THIFENSULFURON METHYL WITH METSULFURON METHYL - A NEW SULFONYLUREA HERBICIDE FOR BROAD-LEAVED WEED CONTROL IN WINTER CEREALS IN NEW SOUTH WALES AND QUEENSLAND

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Summary. Thifensulfuron methyl, at 682g/kg with metsulfuron methyl at 68g/kg is a new post-emergent herbicide (HARMONY®* M Herbicide) for the control of broad-leaved weeds in wheat, barley, oats and triticale in Australia. Results from 24 field trials show that control of climbing buckwheat (black bindweed), *Fallopia convolvulus*, is obtained with 27.3 g/ha thifensulfuron methyl with 2.7g/ha metsulfuron methyl. This rate is also effective against wireweed, *Polygonum aviculare*, deadnettle, *Lamium amplexicaule*, turnip weed, *Rapistrum rugosum* and New Zealand spinach,*Tetragonia tetragonoides*. Spiny emex, *Emex australia* control as good as the standard was obtained with 30.7 g/ha thifensulfuron methyl with 3.1g/ha metsulfuron methyl. Crop tolerance trials showed all 16 varieties of wheat, 3 varieties of oats, 2 varieties of barley and one of triticale were tolerant. Trials on safe intervals for planting rotational crops showed that the following summer crops, sorghum, mung beans, soybeans, maize and sunflowers can follow winter cereals 4 months after treatment with HARMONY® M on soils of pH 7.8 or less and organic matter content of no less that 1.7%.

INTRODUCTION

Climbing buckwheat (black bindweed) *Fallopia convolvulus*, one of the three most important weeds of cereals in Argentina, Canada and USA (5), is found in all cereal-growing areas of Australia except Western Australia (7). Other important weeds, particularly in N.S.W. and Queensland, are wireweed, *Polygonum aviculare*, deadnettle, *Lamium amplexicaule*, turnip weed, *Rapistrum rugosum*, New Zealand spinach, and spiny emex, *Emex australis*.

Chlorsulfuron (GLEAN® Cereal Herbicide) was the first sulfonylurea herbicide for winter cereals (4) which controlled climbing buckwheat. Campion (3) found the half-life of chlorsulfuron in Australia generally to be between one and one and a half months. This degradation is similar to and often faster than conventional soil-active herbicides. However there is an unprecedented difference in sensitivity to chlorsulfuron among different crop and weed species(2). Sweetser et.al.(8) observed that wheat is greater than 1000 times more tolerant to chlorsulfuron than the extremely sensitive sugar beet. Consequently safe intervals for rotational crops following chlorsulfuron use for cereal weeds may exceed one year depending on soil, climate and use rate. This restricts the use of chlorsulfuron for weed control in the "opportunity" or "double - cropping" areas of Northern N.S.W.and the Darling Downs in Queensland where summer crops may be planted after a post-emergent winter cereal herbicide treatment.

Anderson (1) reported that the sulfonylurea herbicide, metsulfuron methyl degraded in the soil to herbicidally inactive products at rates slightly faster than chlorsulfuron under identical conditions. Hutchison et.al. (6) observed that rotational crops sensitive to chlorsulfuron could be planted in soil treated with DPX-M6316 (thifensulfuron methyl), another sulfonylurea herbicide, within 30 days. It therefore appeared that both metsulfuron methyl alone and in mixtures with DPX-M6316 should be investigated in sensitive recropping areas in Northern N.S.W. and Queensland.

An account is given here of trials in Northern N.S.W. and on the Darling Downs of Queensland in 1986-1989 to test the efficacy of metsulfuron methyl alone and in mixtures with thifensulfuron methyl against climbing buckwheat, wireweed, deadnettle, turnip weed, spiny emex, and New Zealand spinach. Trials in 1987 and 1988 on thifensulfuron methyl 682 g/kg

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with metsulfuron methyl 68g/kg (HARMONY® M Herbicide) reporting tolerances of cereal varieties, and safe recropping intervals for rotational crops such as maize, mungbeans, sorghum, soybeans and sunflowers are also discussed.

MATERIALS AND METHODS

Dry flowable formulations containing 682g/kg thifensulfuron methyl with 68g/kg metsulfuron methyl (HARMONY® M Herbicide) and 600g/kg metsulfuron methyl (ALLY® Herbicide) were used. A non-ionic surfactant was always included at the labelled use-rate eg Du Pont Surfactant at 0.1% (v/v).

Trials generally used a randomised complete block design with four replicates. Plot sizes were usually 2.5M by 20 M. Treatments were generally applied using a CO_2 plot sprayer with water volumes of 65 to 115 L/ha and pressure of 190-300 kPa.

Means assessments were analysed by analysis of variance and statistical separation of means obtained using Least Significant Difference.

Weed Control Of the 24 field trials on weed control 14 were carried out in Queensland, 9 in N.S.W. and 1 in Victoria. Standard herbicides were TORDON® 242 (10 trials), TORDON® 50D plus 2,4-D amine (8 trials), GLEAN® Cereal Herbicide (3 trials), AMICIDE® 500 (2 trials) and HOMYX® (1 trial). Rates were registered recommendations, 26.25g picloram with 420g MCPA/ha (TORDON® 242), 23.5g picloram with 94g 2,4-D/ha (TORDON®50-D) and 235g 2,4-D/ha, 15g chlorsulfuron/ha (GLEAN® Cereal Herbicide), 350g 2,4-D/ha (AMICIDE® 500) and 420g bromoxynil with 420g MCPA/ha (HOMYX®)

Applications were made when weeds were in the cotyledon to 6-leaf stages and the cereal crop generally early post-emergence, Zadok 13-Zadok 26. Weed control assessments usually included percentage biomass reduction at 14,50 and about 90 days after treatment. Weed abundance counts were taken at about 50 days after treatment.

Winter cereal crop varietal tolerances. Three trials, two in N.S.W. and one in Queensland, examined the varietal tolerances of wheat, barley, oats and triticale to thifensulfuron methyl with metsulfuron methyl. Treatments were applied using a tractor and boom sprayer. Vigour and/or yield were assessed.

Recropping intervals for rotational crops. Two trials from Queensland are presented. These were at Pilton 1987/88 and Brookstead 1987/88. Herbicide applications were made post-emergence to winter cereal crops and rotational crops planted 6 and 4 months after treatment respectively. Crop vigour was usually rated on 0 - 10 arithmetic scale where 10 = no effect (best plot) in each replicate and 0 = all plants dead. Crop grain yields were generally measured by harvesting each plot using a Hege 125B harvester. Because of floods, early frosts and cattle-grazing the 1987/88 trial at Pilton was not harvested. Maize cobs were harvested by hand in 1988 at Brookstead.

Rainfall recordings between treatment and planting rotational crops were 610 and 355mm respectively at Pilton and Brookstead. The soil at Pilton was a black earth with a pH of 6.9 and OM 4.2%. At Brookstead the soil was a black self-mulching clay with a pH of 7.8 and OM 1.9%. Soil pH was determined by laboratory analysis using the 1:5, soil:water suspension method.

RESULTS AND DISCUSSION

Weed control (biomass reduction) obtained at final assessment with three different rates of thifensulfuron methyl with metsulfuron methyl, one rate of metsulfuron methyl, and standard herbicides at registered rates are shown in Table 1.

Table 1. Comparison of the thifensulfuron methyl with metsulfuron methyl, metsulfuron methyl and standard herbicide treatments for control of climbing buckwheat (CB), wireweed (WW), deadnettle(DN), turnip weed (TW), spiny emex (SE) and New Zealand spinach(NZ).

Herbicide	Rate (g/ha)	Weed control (%)					
		CB	WW	DN	TW	SE	NZ
Thifensulfuron-methyl	20.5						
+ Metsulfuron - methyl	+2.0	78 [13]	86 [8]	89 [4]	88 [2]	58	91
Thifensulfuron-methyl	27.3						
+ Metsulfuron - methyl	+ 2.7	88 [7]	80 [3]	90 [3]	100	58	98
Thifensulfuron - methyl	30.7						
+ Metsulfuron - methyl	+3.1	86 [14]	91 [8]	95 [6]	93 [3]	70	96
Metsulfuron methyl	4.2	70 [15]	76 [8]	92 [5]	92 [2]	70	98
Standards		85 [16]	68 [10]	50 [6]	89 [3]	79	66

[ ] Indicates the number of trials if more than one.

Thifensulfuron methyl at 27.3 g/ha with metsulfuron methyl at 2.7g/ha gave biomass control of climbing buckwheat comparable to that given by the standards and better than metsulfuron methyl at 4.2g/ha. The same rate of thifensulfuron methyl with metsulfuron methyl gave control of wireweed greater than that given by the standards and comparable to metsulfuron methyl at 4.2g/ha. However, wireweed in one of the three trials were under severe moisture stress and this lowered the mean biomass reduction to 80%. The lower rate of 20.5 g/ha thifensulfuron methyl with 2g/ha metsulfuron methyl gave biomass control of deadnettle and turnip weed comparable to metsulfuron methyl at 4.2g/ha and the standards in the case of turnip weed but not dead nettle. The results with New Zealand spinach were similar to those with dead nettle. With spiny emex the highest rate of 30.7g/ha thifensulfuron methyl with 3.1g/ha metsulfuron methyl was required to give biomass control comparable to the standard or 4.2g/ha metsulfuron methyl.

Assessments of biomass at about 14 days after treatment showed that thifensulfuron methyl 27.3g/ha with metsulfuron methyl at 2.7g/ha gave means of 66% and 61% control of climbing buckwheat and wireweed respectively. The standards gave 59% and 48% control respectively. With turnip weed, biomass control at about 14 days after treatment was 73% from thifensulfuron methyl 20.5g/ha with metsulfuron methyl at 2.0g/ha and 63% from standard treatments. So HARMONY® M gave good control of these weeds at an early stage. Moreover, weed counts showed that HARMONY® M treatments resulted in survival of fewer weeds.

No winter cereal crop injury was noted in the three crop tolerance trials. With rates of 20.5g/ha thifensulfuron methyl with 2g metsulfuron methyl to 61.5g/ha thifensulfuron methyl with 6g metsulfuron methyl there were no effects on vigour or yield of Dollar bird, Hartog, Meteor, Osprey, Owlet, Rosella, Sunbird, Sunco, Sunelg, Sundor, Suneca, Takari, Vulcan, Yallaroi, Spear and Kulin varieties of wheat, Minhafer, Coolabah and Camellia varieties of oats, O'Connor and Galleon varieties of barley and Currency variety of triticale.

Two trials on safe recropping intervals for rotational crops after use of thifensulfuron methyl with metsulfuron methyl compared to use of metsulfuron methyl are presented in Tables 2 and 3.

Table 2. Effects of thifensulfuron methyl with metsulfuron methyl and metsulfuron methyl on vigour of rotational crops planted 6 months after herbicide application on soil with pH 6.9 at Pilton Qld. 1987-88.

Herbicide	Rate (g/ha)	Vigour (6 weeks after sowing)				
		Maize	Mungbeans	Sorghum	Soybeans	Sunflowers
Thifensulfuron-methyl + Metsulfuron methyl	30.7 +3.1	9.7	9.7	10.0	10.0	9.7
Thifensulfuron-methyl + Metsulfuron methyl	61.4 +6.2	10.0	9.5	10.0	9.5	9.5
Metsulfuron methyl	4.2	9.7	10.0	9.7	9.5	9.5
Metsulfuron methyl	8.4	10.0	9.7	9.7	10.0	10.0
Control untreated		10.0	9.6	10.0	9.9	9.7
l.s.d. (P=0.05)		0.5	0.7	0.4	0.6	0.9

Data in Table 2 show that at the highest rate tested for weed control in Table 1, 30.7g/ha thifensulfuron methyl with 3.1g/ha metsulfuron methyl, there are no effects on vigour (6 weeks after sowing) of maize, mungbeans, sorghum, soybeans and sunflowers planted 6 months after herbicide treatment on soil with a pH 6.9. Nor is there an effect at double this rate. There is also no effect from the weed control rate of 4.2g/ha metsulfuron methyl and double that rate.

The results in Table 3 show that on soil of pH 7.8 and with an interval of 4 months after herbicide application there are no effects on yields of the rotational crops.

Table 3. Effects of thifensulfuron methyl with metsulfuron methyl and metsulfuron methyl on yield of rotational crops planted 4 months after herbicide application on soil with pH7.8 at Brookstead, Qld 1987-88.

Herbicide	Rate (g/ha)	Yield (t/ha) Maize	Mungbeans	Sorghum	Soybeans	Sunflowers
Thifensulfuron-methyl	30.7					
+ Metsulfuron methyl	+3.1	4.81	0.28	1.13	0.60	0.24
Thifensulfuron-methyl	61.4	5.18	0.39	1.12	0.91	0.19
+ Metsulfuron methyl	+6.2					
Metsulfuron methyl	4.2	4.93	0.32	0.99	0.58	0.17
Metsulfuron methyl	8.4	5.13	0.38	1.17	0.62	0.26
Control untreated		5.12	0.40	1.13	0.74	0.26
l.s.d. (P=0.05)		0.42	0.12	0.20	0.25	0.10

Further trials on recropping intervals for rotational crops are both in progress and planned.

It is concluded that HARMONY® M Herbicide is a promising new post-emergent winter cereal herbicide. The combination of thifensulfuron methyl and metsulfuron methyl has been shown to provide a wider spectrum of broad-leaved weed control than metsulfuron methyl and the standard herbicides. In addition, HARMONY® M will permit early plant-back of the summer rotational crops of sorghum, maize, mungbeans, soybeans and sunflowers.

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