CROP TOLERANCE TO HORMONE-TYPE HERBICIDAL SPRAYS AND THEIR EFFECT ON UNDERSOWN MEDICS

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Important factors affecting tolerance of crops to hormone-type selective sprays are - (1) Type of crop, (2) Stage of crop growth, (3) Material and strength used, (4) Environment. Cereals show greater tolerance than linseed, flax, peas and undersown medics.

In Victoria, replicated crop tolerance trials have been conducted mainly with cereals and undersown barrel medic (Medicago tribuloides), and the materials tested comprise sodium salts of MCPA and 2,4-D, and the triethanolamine and ethyl-ester of 2,4-D applied with low volume equipment on crops containing negligible weed population.

Tolerance of Cereals: Wheat is less liable to injury than barley or oats, but each is susceptible at some periods of growth. Small varietal differences in susceptibility have been observed.

Time and Rate of Application: Trials in which sprays were applied fortnightly after brairding show crops are sensitive to normal amounts of spray until they reach advanced tillering (approx. 8 weeks). During this period 4 oz/ac. A.E. ester and 6 oz/ac. amine 2,4-D caused malformations and distorted growth of wheat, barley and oats - 1 lb/ac. amine caused significant yield reductions. The sodium salts of 2,4-D and MCPA were much less severe. From tillering to the "boot" stage all cereals exhibited a relatively safe period for normal rates of application. This was followed by a second susceptible period in which 1 lb/ac. amine caused lodging and yield reductions in barley, lodging in oats and a reduction in head size of wheat.

At the Mallee Research Station, Walpeup, and at Longerenong College in 1950 and 1951, amounts up to 1 lb/ac. A.E. sodium salt of 2,4-D and 2 lb/ac. of MCPA did not affect the yield of wheat when applied between tillering and heading. In later trials at Walpeup each of the four main types of sprays was tested at 1½ lb. and 3 lb/ac. on wheat. The ester 2,4-D affected foliage, and many significant reductions were recorded (See Table 1).

At the State Research Farm, Werribee, in 1953, using the same materials, significant decreases in yield of grain were obtained only with the ester of 2,4-D - on wheat at 2 lb/ac., and on oats at ½ lb. and 1 lb/ac. The mean yield of ester at ½ lb. and 1 lb/ac. on barley was also significantly below the control.

Effect on Grain Quality: In the various trials conducted at Walpeup and Longerenong between 1950-53, normal applications of hormone-type herbicides did not significantly affect the percentage protein in wheat. In trials where heavier applications were used (1 lb. to 3 lb/ac. A.E.), some protein increases were obtained, but these were usually associated with reductions in yield. Variations in the quantity of protein produced per acre were not significant (Table 2).

Germination: Seed from several of the trials described, including those where growth abnormalities were recorded, gave normal germination in the laboratory.

Field Peas: MCPA at rates up to 8 oz/ac., and amine 2,4-D up to 4 oz/ac., were tested on plots of Collegian peas in which wild mustard (Sisymbrium orientale) was present. All applications caused immediate wilting of peas (severe with 8 oz. MCPA), but they recovered and yields were not visibly affected. Evidence of varietal susceptibility was observed.

Tolerance of Medics: In a replicated experiment at the Mallee Research Station in 1953, 2 oz/ac. A.E. of ester 2,4-D and 4 oz/ac. of MCPA and amine 2,4-D each significantly reduced the population of barrel medic sown with a wheat crop. Heavier rates were more severe in action (Table 3). There was no significant difference in the effect of amine or MCPA, but the ester was more than twice as severe in its lethal effect on medics. A complete kill of medics was obtained with 8 oz/ac. ester, and this quantity of amine or MCPA killed approximately two-thirds of the medics.

Late spraying, as for skeleton weed control, caused higher mortality of medics than an earlier application corresponding with cruciferous weed control. Re-establishment of the medics was adversely affected by even the lightest amounts of spray applied in the previous year, and the stands were progressively poorer as the amounts of spray applied were increased.

Table 1: WHEAT TOLERANCE TRIALS - MALLEE RESEARCH STATION

Average Yields - Bushels per Acre

	Before Jointing		After Jointing	
	1½ lb/ac.	3 lb/ac.	1½ lb/ac.	3 lb/ac.
1952: Control 45.3				
Ester 2,4-D	45.0	43.1 *	42.1 **	39.5 ***
Amine 2,4-D	43.8	42.8 **	43.2 *	42.8 **
Sodium 2,4-D	43.1 *	42.0 ***	45.9	41.8 ***
MCPA	45.9	41.9 ***	42.8 **	43.3 *
1953: Control 25.2				
Ester 2,4-D	22.6 **	22.1 **	21.3 ***	20.2 ***
Amine 2,4-D	24.1	20.9 ***	22.8 *	19.7 ***
Sodium 2,4-D	23.6	23.7	21.8 ***	24.6
MCPA	24.2	24.6	23.4	21.5 ***

Table 2:

EFFECT OF HEAVY APPLICATIONS OF HERBICIDE ON GRAIN PROTEIN

Av. Results 2 years 1952-53 - lb. Protein per Acre

	Before Jointing		After Jointing	
	1½ lb/ac.	3 lb/ac.	1½ lb/ac.	3 lb/ac.
Control 195				
Ester 2,4-D	203	203	192	199
Amine 2,4-D	202	202	194	188
Sodium 2,4-D	200	200	197	191
MCPA	211	197	190	188

The differences shown here are non-significant.

Table 3: BARREL MEDIC TOLERANCE TRIAL - WALPEUP, 1953.

% of Plants Setting at Least on Pod (Unsprayed = 100%)

	Mean of two times of spraying		
oz/ac. A.E.	Ester 2,4-D	Amine 2,4-D	MCPA
2	55.2 (48.01)	-	-
4	13.2 (21.28)	70.8 (57.27)	69.1 (56.25)
6	5.1 (13.10)	45.5 (42.40)	50.5 (45.29)
8	0.0	30.9 (33.75)	33.6 (35.44)
12	0.0	18.0 (25.10)	23.1 (28.71)

P = .05 (9.84), P = .01 (13.09), P = .001 (17.02)

The figures in brackets are the transformed data on which the statistical analysis was based. The arsin $\sqrt{\%}$ transformation was used.