Reprinted with permission from: 1999 Proceedings: Leafy Spurge Symposium, Medora, ND, June 29, 1999, pp. 8-9.

Published by: North Dakota State University Cooperative Extension Service, Fargo, ND.

Integration of the flea beetle, *Aphthona nigriscutis* foudras, and herbicides for control of leaf spurge, *Euphorbia esula L.*

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Abstract:

The combined treatment of the biological control agent, *A. nigriscutis* plus the herbicide treatment picloram plus 2,4-D generally provided better leafy spurge control compared to either method used alone. Leafy spurge control from the combined treatment averaged 44% 12 months after application. Leafy spurge with *A. nigriscutis* was oversprayed with picloram plus 2,4-D with a minimal negative impact to the *A. nigriscutis* population. The number of *A. nigriscutis* adults collected in the field was similar regardless of herbicide application date. Leafy spurge root nutrient content was not affected by picloram plus 2,4-D applied in the fall. Soluble and insoluble carbohydrate and soluble protein concentrations in herbicide treated plants were similar to concentrations in the untreated control. Leafy spurge plants harvested within an insect confining screened cage had root nutrient concentrations similar to roots harvested outside the screened cage.

Uptake and translocation of ^{14}C-picloram and ^{14}C-2,4-D was similar in plants damaged or unaffected by *A. nigriscutis* larvae. Therefore, the observed increase in leafy spurge control from the combined treatment was likely from the combined effect of herbicide toxicity to root tissue plus *A. nigriscutis* larval feeding on leafy spurge root buds.