

METOSULAM - A NEW TRIAZOLOPYRIMIDINE SULFONANILIDE HERBICIDE FOR BROADLEAF WEED CONTROL IN WINTER CEREALS

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Summary. Metosulam, formulated as a 714 g/kg water dispersible granule (ECLIPSE** herbicide) is a new post-emergence broadleaf herbicide for use in winter cereals. Metosulam at 5 g/ha gives control of most species of the Brassicaceae (including wild radish (*Raphanus raphanistrum*)), amsinckia (*Amsinckia calycina*) and is active against most species of the Fabaceae. Metosulam gives useful suppression of a range of other broadleaf weeds, but has no effect on grasses, including annual ryegrass (*Lolium rigidum*) and wild oats (*Avena spp.*). Metosulam has a wide window of application (Zadoks 13-31) and has an excellent safety margin in wheat, barley, oats, triticale and cereal rye. Metosulam is compatible with most selective grass herbicides and cereal broadleaf herbicides.

INTRODUCTION

Metosulam, N-(2,6-dichloro-3-methylphenyl)-5,7-dimethoxy-1,2,4-triazolo[1,5-a] pyrimidine-2-sulfonamide, (ECLIPSE** herbicide) is a new herbicide being developed by DowElanco Australia Limited for broadleaf weed control in winter cereals.

Metosulam is absorbed by roots and foliage of plants and translocated to growing points where it inhibits the enzyme acetolactate synthase (ALS) which is essential for synthesis of amino acids. This paper reports the results of efficacy trials and weed-free crop tolerance screens conducted throughout the major winter cropping regions of Australia from 1988 to 1992.

METHODS

Formulation and Adjuvants. With the exception of initial field screens in 1988, all trials were conducted with a water dispersible granule (W.D.G.) of metosulam. Applications were made with either a non-ionic surfactant (e.g. AGRAL 600 @ 0.1% v/v) or an emulsifiable crop oil (UPTAKE** @ 0.5% v/v).

Efficacy trials conducted on commercial growers' properties using natural weed infestations were laid in a randomised complete block design with three or four replicates. Small-plot trials were applied using a propane-powered AZO precision back-pack sprayer with a hand-held boom (2 or 3 metres long) fitted with flat fan nozzles at 50 cm centres. At an operating pressure of 200 kPa, 100 L/ha of spray solution was applied. Larger plots were treated using a motorbike-mounted sprayer with a 6 metre boom fitted with flat fan nozzles and at 200 kPa operating pressure, 50 L/ha of spray solution was applied.

Weed-free crop tolerance screens were established in representative agronomic areas over at least two seasons and using major commercial crop cultivars.

Plantback trials were conducted over two years in which metosulam at up to 40 g/ha (eight times the proposed label rate) was applied to bare soil and rotational crops sown into the plots.

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RESULTS AND DISCUSSION

Weed control (biomass reduction) was assessed visually at 2,4 and 6 weeks post-treatment and final control levels are summarised and presented in Tables 1,2 and 3.

Metosulam 5 g/ha, applied to weeds which ranged is size from 2-4 leaf to 8-10 leaf, controlled most species of the Brassicaceae including wild radish (*Raphanus raphanistrum*), Indian hedge mustard (*Sisymbrium orientale*), turnip weed (*Rapistrum rugosum*), ball mustard (*Neslia paniculata*) and wild turnip (*Brassica tournefortii*).

Table 1. Metosulam for control (%) of wild radish (RAPRA), Indian hedge mustard (SSYOR), turnip weed (RASRU), ball mustard (NEAPA) and wild turnip (BRSTO).

Herbicide	Rate (g/ha)	RAPRA	SSYOR	RASRU	NEAPA	BRSTO
metosulam*	3.6	93 (11) [75-100]	90 (2) [80-100]	85 (6) [70-95]	73 (2) [60-87]	-
metosulam*	5.0	96 (13) [83-100]	91 (3) [80-100]	83 (1)	88 (2) [85-90]	-
metosulam#	5.0	91 (50) [75-100]	81 (24) [60-100]	91 (18) [70-100]	86 (3) [82-90]	84 (3) [75-100]
metsulfuron#	3.0	-	87 (15) [47-100]	98 (7) [93-100]	90 (3) [85-95]	88 (2) [75-100]
2,4-D [§]	750/400	86 (8) [76-100]	-	100 (4)	-	-

- * UPTAKE oil @ 0.5% v/v. () No. of trials summarised
- # AGRAL 600 wetter @ 0.1% v/v. [..] Range of means
- § 2,4-D amine at 750 g a.e./ha or 2,4-D ester at 400 g a.e./ha.

Metosulam, 5 g/ha with wetting agent applied to weeds which ranged in size from 2-10 leaf (or from 2-4 whorl GALTC), controlled amsinckia (*Amsinckia calycina*) and gave useful suppression of sheepweed (*Lithospermum arvense*), threehorn bedstraw (*Galium tricornerutum*), capeweed (*Arctotheca calendula*) and doublegee (*Emex australis*). On this group of weeds, wetting agent tended to give better enhancement of weed control than UPTAKE oil.

Metosulam 5 g/ha was active against certain species of the Fabaceae, including volunteer field peas (*Pisum sativum*), medics (*Medicago spp.*) and subterranean clover (*Trifolium subterraneum*), however lupins (*Lupinus angustifolius*) were highly tolerant.

Metosulam had no effect on grasses, including annual ryegrass (*Lolium rigidum*) and wild oats (*Avena spp.*).

Metosulam shows promising compatibility with selective grass herbicides (aryloxyphenoxypropionates and cyclohexanediones) and cereal broadleaf herbicides including sulfonyleureas, hydroxybenzoxitriles, phenoxy acid derivatives, ureas and triazines.

New herbicides

Selectivity to winter cereals. In eight weed-free crop tolerance screens conducted from 1989 to 1991 metosulam, was safe to all thirty three varieties of wheat and nine varieties of barley tested (see Table 4). In addition, metosulam at up to twice the maximum proposed label rate was safe to oats (5 varieties), triticale (3 varieties) and one variety of cereal rye.

Table 2. Metosulam for control (%) of amsinckia (AMSCA), sheepweed (LITAR), bedstraw (GALTC), capeweed (AROCA) and doublegee (EMEAU)

Herbicide	Rate (g/ha)	RAPRA	SSYOR	RASRU	NEAPA	BRSTO
metosulam*	3.6	80 (1)	50 (2) [30-70]	52 (2) [50-53]	39 (6) [43-68]	30 (1)
metosulam*	5.0	83 (1)	58 (2) [40-75]	66 (2) [57-75]	47 (10) [33-98]	48 (6) [53-60]
metosulam#	5.0	86 (7) [70-97]	63 (6) [37-100]	77 (6) [67-87]	47 (34) [10-92]	49 (18) [38-90]
metsulfuron#	3.0	91 (4) [0-100]	62 (6) [30-95]	64 (4) [57-70]	15 (14) [0-45]	80 (13) [48-100]

* UPTAKE oil @ 0.5% v/v.

() No. of trials summarised

AGRAL 600 wetter @ 0.1% v/v.

[..] Range of means

Table 3. Control (%) of volunteer peas (PIBST), medics (MEDSP) and subterranean clover (TRFSU) with metosulam

Herbicide	Rate (g/ha)	PIBST	MEDSP	TRFSU
metosulam*	3.6	79 (3) [72-85]	67 (2) [55-78]	-
metosulam*	5.0	79 (3) [72-85]	80 (2) [80]	100 (1)
metosulam#	5.0	71 (7) [53-93]	72 (7) [50-93]	89 (4) [77-100]
metsulfuron#	3.0	78 (5) [48-100]	90 (5) [77-98]	93 (4) [90-98]

* UPTAKE oil @ 0.5% v/v.

() No. of trials summarised

AGRAL 600 wetter @ 0.1% v/v.

[..] Range of means

Metosulam also showed promising selectivity to lupins.

Crop Rotation Intervals. Six trials were established in the southern cereal growing regions of Australia in which susceptible rotational crops (field peas, medics, subterranean clover and vetch) were planted into plots treated 10-12 months earlier with up to 20 g/ha metosulam (four times the maximum proposed label rate). All crops emerged with no sign of metosulam damage.

New herbicides

Two further trials were conducted on black clay soils (Breeza Plains, NNSW) in which susceptible crops were planted one to sixteen weeks after application of metosulam to bare soil. For successful establishment of canola and sunflowers, at least two months plantback interval was required.

Table 4. Cereal yields (expressed as a percent of the untreated control) from weed-free crop tolerance screens 1989-1991.

Rate of metosulam* (g/ha)	Crop stage at treatment (Zadoks)		
	Zd 13-15	Zd 13,22-22,23	Zd 30-31
Wheat			
5.0	98.1 [8.8]	100.3 [6.2]	103.8 [12.2]
10.0	97.9 [7.1]	98.8 [7.7]	102.8 [7.1]
No varieties tested	33	28	16
Barley			
5.0	101.2 [15.6]	105.3 [1.5]	104.0 [6.3]
10.0	99.4 [10.9]	107.0 [11.1]	105.0 [7.3]
No varieties tested	9	3	6

[] Standard deviation.

* plus AGRAL 600 wetter @ 0.1% v/v.

Conclusion. Metosulam is a new post-emergence broadleaf herbicide for cereals offering the unique combination of excellent wild radish control, compatibility with grass and broadleaf herbicides, and the possibility of true one-pass weed control. It is safe to cereals and has acceptable plantback requirements for rotational crops.

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