1984

Cereal crop tolerance to herbicides

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While herbicides play an important role in reducing weed burdens in crops, these same herbicides also have the potential to cause crop damage. The identification of adverse crop-herbicide or herbicide-environment combinations is necessary if the best use is to be made of current or new herbicides.

The 1984 experimental programme was a continuation of that started in 1981. The programme was aimed at evaluating the major herbicides in current use for cereals as well as new herbicides against the recommended varieties at three main sites, these being Wongan Hills, Merredin and Mt Barker. In addition Stage 4 breeding lines were evaluated against the same herbicides but only at Wongan Hills. The herbicides used and their rates and time of application are presented in Table 1. Herbicides were applied at both the recommended and twice the recommended rates of application, except in the breeding line trial where only twice the recommended rate was used. Smaller experiments using only 3 wheat and 2 barley varieties were conducted at Geraldton (84GE52) and Avondale.

Herbicide	Wheat and Triticale	Barley	Oats
Glean	20g, IBS	20g, Z12-14	20g, Z12-14
Isoproturon	2.5L, IBS	2.5L, IBS	-
Diuron + MCPA	350g + 400g, Z13-14		
Hoegrass	1L, Z12-14	1L, Z12-14	-
Combine	2L, Z13-14	2L, Z13-14	-
Tordon 242	1L, Z13-14		
Dicamba + MCPA	80g + 340g, Z14-15.		
Bromoxynil + MCPA	200g + 200g, Z13-14		
Dicamba	200g, Z14-15		
Dicamba+Bromoxynil+MCPA	-	-	40g + 140g +280g Z13-14
Igran + MCPA	500g + 600g, Z13-14		
Linuron + MCPA	-	-	250g + 400g, Z13-14

Table 1. Recommended rate of application and treatment time of the herbicides used in the 1984 herbicide tolerance programme. (Recommended rate as applied per hectare).

As in previous years the 1984 programme encountered the problem of environmental variation. The Mount Barker site was heavily waterlogged, and the barley and triticale experiments were abandoned. The wheat and oats showed some waterlogging, especially in the Hoegrass block for wheat. Annual ryegrass and toadrush were present on the site, but their removal by some herbicides did not result in yield increases. The Merredin site had some waterlogged areas in the barley, wheat and triticale experiments as well as a high grass weed density in some barley and wheat blocks. Two herbicide blocks in the wheat had low fertility and high weed density, and these were abandoned. Boron toxicity also affected some blocks in the barley experiment. The Wongan Hills site was totally weed free and generally very uniform, but copper deficiency was en-

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countered in the Glean block for wheat and an area of low fertility was present in the wheat breeding line experiment.

The tolerance of most wheat varieties to the herbicides used was generally very good at both Wongan Hills and Merredin (Table 2). The herbicide having the greatest effect at these sites was Glean, and examples of yield reductions experienced are presented in Table 3. The results from Wongan Hills were affected by the copper deficiency which affected replicate 1 more than the other three replicates. Mount Barker was affected by waterlogging and a Glean by waterlogging interaction was present. The varieties Tincurrin, Miling, Gutha and Cranbrook were most affected by Glean over the three sites.

Wheat

	Wongan Hills		Merredin		Mt Barker	
Herbicide	1x	2x	1x	2x	1x	2x
Glean	94	88	95	93	82	87
Isoproturon	105	90	107	100	101	104
Diuron + MCPA	109	97	113	93	-	-
Hoegrass	100	93	92	95	64	87
Combine	102	101	105	123	97	83
Tordon 242	103	92	103	78	94	91
Dicamba + MCPA	107	99	-	-	96	91
Bromoxynil + MCPA	100	89	-	-	128	114
Igran + MCPA	-	-	-	-	103	98

Table 2. Average yield (as a per cent of control) of 14 wheat varieties sprayed at the recommended and twice the recommended rates of 9 herbicides at three sites.

	Wongan Hills		Merredin		Mt Barker	
	1x	2x	1x	2x	1x	2x
Gamenya		22				
Halberd	-					
Madden				15	30	16
Egret	15				23	20
Eradu					33	24
Tincurrin	10	24		15	17	23
Bodallin						
Miling	29		12	22		25
Jacup	11				10	20
Canna				15	18	
Millewa		30			26	22
Aroona			13		20	
Gutha	16		12		30	28
Cranbrook	16	31	20		33	19

Table 3. Wheat varieties showing 10% or more yield reduction at the recommended rate and 15% or more yield reduction at twice the recommended rate of Glean.

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The effect of waterlogging at Mount Barker on the wheat experiment was large and especially so in the case of Hoegrass (Table 4). Both the control and recommended rate of herbicide for replicate 2 and 3 in the Hoegrass experienced waterlogging for nearly 2 months, and a strong Hoegrass by waterlogging interaction was observed.

	Hoegrass		Combine		Tordon 242		Dicamba + MCPA	
	1x	2x	1x	2x	1x	2x	1x	2x
Gamenya	24		26	22			10	
Halberd	21	31						
Madden	58	17	17	33				26
Egret	14				22			
Eradu	47			26				
Tincurrin	24							
Bodallin	39					19		
Miling	36					28		15
Jacup	56	30		27			11	25
Canna	25	18			18		18	15
Millewa	50	36		26		26		17
Aroona	22	17		18	12			20
Gutha	61		22	30	17	44		
Cranbrook	29	33		20		25	12	

Table 4. Wheat varieties showing 10% or more yield reduction at the recommended rate and 15% or more yield reduction at twice the recommended rate for 4 herbicides at Mount Barker.

Tordon 242 caused large yield reductions at twice the recommended rate at Merredin, especially on Jacup wheat. While no effect was seen at the recommended rate this herbicide controlled late germinated capeweed, and a response to weed control may have offset any yield loss from the Tordon 242.

The herbicide isoproturon caused very little crop damage on wheat, and where damage occurred this was due to unevenness of incorporation.

The tolerance of barley to the herbicides was generally very good with the exception of Tordon 242 at Merredin. Yield reductions of 19% and 30% at the recommended and twice the recommended rates, respectively, were seen at this site, and prior to harvesting it was observed that many heads were on the ground. Increased brittleness of the ear may be a problem with this herbicide, but it would appear to be confined to the heavier soil types such as at Merredin and Avondale.

Both the oats and triticale tolerated all the herbicides used with very little damage, though Tordon 242 did have some effects at Merredin on both these cereals.

Considerable variation was seen to exist amongst the stage 4 breeding lines to all herbicides. Some lines of each cereal species appear to be sensitive to up to 5 different herbicides based on the 15% yield reduction threshold at twice the recommended rate. An interaction between low fertility and the herbicides Combine and Tordon 242 was seen in the wheat breeding line experiment.

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The Geraldton and Avondale experiments indicated good tolerance to the herbicides used at the recommended rates with the exception of Glean on barley (applied prior to seeding rather than at the Z12-13 stage) at both sites, Combine on Stirling barley at Geraldton, Tordon 242 on Stirling at Avondale and diuron + MCPA on Clipper and Gamenya at Avondale (Table 5.). The Geraldton site was affected by sand-blasting and was worst on the barley, while the Avondale site was badly lodged, especially in the barley and Jacup wheat. Although a high head losss was recorded prior to harvesting on the Jacup plots treated with Tordon 242 this was not reflected in a similar decrease in yield. The reason for this appeared to be due to a reduced height in the Tordon 242 treatment, and this resulted in less lodging.

Geraldton	Glean	Hoegrass	Diuron + MCPA	Amidi	Combine
Stirling	84	112	95	103	84
Clipper	75	102	97	118	103
Jacup	97	113	96	94	105
Eradu	92	142	99	111	99
Canna	93	107	98	102	113

Avondale	Glean	Hoegrass	Diuron + MCPA	Tordon	Combine
Stirling	106	107	109	79	91
Clipper	79	98	68	136	107
Jacup	119	104	103	91 (49)*	116
Eradu	112	98	91	104 (12)*	113
Gamenya	101	103	80	106	101

* Per cent heads on ground at harvest.

Table 5. The yield (as a per cent of control) of 2 barley and 3 wheat varieties in response to the recommended rate of 5 herbicides at Geraldton and Avondale.

Amidi = 80g dicamba + 300g 2,4-D; Z14-15.

The work on herbicide tolerance of cereals in 1985 will look in more detail at the effects of environment on herbicide response with particular emphasis on the effects of low nutrient status of the crop and waterlogging, at upgrading the evaluation of Stage 4 breeding lines, and at the evaluation of new herbicides which promise selective grass control within the cereal crop.