

Methamidophos



Linked with cognitive and developmental problems in children, methamidophos residues are routinely found in vegetables



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Trade names

Cekumidofos, Filitox, Metafort, Metaphos, Metamidofos Estrella, Methafos, Methedrin, Monitor, Morithion, Nitofol, Patrole, Pilon, Red Star Alloran, Rimidofos, Tamanox, Tamaron, Tarn, and many more.

Uses

Insecticide. Broad-spectrum systemic organophosphate, with contact and stomach action.

Used on cotton, rice, citrus, maize, grapes, soybeans, tobacco, vegetables, hops, peaches, bananas, pineapple, etc.

Used to control chewing, mining, and sucking insects such as aphids, leafhoppers, leaf-eating caterpillars, flea beetles, worms, whiteflies, thrips, cabbage looper, Colorado potato beetle, potato tubeworms, armyworms, mites, leafhoppers, and many others.

Classifications and risk statements

WHO: Class Ib highly hazardous.

US EPA: Category I highly toxic.

EU: very toxic by inhalation and if swallowed; toxic in contact with skin; very toxic to aquatic organisms.

NZ ERMA: risks to human health and the environment cannot be adequately reduced to an acceptable level by controls such as full personal protective equipment (including chemical resistant gloves and respirator), extended re-entry intervals (24 hrs, and with chemical resistant gloves, long-sleeved shirt, long trousers - more than 7 days re-entry period needed) and buffer zones (more than 150m needed to protect residential bystanders); has the potential to cause adverse effects on the nervous system at low concentrations; very toxic to aquatic organisms, birds and honeybees.

Regulatory status

International

Rotterdam Convention on Prior Informed Consent (PIC): formulations containing more than 600 g a.i./l of methamidophos are listed because of their acute hazard classification and concern as to their impact on human health under conditions of use in developing countries.

National

Banned in Argentina, Canada, Central America, Dominican Republic, EU, Ivory Coast, Nigeria, Peru, Samoa, and Vietnam.

Banned in Brazil in 2011, with use to end by July 2012.

Banned in China since 2007, but may still be used as residues found in vegetables.

Withdrawn in the USA in 2009. Main countries of use according to Bayer include Australia, Brazil, Colombia, Guatemala, Malaysia, Mexico, and Philippines. Also used in China, Turkey, and India.

International standards

On PAN International's list of Highly Hazardous Pesticides (2010) for global phase-out, because of its acute toxicity and toxicity to bees.

Manufacture

Bayer. Generic versions manufactured in India, China, and Taiwan.

Residues in food

Pre-harvest intervals are long, generally 14–21 days but may be as long as 90 days. Harvesting prematurely can result in high levels of residues in food. The insecticide acephate degrades to methamidophos and may also be a source of residues.

China: residues found in leeks and spinach in 2011, at levels 52 times the safety limit; in tea in 2010; and in milled rice in 2009.

Residues found in mango in India 2011, and in vegetables in Japan. In USA, before it was banned, chlorpyrifos and methamidophos accounted for about two-thirds of overall pesticide dietary risk.

Residues in humans

Residues in children in Nicaragua show high levels of exposure to methamidophos.

Has been measured in human adipose tissue in China.

Health effects

Mechanism of toxicity

Inhibits the enzyme acetylcholinesterase in blood, brain, nervous system and in practically all organs.

Poisonings

Numerous cases of acute poisoning have been reported in Hong Kong and Taiwan from green leafy vegetables containing residues of methamidophos.

Occupational poisoning from methamidophos has been reported in China, Hong Kong, Korea, and USA.

In 1995, 27 provinces in China reported 15,300 poisoning cases caused by normal agricultural pesticide use: more than 50% of these were attributed to parathion, methamidophos and omethoate. In 2006–2008, these 3 insecticides caused 80% of occupational pesticide poisoning.

Biological monitoring in China showed depressed blood levels of acetylcholinesterase after spraying methamidophos which did not fully recover to pre-spray levels.

In the USA, methamidophos ranked second in percentage of cases displaying signs of life-threatening symptoms among occupational cases reported to the Poison Control Center.

Nine people were hospitalised in Japan in 2008 from dumplings deliberately contaminated with methamidophos in a Chinese factory.

Acute toxicity

Highly acutely toxic by inhalation, ingestion or skin contact.

Signs and symptoms of poisoning may include exhaustion, headache, blurred vision, weakness, and confusion. Nausea, vomiting, abdominal pain, diarrhoea, excessive sweating, and salivating may

develop. The pupils are constricted. Difficulty in breathing may be experienced due to constriction and congestion of the lungs and weakness of the respiratory muscles. Arrhythmias and cardiac failure may occur. On severe poisoning, there will be muscle spasms, unconsciousness, and convulsion. Breathing may stop, followed by death.

Irritant to the eyes, causing redness, pain, and blurred vision.

Chronic toxicity

Neurotoxicity: potent neurobehavioural and developmental toxicant, especially if exposure occurs during preconception and early gestation; may cause neurobehavioural disturbances in adults as it can alter serotonin levels; can induce severe delayed polyneuropathy in humans that is slow to resolve; can induce depression and other affective disturbances.

Cancer: some studies indicate mutagenicity and genotoxicity, thus potential carcinogenicity.

Endocrine disruption: decreases progesterone production; altered male reproductive hormones in Chinese factory workers exposed to methamidophos and parathion.

Reproductive and developmental toxicity: embryotoxic in animals; damages sperm; maternal exposure pre-conception and in early gestation can cause adverse effects on physical and maturational development landmarks.

Immunotoxicity: may be immunotoxic.

Other: may increase lung infections.

Environmental and agroecological effects

Toxicity

Very ecotoxic to aquatic organisms, birds, and terrestrial invertebrates.

Agroecological disruption

Bees: very toxic to honeybees.

Beneficials: very toxic to beneficial insects; disrupts some biological controls.

Soil organisms: harmful to the soil organisms including earthworms; may increase soil borne diseases through its effects on soil microorganisms.

Resistance: at least 14 different species of pests have become resistant to methamidophos,

including diamondback moth and certain species of thrips, whitefly, mites, and aphids, on a variety of crops including cotton, rice, vegetables and fruit.

Environmental fate and contamination

Soil: not persistent in soil under aerobic conditions, rapidly metabolised by soil microorganisms.

Aquatic: high leaching potential; has been found in groundwater in the US. Persistent in water, especially in acidic aquatic environments, and in the absence of sunlight.

Alternatives

There are numerous cultural, mechanical and biological solutions to pest control, as well as natural sprays that can be used instead of methamidophos depending on the pest and the situation.

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