PRELIMINARY ASSESSMENT OF SUBTROPICAL LEGUME SPECIES AT SEVERAL SITES IN NORTHLAND

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ABSTRACT

Various subtropical legume introductions were evaluated at several Northland sites from 1967-70. The growth and persistence of most plant material tested was severely limited by low temperatures although several species could be classed as promising. *Desmodium intortum* cv 'Greenleaf', D. *uncinatum* cv 'Silverleaf' and *Lotononis bainesii* cv 'Miles' revealed relatively good persistence and productivity. *Lablab purpureus* cv 'Rongai', *Dolichos axillaris* and several *Vigna* species exhibited good summer-autumn growth rates but only V. *schimperi* had any degree of persistence among the annual types.

Some growth characteristics of the various evaluations are presented and their agronomic potential discussed in relation to Northland farm practice.

INTRODUCTION

The introduction of subtropical grass and legume plant material has been strikingly successful in Queensland, Australia (Hutton, 1969). There probably remains a sufficient pool of untested plant material within the tropics to make plant introduction an attractive means of raising pastoral farm production within that region (Williams *et al.*, 1976).

Several warm season grasses have already been successfully introduced to the northern areas of New Zealand; most notable among these being *Paspalum dilatatum* and Kikuyu *(Pennisetum clandestinum).* Despite the apparent adaption of these grasses in forming dominant associations with temperate grasses and legumes (Lambert, 1967), little attention has been directed towards the evaluation of alternative warm-season legumes in this country, although Rumball and Lambert (1980) have published results of their plant introduction studies conducted in Northland from 1958-78.

In 1967 an evaluation programme was begun by MAF research division with single plant sowings of introduced plant material, which were later extended to small-plot studies at several locations, through until 1970. This paper reports on the preliminary findings of these evaluation studies.

MATERIALS AND METHODS

Seed of plant material were obtained from Cunningham Lab, CSIRO, Brisbane and, after mild scarification of lines with hard seed coats and inoculation with appropriate *Rhizobia,* were sown out in field plantings over the late spring-early summer period. The sites, years and the legumes tested are shown in Table 1.

TABLE 1: Species and cultivars of subtropical legumes evaluated in Northland from 1967-70.

Species	Cultivar	Sites
Desmodium intortum	Greenleaf	1,2,3,4,5,6,7,8
Desmodium uncinatum	Silverleaf	1,2,3,4,5,6,7
Lotononis bainesii	Miles	1,2,3,4,5,6,7
Macroptilium atropurpureum	Siratro	1,2,3,4,5,6
Vigna sinensis	unknown	1,2,3,4,5,6,7
Vigna luteola	unknown	2,3
Vigna oblongifolia	unknown	3
Vigna vexillata	unknown	3
Vigna schimperi	unknown	3
Phaseolus lathyroides	Murray	3
Pueraria phaseloides	unknown	1,2,3
Lablab purpureus	Rongai	2,3,4
Dolichos axillaris	unknown	3
Cajanus cajan	unknown	3
Stylosanthes guyanenis	Schofield	1,3
Stylosanthes humilis	unknown	1,3
Glycine javanica	Clarence	1,2,3
Glycine javanica	Tinaroo	1,2,3
Glycine javanica	Copper	1,2,3

Sites

1. Waiotira 1967
2. Kaitaia 1968, 1969, 1970
3. Whangarei 1968, 1969, 1970
4. Dargaville 1968, 1969, 1970
5. Te Paki 1970
6. Omamari 1969, 1970
7. Ruakaka 1969
8. Matapouri 1970

Initial plantings were limited by seed supplies to single plant studies although later plantings of the more promising cultivars were extended to 1 x 3.5 m plots.

Observational data were recorded for various characteristics such as date of flowering, plant height and vigour, the incidence of pests or diseases. Occasional yield cuts were taken and chemical compositions including *in vitro* digestibilities (IVD) determined on the dry matter samples. The plots were not grazed.

RESULTS

The preliminary assessments of the various legumes under test are shown in Table 2. The establishment and subsequent growth of S. *guyanensis, S. humilis* and the *Glycine javanica* cultivars was inconclusive at the sites tested and no firm conclusions can be drawn on these legumes. Of the remainder, it can be seen that only D. *intortum* and D. *uncinatum* had good persistence (i.e. they were capable of substantial regrowth in the second summer) while L. *bainesii* and V. *schimperi* were considered to have exhibited a fair degree of persistence. The other legumes were incapable of successfully over-wintering at any of the sites where they were tested. Whereas D. *uncinatum,* D. *intortum* and L. *bainessi* were capable of regeneration after winter dormacy, the other subtropical legumes were not. Plots of V. *schimperi* re-established each year, presumably through the production of viable seed following a March flowering period. The period from flowering to cessation of growth in winter was presumably too short (and indeed flowering was not observed at all in some species) for the production of any viable seed in the other legumes tested.

Dry matter yield and herbage vigour assessments showed that most of the legume introductions exhibited summer-autumn activity, with P. *lathyroides* and C. *cajan* the worst and D. *intortum,* D. *uncinatum* and *Lablab purpureus* the best legumes tested in this respect. The lower leaf-stem ratios recorded from the subtropical legume species compared to white clover, is probably reflected in the lower IVD's recorded in Table 3. D. *intortum* and D. *uncinatum* were quite markedly hairy plants and the IVD value recorded for D. *intortum cv* 'Greenleaf' was substantially below that recorded for white clover *Trifolium repens.*

TABLE 2: Observations on various characteristics of subtropical legumes in Northland.

Species	Leaf/Stem ratios	Month when flowering observed	Yield Assessment	Vigour Assessment	Persistence
D. *intortum*	0.43	June	excellent	excellent	good
D. *uncinatum*	0.40	—	excellent	excellent	good
M. *atropurpureum*	1.50	March	fair	good	poor
P. *lathyroides*	1.00	March	poor	fair	poor
L. *bainesii*	0.43	February	fair	excellent	fair
V. *sinensis*	1.00	March	good	good	poor
V. *luteola*	1.00	—	fair	good	poor
V. *oblongifolia*	0.80	—	good	good	poor
V. *vexillata*	1.20	—	good	good	poor
V. *schimperi*	1.00	March	good	good	fair
Lablab purpureus	2.00	—	excellent	excellent	poor
Dolichos axillaris	1.80	—	good	good	poor
C. *cajan*	1.00	—	poor	poor	poor
S. *guyanenis*	—	—	—	—	
S. *humilis*	—	—	—	—	—
G. *javanica*	—	—	—	—	—
T. *repens* (standard)	1.50	January	fair	excellent	excellent

TABLE 3: The chemical composition and *in vitro* digestibility (IVD) of autumn herbage of various legume species grown near Whangarei 1969 and 1970.

Species	%IVD	% elements N	P	Mg	Ca	Na	K
D. *intortum*	50.4	4.00	0.381	0.35	1.20	0.05	2.82
L. *bainesii*	66.4	4.70	0.439	0.30	1.05	0.06	2.80
M. *atropurpureum*	64.7	3.97	0.439	0.47	1.64	0.06	2.53
P. *lathyroides*	62.1	4.84	0.472	0.46	1.60	0.08	2.15
V. *sinensis*	71.1	4.40	0.525	0.39	1.35	0.06	3.64
V. *luteola*	—	3.15	0.130	0.22	1.51	0.13	2.08
V. *oblongifolia*	—	3.75	0.154	0.35	2.00	0.04	2.70
V. *vexillata*	—	3.80	0.177	0.58	1.44	0.04	2.31
V. *schimperi*	—	1.75	0.151	0.21	1.15	0.03	2.40
Dolichos axillaris	—	2.20	0.124	0.24	1.00	0.02	1.50
Lablab purpureus	—	3.83	0.208	0.27	1.70	0.03	2.12
C. *cajan*	—	2.92	0.180	0.18	0.70	0.03	1.50
T. *repens* (standard)	78.9	4.20	0.373	0.30	1.56	0.14	2.86

The range of chemical composition values presented in Table 3 does not reveal any major deviations from expected values except that generally the subtropical legumes had lower sodium content (with the exception of V. *luteola)* than white clover. The nitrogen of V. *schimperi, Dolichos axillaris* and *Cajanus cajan* was low enough to suggest nodulation problems may have existed with these legumes although only C. *cajan* lacked plant vigour.

DISCUSSION

Among the possible advantages of growing subtropical legumes in Northland would be their ability to produce a bulk of herbage over a period of the year when temperate plant growth is severely restricted by moisture stress and/or high temperatures. Several of the legumes tested were able to demonstrate this potential. In addition there appeared to be little disease or pest effects on the herbage growth which, in general, appeared to contain sufficient plant nutrients for satisfactory animal performance although the lower IVD's could be an area of some concern. Subsequent small-plot mowing experiments have confirmed the ability of D. *intortum* cv 'Greenleaf' and D. *uncinatum* cv 'Silverleaf', to produce significant amounts of dry matter over the warmer seasons of the year in Northland (Goold 1978, unpublished data) although there is need for some grazing evaluation on these legumes and also practical methods of weed control in establishing them. The lack of yield and persistence of the other perennial legume introductions indicates their limited potential within the region, an opinion which is in agreement with Rumball and Lambert (1980).

The potential in Northland of the annual legumes such as *Lablab purpureus, Dolichos axillaris* and various *Vigna* species remains to be explored, and, although their traditional role as pulse and green manure crops would seem to have little place in Northland pastoral farm practice, the recent swing towards intensive horticultural development of land within the warm zone, could increase the chance of these species being usefully grown for specialised purposes.

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