Faba Bean, Herbicide Tolerance (Group B), MRZ Wimmera (Horsham), Victoria

Aim

To investigate the tolerance of a newly released faba bean variety PBA Bendoc to residual (simulated) and in-crop application of various Group B herbicides in comparison with the commercial variety PBA Samira.

Treatments

Varieties: PBA Bendoc and PBA Samira
Herbicide treatments: See Table 1

Other Site Details

Sowing Date	21 May
Planting density	20
Stubble height (cm)	Standing (20)
Row Spacing (cm)	36
Fertiliser (kg/ha)[1]	80

1. MAP (9.2, 20.2, 0, 2.7) + Zn (2.5)

Results and Interpretation

- **Key Messages**: Group B herbicide application timing significantly influenced herbicide damage, biomass and grain yield loss of faba bean varieties. Herbicide damage and subsequent yield losses were more severe in the conventional variety PBA Samira than in the group B tolerant variety PBA Bendoc, and generally increased with delaying herbicide application timing from PSPE to 4 node, 8 node and flowering stages. PBA Samira incurred significant yield loss from all the herbicide treatments except PSPE and in crop application of 'Imi2', and application of 'Imi1' up to 8 node stages. In contrast, PBA Bendoc showed improved tolerance and did not have significant yield loss from the herbicide treatments except in-crop application of 'SU1' and 'SU2' at 8 node and flowering stages. The results should be treated with caution due to the confounding effect of dry seasonal conditions and repeated frost events.

- **Establishment and Growth**: Establishment and early growth was variable due to a dry start to the season and low level of mice incidence. Growth of the varieties during the rest of the season was also impacted by continued dry seasonal conditions and several vegetative and reproductive frost events, and hence results should be treated with caution.

- **Herbicide Damage**: Visual herbicide damage scores recorded about 20 weeks after sowing showed significant herbicide treatment by variety interaction. The herbicide damage symptoms observed in the trial included stunting of growth, blackening of leaves, chlorosis, cupping of leaves and plant death. Herbicide damage scores generally increased with delaying herbicide application timing from PSPE to 4 node, 8 node and flowering stages. All the PSPE and in-crop application treatments except application of 'Imi1' at 4 and 8 node stages, and application of 'Imi2' at PSPE, 4 node and 8 node stages caused significant injury to the conventional variety PBA Samira (Table 1). In contrast, PBA Bendoc showed improved tolerance to all the herbicide treatments except sulfonylurea and sulfonamide herbicides, particularly when applied post emergence. Both varieties showed the highest sensitivity to 'SU1', with significant herbicide damage scores of 21-100 in PBA Bendoc and 86-100 in PBA Samira (Table 1). Application of 'SU1' at flowering caused complete flower loss in PBA Bendoc, while PBA Samira had equally severe flower loss from applying 'SU1' at PSPE, 4 node, 8 node and flowering (Table 1). Similarly, varieties showed high sensitivity to 'SU2' applied at 8 node and flowering stages, and 20 gai/ha of flumetsulam applied at flowering. However, the level of damage from the herbicide treatments was generally more severe in PBA Samira than PBA Bendoc.

Table 1. The effect of various Group B herbicide application timings on visual herbicide damage scores (0 – no damage, 100 – complete plant death) and biomass at flowering of faba bean varieties at Horsham, Victoria in 2018.

		Herbicide Damage (0-100)		Biomass (t/ha)	
Active ingredient (g/ha)	**Application Timing**	**AF15369**	**PBA Samira**	**AF15369**	**PBA Samira**
Nil (0)		0	0	2.12	2.30
Sulfonylureas					
'SU1'	PSPE	21	86	2.15	0.85
	4 node	33	81	2.03	0.78
	8 node	48	95	1.79	0.63
	Flowering	100	100	0.46	0.72
'SU2'	PSPE	16	1	2.13	2.30
	4 node	21	48	1.70	1.68
	8 node	41	81	1.84	1.29
	Flowering	76	98	1.50	1.16
Imidazolinones					
'Imi1'	PSPE	3	20	2.94	2.18
	4 node	5	10	2.42	2.76
	8 node	15	14	2.16	2.55
	Flowering	16	34	2.30	1.64
'Imi2'	PSPE	1	10	2.82	2.27
	4 node	5	8	2.08	2.54
	8 node	10	11	2.09	2.28
	Flowering	8	21	2.35	2.57
Sulfonamide					
Flumetsulam (20)	PSPE	16	51	2.32	1.43
	4 node	23	24	1.94	2.19
	8 node	13	15	2.34	2.11
	Flowering	41	73	1.55	1.29
LSD $_{ChemTrt}$ (P<0.05)			**14**		**0.50**
LSD $_{Var}$ (P<0.05)			**3**		**0.14**
LSD $_{ChemTrt*Var}$ (P<0.001)			**16**		**0.68**

- **Biomass at Flowering**: The herbicide treatments caused significant difference in biomass at flowering, but these differences were dependent on variety. In the nil treatment, biomass yield at flowering was 2.12 t/ha for PBA Bendoc and 2.30 t/ha for PBA Samira. The impact of the herbicide treatments on plant growth was generally more severe in the conventional variety PBA Samira than the Group B tolerant variety PBA Bendoc. In PBA Samira, application of 'SU1' caused the highest biomass reduction of 63-73%, regardless of application timing (Table 1). Likewise, application of 'SU2' at 8 node and flowering stages, and 20 gai/ha of flumetsulam at PSPE and flowering caused significant biomass reduction in PBA Samira (Table 1). In contrast, PBA Bendoc showed better tolerance to all the herbicide treatments except application of 'SU1' at flowering, and produced biomass yield equivalent to the nil treatment (Table 1). The biomass yield of the varieties was higher in some of the herbicide treatments compared to the nil due to better control of residual weeds in the herbicide treatment plots.

- **Grain Yield and Harvest Index**: There was a significant herbicide treatment by variety interaction for grain yield. Grain yields of the varieties were very low, about 0.7 t/ha in the nil treatments, due to very dry seasonal conditions and several vegetative and reproductive frost. The conventional variety PBA Samira incurred significant yield loss from all the herbicide treatments except PSPE and in crop application of 'Imi2', PSPE application of 'SU2' and application of 'Imi1' up to 8 node stages (Table 2). The highest yield loss of 73-100% was caused by application of 'SU1' at PSPE and all in-crop application

timings (Table 2). Similarly, in crop application of 'SU2', and PSPE and in-crop application of 20 gai/ha of flumetsulam caused a 26-100% yield loss in PBA Samira (Table 2). In contrast, PBA Bendoc showed improved tolerance and did not have significant yield loss from the herbicide treatments except in-crop application of 'SU1' at 8 node and flowering stages, and 'SU2' at flowering (Table 2). PBA Bendoc recovered from moderate herbicide damage caused by some of the herbicide treatments earlier in the season. Application of 'SU1' and 'SU2' at flowering caused the highest yield loss of 100% in PBA Bendoc.

Averaged across varieties, harvest index was significantly reduced by in-crop application of 'SU1' and 'SU2' at 8 node and flowering stages (Table 2). Similarly, application of 20 gai/ha of flumetsulam at flowering caused a significant reduction in harvest index. Among the varieties, PBA Samira had slightly higher harvest index than PBA Bendoc (Table 2).

Table 2. The effect of various Group B herbicide rates and application timings on grain yield (t/ha) and harvest index of faba bean varieties at Horsham, Victoria in 2018.

		Grain Yield (t/ha)			Harvest Index (HI)		
Active ingredient (g/ha)	**Application Timing**	**PBA Bendoc**	**PBA Samira**	***Ave***	**AF15369**	**PBA Samira**	***Ave***
Nil (0)		0.67	0.70	*0.69*	0.31	0.32	*0.32*
Sulfonylureas							
'SU1'	PSPE	0.63	0.19	*0.41*	0.29	0.29	*0.29*
	4 node	0.48	0.15	*0.32*	0.24	0.35	*0.30*
	8 node	0.34	0.09	*0.22*	0.19	0.21	*0.20*
	flowering	0.00	0.00	*0.00*	0.01	0.01	*0.01*
'SU2'	PSPE	0.72	0.71	*0.72*	0.35	0.31	*0.33*
	4 node	0.55	0.33	*0.44*	0.31	0.18	*0.25*
	8 node	0.49	0.17	*0.33*	0.26	0.13	*0.20*
	flowering	0.10	0.02	*0.06*	0.04	0.01	*0.03*
Imidazolinones							
'Imi1'	PSPE	0.88	0.59	*0.74*	0.3	0.27	*0.29*
	4 node	0.92	0.75	*0.84*	0.37	0.25	*0.31*
	8 node	0.72	0.58	*0.65*	0.34	0.23	*0.29*
	flowering	0.76	0.27	*0.52*	0.34	0.17	*0.26*
'Imi2'	PSPE	1.03	0.93	*0.98*	0.37	0.4	*0.39*
	4 node	0.74	0.62	*0.68*	0.35	0.24	*0.30*
	8 node	0.81	0.64	*0.73*	0.35	0.21	*0.28*
	flowering	0.77	0.51	*0.64*	0.35	0.21	*0.28*
Sulfonamide							
Flumetsulam (20)	PSPE	0.74	0.31	*0.53*	0.32	0.22	*0.27*
	4 node	0.60	0.52	*0.56*	0.3	0.22	*0.26*
	8 node	0.78	0.43	*0.61*	0.34	0.2	*0.27*
	flowering	0.46	0.20	*0.33*	0.27	0.12	*0.20*
Ave		*0.63*	*0.41*	*0.52*	*0.29*	*0.22*	*0.25*
LSD $_{ChemTrt}$ (P<0.05)			**0.22**			**0.10**	
LSD $_{Var}$ (P<0.05)			**0.03**			**0.03**	
LSD $_{ChemTrt*Var}$ (P<0.001)			**0.24**			**ns**	