

Oryzalin - a new product for horticultural use

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SUMMARY

Oryzalin is a dinitrosulphanilamide herbicide which has been developed as a horticultural herbicide. Oryzalin inhibits normal root growth particularly in monocotyledonous weed species. Research has shown oryzalin to be herbicidally efficacious with excellent crop safety when used in a wide variety of fruit, nut and vine crops.

INTRODUCTION

Oryzalin (3,5-dinitro-N⁴N⁴-dipropylsulphanilamide) is a herbicide which has been extensively tested in Australia and overseas.

Oryzalin has a higher water solubility and lower vapour pressure than other dinitroanilines. It has proven effective as a pre-emergence surface applied herbicide around a variety of fruit, nut and vine crops under rainfall or sprinkler irrigation conditions (Ford and Massey, 1971; Kennedy and Talbert, 1977).

The mode of action of oryzalin is similar to that of the dinitroanilines and may be described as the inhibition of normal root growth in susceptible plants (Ashton and Crafts, 1973).

In Australia, evaluation of oryzalin was made during the 1976-77 season in grapes, peaches, almonds, prunes and oranges. In the 1977-78 season, oryzalin was evaluated by farmers in field size applications.

MATERIALS AND METHODS

Experiments were of randomized block design, and each treatment was replicated three or four times. Treatments were applied using a tractor mounted sprayer with a p.t.o. driven Bertolini pump, fitted with Teejet OC-04 or OC-06 off-centre nozzles on a front mounted boom. Plots were sprayed from one side only.

Application volumes ranged from 330 to 1100 l/ha at 170 or 210 kPa. Plot size varied from 8 m x 1 m (in vines, generally one panel from post to post), up to 30 m x 1.5 m (in peaches, prunes, almonds, oranges). Plots generally contained six to eight plants of the test crop. Buffers were imposed around each treated plot.

At each assessment a record was made of all weed species present, and for each species a count was made in at least three quadrats in each control plot. For each weed species a weed control rating on a scale of 0 to 10 was made, where 0 = no effect and 10 = 100% weed control. Observations for crop injury were made on a 0 to 10 scale where 0 = no effect and 10 = complete kill.

Rates of chemical applied were:

oryzalin : 2.25, 3.38 and 4.50 kg a.i./ha, and

simazine : from 0.64 to 1.2 kg a.i./ha.

Oryzalin was applied at each site at the above rates, with and without simazine as a tank-mix, and also compared to simazine alone. The amount of simazine applied varied with soil-type and ranged from 0.64 kg a.i./ha on a Nangiloc sand to 1.20 kg a.i./ha on some older loamy soils.

Rainfall or irrigation water supplied was recorded at each site for 28 days following treatments. In all experiments post-treatment rainfall or sprinkler applied water amounted to 12 mm within 3 weeks after treatment. United States work has shown that under a wide variety of climates, oryzalin needs 12 mm of rain within 3 weeks of application for herbicidal efficacy.

Experiments were commenced in September and October, 1976, with repeat applications being made in October, 1977. Sites were located in the irrigation areas of Victoria and South Australia and in the Barossa Valley of South Australia.

Assessments of crop injury and weed ratings were made early season (1 to 2 months after treatment), mid-season (3 to 5 months after treatment) and late season (5 to 8 months after treatment).

RESULTS AND DISCUSSION

Crop injury

Crops treated in 1976 included grapevines (cultivars : Semillon, Cabernet Sauvignon, Gordo and Palomino), peaches (Fay Alberta), almonds (Paper-shell and E-plus), prunes and oranges (Valencia). No crop injury was recorded at any site, even when oryzalin was deliberately applied over the top of Semillon rootlings at bud-burst. Gordo grapes treated were one year old and although traditionally regarded as a sensitive variety, injury was not observed after 2 years of application. At several sites treated by farmers in the 1977 season, no injury was recorded in any variety of grapevines, including Gordo rootlings sprayed soon after bud-burst. This is in agreement with work reported from the U.S.A. (Colbert et al 1977).

Weed control

Oryzalin at 2.25 kg a.i./ha provided control of several annual grasses and broadleaf weeds for a period of 4 to 6 months. Longer term control, from 5 to 8 months, was provided by oryzalin at 3.38 kg a.i./ha. Tables 1 and 2 present a summary of those weed species controlled by oryzalin.

In most situations where oryzalin can be used the most convenient time of application is September, or around bud-burst of grapes. From the farmer's point of view it is desirable for control to extend beyond picking time or until March/April. With almonds where a "clean floor" is necessary for sweeping of the crop, a later application of oryzalin in October before the summer germinating grasses appear, may be more satisfactory.

For full season control of the grasses and broadleaf weeds listed, from September to March, application of the higher rate of

Table 1. Annual grasses controlled (85 to 100%) by oryzalin at 2.25 to 3.38 kg a.i./ha

Barnyard grass	<i>Echinochloa crus-galli</i>
Love grass	<i>Eragrostis</i> spp.
Pigeon grass	<i>Setaria</i> sp.
Paradoxa grass	<i>Phalaris</i> spp.
Spiny burr grass	<i>Cenchrus pauciflorus</i>
Summer grass	<i>Digitaria sanguinalis</i>

Table 2. Annual broadleaf weeds controlled (85 to 100%) by oryzalin at 2.25 to 3.38 kg a.i./ha

Deadnettle	<i>Lamium amplexicaule</i>
Fat hen	<i>Chenopodium album</i>
Fumitory	<i>Fumaria officinalis</i>
Portulaca (pigweed)	<i>Portulaca oleracea</i>
Sowthistle	<i>Sonchus oleraceus</i>
Wireweed	<i>Polygonum aviculare</i>

3.38 kg a.i./ha is recommended. For example, in two trials in the 1976/77 season, fat hen grew away in late January from an application in the previous September of 2.25 kg a.i./ha, whereas control was achieved with the higher rate of 3.38 kg a.i./ha until April. Table 3 summarizes the results from one of these sites and shows that the addition of simazine improved the control of fat hen 4 months after application. Addition of simazine at low rates (0.64 to 1.20 kg a.i./ha) provided control of broadleaf weeds such as hedge mustard (*Sisymbrium officinale*), wild turnip (*Brassica rapa*), and black nightshade (*Solanum nigrum*) which are not adequately controlled by oryzalin alone (Table 4). Simazine alone on the other hand did not control summer grasses adequately, and it is apparent that a combination of the two products can provide very acceptable commercial control (Table 4).

Some weed species such as skeleton weed (*Chondrilla juncea*), stemless thistle (*Onopordum acaulon*), couch grass (*Cynodon dactylon*) and Johnson grass (*Sorghum halepense*) from rhizomes, are not controlled by any rate of oryzalin. The correct application of herbicides such as 2,2-DPA and glyphosate will, however, control the latter, and in combination with products such as oryzalin and simazine the vine and tree fruit-grower can now achieve complete season-long weed control.

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Table 3. The effect of time upon the efficacy of two rates of oryzalin for control of fat hen¹

Treatment kg a.i./ha	% control of fat hen at		
	22 October, 1976	10 December, 1976	19 January, 1977
oryzalin 2.25	8.63 b ²	89.3 a	53.3 b
oryzalin + simazine 2.25 + 1.2	99.3 a	99.0 a	99.3 a
oryzalin 3.38	100.0 a	96.0 a	86.7 a
oryzalin + simazine 3.38 + 1.2	100.0 a	99.3 a	99.7 a
simazine 1.2	100.0 a	98.3 a	90.0 a
Control	0.0 c	0.0 b	0.0 c

¹ Results from Experiment No. 76-228, Treatments applied 13 September, 1976.

² Numbers within a column followed by the same letters are not significantly different ($P < 0.05$) as determined by Duncan's Multiple Range Test.

Table 4. The effect of oryzalin plus simazine and simazine on the control of some weed species¹

Treatment kg a.i./ha	% control of species indicated			
	Hedge mustard 22 October, 1976 (1)	Wild turnip 10 October, 1976 (2)	Wild turnip 10 December, 1976 (3)	<i>Setaria</i> spp. 12 December, 1977 (4)
oryzalin 2.25	25.0 cd ²	76.7 b	17.5 c	90.2 a
oryzalin + simazine 2.25 + 1.2	90.0 ab	100.0 a	95.0 a	87.5 a
oryzalin 3.38	85.0 ab	97.5 a	52.5 b	98.7 a
oryzalin + simazine 3.38 + 1.2	94.3 a	100.0 a	92.5 a	99.4 a
simazine 1.2	90.0 ab	100.0 a	100.0 a	40.0 c
Control	0.0 c	0.0 c	0.0 c	0.0 d

¹ Results from Experiment Nos:

- (1) - Application 27 September, 1976
- (2) - Application 13 September, 1976
- (3) - Application 13 September, 1976
- (4) - Second application date 5 October, 1977.

² Numbers within a column followed by the same letter are not significantly different ($P < 0.05$) as determined by Duncan's Multiple Range Test.

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