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Performance Tests of Birdsfoot Trefoil in Eastern Kansas

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Birdsfoot trefoil (*Lotus corniculatus* L.) is a widely adapted, nonbloating, forage legume that has excellent potential for improving quality of cool-season pasture grasses in eastern Kansas. In other studies, the variety 'Dawn' has shown promise. These trials were established to evaluate the yield potential and persistence of several birdsfoot trefoil varieties in eastern Kansas.

Varieties

The varieties included in the tests were developed by universities over a period of years, or are introductions from Europe. Early varieties were classed as pasture (prostrate) or hay (upright) types, but varieties developed later are more intermediate in growth habit.

Carroll is a very winter-hardy, pasture type, which is more upright and slightly earlier in maturity than *Empire*. It was developed in Iowa for improved persistence and larger seed size and is marketed by Peterson Seed Company as a proprietary variety.

Dawn is a four-clone synthetic, developed in Missouri. It is slightly more erect and earlier flowering than *Empire*. It was selected for resistance to root rots and leaf and stem diseases, which provide greater persistence. *Dawn* is marketed by Nickerson American Plant Breeders as a proprietary variety.

Empire is a prostrate, late-maturing ecotype selected in Albany County, NY from introduced Euro-

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pean types. It is very winter-hardy and persists well because of its ability to reseed and establish new plants.

Fargo is a naturalized, experimental strain of the Empire type developed in North Dakota.

Fergus is a naturalized, semi-prostrate strain developed from plants of Empire in a 15-year-old Kentucky pasture and imported French germ plasm.

Leo was developed in Quebec, Canada from a Russian introduction. It has excellent early spring vigor and is more winter-hardy than Empire or Viking.

Missouri 20 is a third-cycle selection from the breeding program that earlier released the variety Dawn. This strain was further selected for greater survival under severe defoliation managements and was released as a germ plasm source for plant breeders.

NC-83 Germplasm Pool is an experimental strain formed from 30 clones evaluated in North Central regional trials. It was released as a germ plasm source for plant breeders.

Norcen is a new synthetic variety developed from nine clones selected from breeding programs of the IL, IA, and MO stations. The name refers to the cooperation among the North Central states and the wide adaptation of Norcen in the region.

T-68 is an experimental line selected from Viking by researchers in New York state for resistance to the herbicide, 2,4-D.

Viking is a European, erect, broad-leaved variety developed in New York state from Danish and New York strains. It has more rapid seedling growth and faster recovery from cutting than Empire.

Procedures

Ten varieties were seeded at Ottawa, April 20, 1979 at 7 pounds PLS per acre. The plots were fertilized with 150 pounds per acre of 8-32-16, and Balan (3.5 quarts/acre) was incorporated for weed control prior to planting. Plots were harvested for yield at early to mid-bloom stage. Harvest dates were July 3 and October 6, 1979; May 28, 1980; June 9 and August 4, 1981; May 29, August 5, and September 29, 1982; May 27 and July 19, 1983; and June 19 and July 27, 1984.

Nine varieties were seeded at Mound Valley, April 23, 1980 at 8 pounds per acre, following incorporation of 3.75 pints/acre of Eptam. Plots were fertilized with 50 lbs. P₂O₅ and 100 lbs. K₂O per acre in 1982 and 1984. Plots were not harvested during the establishment year because growth was quite limited by a very dry growing season. Plots were harvested June 5 and August 7, 1981; June 21, 1982; June 28, 1983; May 22 and July 10, 1984; and May 22 and June 26, 1985.

Table 1. Forage yields of birdsfoot trefoil varieties, Ottawa, 1979-1984.

Variety	Dry Matter (Tons/Acre)						Total
	1979	1980	1981	1982	1983	1984	
Norcen	1.87	1.91	3.51	4.40	2.49	2.12	16.28
NC-83 pool	1.74	1.94	3.77	4.48	2.55	1.75	16.23
Missouri-20	1.20	1.79	4.04	4.38	2.36	2.14	15.89
Fergus	1.44	1.80	3.64	4.51	2.42	2.07	15.87
Dawn	1.69	2.02	4.01	4.02	2.28	1.74	15.77
Leo	1.76	1.88	3.35	4.15	2.51	1.57	15.20
Viking	1.66	2.07	3.35	3.98	2.72	0.96	14.74
Empire	1.23	1.86	3.49	3.54	1.94	1.48	13.53
Fargo	0.94	1.53	3.27	3.47	1.96	1.49	12.63
T-68	1.52	1.93	2.53	3.48	2.41	0.67	12.48
Mean	1.51	1.87	3.50	4.04	2.36	1.55	14.61
L S D _{.05}	0.30	0.20	0.64	0.25	0.30	0.52	1.22

Results: Ottawa

Excellent stands were obtained for all varieties except Fargo. Performance of varieties seeded at Ottawa is shown in Table 1. Visual observations in 1982 indicated that Viking, T-68, and Leo were late in maturity; Dawn, Empire, MO-20, Fargo, NC-83 Pool, and Fergus were early; and Norcen was intermediate. Weed invasion was greatest in Empire, Fargo, and Dawn, with little noted in the other entries. Visual stand ratings in October, 1983 showed MO-20, Norcen, Fergus, and NC-83 Pool with best stands; T-68 and Viking, poorest; and Dawn, Leo, Fargo, and Empire, intermediate. By the summer of 1984, stand loss was so great that harvest was not possible for T-68. Some plots of Empire, Fargo, and Viking also had too many weeds to allow harvest.

Forage yields were good during the seedling year and most varieties remained productive throughout the 6 years of the trial. Yields were low in 1980 because lim-

ited rainfall allowed only one harvest. An average of two harvests per year was obtained, which was about one cut less than for adjacent alfalfa varieties. Slower regrowth of trefoil usually results in fewer cuttings and about 80% as much yield as alfalfa.

Based on total yield for the 1979-84 period, the top-yielding varieties were Norcen, NC-83 Pool, Missouri 20, Fergus, Dawn, and Leo; whereas the lowest-yielding group included Empire, Fargo, and T-68. For the period 1979-83, Viking was also in the top-yielding group, but it declined considerably in 1984. After 1982, Dawn and Viking declined in yield relative to the others in the top group, probably because their stands began to thin. Mean yield for the best variety, Norcen, for the 6 years was 2.71 tons/acre and the test average was 2.43 tons/acre. Yields of over 4 tons/acre in 1982 show that birdsfoot trefoil has excellent potential.

Crude protein data are shown in Table 2. Varieties

Table 2. Crude protein contents (%) of birdsfoot trefoil varieties, Ottawa, 1979-1984.

Variety	1979		1981		1982			1983		1984	
	Cut 1	Cut 2	Cut 1	Cut 2	Cut 1	Cut 2	Cut 3	Cut 1	Cut 2	Cut 1	Cut 2
Norcen	17.2	14.7	21.0	15.3	15.5	15.2	18.4	16.0	14.2	15.3	16.2
NC-83 Pool	15.4	13.5	19.5	15.0	14.7	16.3	19.6	15.9	12.9	15.4	15.9
Missouri-20	17.1	12.6	19.1	14.5	15.2	16.4	17.8	15.3	13.8	15.0	15.3
Fergus	17.1	11.9	19.6	13.6	15.2	15.1	18.0	15.3	12.4	13.5	14.4
Dawn	17.2	13.9	19.0	14.6	14.7	16.5	18.0	15.8	13.6	15.0	16.7
Leo	18.5	13.9	22.3	14.8	15.6	15.4	19.1	16.1	13.6	16.5	16.1
Viking	16.9	13.2	19.7	14.5	15.1	13.8	16.6	15.0	11.7	13.5	13.5
Empire	17.1	13.2	18.3	15.2	14.6	15.6	16.1	16.3	13.6	14.9	14.2
Fargo	18.9	13.9	20.0	14.3	14.7	16.3	16.8	16.7	13.8	15.4	15.7
T-68	16.4	13.8	19.2	15.1	16.1	13.3	17.1	15.9	12.2	10.2	-
Mean	17.1	13.5	19.8	14.7	15.2	15.4	17.7	15.8	13.2	14.0	15.3
L S D _{.05}	NS	1.3	1.5	NS	NS	1.0	2.0	NS	1.2	1.1	1.5

Table 3. Performance of birdsfoot trefoil varieties, Mound Valley, 1981-1985.

Variety	Forage Yield (Tons/Acre @ 12% moisture)					Stand Rating *	
	1981	1982	1983	1984	1985	Total	June 18, 1984
Fergus	4.18	4.09	3.72	4.83	4.23	21.11	4.6
NC-83 Pool	4.02	3.60	3.73	4.88	4.53	20.76	4.0
Missouri-20	4.27	4.05	3.54	4.71	4.05	20.61	4.4
Dawn	4.02	4.22	3.98	4.39	3.78	20.39	2.6
Viking	3.92	3.93	3.53	4.85	4.11	20.33	2.8
Norcen	3.69	3.66	3.60	4.79	4.39	20.12	3.7
Empire	4.23	4.27	3.42	4.07	3.78	19.78	2.4
Carroll	3.74	3.84	3.23	4.73	4.16	19.70	3.4
Leo	3.74	3.73	3.29	4.51	3.99	19.25	3.6
Mean	3.98	3.93	3.56	4.64	4.11	20.23	3.5
L S D _{.05}	NS	0.38	NS	0.47	NS	NS	0.8

*0 = None; 5 = Excellent

generally had quite good protein contents. More differences occurred among varieties in the second cut, probably because weeds were present in plots of varieties with poorer stands. Because of its leafiness and small stem diameter, protein quality of birdsfoot trefoil is usually very good.

Results: Mound Valley

Performance of varieties seeded at Mound Valley is shown in Table 3. Forage yields for the first 3 years generally were not indicative of overall performance during the 5-year test. Dawn had the highest total 1981-83 yield, but had relatively poor 1984 and 1985 production, and one of the poorest stands in 1984. Empire was also in the top-yielding group for 1981-83, but declined in stand and relative yield.

Conversely, Norcen was in the low-yielding 1981-83 group, producing significantly less forage than Empire each of the first 2 years (Table 3). However, Norcen retained a good stand and produced relatively higher yields in 1984 and 1985. NC-83 Pool was an average producer during 1981-83, but had a higher 1984 stand rating and was the highest yielder in 1984 and 1985, producing significantly more forage than Empire or Dawn.

The most consistent varieties for 1981-83 production, 1984 stand rating, and total 5-year production were Fergus and MO-20. Fergus produced significantly more forage in 5 years than did Leo, a consistently poor performer, and its stand 4 years after seeding was rated significantly better than all varieties except MO-20 and NC-83 Pool. In general, relative performance of varieties at Mound Valley was similar to that at Ottawa, except that Norcen ranked lower.

Conclusions

These tests indicate that several birdsfoot trefoil varieties have excellent yield potential in eastern Kansas. Compared to alfalfa, trefoil regrows more slowly, resulting in less total yield and fewer harvests. Since it has been shown to persist better under grazing conditions than under the less frequent, but more severe, hay-cutting management, and because it is a nonbloating legume, birdsfoot trefoil could be very advantageous for improving cool-season pastures in eastern Kansas.

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