Evaluation of Legumes in Micro Plot Studies

U. G. Bokhari

Story in Brief

Different types of legumes planted in 20 x 30 ft micro plots indicated that they can be integrated into local grazing systems which will provide adequate dry matter during spring, summer and fall. Dry matter digestibility was high at early growth stages but in some cases declined towards the end of the growing season.

Introduction

Certain types of legumes adapted to particular soil and climatic conditions will benefit farmers in a number of ways depending upon the specific purpose for which the legumes, are included in any farming operation. Generally, almost all types of legumes, if interseeded into an otherwise compatible grass pasture, will improve forage quality, extend grazing period and improve gain of livestock on a per animal or per acre basis. Compatability of legumes with companion plants, persistence of legumes under grazing and N_2-fixation in a sward are some of the problems associated with a grass-legume system. This study was undertaken to study adaptation, growth and some nutritive characteristics of a number of legumes under field conditions in micro plots.

Materials and Methods

Seeds of the following legumes were planted in March-April in 20 x 30 ft plots at 1-ft row spacing. All the seeds were inoculated with appropriate rhizobia before planting.

- Alfalfa (Medicago Sativa L.): varieties, "Cody" and Spreador II (Spreador II was supplied by Northrop King Seed Co.)
- White clover (Trifolium repens L.): variety, "Louisiana S-1"
- Hairy vetch (Vicia villosa (RELL.) HERMANN)
- Korean lespedeza (lespedeza stipulacea Maxim.)
- Sericea lespedeza (lespedeza cuneata (DUMONT) G. DON)
- Birdsfoot Trefoil (lotus corniculatus L.)
- Arrowleaf (Trifolium vesiculosum L.)

Each type was replicated three times in a completely randomized block design. The soil at this site is classified as Dale Fine Silty, mixed, thermic, pachic haplustolls with a pH of approximately 6.6. Urea fertilizer at the rate of 26.8 lb/acre was applied as top dressing before planting and again in October at the same rate. The soil at this site contained less than 4.5 lb of nitrate nitrogen per acre. Average monthly temperature (C°) and precipitation (CM) data are given in Table 3.

Samples for dry matter and IVDMD determination were taken from a 2-ft row in the center of each plot at monthly intervals from April to November. At the same time, soil cores containing whole plants were taken from each plot and brought to the laboratory for acetylene reduction using Perkin Elmer gas chromatograph 990.

Results and Discussion

Dry matter productivity of different types of legumes is given in Table 1. Except for lespedeza, B. F. Trefoil and Arrowleaf, all the other legumes exhibited peak productivity during July. Both types of lespedeza had two distinct peaks during July, September and November. Among the different types of legumes which were planted at the same time, lespedeza (Korean type), B. F. Trefoil and Arrowleaf continued producing new growth in December and may do so during the subsequent months.

Except for hairy vetch, none of the roots of the rest of the legumes were nodulated in June. The slow growth during the initial stage could be attributed to poor nodulation and almost negligible N_2-fixation. However, almost all the legumes were found nodulated during their subsequent growth, which resulted in increasing productivity during the late growth period.

Preliminary analysis of N_2-fixation potentials indicated that about 53 to 160 lb N/acre was fixed by these legumes.

There was a gradual decrease in IVDMD of all the legumes towards the end of the growing season (Table 2) except for white clover and Arrowleaf. Both types of lespedeza had lower IVDMD throughout the growing season than the rest of the legumes tested. Among all the legumes, maximum IVDMD of 78 percent was recorded for white clover and 70 percent for Arrowleaf in September. Minimum digestibility of 30 percent was recorded for Sericia lespedeza in October. Both

Table 1. Dry matter production (pounds/acre) of legumes during 1981 growing season

Species/variety	Date harvest					
	June	July	Aug.	Sep.	Oct.	Nov.
Alfalfa, Cody	2565	3092	1719	1783	1918	609
Alfalfa, Spreader II	3371	3223	2136	1967	2246	572
White clover, Lousiana S-1	697	3030	1983	3313	1501	3290
Hairy vetch	5464	5581	3425	3679	2929	—
Lespedeza (Korean)	1468	6762	6131	16478	—	—
Lespedeza (Sericia)	413	4710	3830	8809	6905	—
B. F. Trefoil	1643	4480	4255	4253	4289	12180
Arrowleaf, Yuchi	2108	7619	4584	7149	9485	19826

Table 2. In vitro dry matter digestibility of legumes during 1981 growing season

Species/variety	Date harvest				
	June	July	Aug.	Sep.	Oct.
Alfalfa, Cody	61.02	59.53	54.50	54.32	47.58
Alfalfa Spreader II	64.48	54.02	58.39	56.49	46.19
White clover, Lousiana S-1	60.66	72.55	63.08	78.68	74.82
Hairy vetch	57.66	68.32	50.92	69.73	51.68
Lespedza (Korean)	55.27	52.12	51.31	49.39	—
Lespedza (Sericia)	44.11	40.41	46.62	35.30	30.06
B. F. Trefoil	64.46	60.36	51.27	60.52	46.42
Arrowfeaf, Yuchi	63.86	69.77	64.00	70.05	58.34

types of alfalfa were high in IVDMD during June and low during October. Samples were not taken during the early growth from April to June due to slow and inconsistent growth of these legumes. Digestibility may be somewhat higher at earlier growth periods.

This preliminary data indicated that legumes of different species planted even at the same time will provide adequate green materials throughout the summer and early fall, and maybe during late fall, if planted at different times during early spring or late fall. There is a great potential for these legumes in our local grazing system if integrated with other small grains and grasses. Spacing planting dates according to types of legumes will also help extend the grazing season through much of the winter, spring and summer.

Most of these legumes except lespedeza are usually planted in September-October, depending on the moisture situation, and will provide adequate materials for grazing during winter and spring.

Table 3. Average monthly precipitation (cm) and temperature (C°) during 1981 growing season

	J	F	M	A	M	J
Temperature (C)	3.3	5.8	11.4	19.7	19.1	26.6
Precipitation (cm)	0.36	2.24	6.78	4.37	10.69	16.41

	J	A	S	O	N	D
Temperature (C)	29.5	26.1	23.5	15.1	10.2	5.1
Precipitation (cm)	6.71	11.25	7.21	17.12	2.62	0.56