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Multi-species grazing using goats and cattle to control leafy spurge

CHAD W. PROSSER, KEVIN K. SEDIVEC and WILLIAM T. BARKER

Department of Animal and Range Sciences, North Dakota State University, Fargo, ND 58105

Leafy spurge (*Euphorbia esula* L.), a herbaceous, deep-rooted, dicotyledonous, perennial, is a noxious weed which infests at least 458 counties in 26 states and six Canadian provinces (1). Leafy spurge is distributed on several habitats ranging from xeric to subhumid, and from subtropical to subarctic. This plant, since introduced from Eurasia, has become a troublesome weed in the Great Plains region of North America where it grows largely devoid of insect and disease pests which keep leafy spurge controlled in its native habitats (2). The weed, extremely persistent and competitive, contributes to significant economic losses to livestock producers.

Angora goats were introduced to Camp Grafton South in southeastern Eddy County as a biological control for leafy spurge. Project objectives were to determine: 1) the effect of angora goat grazing on leafy spurge stem density and associated herbaceous production, 2) determine the differences between multi-species grazing and single species grazing on leafy spurge infested rangeland in regard to herbaceous species utilization patterns.

The study area consisted of 85.5 hectares located in Sections 12 and 13, T. 149 N., R. 63 W. on Camp Grafton South in southeastern Eddy County. The 85.5 hectares was divided into a 37.3 ha cattle only treatment (CO) and a 41.4 ha cattle/goats (multi-species) treatment (CG). Goats only treatment bordered the CG and CO treatments, consisting of two replications (GO1, G02) of 3.5 and 3.2 hectares.

Leafy spurge stem counts were conducted prior to the introduction of angora goat grazing in late May, 1993-1995 to achieve initial stand counts and differences after one and two years of grazing. Stems were counted using $0.1m^2$ frame on ten line transacts. Paired-plot clipping technique was used to determine forage production and degree of use for leafy spurge, graminoids, shrubs and other forbs. Leafy spurge stem counts were tested for significant ($P<0.05$) main effects using multi-response permutation procedure (MRPP) (3).

The cattle only pasture was grazed by 21 cow/calf pairs from 6/15 to 11/1, with a stocking rate of 0.39 ha/AUM for both years. The goats only treatments were grazed by 15 and 16 angora goat nannies per cell in 1993 and 1994, respectively. The stocking rates for the goats only trials were 0.42 ha/AUM and 0.38 ha/AUM, respectively, in 1993 and 1994. The grazing dates were May 27 through September 11 in 1993 and June 1 through

September 1 in 1994. The CG treatment consisted of 41.4 hectares grazed by 21 cow/calf pairs from 7/15-11/1 (0.55 ha/AUM) and 6/1-11/1 (0.39 ha/AUM) in 1993 and 1994, respectively. A total 191 (0.36 ha/AUM) and 156 (0.43 ha/AUM) angora goats grazed from 5/27-9/11 and 6/1-9/24 in 1993 and 1994, respectively.

Leafy spurge stem densities in the CO treatment had a slight increase of 3.1 percent increase after two years of grazing, however, no significant (P > 0. 05) differences were noted (Table 1). The leafy spurge stem densities were reduced (P>0.05) from 11.6 stems to 3.3 stems or a reduction of 71.5 percent on the GO treatment. Stems densities were reduced (P > 0.05) in the CG treatment from 12.4 stems to 7.1 stems with a reduction of 42.7 percent.

Table 1. Initial leafy spurge stem density counts (stems/0. Lm^2) prior to goat turnout at Camp Grafton South, 1993-1995.

	Stem Density[1]				
Treatment	1993	1994	1995	Percent Change	P-value
Cattle Only	12.8[a]	11.6[a]	13.2[a]	+ 3.1	.4
Goats Only	11.6[a]	8.9[a]	3.3[b]	-71.5	$.2^{-10}$
Cattle/Goats Together	12.4[a]	9.4[a]	7.1[b]	-42.7	$.1^{-3}$

[1]Percentages by year with the same letter are not significantly (P > 0.05) different.

Goat grazing within the goats only and multi-species treatments extensively grazed leafy spurge, providing an open canopy and competitive growth advantage for the graminoid species. The mean degree of use of leafy spurge was 68.7 and 71.6 percent in the goats only and multi-species treatments, respectively. The intensive use of the leafy spurge by goats allowed for a more suitable forage base for cattle, creating a higher degree of use of the graminoid species in the multi-species treatment. Graminoid degree of use in the multi-species treatment was 23.5 percent, significantly (P<0.05) higher than the 8.3 and 9.0 percent in the cattle only and goats only treatment, respectively (Table 2).

Table 2. Degree of use (percent) of all graminoid species in leafy spurge infested rangeland by treatment and year at Camp Grafton South, 1993 and 1994.

Treatment	1993[1]	1994	Mean[2]
Cattle Only	10.1	6.4	8.3[a]
Goats Only	7.5	10.4	9.0[a]
Cattle and Goats	27.8	19.3	23.5[b]

[1]No significant (P > 0. 05) differences occurred between years for either treatment.
[2]Means with the same letter are not significantly (P > 0. 05) different.

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