Renewal Assessment Report

beta-cyfluthrin

Volume 3 – B.3 Data on application

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B.3 Data on application

B.3.1 Use of the active substance

For the renewal of approval of beta-cyfluthrin, a foliar spray for field and greenhouse uses, and a seed treatment use are supported. Two representative formulations are included in support of the renewal of approval of the active substance. These are the spray formulation Bulldock 25 EC (25 g/L beta-cyfluthrin, Makhteshim Agan Holding B.V.) for uses on wheat, potato (field) and tomato (greenhouse) and the seed treatment Montur Forte FS 230 (80 g/L beta-cyfluthrin plus 150 g/L imidacloprid, Bayer CropScience AG) for use on beet.

For the foliar sprays the maximum amount of active substance per hectare is 12.5 g/ha for field uses on potato and wheat and 17.5 g/ha for greenhouse use on tomato. For the seed treatment the rate used is 100 ml product/unit of seeds (8 g beta-cyfluthrin/unit, 15 g imidacloprid/unit, 1 unit = 100000 seed). With a maximum of 1.3 units/ha a maximum rate of 10.4 g/ha beta-cyfluthrin (8 g as/unit, max. 1.3 units/ha, 1 unit = 100000 seed) together with 19.5 g/ha imidacloprid (15 g as/unit) would be reached.

B.3.2 Function

Beta-cyfluthrin is a pyrethroid insecticide (Mode of Action Group 3A).

B.3.3 Effects on harmful organisms

Beta-cyfluthrin is an insecticide belonging to the class of synthetic pyrethroids. It is a contact and stomach poison with neurotoxic effects. It produces a rapid knock down effect on various biting and sucking insects. The active substance is not systemic. Beta-cyfluthrin residues are not translocated in the plant. Beta-cyfluthrin predominantly remains on the plant surface (fruit, leaves) or is absorbed into the cuticle.

B.3.4 Field of use envisaged

Products containing beta-cyfluthrin are used on a large spectrum of crops in agriculture and horticulture for insect control in a variety of vegetable, orchard and arable crops in the field and greenhouse. The representative uses for the renewal of approval of beta-cyfluthrin include foliar treatment on wheat, potato (field use) and tomato (greenhouse) and seed treatment for beet, as presented in the GAP tables for the two different products Bulldock EC 25 and Montur Forte.

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

The type of application of beta-cyfluthrin may include overall sprays as well as seed treatment. Beta-cyfluthrin containing products are used in agriculture as seed treatment in a wide range of crops, targeting a wide range of pests. Beta-cyfluthrin is also effective in foliar applications at low doses against a wide range of foliar pests as well as in seed treatment for soil dwelling pests of different orders, including species of Coleoptera, Diptera, Heteroptera, Aleyrodina, Homoptera, Lepidoptera and Orthoptera.
For example in beet pests such as C*haetocnema concina, Atomaria linearis, Pegomyia hyoscyami, Aphis fabae*, and polyphagous soil pests like wireworms are controlled.

B.3.6 Mode of action

The insecticidal substance beta-cyfluthrin belongs to the chemical class of pyrethroids, Mode of Action Group 3A (IRAC MoA classification scheme). Beta-cyfluthrin, similar to most pyrethroids, is active mainly by contact and ingestion. The substance is not systemic and not absorbed by plant foliage. However, the substance remains bonded to the leaf surface after application so that pests that attack the crops some days later are still controlled. Insects or mites must come into contact with beta-cyfluthrin, because of its very low vapour pressure. Beta-cyfluthrin has no ovicidal effect but is effective against all other insect stages.
It is a neurotoxin whose symptoms follow the typical pyrethroid pattern: excitation, convulsions, paralysis, and death. Inside the insects nervous system beta-cyfluthrin interacts with the sodium channels in membranes of the stimuli conduction system causing a train of impulses rather than a single impulse. It works by interacting with the sodium channel on the pre-synaptic neuron causing the continuous release of acetylcholine. The enzyme responsible for the breakdown of acetylcholine (acetylcholine-esterase) is unable to control the release of acetylcholine and this result in continuous firing of the neuron leading to the eventual death of the insect. As well-known from compounds of the pyrethroid chemical class, beta-cyfluthrin has a negative temperature coefficient, working better at lower temperatures. Similar to most other pyrethroids beta-cyfluthrin is not known to have phytotoxic effects neither as sprays nor as seed treatment.

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

Resistance to pyrethroid insecticides including beta-cyfluthrin has been found to varying degrees, depending on the pest species and location. Due to the identical mode of action and structural similarities of 'class 3A' insecticides, it is likely that insects being resistant to beta-cyfluthrin are cross resistant to other pyrethroids. Also cross-resistance to insecticides with other modes of action is possible. Resistance against IRAC MoA-Group 3A insecticides exists in several agriculturally relevant pests including homopteran, dipteran, thysanopteran, coleopteran, lepidopteran, and acari species. Resistance mechanisms known are mainly based on alteration(s) of the target site or an increased metabolic detoxification. Both types of resistance can exist in the same pest population.
Resistance to beta-cyfluthrin has been found in different pest species on several different crops. In oilseed rape, since 1999 resistance within the pollen beetle *Meligethes aeneus* is reported. This resistance has spread all over Europe and nowadays in the majority of pollen beetle populations within Europe the percentage of beetles susceptible to pyrethroids is very low. Additionally in recent years in Germany two further oilseed rape pest species have been found to show resistance to pyrethroids including beta-cyfluthrin. These were the rape stem flea beetle *Psylliodes chrysocephala* and the cabbage seedpod weevil *Ceutorhynchus obstrictus*. In both these species resistance is less widespread than in the pollen beetle and so far mainly restricted to parts of Northern Germany. For the rape stem flea beetle the knockdown resistance (kdr) mechanism has been detected.
For the diamondback moth *Plutella xylostella* resistance against pyrethroids has been described especially from Asia, but also from other parts of the world. As a mechanism involved, the knockdown resistance (kdr) mechanism has been described. The colorado potato beetle *Leptinotarsa decemlineata* is also known to show resistance to pyrethroids in several European countries (metabolic resistance as well as KDR). Pyrethroid resistance (KDR and super-KDR) has also been reported in the polyphagous aphid *Myzus persicae* in Europe, which occurs on a large number of different crops including oilseed rape and beet.
Grain aphids *Sitobion avenae* resistant to pyrethroids including beta-cyfluthrin have been observed in the UK and Ireland. The correlated mechanism was also identified as a knockdown resistance (KDR). Reduced efficacy of pyrethroids against this species has also been found in parts of Germany.

Strategies to avoid resistance against beta-cyfluthrin, especially in case of pest species known for quick resistance development, e.g. aphids, should be based upon sufficient rotation of plant protection products with active substances of different chemical origin and different mode of action.

B.3.8 References relied on

For a reference list see Section 6.