

Increasing Yields with Bees

Background

Faba beans are an open pollinated crop. This means that the bean flower must be visited by a pollinator for it to produce seeds. CSIRO has suggested that the honey bee is responsible for over 80% of pollination in faba beans. The majority of pollination of bean crops is usually carried out by 'feral bees' that live in surrounding scrub. The feral bee populations have been found to vary dramatically from paddock to paddock and from year to year. To assess the yield response using honey bees for pollination in dryland Faba Beans, twelve sites were established across five major farming regions. This report focuses on the results from the Penneshaw site.

What was done

Separate trials were established to assess the impact of the tent on the crop growth. At Warooka the 'tent effect' was 13% difference in yield and at Wolseley the 'tent effect'

was 21%. It is inconclusive as to whether the yield effect is from 'feral bees' from the nearby scrub pollinating the crop or if the tent impedes the growth of the beans.

The trials were harvested by hand.

Trial Results

All the trials (except the broadacre Penneshaw site) had a number of hives placed in the corner of the paddock. This can dilute the bee density in the crop decreasing effective pollination. All hives were placed in crop as close to when 10% of the crop was flowering as possible. Measurements taken from each site indicated that there is a significant increase in the number of pods being produced per stem compared to inside the exclusion tents. The measurements also indicated that there was no significant difference in the number of seeds being produced per pod.

Site	Yield in tent (t/ha)	Yield out tent (t/ha)	% yield increase	LSD (p=<0.05)
Warooka	1.44	2.05	42	0.53
Penneshaw small plots	1.60	2.48	55	0.45
Penneshaw broadacre wide rows	1.13	2.73	140	0.62
Penneshaw broadacre	1.48	2.24	51	0.62
Wolseley	1.24	2.52	81	0.81
Riverton (bottom of slope)	2.15	3.91	81	0.53
Riverton (top of slope)	2.31	3.79	64	0.53
Tarlee Farah	1.68	2.49	49	NR
Tarlee Nura	1.58	2.41	52	NR
Mundalla Farah	1.97	2.31	17	NR
Mundalla commercial	2.58	3.45	33	NR
Mundalla Nura	2.44	2.92	20	NR
Average	1.80	2.76	54	

Table 1: Bean yield results from all sites around the state

However, observations during the measurements suggested that there were more seeds per pod (although not reflected in the final results) and that those seeds were of a higher quality.

It was also noted that during the season, crops that had bees placed in them matured more evenly, appeared to be shorter and retained more flowers. However, these observations were not measured.

Comments

When placing bees in the corner of a paddock, as was done at all sites except the Penneshaw broadacre site, the bees will disperse and it is hard to maintain the correct density of bees within the trial site. This creates selective pollination within the crop resulting in an inferior pollination.

Most sites were moisture limited with poor spring rainfall which impeded yield potential.

Conclusions and into the paddock

This series of trials strongly demonstrates the lack of pollination in broadacre crops. In the past, growers have relied on 'free pollination' from feral bees, however these trials show that feral bees are not effectively pollinating broadacre crops.

Variation in bean yields from year to year has been blamed on seasonal conditions. These trials demonstrate that even in the harshest of conditions the bees can still increase yields. This suggests that the variation in bean crops may in fact be due to poor pollination and not solely to seasonal conditions.

Over use of insecticides in crops over recent years has also substantially reduced the amount of native and feral pollinators in crop.

Growers need to consider the impact they are having on pollinating insects in their crops.

The contribution of yields to pulse crops by effective pollination is hugely underestimated in Australian agriculture.

Summary

The use of managed hives reduces the risk of relying on pollination to be carried out by variable populations of feral bees.

The beehives that have been used in these trials have been managed specifically for pollination, produce very little honey and are placed throughout the crop. This is in contrast to current pollination practices, which use large colonies placed in a convenient position which is usually at the perimeter of the crop.

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Take Home Message

- Managed bee hives have the ability to substantially increase bean crop yields
- Across the 12 bean trials there was an average of 54% yield increase over the exclusion tent
- In trials with adequate introduced bee densities an average of 73% yield increase was achieved over the exclusion tent