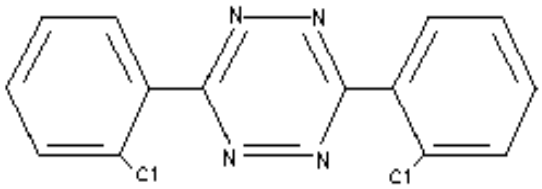
Clofentezine



Chemical name: clofentezine
Other names: 3,6-bis(2-chlorophenyl)-1,2,4,5-tetrazine
1,2,4,5-Tetrazine, 3,6-bis(2-chlorophenyl)
Chlorfentazine, Clofentezin, Clofentezine, Klofentezin, Clofentezina
Compound: $C_{14}H_8Cl_2N_4$
CAS Number: 74115-24-5
Pesticide type: acaricide

Characteristics

An arcaricide belonging to the tetrazine chemical group, acting primarily as an ovicide, with some activity on early motile stages. It has a specific contact mode of action with long residual activity. This compound does not appear to affect predatory mites or beneficial insect species in field experiments. Clofentezine is currently registered for use in 25 countries, including Australia, New Zealand, France, Germany, Israel, Spain, Switzerland and the United Kingdom. Trade names include Apollo, Apolo, Acaristop, Cara or Niagara.

Use

Used for the residual control of mites in plant protection. Used on a wide range of crops – apples, pears, stone fruit, nuts, ornamentals, almonds etc.

Possible hazards and regulation

Not a skin irritant or eye irritant.
Routing monitoring of workers in a factory producing clofentezine showed no adverse effects attributable to exposure to this chemical. No studies on potential risk available.
Not classified as an endocrine disruptor, but some sources list it as a suspected endocrine disruptor.

US EPA classification - III - caution – slightly toxic
WHO U, III - slightly hazardous, unlikely to present acute hazard in normal use

Toxicity

Oral doses are quickly absorbed from the gut limen, with peak concentrations occurring in the plasma after a maximum of 4 – 6 h in rats. The liver is the major site for distribution. Residues persistent in several tissues, with low concentrations present in the liver of rats at 25 days after the last dose.
The main toxicological effects seen in studies in rats and dogs were hepatotoxicity and changes to the thyroid, including follicular hyperplasia.

Toxicity to humans
As with other mammals, clofentezine does not pose a high toxicity risk to humans.

ADI 0 – 0,02 mg/kg/day

Acute toxicity limits

It has low acute oral toxicity in all species tested, causing no serious adverse effects at any dose tested (up to 5200 mg/kg bw in mice and rats). Also low acute toxicity in rats exposed dermally – LD50 2100 mg/kg. Inhalation LC50 for rats is 0,89 mg/l. Doses of up to 2000 mg/kg caused no treatment-related effects in dogs.

Chronic toxicity:
Oral NOAEL 1,72 mg/kg/day in rats. Chronic exposure may induce some increase in cholesterol, triglycerides, liver weight of tested animals.

Reproductive effects:
Decreased body weights of pups in several studies. Not embryotoxic, not directly fetotoxic.
NOAEL for maternal toxicity 250 mg/kg/day.
Unlikely to be genotoxic.

Ecological effects
Low toxicity to birds – acute LD50 more than 3000 mg/kg (bobwhite quail 7500 mg/kg). Highly toxic to fish with acute 96hour LC50 0,015 mg/l in rainbow trout. Highly toxic to aquatic invertebrates – acute 48hour EC50 0,0008 mg/l. Moderately toxic to algae – acute 72hour EC50 0,32 mg/l. Also moderately toxic to honeybees with acute 48hour LD50 84,5 µg/bee. Moderate toxicity with earthworms – acute 14day LC50 215 mg/kg.

Carcinogenity
In a study in mice, there were no consistent or dose-dependent effects on any tumour type. No changes in the thyoroid were seen in the long-term study of toxicity/carcinogenity in rats at 40ppm (1,72mg/kg). Conclusion – clofentezine does not indicate a carcinogenic risk to humans at the levels of exposure likely to be experienced by consumers or workers.
EPA carcinogens C - possible, but after other studies they intended to change it to group D not classifiable as a human carcinogen. Additional data are needed to change this officially.

Mutagenity: all tests for mutagenity negative
Bioaccumulation: low potential for accumulation (bioconcentration factor is a threshold for concern)
Mobility: slightly mobile

Persistence and degradability in environment
Not likely to leach. Biotransformation studies showed that clofentezine residues will dissipate in soil by binding, by biotransformation and, most probably, by hydrolysis. Under aerobic soil conditions in the laboratory, the DT50 for clofentezine ranged from 4 to 8 weeks at 22°C and 9 to 14 weeks at 15°C. Under anaerobic conditions (flooded soil), clofentezine appeared to be more readily bound to soil and less readily transformed than under aerobic conditions. Mineralization of clofentezine residues to CO2 proceeded rapidly in aerobic soils, but ceased when soils were flooded. Studies with sterilized soils indicated that complete mineralization of clofentezine residues required full microbial activity and that non-biotic processes (e.g., hydrolysis) may be important in the transformation of clofentezine in soil. Studies conducted in the laboratory with freshly collected sediment/water samples indicated that clofentezine will partition readily into sediments and will be readily transformed. The DT50's of extractable clofentezine residues from both sediment and water in these samples were <7 days.
Under field conditions in both Canada and the United Kingdom, clofentezine was seen to be non-persistent to moderately persistent in soil, with DT50's ranging between 19 and 73 days. In soil surface litter in a B.C. orchard, clofentezine appeared to be non-persistent following an early season application.

Limits

Food
EPA (ppm): apples 0,05, meat 0,05, milk 0,01, poultry 0,05, walnuts 0,02
EU MRL in food (mg/kg): blackberries and raspberries – 3,0, strawberries – 2,0, wine grapes – 1,0, citrus, pomes and currents – 0,5, tomatoes – 0,3, plums – 0,2, melons – 0,1, other vegetables, fruit and cereal grains – 0,05
Vyhláška č. 381/2007 Sb. (mg/kg): citrus fruit 0,5, tea 0,05, stone fruit 0,5, strawberries 2,0, nuts 0,05, meat 0,05, milk and dairy products 0,05, eggs 0,02
Water
Drinking water MAC (maximum acceptable concentration) 0,01 µg/l (EU Directive 89/778/EC)

Hazard Symbol : N dangerous for the environment
Xn harmful

Risk Phrases :
R20/22 Harmful by inhalation and if swallowed
R43 May cause sensitisation by skin contact
R52 Harmful to aquatic organisms
R53 May cause long-term adverse effects in the aquatic environment

Safety Phrases :
S13 Keep away from food, drink and animal feedingstuffs
S60 This material and its container must be disposed of as hazardous waste
S61 Avoid release to the environment. Refer to special instructions/safety data sheet

Links
http://www.inchem.org/documents/jmpr/jmpmono/v86pr04.htm

http://www.fao.org/ag/AGP/AGPP/Pesticid/JMPR/Download/2005_rep/Clofentezine.pdf

http://whqlibdoc.who.int/publications/2006/9241665211_6_eng.pdf

http://www.pesticideinfo.org/Detail_Chemical.jsp?Rec_Id=PC106

http://www.epa.gov/EPA-PEST/1995/March/Day-08/pr-170.html

http://www.hc-sc.gc.ca/cps-spc/pubs/pest/_decisions/e89-03/index-eng.php

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