EVALUATION OF SAINFOIN CULTIVARS ON THE CENTRAL PLATEAU

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ABSTRACT

Six overseas cultivars and a New Zealand selection of sainfoin were compared with WL318 lucerne under 6 and 8 week cutting intervals. Melrose was the highest yielding cultivar of sainfoin and under the 8 week cutting regime produced just over half the yield of lucerne. The slow autumn growth made by all sainfoin cultivars was largely responsible for their poor annual yields and it is suggested that any New Zealand breeding programme on sainfoin should concentrate on improving autumn growth.

Additional Key Words: New Zealand, cultivars, cutting intervals, defoliation interval, lucerne, pumice soils.

INTRODUCTION

Sainfoin (*Onobrychis viciifolia* Scop.) is a deep rooted perennial legume that is used as forage in many parts of the world. Previous studies on the Central Plateau with sainfoin showed yields were generally in the range 4000-8000 kg DM/ha/year with the highest recorded yield being 10800 kg/ha (Percival & McQueen, 1980). As sainfoin is a potential alternative to lucerne (*Medicago sativa* L.), it is unlikely to be accepted by farmers unless yields are comparable to lucerne. This trial was run to examine the production from a range of sainfoin cultivars.

METHODS AND MATERIALS

Site

The trial was located on a Whenuaroa stony silty sand in the Broadlands district approximately 30 km northeast of Taupo. The site was 330 m above sea level and had been in lucerne for the three previous years. Before the trial was established swedes were grown during the winter.

The paddock was of medium fertility with pH 6.4, and soil test levels of K 9, P 20 and Mg 7. Its recent fertiliser history was 500 kg/ha of 30% potassic serpentine superphosphate applied annually with 2.5 t/ha of lime applied two months before the trial was sown.

Treatments

Six cultivars and a New Zealand selection of sainfoin were compared with WL318 lucerne. The sainfoin cultivars from overseas were largely selected on the availability of seed. The cultivars and their country of origin were:

Buciansky - Czechoslovakia
Eski - USA
Fakir - France
Melrose - Canada
Pola - Poland
Remont - Canada
New Zealand selection

The New Zealand selection was supplied by Grasslands Division, DSIR. It was derived from a number of erect growing cultivars with low shoot numbers, and was a bulk seed harvest from a number of promising plants (W. Rumball, pers. comm.). The lucerne was used as the control line.

Layout and Design

The trial was a split plot randomised block design with 4 replicates in which the cultivars were the main treatments and the sub plots were the cutting intervals of six and eight weeks. The plot size was 7.5 x 1.2 m.

Establishment

On the 19th November 1980, all sainfoin cultivars were sown at 50 kg of viable seed per hectare and the lucerne at 12 kg/ha. The site was cultivated with a rotary hoe prior to sowing. The seed was broadcast after which the plots were raked and then rolled to consolidate them. The seed was coated with the appropriate Rhizobium innoculum immediately prior to sowing.

Trial Management

In the first growing season the objective was to produce well established and uniform stands of all cultivars. However, all plots had high populations of weeds. The main weeds were yarrow (*Achillea millefolium*) and fathen (*Chenopodium album*). The plots were sprayed with a herbicide mixture comprising propyzamide at 3 kg/ha ai and cyanazine at 4 kg/ha ai in August 1981. Some individual yarrow plants were also painted with glyphosate.

The trial was topdressed with 600 kg/ha of 15% potassic serpentine superphosphate and 5 kg/ha of borax in January 1981 and 1250 kg/ha of superphosphate in October 1981. The latter dressing was required to lift the phosphate status as the initial Olsen P of 20 was considered too low (based on unpublished information for lucerne).

Plant establishment was measured 21 days after sowing. In the first growing season the plots were trimmed in January, February and April to a cutting height of 10 cm but yields were not recorded.

In the second growing season (1981/82), the two cutting regimes were imposed from mid-September until early March and a common cut of all plots was made in mid-April 1982. All plots were cut to 6 cm using a small plot flail harvester. All herbage was removed.

RESULTS

Establishment Year

Even though conditions at sowing were dry, germination occurred quickly and there were high populations of seedlings of all cultivars three weeks after sowing. Most of the sainfoin cultivars had seedling populations in the range 250-320 plants/m^2 except Eski and Buciansky which had populations of 150-200 plants/m^2. The lucerne population was much higher at 650 plants/m^2.

Notes made on cool season growth in August 1980 showed some differences in yield, although all cultivars had minimal growth in winter. They were ranked in descending order of yield as Pola, Buciansky, the New Zealand selection, Fakir, Melrose, Remont and Eski. Remont and Eski had virtually no growth.

1981/82 Growing Season

Both the sainfoin and lucerne commenced growth in mid-September. The sainfoin had strong growth until mid-January 1982 with all plots largely free of weeds. From mid-January onwards it was necessary to dissect the sainfoin from the weeds in order to determine the sainfoin yields. The lucerne grew as a pure stand all season with no appreciable weeds. The main weed in the sainfoin was yarrow and it is of note that the lucerne effectively suppressed yarrow whereas sainfoin did not. In September when lucerne had a high population of blue-green aphids none of the sainfoin cultivars were infected.

Of the sainfoin cultivars Melrose had the highest yield and Remont, Eski and the New Zealand selection the lowest yields (Table 1). The annual yield of Melrose was a little over half that of WL318 lucerne. Yields of all sainfoin cultivars were lower under six weekly than eight weekly cutting, while that of lucerne was slightly higher under six weekly than eight weekly cutting. Fakir, having been one of the poorest yielding cultivars under the six week cutting treatment improved its ranking under the eight week regime.

Under 8 week cutting the yield of Melrose during spring and early summer was similar to lucerne. However, from January to April there was a clear advantage to lucerne. Pola, Buciansky and Fakir, the European cultivars of sainfoin had stronger autumn growth than Melrose, but yields were on average still only ten percent of lucerne.

TABLE 1: Individual cultivar and total herbage dry matter yields for 1981/82 (kg DM/ha). Note the statistical analyses did not include lucerne.

Cultivar	Sainfoin yield		Total yield	
	6 wk	8 wk	6 wk	8 wk
Buciansky	3030	4710	4620	5500
Eski	2640	4050	4130	4960
Fakir	2660	4540	4170	5330
Melrose	3450	5230	5080	6170
Pola	3190	4260	4550	5100
Remont	2670	3620	4320	4440
NZ Selection	2480	3710	3940	4490
WL318 Lucerne	10830	10190	10830	10190
SED (within cultivars)	260		250	
SED (all comparisons)	320		330	

1982/83 Growing Season

The weed populations from the previous season reduced the sainfoin population to the point where it was not worthwhile to measure yields during this season. The plots were trimmed regularly and the plant population visually assessed in February 1983. Of the sainfoin cultivars Melrose had a significantly higher population than the others but was only half that of lucerne (Table 2). Most sainfoin cultivars still had higher populations in the eight than the six weekly cutting regime. The lucerne plots were weed free.

TABLE 2: Population assessment 27 months after sowing (0 = nil, 10 = high). Note that the statistical analyses did not include lucerne.

Variety	Cutting interval (weeks)	
	6	8
Buciansky	2.8	2.8
Eski	2.0	2.3
Fakir	2.3	2.3
Melrose	4.3	5.0
Pola	1.8	2.3
Remont	1.8	2.5
NZ Selection	1.0	1.5
WL318 Lucerne	10.0	10.0
SED (within cultivars)	0.35	
SED (all comparisons)	0.8	

DISCUSSION

Results of the present experiment conflicted with a similar study at Palmerston North where Melrose was inferior to Fakir and Pola (Rumball, 1982), which suggests that when sainfoin is grown in New Zealand genotype x environment interactions are agronomically important.

Weed ingression by fathen and yarrow played an important part in the persistence and long term productivity of sainfoin in this experiment. The herbicides applied during the establishment year and during the first winter gave good control so the crops were largely free of weeds in the spring and early summer of the second year. However these weeds became more prominent as the season progressed and appeared directly related to the low autumn growth of the sainfoin. It is unlikely that the sainfoin cultivars used in this experiment would persist on farms without annual applications of herbicide.

To a farmer, the low yields in autumn and high costs of weed control would not compensate for the bloat free and higher nutritive forage (Hanna *et al.*, 1972; Allinson & Osbourn, 1970), which is sainfoin's major advantage over lucerne.

As a perennial tap-rooted legume with a spring and summer growth season, sainfoin has many similarities to lucerne. Therefore, it is difficult to conceive of it filling any

niche in the present farming systems other than that currently filled by lucerne. The corollary to this is that any new sainfoin cultivar need only be adapted for use in those districts where lucerne is currently an important crop viz. Central Plateau, Marlborough, Canterbury and Central Otago.

The lack of autumn growth is the single major factor limiting use of sainfoin in the Central Plateau. It is suggested that in any future New Zealand breeding programme a major objective should be stronger autumn growth. This could also enhance winter growth. The poor performance of the New Zealand selection indicates the work to date did not improve the autumn growth in the Central Plateau environment. Both the current experiment and its predecessors (Percival & McQueen, 1980) showed considerable interplant variation within all sainfoin cultivars, suggesting there is some scope to make progress. However, at Palmerston North, Rumball (1982) noted there was little genetic variation available to enhance cool season activity. It is unlikely that sainfoin will be generally used until an improved cultivar is available.

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