

Faba Bean, Sowing Date x Plant Density, HRZ South West (Tarrington), Victoria
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Authors

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Aim

To evaluate the optimum rate and time of sowing for PBA Samira faba beans for increased yield and profitability.

Treatments

Sowing dates: See Table 1.

Target plant densities: See Table 3.

Table 1. Other site details at Tarrington and Lake Bolac, Victoria.

	Tarrington	Lake Bolac
Sowing dates	26 April, 16 May	23 April, 08 May, 22 May
Emergence dates	20 May, 04 June	25 May, 02 June, 12 June
Stubble	Burnt	Burnt
Row spacing (cm)	20	20
Fertiliser (kg/ha)¹	60	60

¹ MAP (9.2, 20.2, 0, 2.7)

Table 2. Fungicides applied to a sowing date x plant density faba bean trial at Tarrington, Victoria in 2019.

Date applied	Product	Rate/ha	Active ingredient rate/ha
30 July 2019	Veritas®	1L	Tebuconazole 200g Azoxystrobin 120g
3 September 2019	Mancozeb 750 ® Carbendazim 500	1kg 500mL	Mancozeb 750g Carbendazim 250 mL
26 September 2019	Aviator Xpro® ^A	600mL	Prothioconazole 90g Bixafen 45g

Results and Interpretation

- Key Messages: The grain yield of faba beans significantly increased at higher plant densities especially when the diseases were controlled. Despite a late autumn break, with adequate chemical disease control, PBA Samira grain yields more than tripled (from 1.5 t/ha to 5.4 t/ha) when plant densities increased from 5 plants/m² to 45 plants/m² at Tarrington in 2019 (Table 3).
- At Tarrington, gross margin increased from \$180/ha at 5 plants/m² to \$1,280/ha at 35 plants/m² but did not increase significantly from 35 to 45 plants/m² (Table 5). In other words, the economic threshold was reached before the yield threshold in 2019.
- High sowing rates of faba beans have a greater yield potential but also a greater risk profile. Disease was controlled in the experiments at Tarrington and Lake Bolac in 2019 by heavy use of fungicides which may not be economical. A significant financial risk is also involved with high sowing rates. If the grain price of faba beans is \$400/t grain (long-term average at Geelong) and the sowing seed cost is \$1.70/kg then the yield required to cover the variable costs is 1.8 t/ha at 5 plants/m². However, the breakeven yield increases with increasing sowing densities; 3.0 t/ha break even grain yield for a sowing rate of 45 plants/m² (Table 7). The yields produced in surpassed the break-even yields in 2019 due to above average conditions during the 2019 season. However, break-even yields might be potentially difficult to achieve with higher sowing rates due to negative growing conditions that may occur in different seasons.
- Canopy structure and yield components were altered by sowing rates (Table 8). Crops with high plant densities were taller and the height to the first pod was increased. Crops with low crop densities compensated with a greater number of pods per branch and by producing a greater

amount of grain per branch, but the compensation was not great enough to close the yield advantage of higher sowing rates. Therefore, the number of plants in a faba bean crop had a greater effect on grain yield than the productivity of the individual plants.

- Faba beans at Lake Bolac had a slightly lower yield than at Tarrington in 2019, but similar trends were observed. At Lake Bolac, grain yield also increased from 5 to 45 plants/m² (Table 4), and again gross margin increased only up to 35 plants/m² (Table 6).

Table 3. Grain yield (t/ha) of a faba beans at Tarrington, Victoria, with two emergence dates (E) and five plant densities (D).

Plant density (plants/m ²)	Grain yield (t/ha)		
	20 May	4 June	Mean (D)
5	1.5	1.4	1.5
15	3.2	2.9	3.0
25	4.2	3.7	3.9
35	5.0	4.4	4.7
45	5.4	4.7	5.1
Mean (E)	3.9	3.4	
Factor	Emergence date (E)	Plant density (D)	Emergence x Density (ExD)
LSD	0.2	0.2	n.s.
P-value	<0.001	<0.001	0.109

Table 4. Grain yield (t/ha) of a faba beans at Lake Bolac, Victoria, with three emergence dates (E) and five plant densities (D).

Plant density (plants/m ²)	Grain yield (t/ha)			Mean (D)
	25 May	2 June	12 June	
5	1.6	1.7	1.5	1.6
15	3.3	3.1	2.6	3.0
25	4.1	3.7	3.5	3.8
35	4.4	4.2	3.9	4.1
45	4.4	4.3	4.1	4.3
Mean (E)	3.6	3.4	3.1	
Factor	Emergence date (E)	Plant density (D)	Emergence x Density (ExD)	
LSD	0.2	0.1	0.2	
P-value	<0.001	0.002	0.013	

Table 5. Gross margin (\$/ha) of a faba beans at Tarrington, Victoria, with two emergence dates (E) and five plant densities (D).

Plant density (plants/m ²)	Gross margin (\$/ha)		
	20 May	4 June	Mean (D)
5	210	149	180
15	842	709	775
25	1181	953	1067
35	1435	1125	1280
45	1494	1168	1331
Mean (E)	1032	821	
Factor	Emergence date (E)	Plant density (D)	Emergence x Density (ExD)
LSD	149	114	n.s.
P-value	<0.001	<0.001	0.105

Table 6. Gross margin (\$/ha) of a faba beans at Lake Bolac, Victoria, with three emergence dates (E) and five plant densities (D).

Plant density (plants/m ²)	Gross margin (\$/ha)			Mean (D)
	25 May	2 June	12 June	
5	282	338	209	276
15	1003	920	672	865
25	1310	1117	1005	1144
35	1343	1258	1115	1239
45	1290	1259	1147	1232
Mean (E)	1046	978	830	
Factor	Emergence date (E)	Plant density (D)	Emergence x Density (ExD)	
LSD	99	62	107	
P-value	0.001	<0.001	0.013	

Table 7. Breakeven yield (grain yield required to cover variable costs) of faba beans grown at five plant densities at Tarrington, VIC in 2019 (sowing seed cost: \$1.70/kg).

Grain price (\$/t)	Breakeven yield (t/ha)			
	300	400	500	600
5 plants/m ²	1.8	1.4	1.1	0.9
15 plants/m ²	2.5	1.8	1.5	1.2
25 plants/m ²	3.0	2.2	1.8	1.5
35 plants/m ²	3.5	2.6	2.1	1.8
45 plants/m ²	4.0	3.0	2.4	2.0

Table 8. Effect of emergence date (E) and plant density (D) on crop canopy structure and yield components of faba bean grown at Tarrington, Victoria in 2019.

	Crop est. (plants/m ²)	Crop height (cm)	Height to first pod (cm)	Grain-filled pods/branch	Grain biomass g/branch
Emergence date (E)					
20 May	31.1	111.0	27.4	9.6	14.6
4 June	30.8	101.6	27.5	9.4	13.8
Lsd (P<0.05)	2.3	3.3	ns	ns	ns
P-value (E)	0.777	<0.001	0.901	0.353	0.056
Target plant density (D)					
5 plants/m ²	9.6	88.6	20.1	12.7	18.4
15 plants/m ²	19.0	100.6	24.0	10.5	15.3
25 plants/m ²	32.1	107.1	26.9	9.4	14.1
35 plants/m ²	42.9	115.3	30.8	8.0	12.0
45 plants/m ²	51.1	119.6	35.3	7.2	11.0
Lsd (P<0.05)	3.9	3.8	2.8	0.9	1.3
P-value (D)	<0.001	<0.001	<0.001	<0.001	<0.001
Emergence date x Density (ExD)					
20 May	5 pl/m ²	9.2	89.1	19.6	12.4
	15 pl/m ²	18.3	103.9	22.5	10.5
	25 pl/m ²	34.7	113.1	28.0	9.4
	35 pl/m ²	41.8	120.8	30.3	8.3
	45 pl/m ²	51.5	127.9	36.4	7.7
4 June	5 pl/m ²	10	88.1	20.6	13.0
	15 pl/m ²	19.7	97.3	25.6	10.5
	25 pl/m ²	29.4	101.1	25.9	9.3
	35 pl/m ²	44.1	109.9	31.4	7.8
	45 pl/m ²	50.8	111.3	34.1	6.7
Lsd (P<0.05)	ns	5.4	ns	ns	ns
P-value (ExD)	0.322	0.002	0.267	0.473	0.680