HERBICIDE TOLERANCE AND WILD RADISH CONTROL IN LUPINE AND VETCH

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INTRODUCTION

Wild radish (Raphanus raphanistrum Crantz) is a common weed in grain crops throughout the world. Wild radish is a self pollinated annual found mainly in cereals, fallows, and non-crop areas. In Florida it grows as a winter annual in these sites. It is a moderate to vigorous competitor for space.

Extensive work in the control of this weed has been done in Germany, the Soviet Union, and Great Britan. Research has been carried out world wide on the control of wild radish in numerous crops, using many herbicides. In Brazil, wild radish was controlled with 2, 4-D applied by air (Guibert, 1972). Merich et al. (1972) found BAS 3580H (bentazon 26% and dichloroprop 34%) and BAS 3960H (bentazon 25% and mecoprop 37.5%) controlled wild radish, Chrysanthamum segetum, Cusicim spp., Galum aparine, Matricaria spp., and Sinapsis arvensis. Hahn (1973) controlled wild radish in grasses with SYS 67ME (MCPA 86% free acid) at 1.5 kg/ha and SYS 67 Prop (dichloroprop potassium 64% acid). Koboreva (1971) controlled wild radish in buckwheat (Fagopyrum tataricum) with 1-2 kg/ha 2, 4-D amine. Treating with MCPA (1-2 kg/ha) or norea (0.5 kg/ha) increased yields of buckwheat by 1000 kg/ha. Osususka et al. (1973) gained twice the control of wild radish compared to the check with 0.25 kg/ha of atrazine. Cochet et al. (1973) obtained control with Phyt 3425 (chlormtofen 20% + linuron 5%) at 1.85-5.0 kg/ha. Huggenburger et al. (1974) obtained control of wild radish, Digitaria singuevalis, Amaranthus spp., Polygonium spp., and Sinapsis arvensis with oryzalin 1.0-1.4 kg/ha + linuron (1.0-1.4 kg/ha) applied surface preemergence with 12.5 mm precipitation or shallow incorporation. Hermant et al. (1973) treated 4 cm flax (Linum usitatissimum and R. (raphanistrum) in an early stage with bentazon and achieved good weed control with no injury to the flax. Detrernix et al. (1973) achieved control of Raphanus with alachlor (1.7-2.0 kg/ha) or propachlor (0.5 kg/ha) applied preemergence. Leiderman et al. (1972) controlled wild radish with oxadiazon (1.5-2.0 kg/ha). Amaranthus vidis, Galingosa parviflora, and Digitaria sanguinalis were also controlled.

Wild radish is a problem in winter forage crops at the Robinson Farm in Williston, Florida. Since this problem weed existed in land already utilized for research, the following experiment was established to determine possible control measures that could be utilized to control wild radish in lupine, Lupinus angustifolia, and vetch (Vicia villosa).

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MATERIALS AND METHODS

The experiment was conducted at the Robinson Farm in Williston, Florida during the winter of 1979–1980. Wild radish control was evaluated in lupine and vetch which were planted behind several no-tillage operations. The land was harrowed three times and then "Hairy vetch" (33.6 kg/ha) and "Frost lupine" (89.6 kg/ha) were properly inoculated and drilled on November 1, 1979. Lupine was irrigated (3.2 cm) on November 9, 1979 and vetch was irrigated on November 10. A portion of both lupine and vetch received an application of bentazon (1.12 kg/ha) on January 3, 1980. The bentazon was applied in a 280 l/ha spray at 2.8 kg/cm^2.

On January 15, 1980, three chemicals, acifluorfen (Blazer), bentazon (Basagran), and 2, 4-DB (Butyrac) were applied postemergence to vetch and lupine.

Herbicides	Rate
acifluorfen	0.28, 0.43, 0.56
bentazon	0.84, 1.12
2, 4-DB	0.28, 0.56

AG98 at 0.25% v/v was added to acifluorfen. Two applications of each chemical were made to lupine and vetch which had been previously treated with 1.12 kg/ha bentazon and to plots not previously treated. The major weed to be studied was wild radish.

The herbicides were applied with a C02 backpack plot sprayer in 187 l/ha spray at 3.36 kg/cm^2 on January 15, 1980. The second application of acifluorfen and bentazon was made on January 28, 1980 to wild radish plants that were 61 cm high. The second application of 2, 4-DB was made on February 3, 1980. The same method of application was used.

Each experiment was set up in a randomized complete black design and 4 replications were used. The treatments were rated by 4 visual observations for crop tolerance and wild radish control. A rating of 0 equals no affect on the crop or the weed, while a rating of 10 equals complete control of either the crop or the weed.

RESULTS AND DISCUSSION

In the four visual ratings there were significant differences between both weed control and crop tolerance (Tables 1. 2. 3, 4). By the fourth rating, acifluorfen and bentazon had provided almost complete wild radish control at all rates. Acifluorfen had caused from moderate to severe crop injury in vetch and severe crop injury in lupine. Bentazon caused no crop injury in vetch but almost completely removed the lupine.

Bentazon provided good wild radish control in both crops. There was excellent crop tolerance in vetch, but no crop tolerance of bentazon in lupine. Acifluorfen provided comparable weed control to bentazon. There was some tolerance of vetch at the low rate.

2, 4-DB, due to the advanced stage of growth of WR at application, provided no wild radish control. It caused slight crop injury in both vetch and lupine. In vetch it caused leaf curl and in lupine it caused the stem to curl.

The timing of application was not optimum for control with selective herbicides. It is significant that good control of the weed by bentazon and acifluorfen was obtained in this stage of growth.

There seemed to be an interaction with bentazon and temperature. Control of wild radish appeared to be enhanced by hard freezes after application. This was observed at Williston and in wild radish treated with 0.84 kg/ha basagran at the Green Acres research farm.

Bentazon has been shown to be affected by environmental factors (BASF Tech. Info., Bull. No 7804). An optimum temperature for bentazon would be over 18 C (Ellison, 1980). This temperature relationship would have to be considered when determining a control program for a winter weed, since winter temperatures in Florida vary so much.

This experiment should be repeated to observe the activity of these chemicals on the crop and weed, in an earlier growth stage. The affects of temperature on bentazon need to be evaluated further.

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TABLE 1. Control of Wild Radish and Vetch Tolerance From the Use of Herbicides Following an Application of 1.12 kg/ha Bentazon.

Treatment	Date 1-26-80	2-3-80	2-7-80	2-14-80
		Wild Radish Control		
acif1uorfen	6.0 a	8.5 a	9.9 a	9.9 a
bentazon	4.5 a	8.0 a	9.5 b	9.7 a
2,4-DB	1.0 b	1.0 b	1.0 c	1.0 *b*
check	1.0 b	0.0 *b*	1.0 c	1.0 b
		Crop Tolerance		
acifluorfen	2.5 a	5.5 a	6.5 a	6.5 a
bentazon	0.0 a	0.5 c	2.0 b	0.0 c
2,4-DB	0.0 a	2.0 *b*	0.0 b	3.0 b
check	0.0 a	0.5 c	0.0 b	0.0 c

A rating of 0 equals no affect on the crop or weed, while a rating of 10 equals complete control of either the crop or the weed.

Values among treatments within each date followed by the same letter are not significantly different at the 0.05 level of probability according to Duncan's new multiple range test.

TABLE 2. Control of Wild Radish and Vetch Tolerance From the Use of Herbicides With No Previous Herbicide Application.

Treatment	Date 1-26-80	2-3-80	2-7-80	2-14-80
		Wild Radish Control		
acifluorfen	3.5 a	4.5 b	6.5 a	7.0 b
bentazon	1.5 b	6.0 a	8.5 a	8.25 a
2,4-DB	0.0 b	0.0 c	0.5 b	0.0 c
check	0.0 b	0.0 c	0.0 b	0.0 c
		Crop Tolerance		
acifluorfen	3.0 a	4.0 a	5.5 a	4.5 a
bentazon	0.0 b	0.5 b	0.0 b	0.0 c
2,4-DB	0.0 b	2.5 ab	2.0 b	2.0 b
check	0.0 b	0.0 b	0.0 b	0.0 c

A rating of 0 equals no affect on the crop or weed, while a rating of 10 equals complete control of either the crop or the weed.

Values among treatments within each date followed by the same letter are not significantly different at the 0.05 level of probability according to Duncan's new multiple range test.

TABLE 3. Control of Wild Radish and Lupine Tolerance from the Use of Herbicides Following an Application of 1.12 kg/ha Bentazon.

Treatment	Date 1-26-80	2-3-80	2-7-80	2-14-80
		Wild Radish Control		
acifluorfen	4.0 a	7.5 a	9.25 a	9.7 a
bentazon	2.0 b	8.0 a	9.25 a	9.5 a
2,4-DB	1.0 bc	1.0 b	1.0 b	1.5 b
check	0.5 c	1.0 b	1.0 b	1.0 b
		Crop Tolerance		
acifluorfen	8.0 a	9.45 a	9.9 a	9.9 a
bentazon	10.0 a	9.95 a	9.9 a	9.9 a
2,4-DB	2.0 b	5.0 b	4.0 b	2.5 b
check	0.0 b	0.5 c	2.0 b	2.0 b

A rating of 0 equals no affect on the crop or weed, while a rating of 10 equals complete control of either the crop or the weed.

Values among treatments within each date followed by the same letter are not significantly different at the 0.05 level of probability according to Duncan's new multiple range test.

TABLE 4. Control of Wild Radish and Lupine Tolerance From the Use of Herbicides Following No Previous Herbicide Application.

Treatment	Date 1-26-80	2-3-80	2-7-80	2-14-80
		Wild Radish Control		
acifluorfen	3.0 a	4.5 a	6.5 b	8.25 a
bentazon	1.0 b	6.0 a	8.0 a	8.75 a
2,4-DB	0.56 b	0.0 b	0.0 c	0.0 b
check	0.0 b	0.0 b	0.0 c	0.0 b
		Crop Tolerance		
acifluorfen	5.0 a	9.0 a	8.5 b	7.5 a
bentazon	3.5 ab	9.9 a	9.9 a	9.9 a
2,4-DB	0.5 b	3.5 b	2.0 c	2.5 b
check	0.5 b	0.5 b	0.0 d	0.0 b

A rating of 0 equals no affect on the crop or weed, while a rating of 10 equals complete control of either the crop or the weed.

Values among treatments within each date followed by the same letter are not significantly different at the 0.05 level of probability according to Duncan's new multiple range test.