RELATIVE YIELDS OF LABLAB AND VELVET BEAN

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SUMMARY

The growth of lablab bean (*Dolichos lablab*) and velvet bean (*Stizolobium deeringianum*) was compared on alluvial clay and basaltic clay loam soils in the Richmond River district of New South Wales.

Lablab bean produced 76% more leaf and 118% more total herbage than velvet bean and was only partially affected by frost in June. Velvet bean ceased growing in May and was completely desiccated in June. During late autumn naturalised pastures of the region are of low quality and lablab can provide a valuable pasture supplement.

INTRODUCTION

Lablab bean (*Dolichos lablab*) and velvet bean (*Stizolobium deeringianum*) are used as annual forage or green manure crops in the tropical and subtropical regions of Australia. Velvet bean has a long history of use (Mead 1959), whereas lablab bean has been used commercially for only a few years (Wilson and Murtagh 1962).

The growth of the species was compared in 1960–61 in four trials conducted in the Richmond River district of New South Wales. An estimate was also obtained of the ability of each species to provide forage during late autumn.

MATERIALS AND METHODS

Similar trials were sown into cultivated seedbeds at four sites, which are described in Table 1. Lablab bean (Rongai variety) was sown at a seeding rate of 26 lb per acre and velvet bean (black seeded South African variety) at 31 lb per acre. Both species were sown in rows 30 in. apart in contact with a band of neutral-superphosphate (basic superphosphate) fertilizer used at the rate of 243 lb per acre. The legume seed was inoculated with the recommended strain of inoculum (Na 106 for both species). The two treatments were replicated in four randomized blocks of two plots, each 1740 sq ft in area.

TABLE 1

Description of the trial sites.

Site	Average Annual rainfall	Soil type	Usual frost incidence
Duck Creek	70 in.	Heavy alluvial clay	Occasionally in July–August
Wollongbar	66 in.	Red basaltic clay loam	Occasionally in July–August
Wyrallah	51 in.	Alluvial clay	June–August
Fairy Hill	44 in.	Chocolate basaltic clay loam	July–August

The cumulative dry matter yield was estimated at approximately monthly intervals throughout the season by cutting quadrats (4.0 x 2.5 ft) at three random points within a plot. At each point a system of ranked seats (McIntyre 1952)

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was used to determine which quadrat from a group of three should be cut. The cut material was separated into legume and other species. The legume was further divided into leaf (including petioles), stem, and also seed pods when present. The dry matter content was determined by dehydrating at 180°F and all legume fractions were analysed for total nitrogen using the Kjeldahl technique.

The trials at Wollongbar and Wyrallah were grazed during March for four and two days respectively. Approximately 50 cows were allowed access to both the trial and other grazing areas and were not forced to graze the trial area.

The average weekly maximum and minimum temperatures at each locality are given in Figure 1. There was a gradual decline in temperature at all sites from March onwards. A cold snap occurred during May, and a second more severe one in mid to late June. Monthly rainfall exceeded the estimate of monthly evapotranspiration at all sites except in April at Fairy Hill and in June at Fairy Hill and Wyrallah. However in these cases the moisture deficit never exceeded 0.20 inch and the additional moisture requirement was readily supplied from soil moisture reserves.

RESULTS

The dry matter yields of leaf and stem at three sites are shown in Figure 1. The fourth site, Duck Creek, was not included as the trial failed due to a severe infestation of summer grass (*Digitaria sanguinalis*), and only one sample was taken (Tables 2 and 3).

Dry matter production

The growth rate of each species is represented by the slope of the graphs in Figure 1. During the period of rapid growth, lablab bean produced leaf material at a much quicker rate than velvet bean. The rate of stem growth was also greater with lablab bean but the difference was less marked.

The velvet bean was fully grazed at Wollongbar, but the cows only nibbled the lablab bean. However, both species were grazed equally at Wyrallah. Little of the stem material was eaten and the stem yield of lablab bean actually increased during the grazing period at both sites, while that of velvet bean remained approximately constant.

Growth of velvet bean ceased during cool weather in mid-May, but lablab bean was not affected. During June there were a number of frosts which destroyed the remaining velvet bean herbage. There were some losses of lablab bean leaf, but stem yields were not reduced.

The peak yield of dry matter during the season is presented in Table 2 for each site. The peak yield has been taken as the yield present when leaf yield was at a maximum, and where applicable, it also includes the growth removed by grazing.

TABLE 2

The peak dry matter (DM) yield of legume leaf, total legume herbage and other species at four sites.

Site	Legume leaf		Total legume		Other species in		Dominant types in other species
	Lablab	Velvet	Lablab	Velvet	Lablab	Velvet	
	lb DM/acre		*lb DM/acre*		*lb DM/acre*		
Duck Creek	356	174*	568	240*	2419	2852	Summer grass
Wollongbar	1856	1150*	3668	1603*	315	485	Paspalum
Wyrallah	1882	766*	3213	1086*	531	858	Paspalum
Fairy Hill	1975	1351*	4122	2159*	229	1699*	Crab grass and summer grass

*Significantly different (P = 0.05) from the corresponding yield in the lablab bean treatment at the same site.

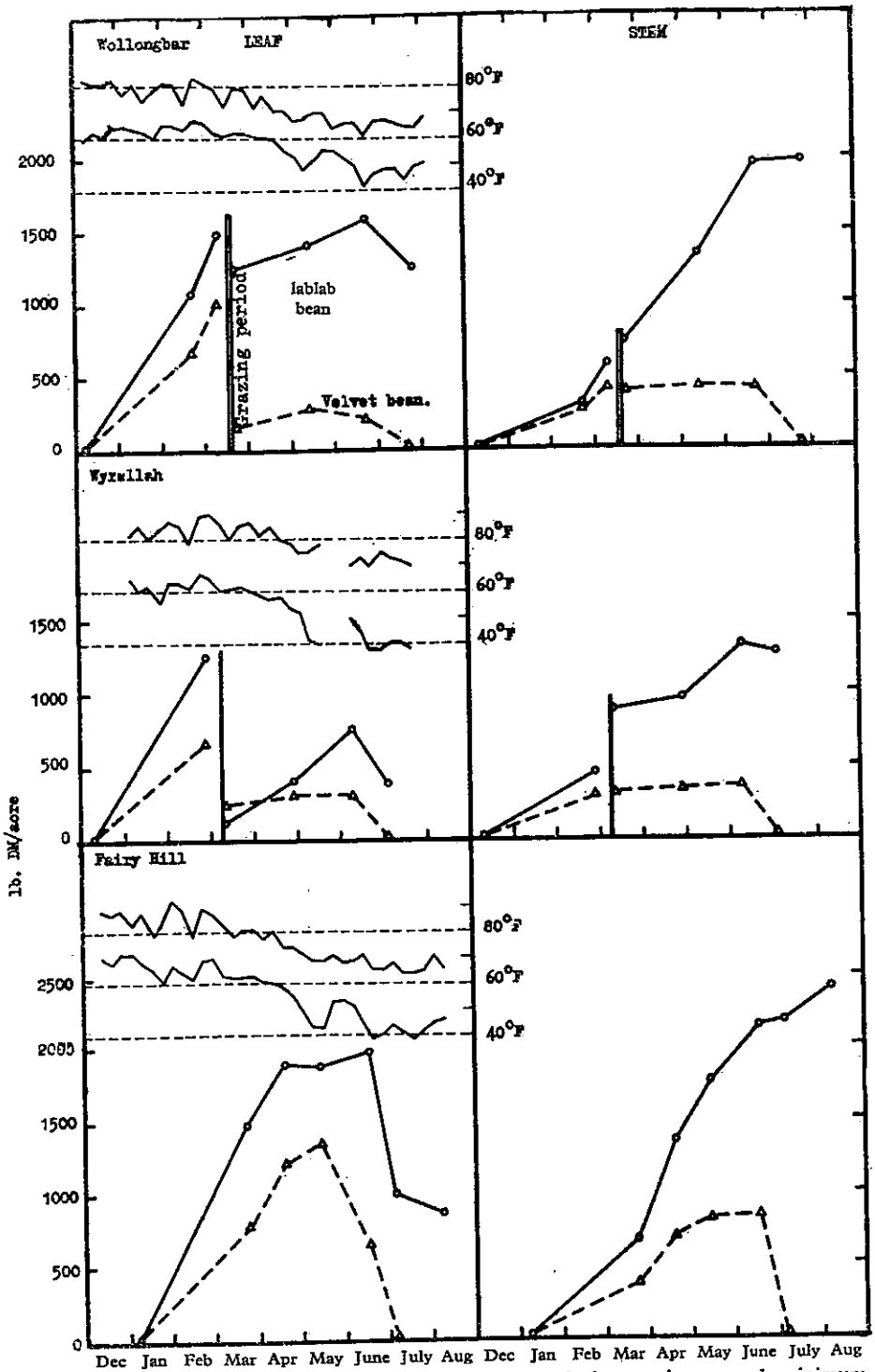

Figure 1. The dry matter yield of leaf and stem, and the maximum and minimum temperatures at three sites.

In all cases the lablab bean yield was significantly greater than that of velvet bean. The peak yield of lablab bean was approximately the same at the three successful sites, regardless of whether the plots were grazed or not. However, the grazed plots produced less stem. At Wyrallah there was little regrowth of velvet bean, and the peak yield of this species was less than at other successful sites.

Paspalum (*Paspalum dilatatum*) regenerated in the plots at Wollongbar and Wyrallah and although there was no significant difference in yield between treatments, there was a tendency for paspalum yields to be greater with velvet bean. Weed growth of summer grass and crab grass (*Eleusine indica*) occurred at the other sites.

Nitrogen yield

With one exception, the nitrogen yield of lablab bean exceeded that of velvet bean throughout the season, and nitrogen yield of leaf and stem fractions was highly correlated with the corresponding dry matter yield (Figure 2). Whereas stems provided the larger proportion of dry matter yield in later samplings, the nitrogen yield was almost always higher in leaves than in stems.

TABLE 3

The yield of nitrogen in the peak dry matter yield of legume leaf and total legume herbage at four sites.

Site	Legume leaf		Total legume	
	Lablab	Velvet	Lablab	Velvet
	lb N/ac		*lb N/ac*	
Duck Creek	5.19	7.33	7.33	5.85
Wollongbar	45.21	33.95	62.24*	39.35
Wyrallah	48.37	23.93	58.13	28.18
Fairy Hill	54.75	41.54	79.80*	55.25*

*Includes nitrogen in partly developed seed pods.

Although velvet bean leaves contained approximately 3.1% more crude protein than lablab bean, there was less nitrogen in the peak dry matter yield of velvet bean because of its lower forage yield (Table 3).

Leaf and stem ratio

As a crop developed, there was a decrease in the proportion of leaf material in the total dry matter yield (Figure 3). In ungrazed stands there was eventually more stem than leaf material. With the exception of the Wollongbar plots which were grazed differentially, the proportion of leaf at the same stage in growth was similar for the two species.

DISCUSSION

The recommended seeding rates used for each species resulted in a higher seedling density of lablab bean. This would have contributed towards its more rapid dry matter accumulation during the early stages but, in addition, individual lablab bean seedlings were observed to be more vigorous than those of velvet bean. This more rapid growth rate of lablab bean during the establishment period restricted the growth of competing species and also led to earlier grazing.

The poor acceptability of lablab bean during grazing at Wollongbar was attributed to the fact that the cows had been grazing velvet bean previously and

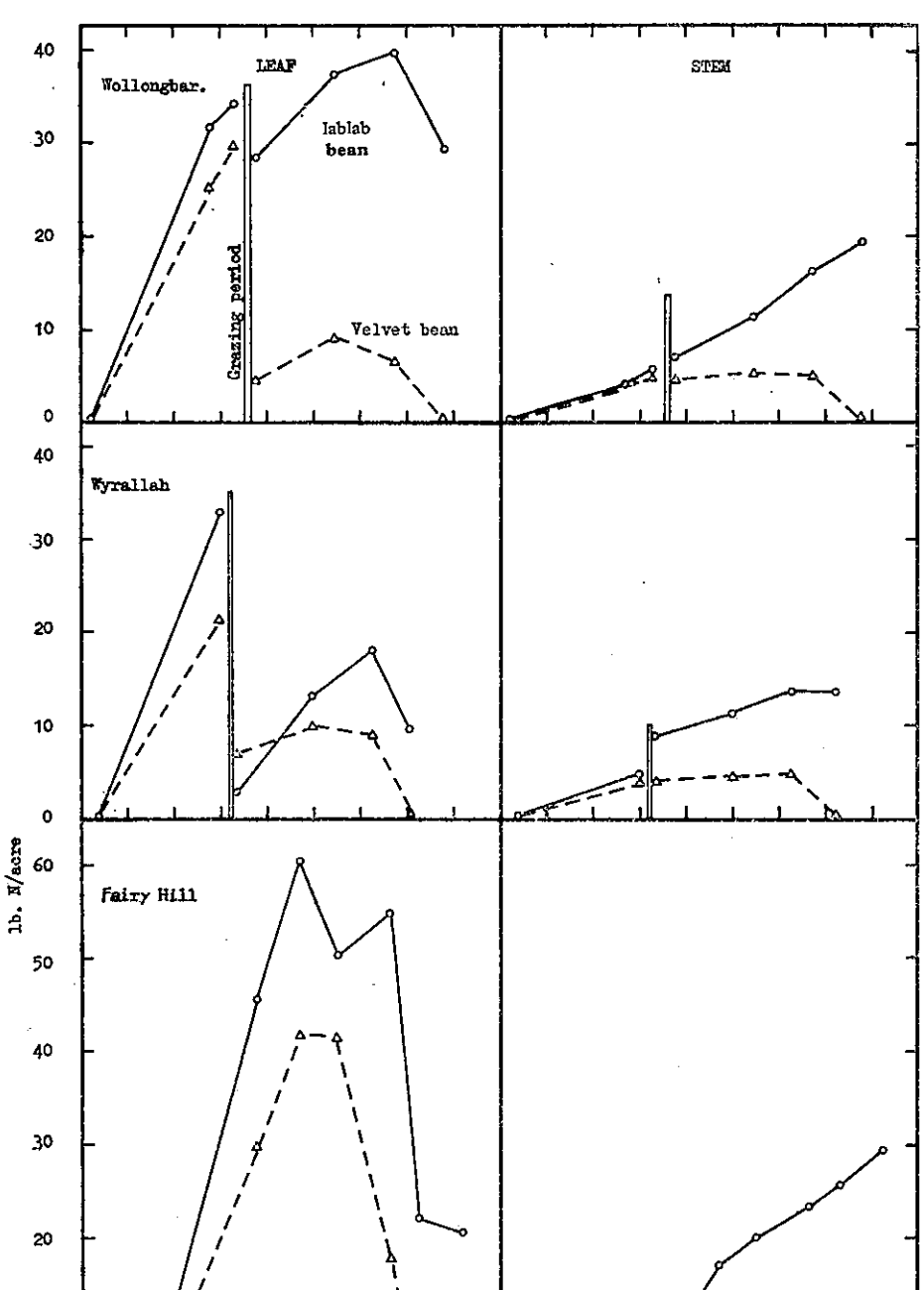

Figure 2. The nitrogen yield of leaf and stem at three sites.

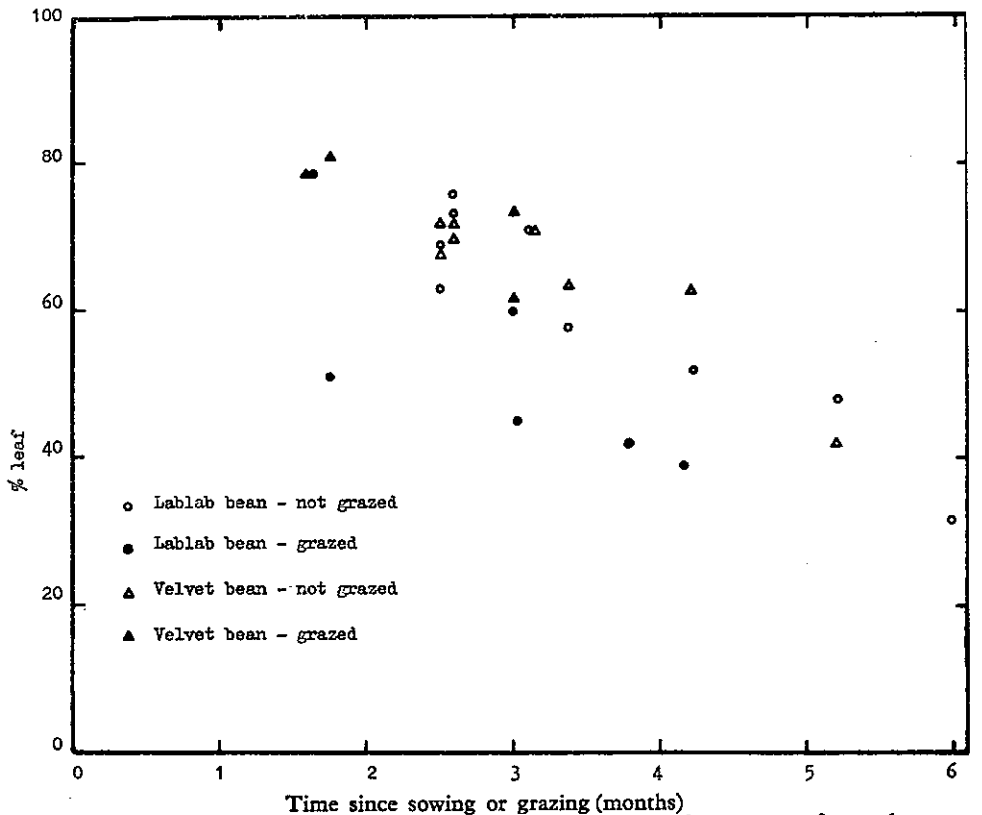

Figure 3. The percentage of leaf in the total herbage at various stages of growth.

had developed a taste for the species. In the light of other experience it was considered that the cows would have also fully grazed the lablab bean if the grazing period had been longer than four days.

A reasonably dense leaf canopy remained following the cursory grazing of lablab bean at Wollongbar, and the consequently reduced rate of leaf regrowth was attributed to the already high level of light interception. The grazing at Wyrallah resulted in almost complete defoliation and was followed by considerable regrowth of leaf material. At both sites lablab bean continued to produce stems.

In contrast, there was little regrowth of either leaf or stem of velvet bean at either site. This lack of regrowth was largely due to the declining temperatures from April onwards and illustrates the lower cold tolerance of velvet bean.

The Fairy Hill plots were not grazed and the leaf yield of lablab bean did not increase beyond 2,000 lb DM/acre. At this stage the leaf canopy was so dense that it appeared to fully intercept the incident light. However, stem weight continued to increase. The leaf growth of velvet bean was restricted by cool weather before it reached a ceiling level.

The results suggest that lablab bean has a ceiling leaf yield of approximately 2000 lb DM per acre. Leaf yields of velvet bean never exceeded 1400 lb DM per acre and it is not known if it would have a similar ceiling level. Because the leaf material forms the major portion of the crop which is actually grazed and is also the major source of crude protein, it is important that the crop be managed to

provide the maximum leaf yield during the anticipated grazing period. If grazing is required throughout the growing season, the crop should be grazed before a full leaf canopy is developed, since there is little or no increase in dry matter beyond this stage. However, if grazing is not required until April-May, the highest leaf yields at this period will be obtained from an ungrazed crop.

The yield and quality of lablab bean forage did not decline until frosts occurred in June. In contrast velvet bean commenced to deteriorate during May. The climatic conditions during the season were typical and this superiority of lablab bean should be exhibited in most seasons.

The ability of lablab bean to provide high quality forage during late autumn strengthens its role as a component of feed-year systems on dairy farms. Naturalised pastures in the region are of poor quality at this time and a farmer usually plans to feed a winter forage such as oats. Unfavourable weather during March and April can delay the sowing of winter forages, thus creating a feed gap in late autumn which lablab bean can fill.

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