

Tolerance of two wheat cultivars to 2,4-d in relation to their ear development stage

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The application of phenoxy herbicides (2,4-D and MCPA) before the completion of spikelet differentiation has been shown to lead to ear deformities in wheat and barley (1). In view of the differences in development patterns in wheat (2) the hypothesis was tested that cultivars which show different times to the completion of spikelet differentiation would vary in their response to 2,4-D when the herbicide was applied at a similar external growth stage.

Methods

The wheat cultivars Kulin and Cranbrook were grown at Goomalling in 1987 and treated with 2,4-D at 250 g a.i./ha on two occasions. At each application plants were assessed for Zadok's score and an ear development score for the main stem (3). At harvest percentage of ears within plots showing deformities, type of deformity, number of ears/m² and grain yield were measured.

Results and discussion

The Zadok's score was similar for both cultivars at each time of application but Cranbrook showed a slower rate of ear development than Kulin (Table 1). The application of 2,4-D induced ear deformities in Kulin and this is likely to have been due to the herbicide effect on spikelet differentiation [occurring post-application). No effect of 2,4-D was noted at the later application once spikelet differentiation was complete. Cranbrook showed a higher level of ear deformities at the second application which also corresponded with the beginning of spikelet differentiation. The majority of deformities in Kulin were missing spikelets and rachis thinning, while for Cranbrook fused and super-numerary spikelets were common. Grain yields were significantly reduced at the first time of application for both cultivars and this was due to both ear deformities as well as a reduction in ear number (reduced by 33 and 56 ears/m² for Kulin and Cranbrook respectively).

Table 1. Development scores, ear deformity scores and grain yields for Kulin and Cranbrook with two application times of 2,4-D.

	Time of Application			
	1		2	
	Kulin	Cranbrook	Kulin	Cranbrook
Zadok's Score	13.0	13.1	14.7	15.0
Ear Development Stage	double ridge	vegetative	maximum spikelet nos.	double ridge
Ear Deformity Score (%)	40	10	0	25
Grain yield (t/ha) - 250 g 2,4-D	2.03	1.42	2.72	2.54
Grain yield (t/ha) of untreated : Kulin = 2.81, Cranbrook = 2.87				
L.S.D. (P < 0.05) for difference in yields between 2,4-D and untreated = 0.71				

The results support the hypothesis that ear deformities are produced when 2,4-D is applied just prior to spikelet differentiation, the timing of which varies according to cultivar. 2,4-D reduced grain yield through effects on ear formation as well as ear number.

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2. Kirby, E.J.M., Siddique, K.H.M., Perry, M.W., Kaesehagen, D. and Stern, W.R. (1989). *Field Crops Res.*20: 113-128.

3. Nerson, H., Sibony, M. and Pinthus, M.J. (1980). *Ann. Bot.* 45: 203-204.