ENTOMOLOGY

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ABSTRACTS

Effect of Barley Yellow-dwarf Virus Infection of Wheat and Oats on the Life Cycle of *Rhopalosiphum padi* (L.). Jaime E. Araya and John E. Foster, Department of Entomology and the U.S. Department of Agriculture, Purdue University, West Lafayette, Indiana 47907.——The life cycle of the bird cherry oat aphid, *Rhopalosiphum padi* (L.), was studied in the laboratory comparing specimens carrying Barley Yellow-dwarf virus (BYDV, PAV isolate) and virus-free aphids. Sections of leaves of wheat cultivars 'Abe' and 'Caldwell,' and oats 'Clintland 64' and 'Porter,' infected with BYDV and virus-free, were used to rear the aphids in Petri dishes at 18 ± 1°C. Daily observations were recorded for pre-and reproductive periods, life duration, adult life, total number of progeny produced, mean progeny produced, and mean number of nymphs per day during the reproductive period of all treatments. The data were analyzed separately for each crop by ANOVAs and the Student-Neuman Keuls' test was used to separate means ($P = 0.05$).

The data showed the aphids had a shorter life period and adult life in virus-infected wheat plant material. There were also differences for life duration when analyzing wheat cultivars x BYDV-infection. Virus infection in wheat increased the reproductive capacity of the aphid. No significant differences were detected when using oats. Further studies are needed to clarify the epidemiological relationships of all strains of BYDV, their vectors, and plant cultivars.

Efficiency of Pollen Traps with Various Sized Trap Screens. William E. Chaney, R.P.E., Extension Apiculturist, Purdue University, West Lafayette, Indiana 47907.——In recent years beekeepers have become interested in trapping the pollen pellets from incoming foraging bees for a variety of reasons. These reasons include: 1) Trapping pollen for sale 2) Trapping pollen to feed to different hives or the same hive at a later date 3) Prevent the hive from becoming pollen-bound 4) Preventing pesticide contaminated pollen from being stored in the hive.

Five sizes of wire mesh were tested in identical traps randomly assigned to a different hive of approximately equal strength. One of these meshes is the commonly recommended size. The study was replicated in three locations. The trapped pollen was collected regularly and weighed. Halfway through the experiment the traps were randomly reassigned within the five hives in each location.

None of the four meshes tested was found to be better than the currently recom-

mended size. The size of the pollen pellet influenced the effectiveness of the various sized meshes. The size of the pollen pellet was determined mostly by the plant foraged and by the habits of individual foraging bees.

Effect of Viruliferous and Non-viruliferous *Rhopalosiphum padi* (L). Aphids on Winter Wheat. B.H. CHEN, J.E. FOSTER, AND H.W. OHM. Departments of Entomology, U.S. Department of Agriculture and Department of Agronomy, Purdue University, West Lafayette, Indiana 47907.——The bird-cherry oat aphid, *Rhopalosiphum padi* (L.) is capable of damaging cereal crops by direct feeding and by transmitting the barley yellow dwarf virus (BYDV). Experiments were conducted to determine the effect of viruliferous and non-viruliferous *R. padi* on two wheat cultivars, Caldwell and Abe, and one wheat germplasm line, Elmo, in the greenhouse. *R. padi* without carrying any isolate of BYDV and those with PAV isolate were used for non-viruliferous and viruliferous infestation respectively. Results indicated that both viruliferous and non-viruliferous *R. padi* significantly affected tiller number, kernel number, and kernel weight per plant of Abe and Elmo. The non-viruliferous and viruliferous aphids reduced the weight of kernels per plant of Abe 37% and 48%, respectively. No significant reductions in these yield components were found on Caldwell plants infested with non-viruliferous aphids. Caldwell was shown to have a measure of tolerance to *R. padi* and/or BYDV while Abe was shown to be susceptible.

Mass Rearing the Bird Cherry Oat Aphid, *Rhopalosiphum padi* (L.). C. KUDAGAMAGE AND J.E. FOSTER, Department of Entomology and the U.S. Department of Agriculture, Purdue University, West Lafayette, Indiana 47907.——Breeding cereal crops for resistance to *Rhopalosiphum padi* (L.) and or barley yellow dwarf virus (BYDV) disease could provide a cheap means of control of the aphid and BYDV without adversely affecting the environment. In a resistance breeding program methods should be available for conveniently rearing the aphids.

Most studies on laboratory rearing have been directed towards finding the effect of host plant and temperature on the reproduction and survival of *R. padi*. However, in the literature, studies on the temperature effects on the biology of the aphid shows considerable variation of results by different workers. Therefore we decided to investigate the effect of temperature and light on mass rearing of bird cherry oat aphid.

We investigated the effect of five temperature regimes 13, 18, 20, 28°C and two photophase and scotophase periods 12:12, 14:10 h on prereproductive period (time taken for the aphids to reach reproductive stage) and fecundity. The optimum temperature and photophase: scotophase for rearing *R. padi* was determined to be 20°C and 14:10 h respectively. At this temperature and photophase the mean progeny production was high and pre-reproductive period was short.

Assessment of Numbers of Striped Cucumber Beetle Adults and Frequency of Feeding Injury on Muskmelon Cultivars. G.L. REED AND D.K. REED, Fruit and Vegetable Insects Research Laboratory, Agriculture Research Service, USDA, Vincennes, Indiana 47591.——Field plantings of 74 muskmelon cultivars were evaluated to compare relative differences in attraction and feeding injury by adult striped cucumber beetles. Seedling and early vining stage of muskmelon plants were observed for numbers of beetles and evidence of feeding injury to leaves and stems. Considerably more beetles were observed on the cultivars Cobmelon, Tamdew and White-rinded honey dew, Charentais Improved and Ogen. Lower frequencies of feeding injury were observed on the stems of cultivars Milwaukee Market, Seneca Delicious, Campo, Early May, and Early Delicious and on the leaves of the cultivar Seneca Delicious.

Relationship of Probing Behavior of *Sitobion avenae* (Fabricius) to Transmission of Luteoviruses Causing Cereal Yellow-dwarf Diseases. H.V. SCHELLER, R.H. SHUKLE, E.S. FURGASON AND J.E. FOSTER, NATO scholar, Departments of Entomology, Electrical Engineering and U.S. Dept. of Agriculture, Purdue University, West Lafayette, Indiana 47907.——The probing behavior of the English grain aphid, *Sitobion avenae* (Fabricious), on oats (*Avena sativa*, var. Clintland 64) has been studied by means of an electronic impedance monitoring system. This system records characteristic waveforms due to changes in the impedance of the aphid/plant connection associated with behavioral elements such as salivation, phloem contact, non-phloem ingestion, and phloem ingestion. Interpretation of recorded waveforms has been confirmed by determining the position of aphid stylets through histological sectioning when characteristic waveforms are produced.

Aphids carrying the PAV strain of barley yellow dwarf virus were given access to noninfected oat plants for limited periods of time. Some aphids were hindered in making phloem contact, other were manipulated to produce multiple probes. Plants were subsequently tested for the presence of virus by means of enzyme-linked immunosorbent assay (ELISA). The association between elements of feeding behavior of *S. avenae* and the transmission of cereal yellow-dwarf virus will be discussed.

Identification of a Pectinase in Larvae of the Hessian Fly, *Mayetiola destructor* (Say). R.H. SHUKLE, H.V. SCHELLER AND J.E. FOSTER, Department of Entomology; NATO scholar, and U.S. Dept. of Agriculture, Purdue University, West Lafayette, Indiana 47907.——The Hessian fly, *Mayetiola destructor* (Say), is a major pest of wheat in the United States, Europe and other parts of the world. We have shown that larvae of this insect possess a pectinase (a polygalacturonase) enzyme that is presumedly involved in the breakdown of cell wall and intercellular matrix material in the wheat plant. Polygalacturonase activity can be demonstrated in extracts of the salivary glands and midgut of larvae by an electrophoretic method using pectin-acrylamide gels. The presence of this enzyme has been further confirmed by reducing sugar assays using polygalacturonic acid (PGA) as the substrate. Optimum pH for hydrolysis of PGA by this enzyme appears to be 7.5. Larvae of five biotypes of *M. destructor* have been examined to date, and all appear to possess polygalacturonase activity.

The possible association of a pectinase enzyme with resistance in wheat to Hessian fly infestation either through a hypersensitive response by the wheat plant, through changes in the chemical composition of cell wall and intercellular carbohydrates, or through the presence of enzyme inhibitors in the plant's tissues will be discussed.

Preference of the Bird Cherry Oat Aphid, *Rhopalosiphum padi* (L.) on Hessian Fly-infested Wheat and Effects on its Biology. V. THIRAKHUPT AND J.E. FOSTER, Department of Entomology and the U.S. Department of Agriculture, Purdue University, West Lafayette, Indiana 47907.——It has been observed frequently in the greenhouse that the Hessian fly-infested wheat plants are also infested with the bird cherry oat aphids much more often than the healthy or resistant plants. The studies were prompted and experiments were planned for confirmation of this observation. The Hessian fly biotype D and biotype D-susceptible wheat varieties—Blueboy, Knox 62, Monon and Seneca—were used as hosts in comparisons with the non-infested plants of the same varieties. Under controlled environmental chamber (20 ± 1°C and 14:10 hours photoperiod), *R. padi* showed significant preferences, providing both free-choice and no-choice tests, on the Hessian fly-infested plants of the three varieties to the non-infested ones, but not on Knox 62. When the aphids were confined on both plants, there were indications that the infested plants provided better conditions to favor their performances.

The most striking effects were on the reproduction and longevity with the least on time to maturity. However, the varietal differences existed and it should be noted that *R. padi* nymphs died before reaching maturity and, thus, failed to establish on the Hessian fly-infested Blueboy.