Trial 1

Grain legumes on Sandy Calcareous Soils

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Project aims The project was established to evaluate commercial and new pulse (grain legume) cultivars on sandy, calcareous soils, in terms of both the crop performance and its benefit in a rotation. Oilseeds (Canola and Mustard) have been included in the project to assess their abilities as a break crop in comparison to pulses. The project also involves the evaluation of different stubble treatments to measure the effect of crop residue incorporation time on soil nitrogen availability and the yield and quality of the following cereal crop.

Soil analysis Samples of soil at the site were taken to a depth of 25 cm, in two increments. Analysis showed Zinc and Sulphur were at very low levels and that total Nitrogen was less than detectable levels. Phosphorus and Potassium were both adequate. The soil was strongly alkaline with a pH (1:5 water) site average of 8.6. Electrical conductivity was low and total soluble salts at 0.04%, indicating no problems with salinity. The soil was therefore typical of many areas in the Mallee where viable grain legume options are extremely limited at present.

Crop establishment On the July 20, approximately 8 weeks after sowing, the site was sampled for crop density, dry matter production and nodulation on the pulses. The good break and continuing rains assisted each crop to establish well, with good plant numbers and dry matter weights being recorded. Plant density was above the optimum or preferred level although ample rainfall avoided moisture stress at this stage of growth and did not threaten yield. Faba beans produced the most dry matter production, benefiting from the high amount of available moisture which suited the vigorous growth of faba beans at this early stages of development.

Nodulation The nitrogen fixing ability of the legume crops were also assessed on July 20, using a scoring system. Nodule development was poor on the roots of all crops. On a scale of 1-5, peas provided the best result, averaging 2.09, however this is not regarded as very high. No further nodule scoring was done on any of the crops for the year although throughout the growing season one or two plants were assessed at random and the amount of nodules on the roots had increased, especially on lupins.

Table 1 Crop production measurements at Birchip site - 1995

CROP	EMERGENCE RESULTS			ANTHESIS RESULTS		HARVEST
	Density plants/m^2	Dry matter g/m^2	Nodules rating 0-5	Density plants/m^2	Dry matter g/m^2	Yield t/ha
Lupins	84.7	12.65	1.45	82.6	235	1.32
Medic	108.2	5.57	0.59	111.9	60	-
Vetch	66.7	10.38	1.82	83.1	145	2.24
Lathryus	54.0	3.87	1.33	59	210	2.44
Chickpea	57.7	4.6	0.05	56	84	1.44
Faba	37.0	33	1.43	52.4	221	1.88
Narbon	48.0	22.42	1.11	63.8	323	2.59
Pea	53.0	21.23	2.09	56.7	350	2.54
Mustard	101.2	17.02	-	87.4	257	0.76
Canola	105.2	14.47	-	95.2	213	1.03
lsd (p=0.05)	32.7	6.85	0.29	32.1	197	0.46

Sampling at Anthesis (flowering) This sampling occurred on the September 27 and due to the continuing above average rainfalls the dry matter weights were again high. The weights ranged from the lowest of 0.6 t/ha for medic to the highest at 3.5 t/ha for peas. Plant densities stayed relatively similar to that at emergence sampling with the majority of crops either increasing slightly due to late emerging plants or decreasing slightly due to competition or weak emergence. Plant densities were still above suggested levels although due to the above average rains and good soil moisture, moisture stress was of little worry.

Lathyrus had the most dramatic increase in dry matter production between the establishment and anthesis sampling of any of the crops. This is typical of its development pattern for lathyrus as it tends to show increased vigour in its latter stages of growth. In general the dry matter production of each of the crops was extremely favourable, indicating that average to above average yields would be received at harvest.

Stubble incorporation On October 3 the first incorporation treatment was carried out on the allocated sections of each plot, which are split for a total of 4 incorporation times. This was effectively green manuring and provided the longest soil incorporation time for biological breakdown of the crop residue and release of nitrogen. This was done with a two way disc and due to the high amount of vegetative matter each split had to be disced twice to ensure a good "kill" and incorporation of the crop with the soil. Soil sampling was again carried out for nitrogen levels. Sampling for Pratylenchus was also done although results are not yet available. The remaining incorporation times are post harvest, presowing and a final treatment where the crop residue is left on the surface and the following crop direct seeded.

Harvest All crops were harvested on December 4th or 5th. Grain yields were very satisfactory with peas and narbon beans both recording over 2.5 t/ha. These high yields were indicated by the dry matter production recorded at anthesis. Vetch and lathyrus also showed commendable yields of over 2.0 t/ha and the remaining crops all provided satisfactory yields. Grain weights and protein levels are currently being measured.

The project in 1996 Soil analysis is being performed on each individual sub-plot to determine the amount of Nitrogen each crop and stubble treatment produced/retained in the soil. The phase is being done in conjunction with the CSIRO laboratories in Canberra.

The Post-Harvest stubble incorporation treatments were completed on December 12 and two more stubble treatments are still to be done, these being pre-sow and direct drill at seeding. A variety of wheat/barley (yet to be decided) will be sown over the whole site in 1996 and the yields and grain quality from each split will determine the best pulse/oilseed and stubble treatment to use in a rotation on sandy calcareous soils. The entire site will therefore be sown to a cereal in 1996 and plots labelled with the 1995 crop and stubble incorporation time. People interested to follow the development of the plots in 1996 are welcome to observe them throughout the season although are asked to please stay on pathways to avoid influencing results.

The following is a brief outline of the pulse crops being evaluated at Birchip and Underbool;

Narbon bean *(Vicia narbonensis*) The national breeding program for this erect crop is based at Walpeup. Cultivars with palatable grain and high sulphur are possible.
Field peas (*Pisium sativum*) The most commonly grown pulse in the Mallee although production is not expanding and is generally confined to the less sandy soils.
Vetch *(Vicia sativus)* The development of cultivars which have grain with a low neuro-toxin content will re-established this as a valuable pulse crop in the Mallee.
Lathyrus *(Lathyrus spp*) This legume, also referred to as grass pea, is being rapidly developed in Australia. Some cultivars now have acceptable grain quality.
Faba beans *(Vicia faba*) The belief that faba beans need more water than the Mallee can provide is being disproved and the new disease resistant varieties are promising.
Chickpeas *(Cicer arietinum*) The high grain prices and tolerance to calcareous soils make this an attractive crop for Mallee soils which are not subjected to erosion.

Lupin *(Lupinus spp*.) Narrow leaf lupin (L. angustifolius) is poorly adapted to high pH soils although rough seeded species (L.atlanticus and L.pilosus) are far better.