

Irrigated faba beans - from two to two hundred

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Summary. A project to develop an irrigated faba bean, *Vicia faba*, industry in the Goulburn Murray Irrigation District (GMID) has increased the number of growers from three, in 1988 to over 100 in 1991. Growers in Southern NSW bring this total to almost 200. The area of faba beans has increased from 200 ha to over 3000 ha. This paper describes the extension process adopted and presents *the* results of experiments investigating the effects of time of sowing and plant population. Maximum yield was obtained at a plant population of 30 plants/m² and early May sowing. Yields declined with later sowing dates and lower populations.

Introduction

In 1987 a comparison of several legumes, under full irrigation, highlighted the potential of faba beans as an irrigated crop. Yields of 5 t/ha from a May sowing and 4.5 t/ha from a late June Sowing were obtained with the crop.

The majority of the references indicate the importance of sowing time, plant population, and the control of chocolate spot, *Botrytis fabae*, and ascochyta blight, *Ascochyta fabae*. Literature searches revealed little work on irrigated faba beans.

Faba beans were a crop that had obvious economic and agronomic potential under irrigation, and subsequently interested farmers. Due to limited information, and resources, we decided that a program involving extension of existing knowledge, "best bet" options, applied research, and monitoring of farm results would be the quickest and most cost effective way of developing the industry.

Methods

Applied research

Time of sowing x plant population. Randomised complete block, factorial, experiments were carried out at Kerang and Tatura in 1989 and 1990. Treatments were time of sowing and plant population. Measurements of morphological characteristics, harvest index and seed yield were taken at one site (Tatura 1990). Seed yield only was measured at the other sites.

Extension

A growers information manual was assembled in 1989, using the best available information. The potential of the crop was publicised in the Northern Irrigation Cropper, a magazine sent to all mixed irrigation farms in northern Victoria.

In 1990 and 1991, growers were actively encouraged to plant faba beans, using local and Statewide press, the Northern Irrigation Cropper, the ABC radio, and growers nights. Those growers who received the grower's manual were subsequently surveyed. Surveys assembled information on key aspects of faba bean agronomy as applied by farmers. The grower's manual was modified each year to reflect experimental results, survey results, and common problems phoned in during the previous season.

Results and discussion

Applied research

Time of sowing x plant population. There was a clear relationship between final yield and both time of sowing and plant population. For three of the four site-years, yields were linearly related to planting date and reduced as planting was delayed (Fig. 1). Grain yield was reduced by 55, 13, and 14 kg/ha for every day that planting was delayed from 1 May for Kerang 1989 (K89), Kerang 1990 (K90), and Tatura 1990 (T90) respectively ($R^2=0.96, 0.87, 0.91$). Grain yield and the response of yield to planting date varied due to site-year specific yield potential restrictions. For example, K90 grain yield was low due to prolonged waterlogging.

T89 yields in Figure 1 vary from K89, K90 and T90 sites in that only one population was planted (32 plants/m²). At this, relatively high population, the earliest planting produced the greatest stem biomass yield (4.63, 2.99 and 1.74 t/ha for -5, 26, and 74 days after 1 May respectively), but a lower number of pods per plant (13.6, 17.0 and 10.8), and the lowest number of seeds per pod (2.07, 2.24 and 2.10). This planting consequently had the lowest harvest index (45, 63 and 63%) and a lower grain yield than the later sowing (3.81, 5.16 and 3.00 t/ha). This grain yield pattern was also observed for the higher K89, K90 and T90 populations (data not presented) but the across population averages, presented in Figure 1, mask this trend.

Figure 2 illustrates that grain yield increased with population up to 30 plants/m² above which a plateau was reached. Below 30 plant/m² each additional plant/m² contributed 70, 25, and 89 kg grain/ha for K89, K90, and T90 respectively ($R^2=0.99, 0.59, 0.97$).

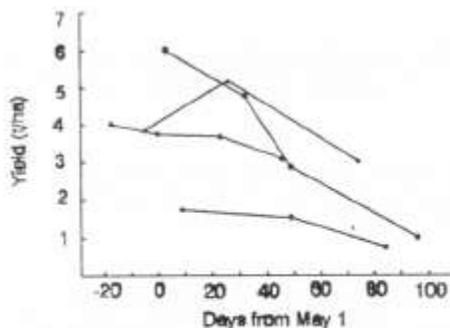


Figure 1. Effect of planting date on seed yield (averaged plant populations). --▲--T90 --◆--K90 --|--T89 --■--K89

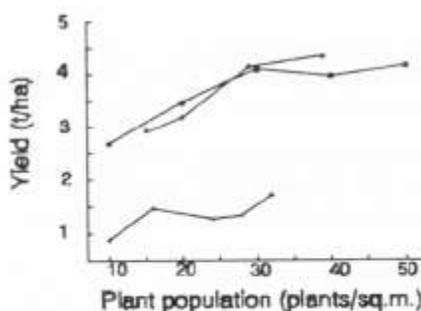


Figure 2. Effect of plant population on seed yield (averaged planting dates). --◆--T90 --|--K90 --■--K89

Extension

Growers manual. The manual was written in two sections, the first a recipe section listing what to do, the second a detailed section discussing the reasons for the recommendations. This approach tried to suit a range of readers. Major recommendations were as follows:

- Sow from 1 May to 16 June. Sow sufficient seed to establish a population of 35 plants/m². Due to the large range in seed size it is important to count and weigh seed to determine sowing rate.
- Inoculate with faba bean inoculum in all soil types.
- Faba beans should be irrigated before or after they are sown. Relying on natural rainfall is risky given the importance of sowing time.
- Weed control with trifluralin and/or simazine will control a wide range of grass and broad leaved weeds. Several selective herbicides can be used to control grass weeds post-emergent.
- Control of chocolate spot and ascochyta blight is of paramount importance. The most effective control strategy is a preventative spray regime. Use mancozeb at six to eight weeks post-emergence (July), repeat in a further six weeks (mid August). Thereafter monitor regularly, daily in wet weather, re-spray if new lesions are detected. Mancozeb is cheap and appears to be effective in controlling both chocolate spot and ascochyta blight if used as a preventative spray.

- Control pests, cow pea aphid, *Penthaleus major*, and native budworm, *Heliothis punctigera*, are the major pests, red legged earthmites, *Halotydeus destructor*, and lucerne flea, *Sminthurus viridis*, can also be important.
- Irrigate to prevent any moisture stress particularly during flowering and pod filling. Thirty per cent of pods that are black indicates physiological maturity; adequate soil moisture should be maintained until this point is reached.
- Faba beans have low levels of self pollination and require insect pollinators. Ensure bee population is sufficient during the flowering period. As a guide, observing less than one bee per 10 m² in the early afternoon during flowering indicates an insufficient bee population and placing hives in the crop should be considered.

Awareness. Use of the Northern Irrigation Cropper, farming and local press, and ABC and commercial radio highlighted the potential of the crop. Combined with grower information nights in 1989 and 1990, this resulted in a mailing list of over 200 intending growers in 1991.

Grower surveys. Post harvest surveys of growers each year provided information on the key agronomic recommendations made in the manual, as applied in the field. Most growers sowed at the recommended time, those that did not, had meant to. Sowing rates were lower than expected, and in 1990 a count of populations in nine good crops revealed only one had over 30 plants/m² although all thought that they had the correct population. In 1991 67 crops were assessed for plant population using fifty 1 m² counts. The average population was 26 plants/m². Only 30% of growers had over 30 plants/m².

Disease control measures were widely adopted and have been very successful with little disease presence during the critical flowering period. Dry springs between 1988 and 1990 meant only one or two sprays were needed by most growers. The only cases where further controls were required were when the preventative strategy was not followed. In these cases poor control was achieved in spite of using the more expensive products, sumisclex and benomyl.

Several growers identified moisture stress in the spring, prior to the first irrigation as a factor limiting yield, and felt they should have irrigated sooner. Monitoring of a demonstration area at Kerang indicated that a crop factor of 0.9 times pan evaporation should be applied in the spring (15). This has been highlighted, in the manual, as a key aspect in achieving high yields.

Conclusions

Faba beans are a highly profitable irrigated crop, however, much is still to be learned about the crops agronomy under irrigation. Water relations, crop nutrition, disease control, and the economic importance of insect pests need to be further investigated.

Extension, using the best available, though imperfect, information and involving monitoring and feedback from farmers, is an effective method of new crop development. It has worked particularly well for irrigated faba beans where growers perceive the need for information, and are prepared to be part of a large test site, for ideas which have a reasonable probability of success. Using this large pool of 'research workers' has enabled a lot to be done with limited resources.

Acknowledgments

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