Lima beans - potential grain crop for Southern Queensland

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Abstract

Lima beans are a summer crop with a narrowly defined optimum sowing time in November - December, up to a month earlier than navy beans in southern Queensland. Varieties have been identified which are 20% - 40% higher yielding than navy beans, and with acceptable canning quality. Lima beans are likely to be better adapted than navy beans for rainfed cropping in the Burnett.

Keywords lima beans, grain legume, planting date, drought tolerance

Lima beans (*Phaseolus lunatus)* has a wide range of seed sizes and colours, but the predominant market class in Australia is the 'Baby Green' seed type, green-white of 30 - 40 g/100 seeds. These are either canned as 3 or 5 bean salad mixes or even as green baby lima beans, or are retailed as dry beans.

Lima beans are a warm season legume, summer grown on well drained kraznozem soils in the Burnett region of southern Queensland. Research has shown that grain yields can exceed navy beans (*Phaseolus vulgaris*) by more than 50% under rainfed conditions. Lima beans may offer growers an attractive alternative crop with high gross margins. The crop may also offer growers a drought adapted crop option of short maturity (100 - 110 days) for mid-summer plantings in the drought prone Burnett districts.

Materials and methods

A number of field trials were conducted at the J. Bjelke-Petersen Research, Kingaroy to better understand the agronomic requirement of the lima bean crop. These studies included experiments to assess the influence of sowing date on grain yield, the physiological basis of lima beans superior drought resistance compared to navy bean, and optimal harvesting techniques.

Results and discussion

Sowing Time:

In three experiments conducted over 3 years (1995-1997), it was found that grain yield was optimised with a November - December sowing (Fig. 1). This response indicates a narrower cropping window than for navy beans which can be sown as late as February without suffering significant yield loss. All these experiments were conducted under irrigated conditions, and indicate that grain yields in excess of 2.5 t/ha are achievable with good water supplies. The higher yields in the 1996/7 season were associated with a trickle irrigation system which was able to effectively meter water onto plots at a truly non-limiting rate.

Physiological Basis of Superior Drought Resistance

Experiments were conducted to determine the physiological basis of the superior drought resistance of lima bean compared to navy bean. Four navy bean varieties (Acc 1280, Narino 11, Mex 685B and Sirius (a current commercial variety) were compared with Bridgeton, a lima bean variety under field conditions, which received a ?typical? end-of-season drought pattern at Kingaroy. Measurements of grain yield, and the physiological components of yield according to the ?water? model proposed by Passioura (1) were derived using the approach outlined by Wright (2). Fig. 2 shows the relative varietal performance for grain yield and the physiological components transpired water (T, mm), water-use efficiency (WUE, kg/ha/mm) and harvest index (HI). The lima bean had substantially higher yield (70%) than all the other navy bean

varieties owing to a superior combination of T, WUE and HI. These results clearly indicate that the lima bean has superior drought resistance characteristics, attributed to deeper roots, desiccation tolerance and high partitioning of total dry matter into grain despite severe crop water deficits.

Figure 1: Effect of sowing date on grain yield response in lima beans.

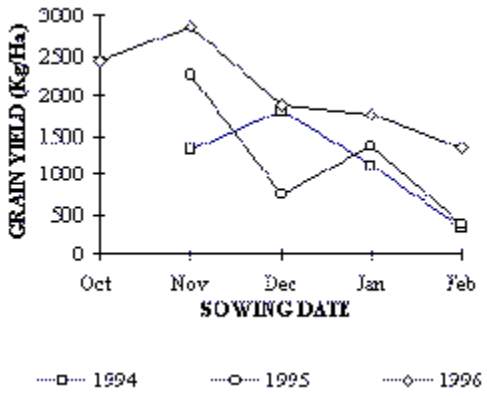

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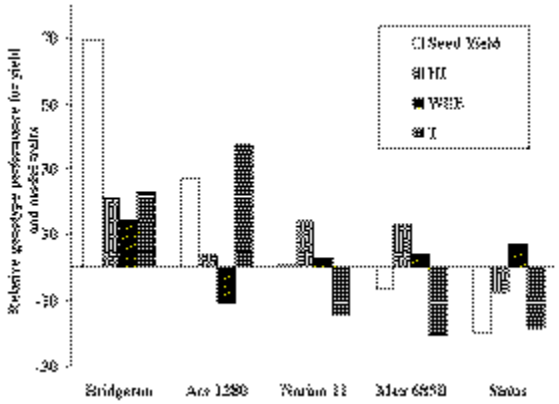
Figure 2: Relative genotype performance of Bridgeton (lima bean) compared to 4 navy bean varieties grown under an end-of-season stress.



Harvesting Procedures

Harvesting of lima beans as a dry grain crop is complicated by an extended branching habit low on the plant, by a degree of indeterminacy in flowering racemes, and the loss of green colouration on the seed after exposure to the sun in over-ripe pods that can split open on drying and dehisce (3). The most satisfactory harvest method has been to cut bushes just below ground level with a rod weeder, rake bushes into windrows, then harvest 1-2 days later using reverse reel pick-up front on the harvester set with a reduced drum speed of about 200 r.p.m. Pre-cleaning to separate trash is required immediately following harvest to preserve market quality.

Conclusions

Lima beans are an attractive alternative to navy beans for rainfed cropping in the Burnett region of south eastern Queensland. Fine tuning of crop management is required for handling as a dry grain crop. Initial

commercial scale field tests are in progress on three farms during the 1997/8 season, with close monitoring of crop growth being provided by Bean Growers Australia (BGA) and DPI.

Acknowledgments

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