A COMPARATIVE STUDY OF HOST PLANT ACCEPTANCE BEHAVIORS IN RHAGOLETIS FRUIT FLIES

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Our research on fruit flies within the genus Rhagoletis is focused on the evolutionary differentiation in host selection behaviors and survival abilities in newly formed races and species of phytophagous insects. Our field and laboratory studies have analyzed the host acceptance behaviors of two closely related sibling species; R. pomonella infests apples and the fruits of other plants in the Rosaceae and R. mendax is a specialist on blueberries (Ericaceae).

In our field behavioral studies we worked with young mated females which were released to either a McIntosh apples plant or Bluehaven blueberry plant inside a large plastic mesh cage. We developed a BASIC language program for a TRS-80, model 100 portable microcomputer to record the number of occurrences, starting times, sequence and duration of 14 different behaviors. The program also enables the observer to keep track of the position of the insect on the host plant (e.g., fruit, leaves or branches) under field conditions. A total of 166 female releases were made to blueberries and apples; 82 of these observations were on pomonella flies and 84 were on mendax flies.

On the fruits of blueberry and apple plants, R. mendax and R. pomonella show differences in the number of occurrences and duration of several key host acceptance behaviors. These behaviors include touching the surface of the fruit with the mouthparts, antennating, probing with the ovipositor, laying an egg in the fruit and dragging the surface of the fruit with the ovipositor while laying down an oviposition deterring pheromone. On Bluehaven blueberries, mendax females displayed these behaviors more often than the pomonella females. This difference between the species was reversed on McIntosh apples where the same set of behaviors were shown more frequently by the pomonella females. On blueberry fruits, mendax females laid over four times the mean number of eggs deposited by pomonella females. The opposite patterns was found on apples where the pomonella flies had a significantly higher rate of oviposition. In the sample of mendax females we have studies, there are none which oviposited in McIntosh apples in field trials.

Another aspect of the behavioral differences which exist between mendax and pomonella are differences in the frequencies of transition between behaviors and the presence or absence of entire sequences of behaviors. The conditional probabilities of transition from one behavior to another were computed from the TRS-80 data files. These were used to construct kinematic diagrams for the behaviors displayed on apple and blueberry plants. On apple fruits, mendax flies show distinctly different sequences of behavior compared to pomonella. The R. mendax females lack the entire behavioral sequence of touching the surface of the fruit with the mouthparts followed by antennating, probing, and dragging the ovipositor. The pomonella flies have higher probabilities of transition between these
host acceptance behaviors. The two species also show differences in the sequences of behaviors they display on blueberry fruits. The results obtained from these experiments and our prior viability studies show that the divergence of host selection behaviors and survival abilities are major components of the evolutionary differentiation between these sibling species of *Rhagoletis*. 