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Feeding in the Pigweed Flea Beetle, *Disonycha glabrata* Fab. (Coleoptera:Chrysomelidae), on *Amaranthus retroflexus*

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Disonycha glabrata (Fabr.) is a foliage feedingChrysomelid beetle (subfamily: Alticinae) characterized byenlarged hind coxa, black and yellow striped elytra with blackouter margins, and spots on the prothorax (Garman, 1892). *D. glabrata* is widely distributed throughout the Americas and has been reported in Colorado, Illinois, Indiana, Ohio, NewYork, south to Florida and west to Arizona. Additionally, it is found in Central and South America and in the West Indies from Jamaica to Trinidad (Blake, 1955). *D. glabrata* feeds almost exclusively on *Amaranthus* and is most frequently reported on *A. retroflexus* (pigweed) (Blake, 1933, 1955).

Little is known about *D. glabrata* beyond taxonomic descriptions and limited life history information. Adult andlarval feeding is characterized by small round holes chewed in the leaves of *Amaranthus*. Eggs are laid in clusters at the base of the plant and on the underside of leaves. Three or more generations occur per year. Developmental time averaged 28.1 days at 30 °C (Hemenway and Whitcomb, 1968). Oviposition is terminated when *A. retroflexus* matures and forms seed. *D. glabrata* overwinter in the adult stage in leaf litter.

Garman (1892) suggested *D. glabrata* may be important as a biological control agent because it attacks pigweed, a common weed pest of many agricultural crops. However, before *D. glabrata* can be considered as a biological control agent, feeding must be quantified and investigated.

MATERIALS AND METHODS

Disonycha glabrata were hand collected from *Amaranthus retroflexus* on 26 September and 3 October, 1989, at the Whitethorne Research Farm in Montgomery County, Virginia and returned to the laboratory. Beetles were allowed to feed on fresh foliage for 24 hours and only viable individuals were selected for feeding studies. *Amaranthus retroflexus* and *Datura stramonium* (jimson weed) were also collected from the Whitethorne Research Farm, wrapped in damp paper towels, plastic and kept refrigerated at 15 °C until needed. Leaf disks (14 mm in diameter) were cut from foliage, weighed, and placed in Petri dishes containing moist filter paper.

Mean 24 Hour Feeding Consumption: Eight beetles were selected from field collected specimens. Each beetle was placed in a petri dish containing three weighed *A. retroflexus* leaf disks. Petri dishes were held in a growth chamber type box at 25 °C, 16:8 (L:D) and beetles were allowed to feed for 24 hours. After 24 hours, remaining leaf fragments were removed and weighed. The experiment was repeated for three consecutive days using the same beetles.

TABLE 1. Mean 24 hour foliage consumption of *Disonycha glabrata* on *Amaranthus retroflexus*.

Individual beetle	Mean (in mg)*	SEM
1	15.5	± 5.0
2	21.5	± 3.6
3	18.3	± 3.8
4	21.6	± 4.0
5	25.3	± 11.9
6	30.4	± 4.3
7	12.5	± 2.7
8	28.8	± 3.8

* Means are not significant at the a = 0.05 level

Feeding Consumption Under Three Densities: Differing densities of beetles (1 beetle per disk, 2 beetles per disk and 3 beetles per disk) were placed in petri dishes containing moist filter paper and three weighed *A.retroflexus* or *D. stramonium* leaf disks . Beetles were held as described above and allowed to feed for 24 hours. After 24 hours, remaining leaf fragments were removed and weighed. The experiment was replicated four times.

Petri dishes containing leaf disks and no beetles were used to measure leaf shrinkage over a 24 hour period. Final leaf weights were corrected for shrinkage. Means and standard errors were calculated. Analysis of variance and Duncan's multiple range test were used to determine significant differences at the $\alpha = 0.05$ level.

RESULTS AND DISCUSSION

No significant differences were detected in feeding rates of individual *D. glabrata* (Table 1). Mean 24 hour foliage consumption of individual *D. glabrata* ranged from 12.5± 2.7 to 30.4 ± 4.3 mg per beetle on *A. retroflexus*. No feeding occurred when *D. glabrata* was placed on *D. stramonium*. Mean mg foliage consumed decreased significantly as density increased from one *D. glabrata* per leaf disk to three *D. glabrata* per leaf disk (Table 2). Mean feeding rates decreased by 31.8 % when density was increased from one beetle per leaf disk (approximately 150 mm^2) to two beetles per leaf disk, and by 57.0% when density was increased from one beetle per leaf disk to three beetles per leaf disk. Mean feeding rate for one beetle per leaf disk was not significantly different from mean 24 hour foliage consumption of individual *D. glabrata*.

Decreased feeding rates at increased densities suggest competition occurred among *D. glabrata*. Maximum feeding was accomplished when no more than one *D. glabrata* occurred per 150 mm^2.

D. glabarata has potential for use as a biological control agent for *A. retroflexus*. Adults feed readily on *A. retroflexus* although competition occurs if densities are greater than one adult per 150 mm^2. Further study of adult feeding preferences and larval feedingrates and should be conducted if *D. glabrata* is to be used for control of *A. retroflexus*.

TABLE 2. Mean feeding of *Disonycha glabrata* on *Amaranthus retroflexus* under three densities.

Density per leaf disk	Mean (in mg)**	± SEM
1	24.2	± 0.7 a
2	16.5	± 1.0 b
3	10.4	± 0.4 c

** Means followed by different letters are significant at the a = 0.05 level

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LITERATURE CITED

Blake, D.H. 1933. Revision of the beetles of the genus *Disonycha* occurring in America north of Mexico. Proc. U.S. Nat.Mus. 82: 1-66.

Blake, D.H. 1955. Revision of the vittate species of the chrysomelid beetle genus *Disonycha* from the Americas south of the United States. Proc. U.S. Nat. Mus. 104: 1-86.

Garman, H. 1892. The pigweed flea beetle. Second Ann. Rep. Kentucky Agr. Exp. Sta. 1889: 27-30.

Henenway, R. and W.H. Whitcomb. 1968. The life history of *Disonycha glabrata* (Coleoptera:Chrysomelidae). J. Kan. Entomol.Soc. 41: 174-178.