

Reprinted with permission from: *Western Society of Weed Science 2000 Research Progress Report. March 14-16, 2000. pp. 11-12.*

Published and copyrighted by: *Western Society of Weed Science,*
<http://www.wsweedscience.org>

Leafy spurge control with *Aphthona nigriscutis* alone or combined with herbicides

RODNEY G. LYM, DON A. MUNDAL, and ROBERT B. CARLSON

An experiment to evaluate the effect of herbicide application timing on biocontrol insect population and leafy spurge control was established on a private farm near Cuba, North Dakota. Approximately 500 *Aphthona nigriscutis* were released in July 1989 in a moderately dense patch of leafy spurge. The insects established and began to spread to other patches of leafy spurge within the pasture prior to the beginning of this experiment.

The experiment was established in two patches of leafy spurge approximately 5000 square feet each and about 100 yards apart. The treatments included picloram plus 2,4-D at 0.5 + 1 lb/A fall applied, picloram plus 2,4-D at 0.25 + 1 lb/A spring applied, and an untreated control. Herbicides were applied annually beginning with the initial spring treatment on June 5, 1992, and the first fall treatment on September 10, 1992. Herbicides were reapplied at similar dates from 1993 to 1995. The plots were 15 by 50 feet, and treatments were replicated four times (two per patch). *A. nigriscutis* population was evaluated by sweep counts with a standard insect collection net and are reported as a mean of three square meters (five sweeps equals 1 m²).

Table 1. Leafy spurge stem density after treatment with *Aphthona nigriscutis* alone or combined with herbicide treatments near Cuba, ND.

Treatment ^a	Rate	Stem density/evaluation date							
		June 1992	May 1993	May 1994	May 1995	June 1996	June 1997	June 1998	June 1999
	lb/A	-----No./m ² -----							
Picloram + 2,4-D (Spring)	0.25+1	220	208	134	16	22	13	15	17
Picloram + 2,4-D (Fall)	0.5+1	164	10	11	0.5	0.5	12	11	9
Insect only	--	187	150	99	5	13	17	17	7
LSD (0.05)		30	27	20	10	10	NS	NS	5

^aHerbicides annually applied in June or September from 1992 to 1995.

Leafy spurge stem density declined rapidly when herbicides were fall applied to plants infested with *A. nigriscutis* (Table 1). The leafy spurge stand declined from 164 stems/m² in 1992, to 10 stems/m² the following year. Leafy spurge gradually declined with the insect alone treatment from 187 stems/m² in June 1992 to 5 stems/m² by May 1995. Both the insect alone and fall-applied herbicide plus insect treatments provided more rapid leafy spurge stem reduction than the spring-applied herbicides plus insects treatment. Herbicides applied in June prevent the adult flea beetles from feeding on those plants, and thus probably reduce egg laying and subsequent larvae feeding.

Leafy spurge stem density continued to decline over time and averaged 11 stems/m² in 1999. Since herbicide application was stopped after 1995, the decline is due to control by *Aphthona* flea beetles alone (Table 1). Control tended to be better with the picloram plus 2,4-D applied in the fall with insects and the insects alone treatment compared to the same herbicides applied in the spring. It is likely that the *A. nigriscutis* will maintain long-term leafy spurge control without further chemical treatments.

The *A. nigriscutis* population gradually increased over time from 1993 to 1996 and averaged 90 adults/m² in 1997 and 1998 regardless of treatment (Table 2). Flea beetle population began to decline in 1997 as the leafy spurge density decreased. There was an average of only 23 beetles/m² in 1998 regardless of the initial treatment. Thus, 9 years after the initial release of flea beetles, the population appeared to be in equilibrium with the leafy spurge population. It took 4 years less for this equilibrium to be reached when herbicides were used in conjunction with the biocontrol agents compared to the insects alone.

In summary, the fall herbicide treatment combined with the biological control agent *Aphthona nigriscutis* provided more rapid leafy spurge control than the insects alone. The leafy spurge density gradually declined when only insects were present and took 3 years longer to reduce the infestation to the same level achieved in 1 year by the herbicide-plus-insect combination treatment and 4 years longer than herbicides alone (based on long-term averages). Leafy spurge density and *A. nigriscutis* population had reached an equilibrium by 6 years after the first herbicide treatment and are expected to maintain acceptable long-term leafy spurge control.

Table 2. Effect of herbicide application on *Aphthona nigriscutis* population 3 years after the biocontrol insect had established.

Treatment ^a	Rate	<i>A. nigriscutis</i> counts ^b /year							
		1992	1993	1994	1995	1996	1997	1998	1999
	lb/A	-----No./m ² -----							
Picloram + 2,4-D (Spring)	0.15+1	1	0	19	76	25	12	17	19
Picloram + 2,4-D (Fall)	0.5+1	21	52	40	30	18	8	26	20
Insects only		12	28	132	70	96	23	27	24
LSD (0.05)		5	16	63	26	29	6	NS	NS

^aHerbicides annually applied in June or September from 1992 through 1995.

^bHighest number collected during sampling from June through September.