



Safety Source for Pest Management

Beyond Pesticides Least Toxic Service Directory

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Boric Acid/ Borates/ Borax

Beyond Pesticides Rating: **Least Toxic**



Boric acid (borax and boron-containing salts) is a low-toxicity mineral with insecticidal, fungicidal, and herbicidal properties. It does not evaporate or volatilize into the air or pose the considerable health concerns associated with synthetic pesticides; however it can still pose health hazards and should be used with care. As with any pesticide, keep boric acid pesticide products out of reach of children and only use it in locations where it will not come in contact with people or animals, such as in cracks and crevices, behind counters, and in baseboards. While boric acid is somewhat slower acting than the synthetic pesticides, like chlorpyrifos, diazinon, or pyrethrins, it is highly effective over a long period of time.

Use and Mode of Action

Registered in 1983 for control of cockroaches, ants, grain weevils and several beetles, it has also been used as an herbicide along rights-of-way and as a fungicide for citrus, and as a wood preservative/fire retardant, and even as an insect repellent in insulation. As an insecticide, boric acid acts as a stomach poison for ants, cockroaches, silverfish and termites, and as abrasive to the insects exoskeleton. As an herbicide, boric acid causes desiccation or interrupts photosynthesis in plants.

Boric acid may be used either in a bait formulation containing a feed attractant or as a dry powder. The powder may be injected into cracks and crevices, where it forms a fine layer of dust. Insects travel through the boric acid, which adheres to their legs. When the insects groom themselves, they then ingest the poison, which causes death three to ten days later of starvation and dehydration. As long as the material is not allowed to become wet, its continuous presence ensures that hatching insects, which sprays commonly spare, are exposed and die. Many insecticidal formulations can be effective for more than a year.

Toxicity

While exposure to boric acid has been linked to adverse health effects, experts agree that careful application offers a safe and effective alternative without the indoor air problems associated with sprays. Boron is a naturally-occurring element in the earth's crust and background levels even circulate in the human bloodstream. Boric acid's exposure risks are minimal because of its method of application.

However, while boric acid has become one of the chemicals of choice for many urban pest control programs, it can be toxic. EPA considers boric acid as a moderately acutely toxic due to acute effects including oral and dermal toxicity, and eye and skin irritation. EPA's reregistration document states that a subchronic borax feeding study using dogs resulted in blood and metabolism disorders as well as effects to the testes, endocrine system, brain weight, and size ratios among various organs and glands. In chronic oncogenicity studies using mice, rats and beagle dogs, boric acid and borax were found not to be carcinogenic; however, testicular effects and decreases in body weight resulted at high dose levels. EPA has classified boric acid as a "Group E" carcinogen, indicating that it shows "evidence of noncarcinogenicity" for humans. In reproductive and developmental toxicity studies using rats, mice and rabbits, maternal liver and kidney effects and decreased weight gain as well as decreased fetal body weights were observed. In two studies, at the highest dose levels, no litters were produced. Prenatal mortality occurred at the highest dose levels in the rabbit study. Boric acid does not cause mutagenicity (U.S. EPA 1993).

Applicators and others in treatment areas may be exposed to boric acid and its sodium salts during or after application. However, there is no reasonable expectation that these pesticide uses may constitute a hazard or risk to people involved in, or near to, handling or application activities. Proper care and adhering to label directions and precautions should reduce exposure and any associated risk (U.S. EPA 1993).

Ecological Effects

Boric acid is practically nontoxic to birds, fish, aquatic invertebrates, and relatively nontoxic to beneficial insects. It's noncrop herbicidal use may harm endangered or threatened plants, and therefore EPA is requiring three phytotoxicity studies to assess these risks (U.S. EPA 1993).

Effectiveness

An EPA assessment of a boric acid pilot pest control program conducted at the U.S. Army's Aberdeen Proving Ground in Maryland found that boric acid was both more economical and more effective than monthly spray treatment. At least one study has shown that the combination of heat, 110 degree F for two hours with boric acid, will increase the speed at which the German cockroach is killed.

References:

Barlow, S.M. & F.M. Sullivan. 1982. *Reproductive Hazards of Industrial Chemicals: An Evaluation of Animal & Human Data*. Academic Press, New York, NY. pp. 130-135.

Bianchini, R.J. 1987. "The use of borate-treated wood in structures." Presentation by U.S. Borax at Forest Products Research Society Conference on Wood Protection Techniques and the Use of Treated Wood in Construction. Memphis, TN. October 28-30.

"Borate prospects are seen as promising." *Chemical Marketing Reporter*. November 16, 1987.

"Boron found to have role in hardening bones." *Chemical Marketing Reporter*. November 9, 1987.

Casarett, et al. 1980. *Toxicology: The Basic Science of Poisons*. 2nd ed. Macmillan Publishing Co., Inc. New York, NY. pp. 440-441.

Gosselin, R.E., et al. 1984. *Clinical Toxicology of Commercial Products*. 5th ed. Williams & Wilkins. Baltimore, MD.

"IN-CIDE: Pest control insulation." *Energy Design Update* 4 (11):13-14.

Olkowski, W. and S. Daar. 1987. "Boric acid: New formulations and application equipment." *The IPM Practitioner* 9(6-7):3-4. Bio-Integral Resource Center. Berkeley, CA.

Siegel, E. and S. Wason. 1986. "Boric acid toxicity." *Pediatric Clinics of North America* 33(2):363-367.

Sprague, R. 1972. "The ecological significance of boron." U.S. Borax Research Corp. Anaheim, CA.

U.S. EPA. 1993. "Boric acid." *R.E.D. Facts*. EPA-738-F-93-006. Office of Pesticide Programs. Washington, DC.

U.S. EPA. 1985. "Guidance for the reregistration of pesticide products containing boric acid and boron containing salts as the active ingredient." Office of Pesticide Programs. Washington, DC.

Weir, R. and R. Fisher. 1972. "Toxicological studies on borax and boric acid." *Toxicology of Applied Pharmacology* 23:351-364.

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