

TOLERANCE OF CEREAL CROPS TO HERBICIDES

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Data on the tolerance of cereal crops to herbicide application were obtained in a series of experiments conducted between 1966 and 1968 at a number of centres in the wheat- and barley-growing regions of Victoria.

Each experiment in the series comprised a range of rates [0, 4 (0.28), 8 (0.56), 16 (1.12), and 32 (2.24) oz a.i. per acre (kg a.i. per hectare)] of each particular herbicide applied to weed-free crops of both wheat and barley. A randomized block design of four replicates was used in each case and grain yield was measured. The number of experiments conducted with each herbicide on the two crops is shown in the Table. The wheat varieties used were Insignia and Olympic, and the barley varieties Prior and Research.

Chemical	Crop	Number of Experiments	Mean Yield - nil spray (kg/ha)	Per cent yield reduction compared with nil spray at the following rates of application (kg a.i. per hectare)		
				0.28	0.56	1.12
<u>Herbicide Applied at Crop Three-leaf Stage</u>						
Bromoxynil	Wheat	6	1940	2.1	3.8	6.6
	Barley	3	2140	2.2	4.4	7.8
Linuron	Wheat	6	2020	-1.3	0.3	12.0
	Barley	3	2170	3.1	7.1	17.0
Prometryne	Wheat	6	2350	1.7	4.0	10.3
	Barley	3	2250	3.0	6.3	12.2
Bromoxynil + MCPA (1:1)	Wheat	3	1690	7.5	13.9	23.0
	Barley	2	2340	0.6	1.4	4.6
MCPA	Wheat	5	1940	1.7	3.5	8.0
	Barley	3	2180	1.2	2.5	4.6
2,4-D Amine	Wheat	6	2070	8.1	14.0	19.2
	Barley	3	2110	4.8	8.9	14.3
2,4-D Ester	Wheat	6	2040	3.9	7.6	14.5
	Barley	3	1800	6.0	6.3	12.7
<u>Herbicide Applied at Crop Post-tillering Stage</u>						
2,4-D Amine	Wheat	3	1800	0.7	1.1	0.0
2,4-D Ester	Wheat	6	1920	1.8	3.8	7.3
	Barley	2	2160	3.4	6.5	13.0

Subsequently, a regression equation was computed for each experiment relating final grain yield to rate of herbicide application. The regression model adopted was  $Y = a + bR + cR^2$  where Y is the grain yield (kg per hectare) and R is the rate of herbicide application (kg a.i. per hectare). For both crops a mean equation relating the effect of each chemical on the final grain yield was calculated by averaging both the constant and the regression coefficients. Using these mean regression equations, the yield reductions resulting from the application of three rates of the various herbicides were calculated, and these are also shown expressed as a percentage of the nil spray treatment, in the Table.

All the herbicides applied at the crop three-leaf stage (with the exception of low rates of linuron on wheat) reduced crop yields to some extent, although large differences in crop tolerance to the different herbicides were evident. With two notable exceptions - bromoxynil + MCPA, and linuron - barley and wheat generally showed a similar tolerance to the herbicides examined. There were no varietal differences evident.

Wheat showed a very low tolerance to bromoxynil + MCPA; an application rate of only 0.28 kg a.i. per hectare bromoxynil + MCPA (commonly used in the control of many weeds in wheat crops) resulted in a yield reduction of 7.5% compared with the unsprayed control, while, in barley, an application rate of 1.12 kg a.i. per hectare resulted in an average yield reduction of only 4.6%. At rates up to 0.56 kg a.i. per hectare, wheat was remarkably tolerant to linuron. However, at rates greater than 0.56 kg a.i. per hectare, this tolerance diminished to such an extent that, in two of the six experiments, the 2.24 kg a.i. per hectare rate almost completely destroyed the wheat crop. Barley did not exhibit any outstanding tolerance to linuron at low rates.

Both wheat and barley showed reasonable tolerance to bromoxynil and prometryne, suggesting that these herbicides are relatively safe to apply to cereal crops.

The tolerance of both crops to MCPA, applied at the three-leaf stage, was somewhat surprising and indicates that in particular weed situations there could be economic advantages in using MCPA rather than one of the newer and more expensive herbicides.

The data obtained with 2,4-D amine and ester showed that both were more severe at the three-leaf stage compared with the normal post-tillering application.