sciences, College of Arts and Sciences, UPLB, College, 4031 Laguna

Initial observations on field infestations in Basilan and Zamboanga revealed mixed populations of various scale insect species on coconuts, with coconut scale insects (*Aspidiotus* spp.) predominating in outbreak proportions in Basilan. Samples were taken to compare the abundance of scale insect species in Basilan, Zamboanga City and Zamboanga Sibugay, as well as obtain insights on the relative proportions and extent of mixing of scale insect populations per leaflet/tree and initially assess the qualitative responses of host plants. Questions are discussed in connection with the present pattern of occurrence of the CSI in those areas, where there is an outbreak in Basilan but not in Zamboanga, despite their relatively short geographic distance.

Key words: *Aspidiotus destructor*, *Aspidiotus rigidus*, Basilan, Coccoidea, coconut scale insects, outbreak

23. INFESTATION TECHNIQUE USING CORNSTALKS ON BIODEGRADABLE SKEWERS (BARBECUE STICKS) FOR FIELD BIOEFFICACY TESTING AGAINST THE ASIAN CORN BORER, *Ostrinia furnacalis* (Guenee), IN THE PHILIPPINES

Merdelyn T. Caasi-Lit, Elisa G. de Leus, Rachel H. Dacuba, Justin Clark S. Erigbuagas and Mark Bryan Lontoc. Entomology Laboratory, Institute of Plant Breeding, Crop Science Cluster, College of Agriculture, University of the Philippines Los Baños, College, 4031 Laguna

Pest resistant crops are primarily identified using bioefficacy studies. These studies entail the infestation of test insects onto candidate crops to screen for the desired resistance trait. An infestation technique using cornstalks on biodegradable skewers was developed to increase the efficiency of infestation of the Asian Corn Borer (ACB) for field bioefficacy testing for Bt and non-Bt corn products. Stalks of isoline maize, aged 30-40 DAP, were sliced at about 1 cm thick and skewered onto pre-thinned toothpicks. The skewered corn stalks were placed into the infestation cup, and thereafter, the newly-hatched larvae were transferred using camel's hair brush. These cups were covered with tissue paper then stored for several days depending on the larval instar required for the infestation. During infestation, the skewered cornstalks were placed inside the whorl, for vegetative stage infestation, or placed on the leaf sheath just below the flag leaf, for reproductive stage infestation. Using this technique, consistent results for the damage ratings and larval counts were generated from both plant stages. Hence, this technique is an effective delivery system for field bioefficacy testing of pest-protected or pest-resistant corn hybrids.

Key words: Asian corn borer, bioefficacy, corn stalks, infestation technique, *Ostrinia furnacalis*

24. PESTICIDE RESIDUES ON VEGETABLES USING RAPID DETECTION TOOLS: AN UPDATE

Cristina M. Bajet, John Julius Manuben, Jasper Sarmiento and Eric Jhon Cruz. National Crop Protection Center, Crop Protection Cluster, University of the Philippines Los Baños, College, 4031 Laguna

Edsel C. Rubico¹, Janice F. Laquinta¹, Romnick A. Latina¹, Gelyn D. Sapin¹, Michelle S. Guerrero² and Barbara L. Caoili¹. ¹Crop Protection Cluster, College of Agriculture, University of the Philippines Los Baños, College, 4031 Laguna; ²Office of the Vice-Chancellor for Research and Extension, UPLB, College, 4031 Laguna

The massive coconut scale insect (CSI) infestation in the recent years has posed serious threat to the coconut industry. This urged agricultural scientists and different concerned agencies, in cooperation with coconut farmers, to devise and implement strategies to reduce CSI damage at a certain manageable level. One integral component of these management strategies is the introduction of natural enemies. Using the large subunit ribosomal DNA (28S) region as a molecular marker, several naturally-occurring parasitoids of CSI were identified. BLAST hit results of the deduced nucleotide sequences showed the identity of the different parasitoid species as related to *Comperiella* (88% identical with *C. bifasciata* GenBank Acc. No. AY599317.1) and *Marietta* (93% identical with *Marietta* sp. GenBank Acc. No. AY599363.1) associated with field-collected *A. rigidus* from Isabela City and Lantawan, Basilan, respectively; *Pteroptrix* (89% identical with *Pteroptrix* sp. GenBank Acc. No. JN623564.1) and *Coccophagus*(?) (90% identical with *Coccophagus* sp. GenBank Acc. No. KF780961.1) associated with scale insects from Zamboanga; and *Encarsia* (91% identical with *E. heratyi* GenBank Acc. No. HQ731041.1) associated with the laboratory-reared *A. excisus* in Isabela, Basilan. Further morphological and molecular studies are still underway to maximize the potential of these biological control agents.

Key words: 28S, Basilan, BLAST, coconut scale insects, parasitoids, Zamboanga

28. DIVERSITY OF SECONDARY ENDOSYMBIONTS ASSOCIATED WITH DIFFERENT *Bemisia tabaci* (Gennadius) (HEMIPTERA: ALEYRODIDAE) BIOTYPES IN THE PHILIPPINES

Justine Bennette H. Millado, Jerwin L. Sanchez, Juanito V. Bariuan, Gelyn D. Sapin and Barbara L. Caoili*. Crop Protection Cluster, College of Agriculture, University of the Philippines Los Baños, College, 4031 Laguna; *corresponding author, e-mail: blcaoili@up.edu.ph

Biotypes of the whitefly, *Bemisia tabaci* (Gennadius), have been noted to harbor symbiotic prokaryotes, which greatly contribute to their biology. Some provide essential nutrition needed for survival while others can be non-essential or even deleterious. A pioneering local study focused on determining the biotypes of local whitefly populations. However, the identity of their associated endosymbionts has yet to be explored. This study attempted to identify the bacterial symbionts associated with different *B. tabaci* biotypes from host plants including eggplant, tobacco, cabbage, ladies' fingers (okra), sweet potato, bottle gourd (upo), cucumber and some weeds and ornamentals collected from several locations. PCR amplification using genus-specific 16s and 23s ribosomal DNA genes revealed the presence of four secondary endosymbionts, namely, *Hamiltonella*, *Rickettsia*, *Cardinium*, and *Wolbachia*. These were isolated from 51 haplotypes of *B. tabaci* consisting of Asia I (74.5%, n=38), MEAM 1 or B (19.6%, n=10), Asia II 10 (3.9%, n=2), and Asia II 6 (2.0%, n=1). *Wolbachia* was found in 94.1% of the samples while *Rickettsia* and *Hamiltonella* were restricted to the destructive MEAM 1 (80.0% and 70.0% respectively) and interestingly, also in a native Asia I sample (10.5% and 2.6%). *Cardinium*, on the other hand, was scarce in MEAM 1 (10%), Asia I (5.3%), and Asia II 10 (50%) and absent in Asia II 6 while *Arsenophonus* was not detected in any of the samples.

Key words: *Bemisia tabaci*, *Cardinium*, *Hamiltonella*, *Rickettsia*, whitefly, *Wolbachia*

29. IDENTIFICATION OF SCALE INSECTS ON COCONUT AND ASSOCIATED CROPS USING 28S GENE

Janice F. Laquinta¹, Edsel C. Rubico¹, Romnick A. Latina¹, Gelyn D. Sapin¹, Michelle S. Guerrero² and Barbara L. Caoili¹. ¹Crop Protection Cluster, College of Agriculture, University of the Philippines Los Baños (UPLB), College, 4031 Laguna; ²Office of the Vice-Chancellor for Research and Extension, UPLB, College, 4031 Laguna

Previous studies using molecular markers identified at least two armored scale insect species, namely, *Aspidiotus destructor* Signoret and *As. rigidus* Reyne, in the outbreak areas. At present, verification of armored scale insect species is being conducted in highly-infested coconut areas such as CALABARZON, Bataan, Zamboanga and Basilan. Samples were also collected from coconut-associated crops, which show symptoms of scale insect damage. DNA extraction was done through withdrawal of the scale insect exudates. The 28S nucleotide region was then amplified and used as a DNA barcode. BLAST hit results revealed four species (98-100% identity) of armored scale insects specifically, *Abgrallaspis cyanophylli* (Signoret), *As. destructor*, *As. rigidus*, and *As. excisus* Green. Soft scale insects namely,

Coccus hesperidum L., *C. formicarii* (Green), *Paralecanium expansum* (Green) and species related to *Eriococcus(?) spurius* (Modeer) were identified to infest coconut. Other scale insect species from different hosts were also identified as *As. cryptomeriae* Kuwana and *Parasaissetia nigra* (Nietner) and species related to *Unaspis euonymi* Comstock and *Chionaspis wistariae* (Cooley). Armored scale insect species found on coconut varieties in Philippine Coconut Authority – Zamboanga Research Center, on the other hand, shared 98% to 100 % identity with *As. destructor*. Moreover, scale insect species collected from different palm species in Basilan and identified as *As. rigidus*, *Ab. cyanophyll*, *C. formicarii*, and *P. expansum*, appeared to be few and infrequently observed, and are found on coconut-associated crops such as coffee, lanzones, mangosteen and banana.

Key words: 28s gene, Basilan, scale insects, Zamboanga

30. PROBING PHILIPPINE TERMITES FOR THE POTENTIAL USE OF LIGNOCELLULASES AND ANTIMICROBIAL PEPTIDES

Jessa Mae T. Camposano¹, Maria Almira S. Cleofe¹, Ana Katrina E. David¹, Ian Phillip P. Paclibare¹, Jessamyn R. Adorada², Barbara L. Caoili² and Ma. Anita M. Bautista¹. ¹National Institute of Molecular Biology and Biotechnology, College of Science, University of the Philippines Diliman, Diliman, Quezon City; ²Crop Protection Cluster, College of Agriculture, University of the Philippines Los Baños, College, 4031 Laguna

Despite the destructive behavior of termites, these insects have growing potential in biotechnology. Termites are known to degrade cellulosic materials and are able to elicit an adaptive bacterial response through the production of antimicrobial peptides. This study investigates the cellulolytic microbiota and antibacterial response of Philippine termites, *Nasutitermes* sp and *Microcerotermes* sp. For the cellulolytic activity, filter paper and carboxymethyl cellulose (CMC) agar plates were used, and the samples were characterized by Congo red assay, 16S rRNA sequencing and Analytical Profile Index (API) system. Cloning, transformation and DNA sequencing, on the other hand, were performed for the unculturable bacteria. Seven colonies under 12 different genera and two endosymbionts were isolated from *Nasutitermes* sp., and 10 colonies under two genera were obtained for *Microcerotermes* sp. Congo red assay showed one cellulolytic isolate from the *Nasutitermes* sp. and five isolates from the *Microcerotermes* sp. For the unculturable bacteria, three species were identified from *Nasutitermes* sp. and two species from *Microcerotermes* sp. To investigate the antimicrobial activity of termites, workers were induced with *Bacillus subtilis* (Ehrenberg) Cohn and *Vibrio cholerae* Pacini using three methods (i.e., filter paper feeding, dipping and walking). Protein extraction was performed after 6-8 and 24 hours incubation using ammonium acetate buffer. Extracts were tested against the same bacterial species and results show that antibacterial activity is present. The results indicate that termites are indeed an abundant source of bioactive compounds for future biotechnological needs.

Key words: antimicrobial peptides, lignocellulases, *Microcerotermes*, *Nasutitermes*, termites

31. DETOXIFICATION AND CHEMOSENSATION GENE RESPONSES TO REPELLANT AND NON-REPELLANT TERMITICIDE IN PHILIPPINE MILK TERMITE, *Coptotermes* sp. (ISOPTERA: RHINOTERMITIDAE)

Tristan Cesar M. Mañalac¹, Aileen Jane H. De Claro¹, Kim Ivan A. Abesamis¹, Jessamyn R. Adorada², Gelyn D. Sapin², Barbara L. Caoili² and Ma. Anita M. Bautista¹. ¹National Institute of Molecular Biology and Biotechnology, College of Science, University of the Philippines Diliman, Diliman, Quezon City; ²Crop Protection Cluster, College of Agriculture, University of the Philippines Los Baños, College, 4031 Laguna

Termites are social insects capable of extensive structural damage that requires billions of dollars for control. The most common method of termite control is the use of insecticides which can be repellent or non-repellent. The overuse of insecticides, however, poses risks as it may lead to resistance development. Therefore, for resistance management, it is important to understand the molecular basis implicated in resistance development such as chemosensation and detoxification. The genes primarily involved in chemosensation are the odorant-binding proteins (OBPs) and chemosensory proteins (CSPs) which are believed to mediate termite behavioral response to insecticide. For detoxification, it is primarily mediated by cytochrome P450 monooxygenases (CYP450). This study aims to determine the effect of repellent insecticide exposure on the expression of identified chemosensation genes in *Coptotermes* sp. and the effect of non-repellent insecticide exposure on the expression of CYP450 detoxification genes to explore the underlying mechanism of resistance development. To achieve this, an insecticide bioassay

on termiticide-exposed and -unexposed worker termites followed by quantitative real-time PCR, was performed. From the results of the gene expression analysis, up- and down-regulations were observed in the target genes which indicate that these insecticides indeed affect the expression of these genes and, consequently, the chemosensation and detoxification responses of termites. However, since the up- and down-regulations of genes observed are not significantly different between the termiticide-exposed and unexposed worker termites, the study suggests that the termites have a faint chance of developing CYP450-based and behavioral resistance to the insecticides.

Key words: chemosensation, *Coptotermes*, detoxification, Philippine milk termite

32. RESISTANCE STABILITY OF MULTI-ADAPTATION TRIAL (MAT) CHECK VARIETIES TO MAJOR INSECT PESTS OF RICE

Gileyd C. Santiago. Crop Protection Division, Philippine Rice Research Institute, Maligaya, Science City of Muñoz, Nueva Ecija

Resistant rice varieties are needed to reduce losses caused by insect pests in irrigated rice. The stability of resistance depends on the genetic interaction between the rice host and the insect herbivore. The expression and long-term stability of resistance to a herbivore insect in a plant species depend on the genotype of the host, the genotype of the insect, and the interaction between the plant and the insect under different environmental conditions. Evaluation of different rice lines with their check varieties for resistance against major insect pests of rice was carried out in both field and greenhouse conditions in 10 National Cooperative Test (MAT) sites. The study focused on the reactions of the check varieties used in MAT trials against major insect pests of rice. The stability in terms of resistance of seven check varieties used in MAT trials namely: PSB Rc18, PSB Rc82, NSIC Rc134, NSIC Rc138, NSIC Rc222, NSIC Rc224 and NSIC Rc240 was determined. Comparison was based on their reactions to major insect pests of rice in five years (2010-2014). PSB Rc18 and PSB Rc82 were the most stable among the check varieties. These varieties exhibited high resistance to intermediate reactions to stemborer, brown planthopper and green leafhopper.

Key words: multi-adaptation trial, resistance stability, rice host plant resistance

33. COMPARISON OF FOUR DIFFERENT INFESTATION TECHNIQUES FOR FIELD BIOEFFICACY TESTING AGAINST THE ASIAN CORN BORER, *Ostrinia furnacalis* (Guenee), IN THE PHILIPPINES

Merdelyn T. Caasi-Lit and Mark Bryan T. Lontoc. Entomology Laboratory, Institute of Plant Breeding, Crop Science Cluster, College of Agriculture, University of the Philippines Los Baños, College, 4031 Laguna

The search for pest-resistant crops, both through classical host plant resistance strategies and by modern genetic modification technology, necessitates bioefficacy testing. Specifically for bioefficacy studies of Bt corn hybrids against the Asian corn borer (ACB), *Ostrinia furnacalis* (Guenee), infestation is done mainly by manually placing the eggmasses with a pair of forceps or larvae onto the plants with a camel hair brush as well as the bazooka technique. The advantages and disadvantages of these techniques have been discussed by previous authors. Different infestation techniques, namely, the use of camel's hair brush, bazooka, corn stalks and blackhead stage eggmasses were compared to test their effectiveness as delivery systems for neonate ACB larvae for bioefficacy testing. This was done for both greenhouse and field trials. Results showed that corn stalks at 25-30 DAP and blackhead-stage eggmasses at 50 DAP had the highest larval survival. However, using corn stalks and directly infesting the neonates require a lot of labor inputs during preparation. The use of bazooka gave the most inconsistent results due to the quality of the corn grits and the inevitable presence of predators during infestation.

Key words: Asian corn borer, bazooka, camel hair brush, corn, corn stalks, infestation techniques, neonates, *Ostrinia furnacalis*, *Zea mays*

34. NON-CHEMICAL METHODS OF CONTROLLING EGGPLANT FRUIT AND SHOOT BORER, *Leucinodes orbonalis* (Guenee) (LEPIDOPTERA: PYRALIDAE)

Pio A. Javier, Evangeline G. Punzalan and Ramel H. Madlangbayan. Crop Protection Cluster, College of Agriculture, University of the Philippines Los Baños, College, 4031 Laguna

Due to excessive use of synthetic insecticides and the very high demand for organically grown eggplant, there is an urgent need to evaluate the effectiveness of non-chemical control methods (release of *Euborellia annulata* Lucas, *Trichogramma* spp., spraying of langkauas + oregano crude extracts, planting of lemon grass as repellent and sanitation) against eggplant fruit and shoot borer (EFSB), *Leucinodes orbonalis* Guenee, the most destructive insect pest of eggplant. The experiment was conducted at the Central Experiment Station, UPLB, from February to December 2015. The effectiveness of the non-chemical methods was compared with that of spraying methomyl, the conventional method of controlling EFSB. The field releases of *Trichogramma* in combination with the release of earwig, were separately conducted in organic farm in San Pablo City (SPC), Laguna. Based on two trials at UPLB, release of earwigs, and spraying of langkauas + oregano crude water extracts were consistently as effective as methomyl in reducing EFSB fruit damage. The highest yield was obtained from plants in plots where earwigs were released and those sprayed with methomyl. However, the highest net income was obtained from plants released with earwig, *E. annulata* followed by spraying of langkauas + oregano crude extracts and sanitation. Lower net profit was obtained with the conventional insecticide application since the insecticide is quite expensive while the market price of produce is higher for organically grown crops. The field releases of *Trichogramma* and earwigs at SPC resulted in crop yield comparable with that of spraying of crude plant extracts. Results suggest that each of the component control methods (release of earwig; *Trichogramma*; spraying of langkauas + oregano extracts and sanitation) could contribute in reducing EFSB damage, thereby increasing the yield of eggplant. The effectiveness of field releases of earwig, spraying of langkauas + oregano crude extracts, and sanitation in combination with the release of *Trichogramma* egg parasitoid, is currently being verified in an organic farm in San Pablo City (SPC).

Key words: botanical insecticide, eggplant fruit and shoot borer, *Euborellia annulata*, *Leucinodes orbonalis*, non-chemical control, *Trichogramma*.

35. EFFECTS OF RELEASING TWO BATCHES OF DUCKS ON THE POPULATION OF RICE INSECT PESTS AND NATURAL ENEMIES

Evelyn M. Valdez, Jesusa M. Rivera and Rizal G. Corales. Philippine Rice Research Institute, Maligaya, Science City of Muñoz, Nueva Ecija

The rice-duck production system is a traditional practice in China, Japan and Korea. It was introduced to other Asian countries several years ago. The common practice is that 100-150 ducklings are introduced into the paddies at 10-15 days after transplanting. The ducks are then withdrawn from the rice paddies at heading stage. Results from our previous studies at PhilRice showed that 500-1,000 ducks/ha stocking densities are technically and economically feasible. The versatility of ducks as biological control agents paved the way for a more ecological and safer approach to pest management. Planthoppers and defoliators are emerging late season pests which can result in high yield losses. Integrating another batch of ducklings into the rice paddies at heading stage may provide protection against late season pests and will provide additional income. To determine the effect of the release of two batches of ducks as biological control agents, a field experiment was established during 2015 dry and wet seasons at the experimental field of PhilRice Central Experiment Station. The results revealed that arthropod populations in plots without ducks were higher starting at 60 DAT but the effect was insignificant on pest damage.

Key words: high stocking duck density, IPM in rice, natural enemies, rice-duck farming, rice insect pests

36. LARVICIDAL ACTIVITY OF *Bacillus thuringiensis* ssp. *israelensis* AGAINST THE DENGUE MOSQUITO, *Aedes aegypti* (L.) AND ITS EFFECT ON THE BEHAVIOR AND SURVIVAL OF WATER BUG *Diplonychus rusticus* F.

Pio A. Javier and Annabelle B. Albaytar. Crop Protection Cluster, College of Agriculture, University of the Philippines Los Baños, College, 4031 Laguna

The larvicidal activity of *Bacillus thuringiensis* subsp. *israelensis* (*Bti*) against the different larval instars of dengue mosquito, *Aedes aegypti* (L.), was determined in the laboratory. Cadavers of infected *A. aegypti* larvae were also fed to healthy *A. aegypti* larvae and mortality was determined at 24 and 48 hrs after feeding. Likewise, the effect on the behavior and survival of water bug, *Diplonychus rusticus*

F. (predator of wrigglers), was determined when exposed to *Bti*-infected larvae. *Bti* at recommended rate caused 100% mortality among all instars of *A. aegypti* larvae. Feeding healthy larvae with *Bti*-infected mosquito cadavers also caused 98% larval mortality in 24 hrs. Incorporation of *Bti* in bamboo leaf infusion as oviposition attractant provided -0.19 oviposition activity index (OAI) compared to -0.12 OAI in water with *Bti*, which suggests that *Bti* has very little effect on the oviposition activity of gravid female *A. aegypti*. Numerically, there was higher mean number of eggs laid in *Bti*-treated leaf infusion than in *Bti*-treated water. On the other hand, *Bti* is non-toxic to *D. rusticus* nymphs exposed to *Bti* water and when fed with *Bti*-infected larvae. However, in the laboratory, the release of first, second and third nymphal instar water bugs in *Bti*-treated water prevented them from diving through the water due to surface tension which caused body desiccation and ultimately, death of the water bugs. This was not observed in the fourth and fifth instar water bug nymphs. Results suggest that the granulated form of *Bti* is highly effective against the larvae of *A. aegypti* in container and could be compatible with water bugs in the "attract-and-kill strategy" for reducing dengue mosquito population in the field.

Key words: *Aedes aegypti*, *Bt israelensis*, *Diplonychus rusticus*, larvicidal, mosquito wrigglers, water bug

37. PRELIMINARY STUDY ON SUSCEPTIBILITY OF *Microcerotermes losbanosensis* Oshima TO *Heterorhabditis indica* Poinar et al.

Gelyn D. Sapin* and Barbara L. Caolli. Crop Protection Cluster, College of Agriculture, University of the Philippines Los Baños, College, 4031 Laguna; *e-mail: gdsapin@up.edu.ph

The use of entomopathogenic nematodes (EPNs) for the control of soil and cryptic insect pests has been demonstrated in nematode species under the families Steinernematidae (*Steinernema* spp., *Neosteinernema* spp.), Heterorhabditidae (*Heterorhabditis* spp.) and Mermithidae. *Microcerotermes losbanosensis* Oshima is one of the most common species of termites that infest homes and wooden structures in both rural and urban environments. A bioassay exposed 20 workers and three soldiers of *M. losbanosensis* to approximately 675 infective juveniles (IJs) of *Heterorhabditis indica* Poinar et al. At 24 hours post infection (hpi), mortality ranging from 13.04% to 86.96% (mean = 47.83%) was observed. Meanwhile, 34.78% to 100% (mean = 84.54%) mortality was recorded after 48 hpi. At seven days post infection, 100% mortality was achieved. Our results showed that *M. losbanosensis* was susceptible to *H. indica*. Further studies such as reproduction of *H. indica* in termites, determination of the optimum amount of IJs in the inoculum, and behavioral responses (i.e., repellency) of termites to EPNs are needed to efficiently utilize this *H. indica* population as a biological control agent for the management of termites.

Key words: entomopathogenic nematodes, *Heterorhabditis indica*, *Microcerotermes losbanosensis*, termites

38. MOLECULAR IDENTIFICATION OF POTENTIAL ENTOMOPATHOGENIC FUNGI ISOLATED FROM COCONUT SCALE INSECTS (*Aspidiotus* spp.)

Constance Aurelle M. Macalinao, Ester A. Magsino, Fe D. Alzona, Regina Faye C. Sandoval and Barbara L. Caolli*. Crop Protection Cluster, College of Agriculture, University of the Philippines Los Baños, College, 4031 Laguna; *e-mail: blcaolli@up.edu.ph

A total of 244 entomopathogenic fungal (EPF) isolates were purified from coconut scale insects (CSI) (*Aspidiotus* spp.) collected from 22 localities in 10 provinces (Aurora, Basilan, Bataan, Batangas, Cagayan, Cavite, Isabela, Laguna, Quezon and Zamboanga) from 2014 to 2016. Materials for DNA extraction were obtained from a single spore colony. The ITS-5.8s nucleotide regions were amplified but only 158 EPF samples were successfully sequenced. These nucleotide sequences were then compared with the sequences in the GenBank database using Basic Local Alignment Search Tool (BLAST) of National Center for Biotechnology Information (NCBI). Some of the fungal genera identified were: 1) entomopathogenic strains, namely, *Aschersonia*, *Fusarium* and *Purpureocillium*; 2) the endophytes, *Clonostachys* and *Penicillium*; 3) a plant disease antagonist such as *Lecanicillium*. The potential entomopathogenicity of these isolates are currently being evaluated using Koch's postulates tests and bioassays.

Key words: *Aspidiotus* spp. coconut scale insects, entomopathogenic fungi

39. FIRST RECORD OF A *Steinernema* SPECIES IN ZAMBOANGA CITY

Romnick A. Latina* and Barbara L. Caolli Crop Protection Cluster, College of Agriculture, University of the Philippines Los Baños, College, 4031 Laguna; *e-mail: romnicklatina@gmail.com

Over the past years, the utilization of entomopathogenic nematodes (EPNs) has grown exponentially, making entomopathogenic nematology as one of the growing fields in crop protection and as a promising, eco-friendly alternative for insect pest management. Using *Ostrinia furnacalis*-bait technique, an EPN population was isolated from soil samples collected from San Ramon, Zamboanga City, Zamboanga del Sur. Morphological observations based on general diagnostic characters of the infective juveniles (IJs), first generation females and males, insect cadaver properties and molecular characterization using the 16S and 28S of the ITS region of the rDNA led to its classification under the genus *Steinernema*. Based on the average IJ length ($492.25 \pm 85.14 \mu\text{m}$), and the wide spicule head exhibited by the males, this EPN shows resemblance to the members of the *S. carpocapsae* group. However, molecular data suggest that it is a novel species.

Key words: entomopathogenic nematodes, ITS, *Ostrinia furnacalis*, spicule, *Steinernema*, Zamboanga City

40. FIELD EVALUATION OF SPINETORAM 60 SC FOR EFFICACY AGAINST DIAMONDBACK MOTH [*Plutella xylostella* (L.)] ON CABBAGE (*Brassica oleracea* L.) IN BENGUET, PHILIPPINES

E.V. Cardona, Jr.¹, B.V.G. Ermita², S. Samanwong³, V.O. Luasing². ¹Department of Entomology, College of Agriculture, Benguet State University, La Trinidad, Benguet, Philippines, ²Dow AgroSciences B.V. Philippines Branch, 6750 Bldg., Ayala Avenue Makati City, Philippines, ³Dow AgroSciences (Thailand) Ltd. Sukhumvit 42 Road, Prakanong, Klongtoey, Bangkok 10110, Thailand

Spinetoram (Exalt 60 SC), a new chemical in the spinosyn class of insecticides, was evaluated for efficacy against Diamondback Moth or DBM [*Plutella xylostella* (Linnaeus)] in the Philippines. The field trials were conducted in three Benguet locations, namely, La Trinidad, Atok and Buguias. Four rates of Spinetoram at 15, 20, 30 and 45 g ai/ha were evaluated for control of DBM population and agronomic parameters (phytotoxicity, insect/DBM damage, quality of harvest and yield) versus commercial standards Pyridalyl, Chlorantraniliprole, Flubendiamide and Spinosad at their recommended label use rates. Results showed that Spinetoram provided better control of DBM population, less DBM damage, better quality of harvest and higher yield versus commercial standards Chlorantraniliprole and Flubendiamide. Moreover, the different treatments of Spinetoram also exhibited comparable to better DBM control and other above mentioned agronomic parameters versus commercial standards Spinosad and Pyridalyl.

Key words: cabbage, diamondback moth, *Plutella xylostella*, Spinetoram 60SC

41. CROPGUARD® SPRAY OIL APPLIED ALONE AND AS ADJUVANT AS PESTICIDE ENHANCER FOR THE CONTROL OF MAJOR INSECT PESTS OF STRING BEANS AND EGGPLANT

Marilyn G. Patricio*, Arturo O. Manipon, Rolando Pagaduan and Rovel S. Melegrito. Research Office, Central Luzon State University, Science City of Muñoz, Nueva Ecija; *e-mail: marilynpatricio_3025@yahoo.com.

The use of adjuvant in crop production is now the recent trend and has indicated some potential to increase effectiveness of some chemical products when mixed together. The study determined the performance of CropGuard® spray oil alone and in combination with the insecticide Rynaxypr against major insect pests in string beans and eggplant at the Research Experimental Area, Central Luzon State University, Science City of Muñoz, Nueva Ecija. Three rates of CropGuard® viz., 32, 64 and 96ml/16Lwater, chemical insecticide Rynaxypr at full and half the recommended rate (RR) at 30ml and 15ml/16Lwater, respectively and their combination were evaluated. An adjuvant Hoestick plus insecticide Rynaxypr and untreated control served as standard checks. Application of CropGuard® at 64 and 96 ml/16L water provided resulted to low aphid population but not significantly different from combination with either full and half RR of insecticide Rynaxypr. On eggplant, results revealed that application of CropGuard® at 32ml/16Lwater + RR Rynaxypr insecticide provided consistently and significantly the lowest number of green leafhoppers, aphids and fruit borer larvae as compared with the rest of the treatments. On the other hand, the population of beneficial insect, coccinellid beetle was slightly affected with the application of CropGuard® at any rates + RR Rynaxypr insecticide. Significantly

more (73) and heavier (6.24kg per plot) fruits were also obtained from plants treated with Cropguard® at 32ml/16L water and Rynaxypr.

Key words: adjuvant, CropGuard®, eggplant, Rynaxypr, string beans

42. EVALUATION OF SOME BOTANICALS FOR THE CONTROL OF THE RICE GRAIN BUG, *Paraeucosmetus pallicornis* (Dallas), UNDER LABORATORY AND SCREENHOUSE CONDITIONS

Gerardo F. Estoy, Jr., Belen M. Tabudlong, Susana B. Montilla and Malou A. Bernat. Philippine Rice Research Institute, Agusan Experiment Station, Basilisa, Remedios T. Romualdez, Agusan Del Norte and Caraga State University, Ampayon, Butuan City

Nine botanical extracts: neem leaf, wild sage, lagundi leaf, marigold leaf, ginger rhizome, chili pepper fruits, tobacco leaf, lemon grass, sugar apple and insecticide (check) were evaluated against adult rice grain bug (RGB), *Paraeucosmetus pallicornis* (Dallas). Bioassays were conducted separately using filter paper and spraying methods under the laboratory and screenhouse conditions to determine the effectiveness of each botanical extract on the RGB. The mortality of RGB using filter paper and spraying methods varied based on the three trials conducted. Low mortality of the insects was recorded after three and six days post treatment which ranged from zero to 27% and three to 67%, respectively. The tobacco leaf extract was very effective against RGB adults resulting in 100% mortality after five minutes post treatment, while insecticide caused the same mortality after one hour for both application methods used. On the other hand, spraying method using lemon grass extract caused highest percent mortality (50%) during the 1st trial and sugar apple (70%) in the 2nd trial after three days post treatment. Other botanicals such as neem leaf extract, ginger rhizomes extract, chili pepper fruit extract and lemon grass extract showed more than 50% mortality after six days with 63%, 57%, 63% and 80% in the 1st trial, respectively. In addition, the RGB was affected after one hour exposure to lagundi leaf extract showing 13-17% mortality in the laboratory.

Key words: botanical extracts, mortality, *Paraeucosmetus pallicornis*, rice grain bug

43. LABORATORY EVALUATION OF PIRMECON AGAINST RICE WEEVIL COMPLEX, *Sitophilus* spp., RED FLOUR BEETLE, *Tribolium castaneum* (Herbst), AND LESSER GRAIN BORER, *Rhyzopertha dominica* (Fabr.)

Pio A. Javier and Evangeline G. Punzalan. Crop Protection Cluster, College of Agriculture, University of the Philippines Los Baños, College, 4031 Laguna

The effectiveness of three concentrations of Pirmecon 55EC (3.30, 6.60 and 13.20 ml/li H₂O) was evaluated against three stored product insect pests [rice weevil complex, *Sitophilus* spp.; red flour beetle, *Tribolium castaneum* (Herbst) and lesser grain borer *Rhyzopertha dominica* (Fabr.)]. Actellic 50EC at 6.60 ml/li served as standard insecticide while plain water was used as control for comparison. Each concentration of the test insecticide was sprayed separately on 20 x 30 cm polypropylene sack to the point of run-off, air-dried and placed inside a 19-cm diameter acrylic pan. The test insects were separately introduced inside the acrylic pan containing the sack impregnated with each of the insecticide treatments. The exposure of *Sitophilus* spp., *T. castaneum* and *R. dominica* immediately after sack-impregnation with Actellic and three concentrations of Pirmecon provided 100% mortality of all the test insects. The sack impregnation of the different insecticide treatments remained residually effective against *Sitophilus* spp. and *T. castaneum* until 60 days, with 100% mortality. Likewise, 100% mortality was obtained for *R. dominica* when exposed from 5-25 days after sack impregnation with all insecticide treatments. Pirmecon at 6.60 ml/L is as effective as the standard insecticide (Actellic) in protecting grains against the infestation of *Sitophilus* spp., *T. castaneum* and *R. dominica*, even up to 60 days after sack impregnation.

Key words: Pirmecon 55EC, *Rhyzopertha dominica*, *Sitophilus*, *Tribolium castaneum*, stored product pests

44. SEASONAL PATTERNS OF BROWN AND WHITE-BACKED PLANTHOPPER POPULATIONS ON RICE

Genaro S. Rillon¹, Alvin J. Gabriel¹ and Jang-Kyun Seo². ¹Crop Protection Division, Philippine Rice Research Institute (PhilRice), Maligaya, Science City of Muñoz, 3119 Nueva Ecija, Philippines; ²Crop Protection Division, National Academy of Agricultural Science (NAAS), Rural Development Authority (RDA), Korea; Corresponding author: e-mail: gs.rillon@philrice.gov.ph, gsrillon@yahoo.com

Monitoring technique for rice planthopper using light trap was established in 2014 to 2015 at the PhilRice Central Experiment Station (CES), Maligaya, Science City of Muñoz, Nueva Ecija. The highest numbers of planthopper population were recorded in March to April and August to September. Considering the months of January to June, there was about 72% reduction in RPH population in 2014 compared to that in 2015. The planthopper field populations were also determined using sticky trap in two sites located in PhilRice CES, Science City of Muñoz and Mabini, Sto. Domingo, Nueva Ecija. During the 2015 dry season, the highest numbers of planthoppers were in the months of March to April. These populations were about twice lower than those in the dry season of the previous year. Moreover, it was also noted that the ratio of populations of planthoppers to that of spiders was high at about 1:1. These observed high populations of RPH were monitored using sticky trap and coincided with the reproductive to ripening phases of rice plants in the field. Further, planthopper adults invaded rice at reproductive phase and seems to invade rice earlier during wet season. For both dry and wet seasons, monitoring data showed that white-backed planthopper was usually earlier in colonizing rice plants than the brown planthopper.

Key words: brown planthopper, monitoring, white-backed planthopper, rice, seasonal populations

45. SURVEY OF INSECTS, MITES AND SLUGS ASSOCIATED WITH SELECTED FRUIT CROPS GROWN IN THE PROVINCES OF THE CORDILLERA ADMINISTRATIVE REGION (CAR)

Lucille M. Faroden¹, Lita M. Colting¹, Kevin Joe P. Eladjoe¹, Arnel T. Manuel¹, Marissa R. Parao² and Joan D. Bacbac³. ¹Department of Entomology, College of Agriculture, Benguet State University (BSU), La Trinidad, Benguet; ²College of Forestry, BSU, La Trinidad, Benguet; ³Office of the Coordinator, High Value Crops Development Program, Department of Agriculture-Regional Field Office-Cordillera Administrative Region

The climate in the Cordillera Administrative Region is suitable for growing various semi-temperate vegetables and other fruit-bearing crops. The high altitude of Benguet makes it ideal for strawberry production, while the municipality of Itogon and the provinces of Apayao and Abra with a warmer temperature are suited for banana and mango production. Conducted with another parallel study, the assessment and identification of beneficial and pest arthropods of selected fruit crops were done through field survey, collection and identification. The presence and degree of injury inflicted by arthropod pests were also recorded. The banana aphid, *Pentalonia nigronervosa* Coquerel, a notorious vector of the banana bunchy top virus, remained to be a major pest of banana as it was found prevalent in every banana plantation visited. It is present especially on Lacatan variety. Mango twig borers (*Callimetopus* sp.) were the most destructive pests observed on mango, the two-spotted spider mites (TSSM) *Tetranychus urticae* Koch remained to be the major pest on strawberry while the veronicid slug is an emerging major pest as it targets the berries and reduces yield. The lady beetle *Harmonia* sp., was observed preying on *Pentalonia* aphids. Although the said lady beetle generally preys on any aphid species, in mango, the red weaver ant *Oecophylla* sp., a generalist predator, was also observed. To summarize, there were a total of 19 arthropods identified and collected on banana plants, 10 on mango plants, and eight on strawberry.

Key words: arthropods, banana, *Callimetopus*, lacatan, mango, *Oecophylla*, *Pentalonia nigronervosa*, strawberry, *Tetranychus urticae*

46. DEVELOPMENT, MORTALITY RATE AND ADULT LONGEVITY OF RICE GRAIN BUG, *Paraeucosmetus pallicornis* (Dallas), ON RICE AND STRING BEANS *Vigna sesquipedalis* (L.) UNDER CONTROLLED CONDITIONS

Leslie T. Ubaub¹ and Earl Anthon P. Cadalin². ¹College of Agriculture and Related Sciences, University of Southeastern Philippines, Tagum-Mabini Campus, Apokon, Tagum City, Philippines; e-mail: leslieubaub@gmail.com; ²Visayas State University, Baybay City, Leyte, Philippines

Paraeucosmetus pallicornis (Dallas), locally known as Rice grain bug (RGB) is considered a new pest of rice in the Philippines. Originally, RGB is a pest attacking string beans which is commonly planted along the bunds of rice field. This study was conducted to be able to establish the effect of string beans and rice plant on the duration of each developmental stage and adult longevity of *P. Pallicornis* Dallas under controlled condition. The duration of egg incubation and adult longevity of RGB both on rice and string beans in laboratory and greenhouse were not significantly different. Although there were nymphal instar

durations that were found to be significantly different, this not affect the total developmental period of RGB on rice and string beans under laboratory conditions. In the greenhouse, the total development periods of RGB were significantly different on rice and string beans wherein RGB reached adult stage on the average of 30.75 days on rice plants compared to an average of 43.59 days for those on string beans. This suggests the possibility that a second generation of RGB will be produced by the new batch of RGB adults bred on rice plants. Considering that the reproductive to ripening phase of rice is about 65 days, the duration of this phase could accommodate a second generation of RGB nymphs and adults. Percent mortality of RGB on rice and string beans was 23.33% under laboratory condition while in greenhouse, 76.66% was recorded in rice and 55% on string beans.

Key words: adult longevity, development, mortality, rice, rice grain bug,, *Paraucosmetus pallicornis*, string beans

47. MONITORING OF RICE PESTS IN WESTERN PANGASINAN

Bonifacio F. Cayabyab¹, Mauro L. Antineo², Melvin D. Ebuenga¹, Ronna P. Frianeza², Pablito G. Gonzales¹, Gideon Aries S. Burgonio³ and Ireneo B. Pangga¹. ¹Crop Protection Cluster, College of Agriculture, UP Los Baños, College, Los Baños, Laguna, ²Provincial Agriculture Office, Dasol, Pangasinan, ³Office of the Vice Chancellor for Research and Extension, UP Los Baños, College, Los Baños, Laguna

Ocular observation, sweep net, and key person interview were utilized to monitor the unusual high population occurrence of armyworms, brown planthoppers (BPH) and white-backed planthoppers (WBPH) in rice fields in Western Pangasinan towns of Alaminos, Agno, Bani, Burgos and Mabini from July to September, 2016. In rice fields with different growth stages and varieties, sweep-net sampling (10 sweeps/plot) replicated three times was done to generate insect counts data. The results showed a mean population of up to 660 white-backed planthoppers per plot across six barangays in the said towns of Western Pangasinan. Glutinous rice fields in Brgy. Magsaysay, Alaminos were infested by BPH causing very severe cases of hopper burns. In the town of Burgos, out of 168.2 hectares 14.9 hectares and 35.5 hectares were infested by BPH/WBPH and armyworm, respectively during the last week of August 2015. Meanwhile, in Mabini around 72 hectares of rice area were affected by BPH/WBPH. The occurrence of patches of high population can be attributed to the dry spell followed by strong rains in the above mentioned localities prior to the increased population and damages caused by the above mentioned rice pest. A proactive surveillance of rice pests in the same localities and other areas, especially now with the on-going El Niño episode in the country, is imperative.

Key words: armyworms, brown planthoppers, sweep net, ocular white-backed planthoppers

48. OCCURRENCE OF CIGARETTE BEETLE, *Lasioderma serricorne* (FABRICIUS) (COLEOPTERA: ANOBIIDAE), ON COMMERCIAL SIBOT HERB MIXTURE

Ireneo L. Lit, Jr.^{1,2}, Merdelyn T. Caasi-Lit³, Cristian C. Lucañas¹ and Whizvir O. Gustilo. ¹Entomology Section, Museum of Natural History, ²Institute of Biological Sciences, College of Arts and Sciences, University of the Philippines Los Baños Laguna, 4031; ³Entomology Laboratory, Institute of Plant Breeding, Crop Science Cluster, College of Agriculture, University of the Philippines Los Baños Laguna, 4031

"Sibot" or "sibut" is a mixture of culinary herbs, mostly of Chinese origin, used in the preparation of black chicken soup. The concoction is believed to have medicinal properties especially for patients recuperating from serious maladies. Among commercially available packets of sibot culinary herb mix, live insects were observed, which upon detailed observation in the laboratory, were identified to be anobiid beetles of *Lasioderma serricorne* (Fabricius) (Coleoptera: Anobiidae), more commonly known as cigarette beetle and is a well-known stored product pest. Chefs or cooks who prepare sibot chicken soup may or may not be aware of the insect pest and it is not clear whether the insect itself adds flavor to the uniquely pleasant Chinese cuisine. It is clear, however, that one of the components of sibot herb mix, most probably the soft woody stem or dried starchy slices of *Dioscorea polystachya*, and/or the dried goji berry *Lycium barbarum*, may serve as the primary host of the beetle among the component herbs of sibot and therefore, a possible source of infestation for other stored products. Infestations among sibot samples from selected markets in Laguna are compared.

Key words: Anobiidae, cigarette beetle, culinary mix, *Lasioderma serricorne*, sibot

49. **HOST PATCH STRUCTURE AND CROPPING SYSTEMS AFFECTING DENSITY OF COCONUT SCALE INSECTS (CSI), *Aspidiotus* spp., IN REGION 4A COCONUT LANDSCAPES**

Japhia V. Medillo, Cella dR. Medina, and Luis Rey I. Velasco. Crop Protection Cluster- College of Agriculture, UPLB, College, Laguna;
²Crop Protection Cluster- College of Agriculture, UPLB, College, Laguna

The abundance and distribution of coconut scale insects (CSI), *Aspidiotus* spp. (Hemiptera: Sternorrhyncha: Diaspididae) was studied in relation to the landscape structure in Region IV A. An area wide stratified purposive sampling in 50 x 50 m site done in patchy and contiguous coconut farms. Higher insect density in patchy compared to contiguous landscapes was observed in 0.05% confidence. Number of alive and dead insects in patchy host were higher; 178.74, 141.10; and 42.97, 79.19 in contiguous hosts. Cropping systems affected insect densities. It is higher in intercrop systems. This study showed that CSI prefer patched landscape, suggesting that resource concentration by Root (1973) is not applicable. Important factors like host plant quality, favorable environment conditions, alternate hosts, and cropping systems are important factors in a host patch structure for a successful colonization.

Key words : coconut scale insects, *Aspidiotus* spp., resource concentration hypothesis, host patch structure, cropping system

50. **OBSERVATIONS ON NESTS OF SOME HYMENOPTERAN SPECIES IN LAGUNA AND QUEZON, LUZON, PHILIPPINES**

Kristine O. Abenis¹ and Ireneo L. Lit, Jr.^{1,2}, ¹Entomology Section, Museum of Natural History and ²Institute of Biological Sciences, College of Arts and Sciences, University of the Philippines Los Baños Laguna, 4031

Vespididae and Sphecidae are some groups of Hymenoptera that are nest-building. Several authors included studies of nests to gather data on insect behavior and ecology and correlate those with other aspects of taxonomy and systematics. The nests for study provide information on nest architecture, correlation of cell size and sex, provision to larvae or prey preferences, life history and other facets of the ecology of the species. The patterns of nests are said to be usually uniform in a single genus and in some groups these are being used to characterize species. Field surveys conducted in Mt. Makiling and Real, Quezon Land Grant from 2015 to 2016 revealed diversity in nest architecture of some vespid and sphecid species occurring in Luzon, Philippines. Nests and associated species observed in the wild and those collected during the surveys were photographed and provided with the abovementioned information whenever possible.

Key words: hymenopteran nests, Sphecidae, Vespidae

51. **FROM SWEET FIELDS INTO DARKNESS: A CAVE-INHABITING CHEYLETID MITE FROM THE PHILIPPINES**

Leonila A. Corpuz-Raros¹ and Jeremy C.B. Naredo². ¹Crop Protection Cluster, College of Agriculture, University of the Philippines Los Baños, College, Laguna; ² Museum of Natural History, University of the Philippines Los Baños, College, Laguna

An undescribed species of the genus *Lanceaheylya* Xia, Klompen & Childers, 2011 (Acariformes: Prostigmata: Cheyletidae) has been collected from bat guano inside a cave in Bulacan Province, Luzon Island, Philippines. This species differs from the type species, *L. whartoni* Xia, Klompen & Childers, 2011, by the lanceolate caudal seta *h2* which, like the humeral seta *c2*, is differentiated in shape from the squamiform setae of dorsal shields; presence of horn-like anterolateral projections on protegmen, reticulate (vs. granulate) pattern of tegmen and protegmen; presence of cupules *im* and *ip*; and transverse arrangement of anal setae *ps1-3* on a half-moon shaped anal plate (vs. longitudinal). The habitat of the *Lanceaheylya* species from the Philippines differs extremely from that of *L. whartoni* which was described from leaves of oranges in California. Morphological characteristics are described and illustrated based on the female of this species.

Key words: Acari, cave-inhabiting mite. Cheyletidae, guanophile, *Lanceaheylya*

52. **DISTRIBUTION AND PARASITIZATION RECORDS OF *Comperiella* sp. (HYMENOPTERA: ENCYRTIDAE) IN SOUTHERN TAGALOG PROVINCES INFESTED BY *Aspidiotus rigidus* Reyne (HEMIPTERA: DIASPIDIDAE)**

Billy Joel M. Almarinez^{1*}, and Divina M. Amalin¹. ¹Biology Department, College of Science, De La Salle University, Manila.
*Corresponding Author: billy.almarinez@dlsu.edu.ph

The outbreak of the invasive coconut scale insect, *Aspidiotus rigidus* Reyne, in Southern Luzon, first observed in 2009 in the province of Batangas, severely devastated plantations and consequently impaired production in the coconut-producing areas of Southern Luzon. It was declared a national emergency in mid-2014. In the light of this crisis, surveys were conducted in search of native natural enemies that may be part of the pest's natural enemy complex and that may eventually be used as biological control agents as part of an environmentally sound and sustainable integrated pest management (IPM) protocol. Among the natural enemies found, a tiny parasitoid wasp, identified to belong to the encyrtid genus *Comperiella* Howard, showed direct association with *A. rigidus* in Calauan, Laguna. No record of a native species of *Comperiella* has been reported prior to the survey conducted in Calauan, Laguna. Additionally, thorough morphological examination of the parasitoid suggested that the parasitoid is a completely new species. Its distribution covers not only the province of Laguna but all areas of Southern Tagalog with coconut scale-infested trees. From samples of coconut fronds collected randomly from different points in three provinces in August 2014, its parasitization in *A. rigidus* ranged from about 65 to 92%, with the highest average percent parasitization recorded in the Batangas towns of Tanauan and Sto. Tomas. Furthermore, correlation and linear regression analyses showed density-dependent parasitism by *Comperiella* sp. on *A. rigidus*. These findings, in conjunction with the observed spread of the parasitoid in the Southern Tagalog, suggest the high potential of this new species of *Comperiella* as a biological control agent against *A. rigidus*.

Key words: *Aspidiotus rigidus*, coconut scale insects, *Comperiella*, Encyrtidae