DISCRIMINATION OF OCCUPIED HOST FRUIT BY PLUM CURCULIO FEMALES (COLEOPTERA: CURCULIONIDAE)

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Abstract—Larval survival of plum curculios (PCs), Conotrachelus nenuphar (Herbst), was found to decrease with increasing egg density per fruit. Subsequently, we assayed PCs for propensity to avoid egg-laying at sites (immature plums) already occupied by conspecific eggs. Laboratory choice tests showed PCs made an equal number of visits to and ovipositions in fruit with a single oviposition as in clean fruit. Although there was a trend toward more visits to fruit which contained four or eight oviposition wounds and eggs or eight artificial punctures than to clean fruit, PCs oviposited less frequently into these than clean fruit. Results suggest that wounding of fruit may enhance the ability of ovipositing PCs to locate fruit, but at the same time may furnish cues allowing some degree of discrimination against heavily infested fruit for oviposition.

Key Words—Plum curculio, Conotrachelus nenuphar (Herbst), Coleoptera, Curculionidae, oviposition, host discrimination, host location.

INTRODUCTION

Mechanisms which allow resource partitioning and subsequent avoidance of overcrowding and competition among individuals within a host of limited resource capacity are often of positive selective value (Prokopy et al., 1984). Prokopy (1981) reviewed the literature on an array of insects which respond to marking pheromones to avoid ovipositing at sites infested with their own progeny or progeny of conspecifics. Chemical cues emitted from a host likewise
may serve as signals of egg or larval occupancy (Rothschild and Schoonhoven, 1977; Renwick and Radke, 1981, 1985; Girolami et al., 1981; Saxena and Basit, 1982; Mitchell and Heath, 1985).

In recent years, we have been investigating partitioning of larval fruit resources by some of the major apple pests in northeastern North America. Thus far we have found that (1) the apple maggot fly, *Rhagoletis pomonella* (Walsh), lays down a pheromone after oviposition that deters conspecifics from laying additional eggs in the same host fruit (Prokopy, 1972); (2) ovipositing codling moths, *Cydia pomonella*, (L.) do not discriminate against occupied sites through chemical signals but may partition ovipositional resources via other mechanisms (Roitberg and Prokopy, 1982); and (3) the European apple sawfly, *Hoplocampa testudinea* (Klug), responds to wound exudates of host tissue in discriminating against apples already infested with conspecifics (Roitberg and Prokopy, 1984). To date, no quantitative work has been done to determine if a fourth major apple pest, the plum curculio (PC), *Conotrachelus nenuphar* (Herbst), assesses fruit for the presence of conspecifics.

PC adults overwinter in ground cover or soil in or near woods bordering host trees, yet little is known about how PCs locate and choose egg-laying sites upon spring emergence. We do know that within host trees, the majority of movement is by crawling on branches, stems, and petioles until a fruit is encountered (Owens et al., 1982).

Oviposition commences when a female first feeds under the skin of a fruit, forming a flap. She then reverses position and deposits an egg under the flap. After egg deposition, the female again reverses position and continues feeding, forming a large crescent of gouged tissue above the flap. This is thought to relieve pressure produced by proliferating cells of the growing fruit. PCs in nature have been observed ovipositing repeatedly into the same fruit (Quaintance and Jenne, 1912; Owens et al., 1982). This behavior suggests PCs may not discriminate strongly against fruit previously infested with conspecifics. On the other hand, Jacklin et al., (1968) found that PC larval crowding in apples reduced larval weight and rate of survival, hinting that a mechanism by which females could assess conspecific density within a host might be of selective advantage.

At least two other Curculionidae are known to partition resources by avoiding occupied hosts for oviposition. The boll weevil, *Anthonomus grandis grandis* (Boheman), has been shown to discriminate against cotton squares that contain one or more eggs (Stansly and Cate, 1984), and *Ceutorhynchus assimilis*, the cabbage seed weevil, lays down a marking pheromone after oviposition which acts as an oviposition deterrent (Kozlowski et al., 1984). Here we report evidence indicating that PCs can, in fact, recognize a high density of conspecifics within a host via cues emitted from oviposition and/or feeding puncture sites.