Dimethenamid-p – a new selective herbicide for Australian horticulture

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Summary Dimethenamid-p is a pre-emergent herbicide for the control of a number of economically important broadleaf and grass weeds. Registration is currently being sought in Australia on crops including green beans (*Phaseolus vulgaris* ssp. *nanus*), pumpkins (*Cucurbita moschata*), kabocha (*Cucurbita maxima* × *C. moschata*), processing peas (*Pisum sativum*) and sweet corn (*Zea mays* ssp. *everta*). Dimethenamid-p belongs to the chloroacetamide group of herbicides and is classified as a group K herbicide. Selective control of *Amaranthus powellii*, *Fumaria* spp., *Galinsoga parviflora*, *Nicandra physaloides*, *Eleusine indica*, *Echinochloa crus-galli* and *Digitaria ciliaris* has been achieved in the above crops. Most of the Australian trial work was conducted with dimethenamid, however, registration is being sought for dimethenamid-p which is the active isomer of dimethenamid. The bridging studies have been conducted to show the equivalency between dimethenamid and dimethenamid-p.

Keywords Dimethenamid, dimethenamid-p, pre-emergent herbicide, *Amaranthus powellii*, *Fumaria* spp., *Galinsoga parviflora*, *Nicandra physaloides*, *Eleusine indica*, *Echinochloa crus-galli*, *Digitaria ciliaris*, green beans, pumpkins, kabocha, processing peas, sweet corn.

INTRODUCTION

Dimethenamid was discovered by Sandoz Agro in 1985 and its first global registration was in South Africa in 1992 on dry beans (*Phaseolus vulgaris*), corn (*Zea mays*) and squash (*Cucurbita pepo* var. *pepo*). It is currently registered in a number of countries including New Zealand, USA, Brazil, France and South Africa for pre-emergent weed control in a range of crops including soybeans (*Glycine max*), sugar beet (*Beta vulgaris*), maize (*Zea mays*) and potatoes (*Solanum tuberosum*) (Thomson, 1997). Global registrations of dimethenamid are being replaced by dimethenamid-p, the active isomer of dimethenamid.

Dimethenamid-p belongs to the chloroacetamide group of herbicides and is classified as a group K herbicide according to Avcare's groupings based on mode of action. Dimethenamid-p has a unique sulfur-containing phenyl ring which produces a different behaviour in the soil and metabolism in plants to the other chloroacetamide herbicides.

The registration of dimethenamid-p is keenly sought by the various horticultural industries in Australia, as the relatively small areas of these crops make them unattractive to herbicide manufacturers. Dimethenamid-p will provide a new management tool to help overcome some significant weed problems that affect the efficiency of growing these crops.

This paper summarises efficacy and crop tolerance trials on vegetables conducted by Serve-Ag.

MATERIALS AND METHODS

Dimethenamid has been evaluated in replicated small plot trials for the past nine years in Australia. Small plot trials were sprayed with flat fan nozzles, generally applying water rates of between 200 and 300 L ha^{-1} at an application pressure of between 200 and 300 kPa. In all trials dimethenamid was applied post-plant pre-crop emergence. Dimethenamid rather than dimethenamid-p was used in all trials presented in this paper. Plot sizes were between 10 and 30 m^2. Assessments were conducted as whole plot subjective ratings using the European Weed Reseach System (EWRS) scales for weed efficacy (1 = total weed control, 9 = no effect on weeds). Dimethenamid has been compared to a range of other herbicides used both alone and in combinations.

RESULTS

Results of weed efficacy trials conducted in a number of different crops are summarised in Tables 1–7. At rates of between 0.68 and 2.7 kg a.i. ha^{-1}, dimethenamid is particularly active on *Amaranthus powellii* S.Watson (Table 1), *Fumaria* spp. (Table 2), *Galinsoga parviflora* Cav. (Table 3), *Nicandra physaloides* L. (Table 4) and *Eleusine indica* (L.) Gaertner (Table 7). Dimethenamid is less active on the grasses *Echinochloa crus-galli* (L.) P.Beauv. (Table 5) and *Digitaria*

Table 1. Dimethenamid activity on *Amaranthus powellii.*

Dimethenamid rate kg ha^{-1}	Mean EWRS rating	No. of trials
0.90	4.0	2
1.35	2.3	3
1.80	2.5	2
2.70	1.6	3

Table 2. Dimethenamid activity on *Fumaria* spp.

Dimethenamid rate kg ha^{-1}	Mean EWRS rating	No. of trials
0.68	2.3	1
1.35	2.7	4
2.70	3.2	2

Table 3. Dimethenamid activity on *Galinsoga parviflora*.

Dimethenamid rate kg ha^{-1}	Mean EWRS rating	No. of trials
0.68	1.7	2
1.35	1.0	2
2.70	1.0	1

Table 4. Dimethenamid activity on *Nicandra physaloides*.

Dimethenamid rate kg ha^{-1}	Mean EWRS rating	No. of trials
0.68	3.0	1
0.90	4.0	2
1.35	2.6	3

Table 5. Dimethenamid activity on *Echinochloa crus-galli*.

Dimethenamid rate kg ha^{-1}	Mean EWRS rating	No. of trials
0.90	6.4	2
1.35	4.3	2
1.80	3.3	1
2.70	3.4	3

Table 6. Dimethenamid activity on *Digitaria ciliaris*.

Dimethenamid rate kg ha^{-1}	Mean EWRS rating	No. of trials
0.68	6.8	1
0.90	2.3	3
1.35	4.1	3
1.80	1.0	1
2.70	1.3	1

Table 7. Dimethenamid activity on *Eleusine indica*.

Dimethenamid rate kg ha^{-1}	Mean EWRS rating	No. of trials
0.68	3.1	4
0.90	1.0	1
1.35	2.6	3
2.70	1.4	2

ciliaris (Retz.) Koeler (Table 6) with rates of 1.35 kg ha^{-1} and 0.90 kg ha^{-1} respectively required for effective control of these weeds.

Crop tolerance to dimethenamid is dependent on soil type. Figure 1 shows the increased crop damage in green beans with a decrease in the cation exchange capacity of the soil. Similar relationships were also observed for sweet corn and pumpkins, while processing peas were more tolerant of dimethenamid.

DISCUSSION

Data collected from Australian field trials has been used to support an application to the National Registration Authority (NRA) for registration of dimethenamid-p in crops including green beans, pumpkins, kabocha, processing peas and sweet corn. Dimethenamid-p is the active isomer of dimethenamid. Although most of the Australian trial work was conducted with dimethenamid, the bridging studies have been conducted to show the equivalency between dimethenamid and dimethenamid-p. Weeds where selective control in crop has been achieved include *Amaranthus powellii*, *Fumaria* spp., *Galinsoga parviflora*, *Nicandra physaloides*, *Eleusine indica*, *Echinochloa crus-galli* and *Digitaria ciliaris.*

Guidelines have been developed to cover the use rate of dimethenamid-p on different soil types based on the cation exchange capacity of the soil. This will ensure crop safety over a wide range of soil types.

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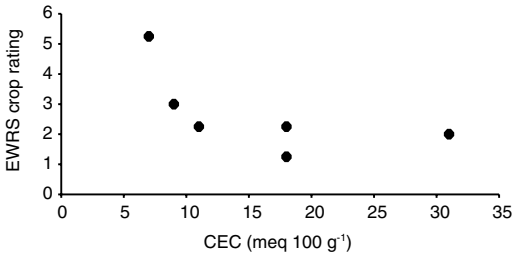

Figure 1. Influence of soil cation exchange capacity on dimethenamid at 1.35 kg ha^{-1} crop safety in green beans. EWRC rating of crop safety: 1 = no damage, 9 = crop death.