

chemicalWATCH Factsheet

ACEPHATE

This systemic, broad-spectrum organophosphate insecticide, known by the trade-name Orthene™, is produced by the Chevron Chemical Co. It is widely used in agriculture, seed production, in greenhouses, on turf and on commercially grown ornamentals, sometimes in combination with other pesticides. EPA has not produced a Reregistration Eligibility Document for acephate, but they required acephate product labels to contain the signal work CAUTION because of its toxicity category III rating (EXTOXNET 2001). They have also imposed an interim worker reentry period of 24 hours for commercial use, and protective clothing requirements.

Acute Toxicity

Although acephate is only moderately acutely toxic, with an oral rat LD50 (lethal dose needed to kill 50% of the test population) of 500 to 1000 mg/kg, the state of California reported 39 incidents of acephate poisoning between 1982 and 1986, most (25/39) involved applicators who were exposed to the concentrated material. In common with other organophosphates, acephate inhibits acetylcholine esterase (AChE), an essential nervous system enzyme, causing characteristic symptoms such as headaches, fatigue, stomach cramps, nausea, and in extreme cases, respiratory depression.

Interestingly, technical acephate is more acutely toxic than the purified form, because technical acephate contains as much as 30% of a more toxic breakdown product, methamidophos, another organophosphate pesticide known as Monitor™. Another impurity, methylthioacetate (MTA), can be found in small amounts in acephate formulations,

and further testing is being required to address its significance. One acute dermal toxicity study in rabbits found that MTA could cause blindness when applied at concentrations between 1500 and 3000 mg/kg.

EPA published a Registration Standard on acephate in September, 1987, which reviewed the existing database and data gaps needing to be filled. According to the Agency, acephate is quickly cleared, does not bioaccumulate, and is excreted mostly as the unchanged compound, although a small amount of methamidophos (also quickly excreted) is formed by intestinal microbes in the rat.

Chronic Toxicity

Chronic toxicity effects were all related to AChE inhibition. A single, insensitive, neurotoxicity test found no delayed neurotoxicity. Acephate has not been found to cause birth defects in rats and rabbits. However, in a reproductive effects test, a “non-observable-effects-level (NOEL)” was never established, and low pregnancy rates, high loss of litters and decreased numbers of live fetuses were observed in every treatment group, 50 ppm (parts per million) and higher.

EPA has classified acephate as a Category C or possible human carcinogen. Oncogenicity test results found an increased incidence of adrenal medullary tumors and pituitary tumors in male rats when compared with experimental controls. In female mice, an increased incidence of liver tumors and liver hyperplastic nodules, thought to be precursors to tumors, was seen at the highest doses tested. Acephate is mutagenic in short-term assays, but not in tests conducted *in vivo*,

on live animals.

Environmental Effects

Although acephate dissipates rapidly from aerobic soil with half-lives of three to six days, it is, according to EPA, “mobile in most soils [therefore] the potential for groundwater contamination exists ...[however]...most of the applied acephate and the breakdown product methamidophos degrade to immobile compounds within 20 days...[and therefore]...the probability of contamination is limited.” The USDA reviewed studies conducted by Chevron in the early 1970’s and reported in a review, “Orthene™ has a longer half-life on foliar surfaces than in soil or water...in studies using lettuce, broccoli and cotton leaves, only an average of 5% of the applied Orthene™ could be washed off leaves three, seven and fourteen days after treatment at two lbs/acre.”

Ecological Effects

Acephate, and especially methamidophos, are highly toxic to bees, and moderately toxic to birds. EPA stated, “studies indicate that acephate treatments may result in local population reductions in some avian species as well as a high incidence of sublethal AChE inhibition...,” although EPA did not feel that long-lasting harm to bird populations would occur.

Bibliography on reverse

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Acephate *chemicalWATCH* Factsheet Bibliography

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