Kerang VIC

Irrigated trials conducted at the Kerang irrigated research centre 2021 were managed by the Irrigated Cropping Council.

Trial 1. Optimum Plant Population Under Sprinkler Irrigation

Protocol Objective: To assess the influence of plant population and cultivar on crop structure, dry matter production and grain yield in two identical faba beans trials (one under overhead irrigation (Trial 1) and one with surface irrigation (Trial 2)

Location: Kerang, Victoria
Sown: 7th May 2021
Harvested: 17th December 2021
FAR Code: ICC F21-01-3
Cultivar: PBA Amberley and Fiesta VF
Rotation position: Wheaten Hay **(**2020), Dryland vetch/brown manure (2019), Oaten Hay (2018)
Soil Type: Neutral medium grey clay
Irrigation: Overhead sprinkler irrigation, 9 applications totalling 225mm (2.25ML/ha)
GSR: April-October 160mm. Total Water available 385mm

Key Messages:

- *Both cultivars showed a similar yield response to increasing plant population with no advantage in yield from plant populations above approximately 20 plants/m2, but significant reductions in yield associated with populations of 15 plants/m^2.*
- *Establishment rate for the different seed rates in the trial averaged 77% with 10-36 seeds/m2 producing 8 – 27 plants/m^2*
- *Fiesta had slightly higher biomass at early flowering but moisture stress had begun to affect the trial. Optimum yields were associated with crop canopy harvest dry matters of 11-12t/ha.*
- *Water use efficiency was 16.1 kg/mm*

Table 1. Grain yield (t/ha) of four seed rates with two different cultivars grown under overhead irrigation.

		Yield t/ha		
Plants/m^2(actual)		**PBA Amberley**	**Fiesta**	**Mean**
Amberley	**Fiesta**	**Yield t/ha**	**Yield t/ha**	**Yield t/ha**
8	8	3.85 -	4.39 -	**4.12 c**
15	15	3.73 -	4.40 -	**4.07 b**
18	19	4.20 -	5.18 -	**4.69 a**
27	26	4.50 -	5.17 -	**4.84 a**
Mean		**4.07 b**	**4.78 a**	

Seed Rate	LSD P=0.05	0.38	**P val**	<0.001
Cultivar	LSD P=0.05	0.27	**P val**	<0.001
Seed Rate x Cultivar	LSD P=0.05	ns	**P val**	0.665

Highest yield grain was from the 24 seeds/m^2 rate (19.1 plants/m^2) in Fiesta, but this not significantly different to the 36 seeds/m^2 yield (26-27plants/m^2). Fiesta had a significantly higher average yield than Amberley, and higher yield at each seeding rate.

Released: 27 Sept 2022

The GRDC Optimising Irrigated Grains Project is a collaborative project including the following project partners:

The irrigation strategy for the trial was to irrigate 'for establishment' or sufficient irrigation to enable establishment but little recharge of the soil in autumn and then to irrigate 'for productivity' in the spring. April and May saw well below average rainfall (11.2mm versus 61.6mm average) and so the irrigation applied just before sowing was deemed insufficient to ensure establishment, and a further 25mm was applied. This resulted in the trial going into winter with very little subsoil moisture.

June and July received average rainfall, but August was well below average (17.2mm vs 36.8mm). This resulted in severe moisture stress in early August. As the irrigation season does not open until mid-August, the moisture stress could not be addressed until 20 August. 175mm was applied in the spring (compared to 180mm applied to the 'flood' trials) but plant growth had already been compromised and yield failed to recover when compared to the flood irrigated trials.

Water use efficiency was 16.1 kg/mm.

Table 2. Influence of plant population and cultivar on establishment plants/m^2 (25 June)

		Plants population		
Seed Rate (seeds/m^2)	**PBA Amberley**	**Fiesta**		**Mean**
	Plants/m^2	**Plants/m^2**		**Plants/m^2**
10 seeds/m^2	8 -	8 -		**8 d**
18 seeds/m^2	15 -	15 -		**15 c**
24 seeds/m^2	18 -	19 -		**19 b**
36 seeds/m^2	27 -	26 -		**27 a**
Mean	**15**	**17 -**		
Seed Rate	LSD P=0.05	2	**P val**	<0.001
Cultivar	LSD P=0.05	ns	**P val**	0.837
Seed Rate x Cultivar	LSD P=0.05	ns	**P val**	0.504

Table 3. Influence of plant population and cultivar on biomass at early flowering (25 August)

		Biomass (early flowering)		
Seed Rate	**PBA Amberley**	**Fiesta**		**Mean**
(seeds/m^2)	**t/ha**	**t/ha**		**t/ha**
10 seeds/m^2	2.02 cd	1.59 d		**1.80**
18 seeds/m^2	2.50 bc	3.09 b		**2.79**
24 seeds/m^2	3.06 b	3.92 a		**3.49**
36 seeds/m^2	3.10 b	4.41 a		**3.76**
Mean	**2.67**	**3.25**		
Seed Rate	LSD P=0.05	0.51	**P val**	<0.001
Cultivar	LSD P=0.05	0.36	**P val**	0.003
Seed Rate x Cultivar	LSD P=0.05	0.73	**P val**	0.015

Only the means for the early flowering biomass are presented as there was significant interaction between seeding rate and cultivar.

Fiesta and higher seeding rates trended towards higher biomass than Amberley earlier in the season as demonstrated by biomass results at early flowering.

The GRDC Optimising Irrigated Grains Project is a collaborative project including the following project partners:

Table 4. Influence of plant population and cultivar on biomass at harvest (17 December)

	Biomass (harvest)		
Seed Rate (seeds/m²)	**PBA Amberley**	**Fiesta**	**Mean**
	t/ha	**t/ha**	**t/ha**
10 seeds/m²	8.99 -	8.92 -	**8.95 c**
18 seeds/m²	10.05 -	9.99 -	**10.02 bc**
24 seeds/m²	11.27 -	11.44 -	**11.35 ab**
36 seeds/m²	13.56 -	10.62 -	**12.09 a**
Mean	**10.96 -**	**10.24 -**	
Seed Rate	LSD P=0.05	1.73	**P val** 0.005
Cultivar	LSD P=0.05	ns	**P val** 0.232
Seed Rate x Cultivar	LSD P=0.05	ns	**P val** 0.220

Highest biomass at harvest was 13.56 t/ha produced by the highest seeding rate in Amberley. However the highest seeding rate of 36 seeds/m^2 (or 26.5 plants/m^2) was not significantly different to that achieved at the 24 seeds/m^2 seeding rate (18.5 plants/m^2).

Harvest Index was not influenced by seeding rate, however the data should be viewed with caution due to the high variability of the data.

The average yield for the trial was 4.43 t/ha. This represents a WUE of 16.1 kg/mm. Harvest Index averaged 0.40.

SAGI statistical analysis (Predicted values for Yield and Harvest dry matter)

The following statistical analysis of key harvest assessments has been carried out by SAGI. This analysis uses spatial statistical analysis to refine predicted values for key assessment values.

The GRDC Optimising Irrigated Grains Project is a collaborative project including the following project partners:

Table 1: Harvest Traits for the Treatments

Cultivar	SeedingRate	Yield (t/ha)	Harvest DM
Amberley	10	3.58 ± 0.17 -	9.04 ± 0.84 -
Fiesta	10	4.05 ± 0.17 -	9.03 ± 0.84 -
Amberley	18	3.49 ± 0.17 -	9.89 ± 0.84 -
Fiesta	18	4.1 ± 0.17 -	9.91 ± 0.84 -
Amberley	24	3.89 ± 0.17 -	11.24 ± 0.84 -
Fiesta	24	4.79 ± 0.17 -	11.43 ± 0.84 -
Amberley	36	4.19 ± 0.17 -	13.6 ± 0.84 -
Fiesta	36	4.82 ± 0.17 -	10.6 ± 0.84 -

Note: values expressed as mean ± standard error of prediction - no subscripts relevant for this response

A summary of the experiment statistics is below:

Table 2: Key statistics for each response analysed

Statistic	Yield (t/ha)	Harvest DM
LSD	0.462	2.410
Mean	4.100	10.600
Cultivar_p-value	0.005	0.289
SeedingRate_p-value	0.000	0.008
Interaction_p-value	0.555	0.204
CV	13.508	19.559

Trial 2. Optimum Plant Population Under Surface Irrigation

Protocol objective: As trial 1 but with surface irrigation not sprinkler

Location: Kerang, Victoria
Sown: 7th May 2021
Harvested: 17 December 2021
FAR Code: ICC F21-01-4
Cultivar: PBA Amberley, Fiesta VF
Rotation position: Wheaten Hay **(**2020), Dryland vetch/brown manure (2019), Barley (2018)
Soil Type: Neutral medium grey clay
Irrigation: Surface irrigation, 4 applications totalling 420mm (4.2ML/ha)
GSR: April-October 160mm. Total water available 580mm

Key Messages:

- *Under surface irrigation faba yields exceeded 7t/ha with a significant interaction between plant population (seedrate) and cultivar.*
- *Fiesta achieved its highest yields at only 17plants/m^2 whereas PBA Amberley had an optimum of 27 plants/m^2.*
- *However, the results indicate more severe consequences of dropping too low (15-20 plants or below) with plant population in faba beans vs higher plant populations 25-30 plants/m^2. irrespective of cultivar.*
- *Establishment rate for the trial averaged 89% with decreasing establishment at higher seed rates.*
- *Biomass increased as seeding rate increased at early flowering, but there was no influence on harvest biomass from plant population.*

The GRDC Optimising Irrigated Grains Project is a collaborative project including the following project partners: