

**[2719] MINING THE DATA OF A PEST MANAGEMENT COMPANY: IMPROVEMENTS TO TUBER FLEA BEETLE AND GREEN PEACH APHID IPM OF CANADIAN POTATOES**

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Insect monitoring data supplied by a professional integrated pest management (IPM) company included weekly counts of numerous pest and beneficial insects in more than 100 potato plantings in each of four years. Data for two pest insects, tuber flea beetle (*Epirix tuberis*) and green peach aphid (*Myzus persicae*), were analyzed using geographic information systems (GIS) software and conventional statistical methods for the purpose of gaining knowledge of the insects population characteristics so to improve the operational efficiency of the company. For tuber flea beetles, the effects of crop rotation were examined by overlay analysis using GIS software. Analysis revealed a significant linear increase in F1 beetle populations in field edge and interior samples with an increase in the number of consecutive years the crop was planted to potatoes. The frequency of sampling days in which overwintered and F1 beetles exceeded threshold levels in interior regions of unrotated fields was twice as great as for rotated fields. In general, the consequence of not practicing crop rotation was assessed to be a 6.4 – 9.5% increase in the potato-growing area requiring insecticidal control of tuber flea beetles. The results emphasized the importance of crop rotation for beetle control. Knowing which fields have and have not been rotated can assist IPM companies in prioritizing monitoring activities early in the season. For the green peach aphid, analysis of four years of data (one year with abnormally high aphid levels) revealed that none of the potato fields studied exceeded the normal aphid threshold level (10 aphids/triplet) until the tenth week of monitoring, which occurred between July 9 and 15. No differences in aphid levels were detected between edge and interior samples, suggesting that sample means could be regarded as randomly distributed throughout the field. When comparing per triplet aphid counts (normally used in monitoring aphids) with a binomial sampling system (presence or absence of aphids), per triplet counts best correlated with the proportion of triplets exceeding three aphids ( $R^2=85\%$ ). These findings indicate that aphid monitoring can be delayed and sampling reduced by either abandoning edge or interior samples, or by replacing the assessment of the threshold using per triplet counts with enumeration of the proportion of triplets exceeding three aphids.

Index terms: *Epirix tuberis*, *Myzus persicae*, Integrated Pest Management, Geographic Information Systems, potato.

**[2720] INTEGRATED PEST MANAGEMENT OF MAJOR INSECT PESTS UTILIZING APHID RESISTANT VARIETY AND NATURAL ENEMIES ON GREENHOUSE MELON**

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The development of integrated pests management (IPM) for the major insect pests, cotton aphid *Aphis gossypii*, silverleaf whitefly *Bemisia argentifolii*, twospotted spider mite *Tetranychus urticae* and melon thrips *Thrips palmi*, utilizing natural enemies such as *Chrysoperla carnea*, *Encarsia formosa*, *Phytoseiulus persimilis*, *Orius sauteri* is expected, in Japan. However, there is one problem. When all insect pests are to be controlled by utilizing only natural enemies, multiple species of natural enemies need to be released many times respectively. In the actual cultivational usage, the control expense will be very high. Therefore, an attempt at successfully using IPM program for major insect pests, utilizing the aphid resistant variety of melon combined with natural enemies, was conducted with the purpose of reducing the number of released times or released quantities. In this study, the population development of cotton aphid on resistant variety (Kurume No.5), which was bred in our institute and a common variety (Earl's Seinu Natsu II; non-resistant) were compared to greenhouse melon cultivated from the spring to summer seasons. And, the IPM programs combined four species of natural enemies, *C. carnea*, *E. formosa*, *P. persimilis*, and *O. sauteri* with a resistant variety and a common variety for the major insect pests, which were tested in the same conditions. Aphid populations on the resistant variety were controlled from 1/3rd to 1/4th of the density as compared with the ones on the common variety. Also, silverleaf whitefly populations were slightly lower on the resistant variety when compared with the ones on the common variety. When the larva of *C. carnea* were released onto the cotton aphid, five times every two weeks since the aphids population started to increase on the common variety, the aphid populations were effectively controlled to a low density, and this result was less than economic injury level. Control effect on the resistant variety was more efficient than on the common ones under the same releasing conditions. These results indicate that it will be possible to reduce the number of releasing times and released quantities substantially. High effects of control were obtained by the two times release of *P. persimilis* onto spider mite as well as by the one time release of *O. sauteri* onto melon thrips for the resistant and common variety with no difference in test results. Good whitefly control resulted when the four times release method of *E. formosa* was used on the whitefly early growth stage of population.

Index terms: melon, aphid resistant variety, IPM, natural enemy

**[2721] EFFECTIVENESS OF VINYL FILM THAT COMPLETELY ABSORBS ULTRAVIOLET REGION SPECTRUM FOR IPM IN GREENHOUSE CULTIVATION**

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Vinyl film that completely absorbs ultraviolet region spectrum (UVA) is used as the covering material of plastic greenhouse. In the plastic greenhouse covered with UVA, occurrence of several diseases become smaller and plant grows more than that covered with common agricultural vinyl film (CA). Injury of several pests, i.e. thrips, aphids, whitefly, are also smaller in the greenhouse covered with UVA, but the mechanism of the reduction of the injury is unknown. To examine the mechanism of the reduction of injury of *Thrips palmi*, cucumber plants were cultivated in a greenhouse covered with UVA and that covered with CA. Female adults were released in both greenhouses, and the population growth and the movement of the adults was examined. The populations increased in the same manner in both greenhouses. The dispersal of the adults released was limited and occurred only along with the rows in both greenhouses. Dispersal and flight in the greenhouse covered with UVA were more limited than those in the greenhouse covered with CA. Immigration into the greenhouse covered with UVA was also less than that covered with CA. Elimination of ultraviolet region spectrum does not affect the population growth of *Thrips palmi* but it decreases the immigration into the greenhouse. Decrease of immigration brings the decrease of injury in the greenhouse covered with UVA. To examine the effect of UVA to the biological control of *Trialeurodes vaporariorum* by *Encarsia formosa*, tomato plants were cultivated in plastic greenhouses covered with two types of vinyl film and *T. vaporariorum* and *E. formosa* were released in both greenhouses. The population of *T. vaporariorum* fluctuated in the same manner in both greenhouses, and *E. formosa* well controlled *T. vaporariorum* in both greenhouses. Dispersal of *E. formosa* in the greenhouse covered with UVA were less than those in the greenhouse covered with CA. Elimination of ultraviolet region spectrum does not affect the biological control of *T. vaporariorum* by *E. formosa*, but it decreases the dispersal in the greenhouse. UVA is a beneficial material for the IPM in greenhouse cultivation because of the reduction of disease and insect pests, but we have to pay attention to the decrease of dispersal of natural enemies in the greenhouses covered with UVA.

Index terms: *Thrips palmi*, *Encarsia formosa*, *Trialeurodes vaporariorum*, immigration, dispersal.

**[2722] CALCIUM SILICATE APPLICATION ENHANCES RESISTANCE OF SUGARCANE TO THE STALK BORER *ELDANA SACCHARINA***

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The African sugarcane stalk-borer, *Eldana saccharina* (Lepidoptera: Pyralidae), is the most important pest in sugarcane in South Africa. Resistant varieties can reduce the impact of the pest, but additional measures that enhance plant resistance deserve consideration. Six commercial varieties of sugarcane were treated with calcium silicate to investigate the effect of assimilated silicon on host-plant resistance to *E. saccharina*. A replicated split-plot trial was established in a shade house using cane planted in pots containing river sand. Two treatment levels of calcium silicate (2500 kg/ha and 5000 kg/ha or ca. 400 and 500 kg/ha of pure silicon, respectively) were applied at planting and again at six months. Controls received no calcium silicate. Leachate and leaf samples taken from all treatments confirmed that silicon levels in the growing medium and the plant itself were in accordance with applied treatment levels. The plants were artificially infested with *E. saccharina* eggs at 9.5 months and the trial was harvested six weeks later to record *E. saccharina* larval and pupal numbers and mass (borer performance) and borer damage (stalk length and number of stalk internodes bored). Silicon application significantly reduced borer performance and damage (ANOVA; min. F value=5.1; p<0.05), in particular between controls and the higher (5000 kg/ha) silicon treatment level, where borer mass was reduced by 19.8% and borer damage by 33.7%. Values for the 2500 kg/ha treatment were intermediate between controls and the higher treatment. The interaction between variety and silicon treatment was non-significant when varieties were examined individually in the analysis. However, the interaction was significant (F=3.6; p<0.05) for number of stalk internodes bored when combined results from two susceptible and two resistant varieties were compared in the ANOVA. The ameliorating effect of silicon on resistance was greater for susceptible than for resistant varieties. Results indicate that calcium silicate application in the field may achieve a substantial increase in resistance of sugarcane to *E. saccharina* attack. As the effect of silicon on resistance was greater for susceptible (high sucrose content) varieties, this may permit planting of such varieties in rain-fed (as opposed to irrigated) areas, where the risk of borer attack is greater.

Index terms: Lepidoptera, Pyralidae, pest, silicon