

EFFECT OF TIME OF SPRAYING OF BARBAN ON FOUR WILD OAT (*AVENA SPECIES*) STRAINS FROM THE DARLING DOWNS, QUEENSLAND

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SUMMARY

A pot trial was carried out, using cream, grey and brown strains of *Avena ludoviciana* and a brown strain of *A. fatua*, to assess the importance of time of application of barban relative to previous emergence of wild oats.

It was found that all strains were killed if sprayed 7 days after emergence. The *A. fatua* strain showed an 80% kill when sprayed 21 days after emergence. All *A. ludoviciana* strains showed increasing tolerance to barban with increasing age. The grey strain of this species proved to be the most tolerant of barban.

It was concluded that, under crop conditions, provided barban is applied accurately, satisfactory control of wild oat strains can be achieved if the chemical is applied no later than 14 days after emergence of the weed.

I. INTRODUCTION

It has been known for some time that various strains of wild oat show different reactions to chemical weedicides. Rydrych and Seeley (1964) showed that *Avena fatua* strains reacted differently to I.P.C. applications. Jacobsohn and Anderson (1968), working on the same species, showed very clear strain differences to applied diallate, triallate and barban. Watkins (1970) reported strain tolerances in *A. fatua* and *A. ludoviciana* strains to applied triallate and barban, and showed that the latter species displayed a greater tolerance to barban than did the former. Barban, however, has given excellent control of some *A. ludoviciana* infested paddocks on the Darling Downs of Queensland.

Friesen (1967), working on *A. fatua*, reported that barban should be applied within 14 days from emergence of the weed. He concluded that stage of plant development was not as important as days after weed emergence in the application of barban. As this has important commercial applications, a trial was conducted to test Freisen's findings, using strains of *A. ludoviciana*, the dominant wild oat species on the Darling Downs (Watkins 1967), and an *A. fatua* strain as a comparison.

II. EXPERIMENTAL

Four strains of wild oat were chosen—cream, grey and brown *A. ludoviciana* and brown *A. fatua*. The cream strain used differed from the one used by the author in previous work (Watkins 1970). Twenty dehusked caryopses of each were planted in 6 in. pots and covered with 1 in. of soil. Plants were sprayed 1, 2, 3, 4 and 5 weeks after 50% emergence. Three replications were used. Plant populations were maintained at 10 per pot. The *A. fatua* strain was slow in germinating and did not reach 50% emergence until 2 days after the other wild oat strains. Hence the former strain was sprayed each time 2 days after the others.

Barban was applied at the rate of 8 oz a.i./ac, using a low-pressure gas sprayer described elsewhere (Watkins 1970). Pots were left in the open (inside a rat-proof enclosure) and were subject to the local weather conditions. Four weeks after the final spray application all plants, dead and alive, were cut at ground level, dried and weighed.

III. RESULTS

Stage of growth at the time of spraying is given in Table 1, expressed as the number of leaves per plant. Stage of development remained similar in all strains until the third spray application, when cream *A. ludoviciana* and brown *A. fatua* appeared to be developing faster than the others. This continued for the duration of the trial. Optimum stage of development of the plants for the most efficient kill by barban (according to label directions) was reached 2 weeks after emergence.

TABLE 1
AVERAGE NUMBER OF LEAVES PER PLANT AT THE TIME OF SPRAYING OF BARBAN

Time of Spraying (weeks after emergence)	<i>A. ludoviciana</i>			<i>A. fatua</i>	Average
	Cream	Grey	Brown	Brown	
1	1.1	1.2	1.1	1.1	1.1
2	2.0	2.0	1.9	2.1	2.0
3	3.3	2.8	2.8	3.0	3.0
4	4.4	4.0	3.9	4.2	4.1
5	6.0	5.7	5.5	6.0	5.8

Data recorded in Table 2, however, indicate that maximum kill in all strains was reached only 1 week after emergence and that only in the brown *A. fatua* strain did susceptibility to the chemical persist to any degree after this period.

Unfortunately, rain fell on the brown *A. fatua* strains within $\frac{1}{2}$ hr of the 4-weeks-after-emergence spray application. This may have reduced the full effect of the chemical on this strain. Growth was still retarded, however, and dry matter per plot was still significantly less than in the control.

TABLE 2
 NUMBER OF WILD OATS KILLED BY BARBAN AT EACH TIME OF APPLICATION
 Assessed 4 weeks after the final spraying

Time of Spraying (weeks after emergence)	<i>A. ludoviciana</i>			<i>A. fatua</i>	Average
	Cream	Grey	Brown	Brown	
Control	0	0	0	0	0
1	10	10	10	10	10
2	2	2	5	8	4
3	0	0	1	8	2
4	0	0	0	0	0
5	0	0	0	0	0

Although very little effect of barban was seen on the *A. ludoviciana* strains after the 1-week spray application, dry-matter figures (Table 3) indicate that growth was severely, but not always significantly, retarded in all but the grey strain. After the 1-week spray, the grey strain showed no significant reduction in plant dry matter when compared with the control. In fact, a growth response was recorded in the plants sprayed 5 weeks after emergence.

TABLE 3
 EFFECT OF TIME OF SPRAYING OF BARBAN ON WILD OAT STRAINS
 Dry matter (g) per plant

Time of Spraying (weeks after emergence)	<i>A. ludoviciana</i>			<i>A. fatua</i>	Average
	Cream	Grey	Brown	Brown	
Control	0.17	0.13	0.19	0.19	0.17
1	0.09	0.02	0.03	0.03	0.04
2	0.07	0.09	0.06	0.05	0.07
3	0.12	0.10	0.12	0.07	0.10
4	0.16	0.14	0.13	0.14*	0.14
5	0.15	0.17	0.15	0.17	0.16

Necessary differences for significance: 5% = 0.04;
 1% = 0.05.

S.E. of individual mean 0.02.

* Rain fell within $\frac{1}{2}$ hr of spray application to *A. fatua*.

In the cream *A. ludoviciana*, dry-matter production per plant was still significantly less than the control up to and including the spray application 3 weeks after emergence, while in the brown strain of the same species, significant dry-matter reductions per plant were recorded up to the spray application 5 weeks after emergence.

IV. DISCUSSION

Previous work on strain tolerance to barban (Watkins 1970) indicated that the *A. ludoviciana* strains appeared to have a high tolerance to this chemical, with the cream strain being the most susceptible of this species. Unfortunately, no seed of the cream strain used in the previous work was available for this trial, and a different cream *A. ludoviciana* strain was used. Results show that the two cream strains differ from one another in their reaction to barban.

In the previous work mentioned, barban was applied at only one stage of growth, 3 weeks after emergence when all plants were approximately at the 2-leaf stage. The results from the present trial indicate that chemical tolerance lies not so much in the wild oat strain itself as in the time when the chemical is applied.

Grey *A. ludoviciana* again, however, showed itself to be very tolerant of the chemical, since the period of susceptibility of this strain to barban was very short, lying somewhere between emergence and 2 weeks after emergence.

With the exception of the cream *A. ludoviciana* strain used, strain tolerance was similar to that recorded from previous work (Watkins 1970).

Overall, the results tend to support the work by Freisen (1967) and Quail and Carter (personal communication) of Sydney University. Time of application is the important factor in barban application—not time in relation to plant development, but time in relation to days after weed emergence.

The application of this knowledge to field conditions presents some difficulties though there is no doubt about its commercial significance. To apply a chemical in the field with accuracy is difficult. When the target for the spray is 1–1½ narrow leaves standing 1–2 in. above the ground, the task of spray application is even more difficult and requires special equipment.

The germination of wild oat is spread over a long period in Queensland wheat areas, and to assess just when the majority of wild oat plants have emerged is not easy, and is usually a guess. Since data from this trial indicate that the *A. ludoviciana* strains have a limited susceptibility period, particularly in the grey strain of this species, it is easy to reason why barban has not given, on the Darling Downs, the wild oat control that has been recorded elsewhere.

It appears that, in general, barban should be applied no later than 14 days after emergence of the weeds in *A. ludoviciana* dominant paddocks, but where *A. fatua* dominates, spraying can be delayed up to 3 weeks from weed emergence. Under these conditions, however, the dominance of *A. ludoviciana* strains must be expected to increase.

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