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Sex ratio effects on fecundity and fertility of a leafy spurge flea beetle *Aphthona lacertosa*

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Abstract:

Aphthona spp. flea beetles have been used to control leafy spurge throughout the north central Great Plains including North Dakota. However, *Aphthona* flea beetles have not been successful at controlling leafy spurge in all infested areas. These failures may be due to a number of factors including climate, soil and vegetative characteristics, or the insects biology. The flea beetles have been collected from field insectaries and redistributed to other leafy spurge sites. Some of these collections have shown a female bias, with as few as 4% males. A lack of sufficient male numbers may be a factor contributing to the failure of *Aphthona* flea beetles to establish in some of the leafy spurge infestations. A laboratory study was conducted to determine the impact of sex ratios on the fecundity and fertility of a leafy spurge flea beetle, *Aphthona lacertosa*.

Four sex ratios were established using newly emerged field collected *A. lacertosa.* The number of females remained constant among the experimental treatments, while the number of males was altered to establish the ratios of 0:1, 1:3, 1:1, and 3:1, male:female. The males in a fifth treatment of 1:1 were removed after 24 hours to determine if multiple matings are necessary for continued oviposition. Each treatment was maintained in plexi glass cylinder cages (9.3 x 4.1 cm). A 4.1 cm diameter piece of felt was placed in the bottom of each chamber for oviposition. In addition, each chamber was supplied with leafy spurge leaves for food and moisture. The experimental chambers were maintained in an environmental chamber (23° C, 12:12 L:D). Each day, for a duration of 30 days, the oviposition pads were examined for eggs. Pads with eggs were placed on moistened patching plaster in a sealed petri dish (4.1 cm diameter) and placed in an environmental chamber (23° C, 0:24 L:D) to observe for larval emergence. Also, the number of purged, dead, and prehatched eggs were recorded. Each experimental treatment consisted of 9 replications.

A low percentage of males in a population of *A. lacertosa* may not be a contributing factor to the failure of this species to establish in leafy spurge infested areas. The fecundity of *A. lacertosa* among the three sex ratios of 1:3, 1:1, and 3:1 was not significantly different. In addition, fertility did not differ among these three sex ratios. Females not exposed to males, or exposed to males for only 24 hours, oviposited significantly fewer eggs compared to females exposed to males during the 30 day oviposition period.

Table. The effects of sex ratio on the fecundity and fertility of *Aphthona lacertosa*.

	Mean total *A. lacertosa* eggs per day				
M:F sex ratio	Oviposited	Hatched	Dead	Purged	Prehatched
0:1	4.6a	0.04a	4.1 a	0.3a	0.04a
1:3	7.2b	0.5b	5. 1 bc	1.3b	0.2a
1:1	7.5b	0.4b	5. 1 abc	1.3b	0.7b
3:1	7.5b	0.4b	5.4c	1.4b	0.2a
1:1a	4.8a	0.04a	4.5ab	0.2a	0.04a

[a]Male flea beetles were removed after 24 hr.