**Cyfluthrin**

**TRADE OR OTHER NAMES:** Cyfluthrin is the active ingredient in many insecticide products including Baythroid, Baythroid H, Attatox, Contur, Laser, Responsar, Solfac, Tempo and Tempo H. Combination products include Baythroid TM (+ methamidophos) and Aztec (+ tebupirimphos) (69).

**REGULATORY STATUS:** First registered by EPA in 1987, cyfluthrin is found in both restricted use (RUP) and general use insecticides (70). Cyfluthrin containing products may be classified by EPA as acute Toxicity Category II (bearing the signal word "Warning") or Toxicity Category I (bearing the signal word "Danger") based on its potential to cause eye damage (69). Currently, there are tolerances for residues of cyfluthrin in or on raw agricultural products ranging from 0.05 (hog meat) to 4.0 ppm (hops) (71). Note: These are subject to change. Check with specific state regulations for local restrictions which may apply.

**INTRODUCTION**: Cyfluthrin is a synthetic pyrethroid insecticide that has both contact and stomach poison action. It is a non-systemic chemical used to control cutworms, ants, silverfish, cockroaches, termites, grain beetles, weevils, mosquitoes, fleas, flies, corn earworms, tobacco budworm, codling moth, European corn borer, cabbageworm, loopers, armyworms, boll weevil, alfalfa weevil, Colorado potato beetle, and many others. Its primary agricultural uses have been for control of chewing and sucking insects on crops such as cotton, turf, ornamentals, hops, cereal, corn, deciduous fruit, peanuts, potatoes, and other vegetables. Cyfluthrin is also used in public health situations and for structural pest control (72).

**FORMULATIONS:** Cyfluthrin based insecticide formulations are available in the form of emulsifiable concentrates, wettable powder, aerosol, granules, liquid, oil-in-water emulsion and ULV oilspray (69). Typical application rates for agricultural use range from 0.0125 - 0.05 pounds/acre, substantially lower than many other commonly used insecticides. Pyrethrin and pyrethroid formulations typically contain piperonyl butoxide which acts as a chemical synergist. Typical carriers include organic solvents and water. It is incompatible with azocyclotin.

**TOXICOLOGICAL EFECTS**

* **Acute Toxicity**: Cyfluthrin is considered moderately toxic to mammals. The oral dose of cyfluthrin that resulted in mortality to half of the test animals (LD50) ranged from 869 - 1271 mg/kg in rats, 291 - 609 mg/kg in mice, >1000 mg/kg in sheep, > 100 mg/kg in dogs and > 1000 mg/kg in rabbits (74). In inhalation toxicity tests with rats, the concentration of cyfluthrin in air that resulted in mortality to half of the test animals (LC50) was >1,089 ug/l in 1 hour tests, and ranged from 469 - 592 ug/l in 4 hour tests (74). Although cyfluthrin is an irritant to human skin, especially facial skin, it is not considered to have high dermal toxicity. The dermal LD50 in tests with rats was > 5,000 mg/kg, and was not found to be a skin irritant or sensitizer in guinea pigs and rabbits (73, 74).
* **Signs and Symptoms of Acute Poisoning:** Although cyfluthrin is a skin and eye irritant in humans, pyrethroid poisonings are rare. The main reason for their low toxicity in humans, is that they are rapidly broken down in the human body by liver proteins, and eliminated fairly quickly (see fate in humans and animals section). Also, pyrethroids are not well absorbed into the bloodstream, contributing to their moderate acute toxicity in mammals. In laboratory tests where animals have been exposed to very large doses of pyrethroids orally or by injection, there have been effects on the nervous system. Symptoms of acute poisoning include irritability, excessive salivation, uncoordinated gait, tremors, convulsions, and death. Cyfluthrin may cause itching, burning, or stinging if it comes in contact with human skin.These sensations can progress to a numbing effect that may last up to 24 hours. Usually, there is a 1-2 hour delay of skin irritation following exposure, but it may occur immediately. Dermal irritation may be worsened by sweating, exposure to sun or heat and application of water(75).
* **Chronic Toxicity:** Long-term feeding studies have been conducted with mice, rats and dogs. Invest-igations of blood chemistry, and necropsies of vital organs did not indicate any organ specific toxicity. The only long-term effects of exposure to cyfluthrin were the retardation of weight gain, and changes in some organ weights associated with body weight effects in the high dose groups (74). In a two-year feeding study with rats fed up to 450 ppm Baythroid, decreased body weights were observed in males, and some inflamation of the kidney was observed in females (76).
* **Reproductive Effects:** A three generation reproductive study in rats produced a systemic No Observable Effect Level (NOEL) of 50 ppm (2 mg/kg/day), and a Low Observable Effect Level (LOEL) of 150 ppm (7.5 mg/kg/day) based on decreased body weights in pups. It was also determined that the NOEL and LOEL for viability of offspring were 50 ppm and 150 ppm, respectively (76).
* **Teratogenicity Effects:** A developmental toxicity study in rats given doses of up to 30 mg/kg cyfluthrin over days 6-15 of gestation resulted in a maternal NOEL of 3 mg/kg/day based on behavioral changes in gait and coordination, and a teratogenic NOEL of 30 mg/kg/day (highest dose tested). Another study in rabbits resulted in a maternal NOEL of 15 mg/kg/day based on fetal abortion and resorption. No developmental abnormalities were observed at the highest dose tested of 45 mg/kg/day (76).
* **Carcinogenic Effects:** There was no evidence of carcinogenicity in rats or mice.
* **Mutagenic Effects:** Cyfluthrin was negative for mutagenicity.
* **Organ Toxicity:** Short and long term studies of the effects of cyfluthrin on mammalian systems have resulted in pockets of inflamation in the kidneys of females, and reversible damage to the sciatic nerve (this nerve controls sensation in the leg)(74).
* **Fate in Humans and Animals:** Cyfluthrin metabolism in mammals occurs in two phases (biphasic), an initial fast phase, and a slower second phase. Laboratory tests show that about 60% of an intravenous dose of cyfluthrin is eliminated in the urine in the first 24 hours, with only an additional 6% eliminated in the next 24 hours. Similarly, 20% of the administered dose was eliminated in the feces in the first day, followed by 3-4% the next day. Another test with a single oral dose of cyfluthrin showed that 98% of the material was eliminated by 48 hours (74).

**ECOLOGICAL EFFECTS**

* **Effects on Birds:** Cyfluthrin is of low toxicity to upland game birds and waterfowl. LD50 values range from >2,000 mg/kg in acute oral tests with bobwhite quail, to >5,000 mg/kg in subacute tests with both mallard ducks and bobwhite quail (70). Other tests with chicken hens have resulted in LD50 values of 4,500 - >5,000 mg/kg depending on the vehicle of administration (74). Little information was found concerning the toxicity of cyfluthrin to songbirds. LD50 values for canaries range from 250-1000 mg/kg (73).
* **Effects on Aquatic Organisms:** Cyfluthrin is highly toxic to marine and freshwater organisms. The concentration of cyfluthrin in water that resulted in the mortality of half of the test organisms (LC50) was 0.00068 mg/l in rainbow trout, 0.0015 mg/l in bluegill, 0.022 mg/l in carp, and 0.0032 mg/l in golden orfe (70, 73). Cyfluthrin is exceptionally toxic to the freshwater invertebrate Daphnia magna, (LC50 = 0.14 ng/l or .00000014 mg/l). Marine and estuarine invertebrates are also extremely sensitive to cyfluthrin. The LC50 for mysid shrimp was 2.42 ng/l and the EC50 for the eastern oyster was 3.2 ng/l. The LC50 for the sheepshead minnow was 0.004 mg/l (70).
* **Effects on Other Animals (Nontaret species):** Cyfluthrin is highly toxic to bees with an LD50 of 0.037 mg/bee (70). Pyrethroids are known to be highly toxic to other beneficial insects.

**ENVIRONMENTAL FATE**

* **Breakdown of Chemical in Soil and Groundwater:** Cyfluthrin is sensitive to breakdown by sunlight. On the surface of soils, its half-life is 48-72 hours. It has a half-life of 56-63 days in German loam and sandy loam soils, respectively, and has similar persistence in soils under conditions of low oxygen (anaerobic). Cyfluthrin is very immobile in soils, and is not considered a threat to contaminate groundwater (77). The primary breakdown products of cyfluthrin are carbon dioxide and 4-fluoro-3-phenyl-benzaldehyde (a compound of considerably lower toxicity than the parent compound) (70).
* **Breakdown of Chemical in Surface Water:** Cyfluthrin is broken down quickly in surface water. Beacuse it is realtively non-soluble, and less dense than water, it will float on the surface film of natural waters. At the surface, it is subject to breakdown by exposure to sunlight (1 day). It is stable to breakdown by water at acidic pH, and quickly hydrolyzed in water under basic conditions (77).
* **Breakdown of Chemical in Vegetation:** There is little information available about the breakdown of cyfluthrin in vegetation. One study determined that very small amounts of cyfluthrin residues remained on strawberries 7 days after the last of 3 weekly applications (78). Another researcher identified a protein in tomatoes that is capable of breaking down cyfluthrin (79). Researchers in Australia demonstrated that cyfluthrin is stable and resistant to breakdown when used on wheat in storage for up to 52 weeks (80).

**PHYSICAL PROPERTIES AND GUIDELINES**

**Physical Properties:**

* **Appearance:** pasty yellow mass
* **Chemical Name:** Cyano(4-fluoro-3-phenoxy-phenyl)methyl3-(2,2-dichloroethenyl)-2,2-dimethylcyclopropanecarboxylate.
* **CAS Number:** 68359-37-5
* **Molecular Weight:** 434.3
* **Water Solubility:** 0.002 mg/ml @ 20 degrees C.
* **Solubility in Other Solvents:** > 200 g/l in dichloromethane and toluene, 10-20 g/l hexane, 20-50 g/l propan-2-ol
* **Melting Point:** Not Available
* **Vapor Pressure:** 1.62 x 10 to the minus 8 mmHg
* **Partition Coefficient:** Not Available
* **Adsorption Coefficient:** 5.62

**Exposure Guidelines:**

* **ADI:** 0.02 mg/kg b.w.
* **MCL**:Not Available
* **RFD:** 0.025 mg/kg/day
* **PEL:** Not Available
* **HA**: Not Available
* **TLV**: Not Available

**BASIC MANUFACTURER**

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