Renewal Assessment Report

Dimethenamid-P

Volume 3 – B.3 Data on application

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Rapporteur Member State: Germany

Co-Rapporteur Member State: Bulgaria

Version history

When	What
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B.3 Data on application

B.3.1 Use of the active substance

Dimethenamid-P is evenly distributed by spray application at dose rates up to 864 g as/ha using water as a spray carrier to control a wide range of annual dicotyledonous weeds and annual monocotyledonous weeds in different crops. The dimethenamid-P containing herbicide BAS 656 12 H is mainly a soil acting herbicide, which can be applied pre- and post-emergence of the crop. For optimum weed control weeds should not be more advanced than cotyledone stage or slightly beyond. Regarding post-emergence application the foliar uptake is minor, but the prevention of new emerging weeds is a valuable property.

B.3.2 Function

Dimethenamid-P is used as herbicide.

B.3.3 Effects on harmful organisms

Dimethenamid-P is providing soil residual and, to little extend, foliar activity with application either before or shortly after weed emergence, leading to the inhibition of cell division. In germinating monocotyledonous weed species dimethenamid-P is predominantly absorbed via the emerging coleoptile. In dicotyledonous weed species dimethenamid-P enters the plant primarily via root uptake (radicule) and via the germinating shoots (hypocotyls). After uptake dimethenamid-P is hardly translocated within the plant. Typical symptoms of the aerial parts of broadleaf weed species that emerge include severe stunting, intense green coloration and a leathery appearance of the cotyledons. Emerged grasses are stunted and twisted.

B.3.4 Field of use envisaged

Agriculture

B.3.5 Harmful organisms controlled and crops or products protected or treated

Dimethenamid-P is used in a wide range of crops including (representative uses in bold):

Cereals crops
- **Maize**
- Sorghum
- Millet
- Miscanthus

Oilseed crops
- **Sunflower**
- **Soybeans**
- **Winter Oilseed Rape**
- Oilseed Pumpkin

Beet roots
- **Sugarbeet**
- Red beets
- Cichory roots

Legume crops
- Dry pulses (dry harvest)
  - beans: field beans,
  - peas: chickpeas, field peas
  - lupines
- Legume vegetables (fresh harvest)
  - beans (with & without pods):
    green bean (french beans, snap beans), scarlet runner bean, slicing bean
  - peas (with & without pods):
    garden pea, green pea, sugar peas

Vegetables
- Brassica Vegetables
  - Head cabbage
  - Leafy cabbage
  - Flowering cabbage
  - Kohlrabi
- Bulb Vegetables
  - Onion, welsh onions
  - Shallot
  - Garlic
  - Chives, salad onions
- Root & Tuber Vegetables
  - Carrots
  - Potato
  - Horse radish
  - Turnips, swedes
  - Parsnip
  - Celeriac
- Stem Vegetables
  - Leek
  - Celery
  - Asparagus
  - Fennel
  - Rhubarb
- Fruiting Vegetables
  - Cucumber, gherkin
  - Pattison
  - Melon,
  - Pumpkin, zucchini
- Leafy Vegetables & Herbs
  - Lettuce
  - Cichory

Biannual / perennial crops
- Berries & Small Fruits
  - Currants
  - Raspberries
- Pome & Stonefruit

- Tree Nuts

Others
- Ornamentals
- Tree nursery
- Temporary fallow fields

Dimethenamid-P is used to control the most important broadleaf weeds such as:
Aethusa cynapium,
Amaranthus sp.,
Ambrosia artemisiifolia,
Anagallis arvensis,
Atriplex patula,
Capsella bursa-pastoris,
Chenopodium album,
Datura stramonium,
Fumaria officinalis,
Galeopsis tetrahit,
Galinsoga parviflora,
Galium aparine,
Lamium sp.,
Matricaria sp.,
Melandrium noctiflorum,
Polygonum lapathifolium,
Polygonum persicaria,
Portulaca oleracea,
Solanum nigrum,
Senecio vulgare,
Sinapis sp.,
Sonchus arvensis,
Stellaria media,
Thlaspi arvense,
Veronica sp.

and annual grasses such as:
Avena fatua,
Digitaria sp.
Echinochloa sp.
Lolium sp.
Panicum sp.
Poa annua,
Setaria sp.

B.3.6 Mode of action

Dimethenamid-P, classified by HRAC into group K3, belongs to the chemical class of chloroacetamides. In contrast to other representatives of this chemical family dimethenamid-P is not based on a benzene ring, but contains a sulphur based thiophene ring. The mode of action of the chloroacetamide herbicides is believed to function through the inhibition of the synthesis of very-long-chain fatty acids (VLCFAs) in the lipid biosynthesis pathway.

The activity is based on the influence on cell division and cell growth. A major effect in inhibiting the cell division is the alkylation of sulfhydryl groups in different enzymes. However, the molecular mechanism of dimethenamid-P has not yet been clarified in detail. To date inhibitions of fatty acid and lipid biosynthesis are known. Results from recent studies indicate that in particular the elongation of C_{18} fatty acids to very long-chain fatty acids is blocked by chloroacetamides. The interaction with the fatty acid or lipid biosynthesis possibly explains the observed reductions in the cuticular waxlayer on seedlings after treatment with chloroacetamides. Furthermore, chloroacetamides affect protein synthesis and inhibit flavonoid (including anthocyane) and isoprenoid biosynthesis. From this metabolic pathway the phytohormone gibberelline derives from and its synthesis is affected by chloroacetamides at the level of hydroxylation. In the plant dimethenamid-P is split into several metabolites, which in turn are detoxified by glutathion compounds.
The currently popular hypothesis which offers a possible explanation for the individual effects is based on the alkylating properties of chloroacetamides and the formation of conjugates with acetyl-coenzyme A as well as with other molecules of the SH-groups. As a result of these interventions, the plant cell division and cell elongation processes as well as tissue differentiation are inhibited. The root and shoot growth is suppressed. The result is shortened seedlings with reduced growth, subsequently giving rise to stunting, deformation and death of weed seedlings.

B.3.7 Information on the occurrence or possible occurrence of the development of resistance and appropriate management strategies

The resistance risk assessment submitted by the applicant in principal follows the EPPO Standard 1/213.

Mechanism of resistance
Dimethenamid-P belongs to the Herbicide-Resistance Action Committee (HRAC) group K3 (inhibitors of very-long-chain-fatty-acids (VLCFA)). For dimethenamid-P, no information on potential resistance mechanism is available.

Evidence of resistance and cross resistance
Four grass weed species with resistance to HRAC group K3 active substances are reported worldwide (www.weedscience.org, Nov 2014): *Alopecurus myosuroides* (Germany), *Echinochloa crus-galli var. crus-galli* (China, Thailand, Philippines), *Lolium perenne* ssp. *multiflorum* (US) and *Lolium rigidum* (Australia). For all reported resistant species, multiple resistance to up to seven different modes of action has been confirmed in at least one resistant biotype. The resistant biotype of *Alopecurus myosuroides* shows resistance to flufenacet and additional resistance to ACCase, ALS and PSII inhibitors. No case of resistance to dimethenamid-P has so far been reported worldwide.

Analysis of the inherent risk
Only one case of resistance to HRAC group K3 (in *Alopecurus myosuroides*) has been reported in Europe although herbicides in this group have been used for many decades. As dimethenamid-P is not intended for the control of *Alopecurus myosuroides,* the inherent risk of the active substance can therefore be regarded as low. In general, there are some target weed species of dimethenamid-P that exhibit a high resistance risk, namely *Echinochloa crus-galli* (for which resistance to HRAC group K3 has been reported) and *Amaranthus* species. However, resistance to HRAC group K3 has not been reported for these species so far.

Analysis of the agronomic risk
Dimethenamid-P is used for the control of certain grasses and dicotyledonous species in maize, soybeans, sugar beet, sunflower and winter oilseed rape. In many European cropping systems, cereals are grown in monoculture situations or constitute a high percentage of the respective crop rotation. The application frequency of dimethenamid-P can therefore be increased in certain crop rotations. However, other herbicides with alternating mode of action are commonly applied in cereals which reduced

the agronomic risk of herbicide resistance. The agronomic risk of dimethenamid-P can be assessed as being low.

Summary and conclusion
Due to the low inherent and agronomic risk, the overall resistance risk of dimethenamid-P can be assessed as low.

B.3.8 References relied on

There are no references in support of this section.