

**Performance of Empire and Viking Birdsfoot  
Trefoil *Lotus corniculatus* L.  
in Simple Pasture Mixtures.**

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Birdsfoot trefoil is a long lived, drought resistant pasture legume with a wide pH and fertility range tolerance. There are two principal varieties: 'Empire', a decumbant type and 'Viking' an upright type. Its seeds shatter readily thus reseeding itself. It might, thus, have a possibility of inclusion as the legume component in pastures which can be put to intensive management for such a reason.

Complex mixtures of bunch type grasses have proved to be of no advantage over the high yielding pure species of grass (10,6) while in grass legume mixtures, heavy weed infestation occurs within 7-9 years (6). Legumes compete better with grasses under shortage of nitrogen (1). This competing ability may not, however, be solely due to nitrogen deficiency (8). Bromegrass and alfalfa are equally persistent while either of these alone is more aggressive with plants of its type i.e. grass with grass and legume with legume (4). Perennial rye grass usually takes over the voids in red clover and white clover mixtures and is more aggressive than orchardgrass or bromegrass with other legumes (2,3,5).

Birdsfoot trefoil is low in vigor in the first year especially when cut early in the season (7) and yields better with bromegrass or timothy than other grasses (5).

Complex pasture mixture was not found to be higher yielding than a simple mixture of 6-7 adapted species or a simple mixture of one grass and one legume (6,9). Tall growing simple ladino mixtures were better yielding than short growing mixtures (6,9). Orchardgrass was higher yielding than bromegrass or timothy in simple mixtures (11). Simple birdsfoot trefoil mixtures were better yielding than red-clover or sweet clover mixtures after the first year. Timothy — birdsfoot trefoil mixture was the highest yielding of the simple mixtures (7).

The purpose of this study was to evaluate the compatibility of 'Empire' and 'Viking'

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birdsfoot trefoils with several grasses as measured by persistence in the stand and forage yield under three and four harvest systems.

## MATERIALS AND METHODS

The grasses used in this experiment were tall fescue (*Festuca eliator* var. *arundinacea*), perennial ryegrass (*Lolium perenne*); smooth brome grass (*Bromus inermis*), orchardgrass (*Dactylis glomerata*), timothy (*Phleum pratense*), Kentucky bluegrass (*Poa pratensis*) and redtop (*Agrostis alba*). The other cultural practices are later reported (10).

## RESULTS AND DISCUSSION

The percentage of established 'Viking' trefoil was higher than or equal to 'Empire' trefoil in all the mixtures seeded in 1959. In 1960 seedings, the percentage of established empire trefoil was higher than the Viking trefoil when grown in association with tall fescue, perennial ryegrass or smooth brome grass but lower than Viking trefoil when grown with Kentucky bluegrass. Both varieties were similar when grown in association with timothy or redtop (Table 1). These differences were perhaps due to the varying competing ability of trefoils with grasses under normal rainfall conditions as in 1961. Timothy, Kentucky bluegrass and redtop were compatible with trefoil, tall fescue was compatible under low rainfall as in 1960 and competitive under normal rainfall conditions with trefoil (Table 1).

### Botanical Composition

The botanical composition in 1960 was taken once prior to the first harvest, but in 1961 it was taken prior to each harvest. The percentage of legume before the 1st harvest in 1960 and 1961 has been presented in Table 1. In 1961, the legume percentage varied in

Table 1 Percentage of birdsfoot trefoil in simple mixtures seeded in 1959 and 1960 prior to the first harvest in 1960 and 1961 respectively (average of 2 harvests).

Trefoil Variety grass spp.	1960		1961	
	Empire	Viking	Empire	Viking
Tall fescue	50	50	20	15
P. ryegrass	15	15	40	11
Brome grass	25	30	24	13
Orchardgrass	10	15	20	24
Timothy	50	60	36	37
Kentucky Bluegrass	70	85	54	67
Redtop	95	95	54	56

Table 2 Percentage of birdsfoot trefoil in simple mixtures, recorded prior to each harvest date in 1961 from stands established in 1960.

Simple Mixture	4 harvests				3 harvests		
	1	2	3	4	1	2	3
'Empire' trefoil with:							
Tall fescue	19	35	31	36	20	20	28
P. ryegrass	38	78	81	60	41	78	74
Bromegrass	19	39	51	55	29	64	59
Orchardgrass	21	36	29	41	19	44	45
Timothy	36	68	61	55	36	58	50
Kentucky bluegrass	50	76	66	48	58	75	65
Redtop	53	74	76	80	55	63	68
'Viking' trefoil with:							
Tall fescue	15	55	36	40	14	43	35
P. ryegrass	10	65	78	69	21	79	71
Bromegrass	13	69	53	63	13	70	50
Orchardgrass	13	39	26	39	35	50	49
Timothy	33	84	74	60	41	73	49
Kentucky bluegrass	64	80	75	69	69	71	56
Redtop	54	93	73	69	58	76	59

Table 3 Dry matter yield of simple mixtures under two systems of harvest (tons/ha).

Harvest Mixture	1960			1961		
	4	3	Ave.	4	3	Ave.
Complex Pasture Mixture	7.78	8.53	8.75	9.03	8.95	8.98
Empire trefoil with:						
Tall fescue	9.50	12.00	10.75	11.35	11.18	11.25
P. ryegrass	7.70	11.40	9.55	9.98	9.28	9.63
Bromegrass	9.95	12.33	11.13	12.25	11.15	11.70
Orchardgrass	8.53	11.93	10.23	10.90	12.85	11.88
Timothy	9.63	13.58	11.60	11.83	11.75	11.48
Kentucky bluegrass	11.48	13.20	12.35	13.85	12.20	13.03
Redtop	9.40	11.53	10.48	11.70	12.45	12.08
Viking trefoil with:						
Tall fescue	11.85	13.30	12.58ab*	11.25	13.65	12.45a
P. ryegrass	7.40	11.23	9.30b	9.80	9.93	9.63c
Bromegrass	10.58	12.55	11.55ab	13.63	13.78	13.70a
Orchardgrass	10.60	14.30	12.45ab	10.43	11.20	10.83bc
Timothy	12.90	14.60	13.78a	11.55	13.15	12.35ab
Kentucky bluegrass	12.58	14.75	13.68a	13.15	13.55	13.35a
Redtop	10.63	11.60	11.10ab	11.03	14.68	12.85a

\* Means followed by the same letter are not significantly different, others are ( $P = .01$ ).



Table 4 Relative dry matter yield of pure species as compared to simple mixtures. Under four harvests.

Grass & Legume	Pure sp.	1960		Pure sp.	1961	
		Empire	Viking		Empire	Viking
Tall fescue	7.33	9.50	11.85	9.15	12.00	13.30
P. ryegrass	5.20	7.70	7.40	6.00	11.40	11.23
Bromegrass	12.50	9.95	10.58	9.28	12.33	12.55
Orchardgrass	9.30	8.53	10.60	8.10	11.93	14.30
Timothy	4.90	9.63	12.90	5.75	13.58	14.68
Kentucky bluegrass	3.33	11.48	12.58	3.58	13.20	14.75

different grass mixtures under the two systems of harvest (Table 2). The percentage of legume in the second harvest was higher than the first harvest. (Table 2). This was perhaps due to the reduction of shading of trefoil by the grass component of mixtures after the first harvest.

### Dry matter yields

In both 1960 and 1961, the average yield of the simple mixtures was better than the complex mixture thus indicating the superiority of a well adapted simple mixture (birdsfoot trefoil and grass). Also in both years the Viking mixtures were more productive than the Empire mixtures. In Viking mixtures, yields from three harvests per season were better than four harvests per season. Kentucky bluegrass Viking trefoil mixtures was the most productive in both years while perennial ryegrass Viking trefoil mixture was the poorest. Timothy in 1960 (dry year) and bromegrass, tall fescue and redtop in 1961 (normal year) were also high yielding simple mixtures (Table 3).

All the grass mixtures yielded higher than in pure species except bromegrass, orchardgrass and tall fescue in 1960. Bromegrass and orchardgrass in pure stands yielded higher

Table 5 Relative Dry matter yields of pure species as compared to simple trefoil mixtures. Under three harvests.

Grass & Legume	Pure sp.	1960		Pure sp.	1961	
		Empire	Viking		Empire	Viking
Tall fescue	11.68	11.35	11.25	10.80	11.18	13.65
P. ryegrass	8.60	9.98	9.30	6.70	9.26	9.93
Bromegrass	11.30	12.25	13.63	9.93	11.15	13.78
Orchardgrass	9.48	10.90	10.43	10.95	12.85	11.20
Timothy	9.50	11.83	11.55	9.38	11.75	13.15
Kentucky bluegrass	7.68	13.85	13.15	9.48	12.20	13.55

than in the simple mixture under four harvest and tall fescue alone under three harvest systems (Tables 4 and 5).

### LITERATURE CITED

Compatibility and dry matter yields of fourteen simple birdsfoot trefoil mixtures and one complex pasture mixture were studied under two systems of harvest in a field experiment at Columbus, Ohio, U.S.A. The legume component of the simple mixtures was increased after the first harvest in the season. Simple birdsfoot trefoil mixture produced more dry matter than the complex pasture mixture and 'Empire' birdsfoot trefoil was more compatible and higher in yield in association with Kentucky bluegrass and timothy than with other grasses. 'Viking' birdsfoot trefoil was more compatible and gave a higher yield in orchardgrass associations under a three-harvest system and in smooth bromegrass association under a four-harvest system than with other grasses or systems of management. 'Viking' birdsfoot trefoil associations on the average, were more productive than 'Empire' birdsfoot trefoil associations. The simple mixture yielded more than the grasses alone except bromegrass and Orchardgrass under four harvests and tall fescue under three harvests in one year only.

### SUMMARY

1. Blackman, G. E. and W. G. Templeman, 1938. The interaction of light intensity and nitrogen supply in the growth and metabolism of grasses and clover. *Ann. Bot. N. W.* 2:765-791.
2. Burger, A. W., E. C. Spurrier, and J. E. Foster, 1952. Grass and legume combination for beef production. *Maryland Agr. Exp. Sta. Bull.* 442.
3. Crowder, L. V. 1960. Height and frequency of cutting perennial ryegrass, cocksfoot, kikuyegrass in mixtures with white clover, *Agric. Trop. Bogota.* 16:327-382.
4. Harrison, C. M., H. M. Brown, and H. C. Rather, 1947. The production of forage crop mixtures under different systems of management. *Jour. Amer. Soc. Agron.* 39:214-223.
5. Hunt, I. V. 1960. Comparing the output from mixtures based on perennial ryegrass and on meadow fescue. *Jour. Brit. Grassland Soc.* 15:308-14.
6. Kozlov, A. I. 1939. Meadow-Pasture seedings. *Sovet. Agron. No. 10/11* 36-39. (*Herbage Abstracts*, Dec. 1940).
7. MacDonald, H. A. 1946. Birdsfoot trefoil, its characteristics and potentialities as a forage legume. *Cornel Univ. Agr. Expt. St. Memoir* 26.
8. McCloud D. E. and G. O. Mott, 1953. Influence of association on yield of legume-grass mixtures. *Agr. Jour.* 45:61-66.
9. Prince, F. S., and P. T. Blood, 1950. Pasture management investigation *Agr. Expt. Sta. Cir.* 81. New Hampshire.

10. Sawhney, Jagdev S. and S. R. Anderson, 1973. The effect of cutting frequency on persistence and dry matter yield of some grasses and legumes seeded alone or in a complex pasture mixture. *Libyan Jour. Agr.* 2:59-63.
11. Washko, J. B. and R. P. Pennington, 1956. Forage and Protein production of nitrogen fertilized grasses compared with grass-legume association. *Pa. Agr. Exp. Sta. Bull* 611.