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Integration of herbicides with *Aphthona* spp. flea beetles for leafy spurge control

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The timing of herbicide treatments on *A. nigriscutis* and *A. czwalinae* survival and establishment was evaluated. Two locations of *A. nigriscutis* and one location of *A. czwalinae* were established. The treatments included picloram plus 2,4-D at 4 plus 16 oz/A spring applied picloram plus 2,4-D at 8 plus 16oz/A fall applied, and *Aphthona* spp. alone. Stem density was evaluated in the spring, and adult sweep counts were conducted through the summer. For the first experiment, *A. nigriscutis* were released in the 1989 and herbicide treatments were initiated in spring (June) of 1992 at Cuba. Stem density in the insect-only treatment declined by 47% from 1992 to 1994. The greatest leafy spurge stem density was reduced 97% by the insect plus fall applied herbicide treatment. The spring applied herbicide plus insect treatment reduced leafy spurge less than the insects alone. The *A. nigriscutis* population in the non-herbicide treatments increased from 11 beetles/m² in 1992 to 28 beetles/m² in 1994. The *A. nigriscutis* population in 1994 declined to less than 1 beetle m² when herbicides were spring applied. When herbicides were fall applied 37 beetles/m² were found. Similar experiments were started in 1993 with 3,000 *A. nigriscutis* released at the Ekre Research Station near Walcott and 30,000 *A. czwalinae* released at Camp Grafton south of Devils Lake. Herbicide treatments were fall applied and stem density and adult beetle sweep counts are currently being conducted.

The establishment and movement of *A. nigriscutis* on leafy spurge patches is currently being evaluated. *A. nigriscutis* was released as 100, 200, 300, 400, or 500 adults per site along a 2.5 miles stretch of the Burlington Northern railroad right-of-way near Buffalo. The insects were released in dense stands of leafy spurge on June 28, 1993. Stem density was evaluated in the spring and adult sweep counts are currently being conducted through the summer. *A. nigriscutis* flea beetles were at all release sites in 1994, which is 1 year after release, but stem density has remained the same at 17 stems/0.25m² from 1993 to 1994.

The survival of *A. czwalinae*, *A. flava*, and *A. nigriscutis* were evaluated on leafy spurge biotypes from Austria, Manitoba, Montana, Nebraska, North Dakota, South Dakota, and Wyoming. The seven biotypes were grown in a greenhouse for 4 to 5 months in

2.5 by 8 inch pots. These pots were planted directly outside in April. The pots were arranged in a RCBD with 12 replications in a 36 ft² area. Cages were placed over the experiments and 200 *Aphthona* spp. were released. The pots were dug in November, placed in a cooler at 3°C for 8 weeks, and then placed under greenhouse lights (16 hours) at 24°C. Adult emergence was evaluated for biotype preference but too few adults emerged to provide accurate data. The study is being repeated in 1994.