

(Müller), *O. draparnaldi* (Beck), *O. helveticus* (Blom), and *O. alliarius* (Miller).

When slug or snail damage is suspected, look for these pests in the soil around the plants or under boards and trash. At night they may be found on the surface of the soil or feeding on the plants. If the pests are found, the use of metaldehyde dusts, sprays, or baits is indicated. Metaldehyde is unique in being both an attractant and a toxicant for slugs and snails, and it therefore can be used very effectively in controlling these pests as described in the following sections.

Suggested Uses on Food Crops

BAITS

Baits formulated with from 1% to 20% of metaldehyde have effective attractant properties; the higher levels are more effective as toxicants. In order to increase the lethal effects of the baits at low metaldehyde concentration, other pesticides such as calcium arsenate or chlordane may be incorporated by the formulator according to his label registration.

Uses of metaldehyde baits at rates of 1.5 to 20 pounds of metaldehyde per acre are registerable by the Environmental Protection Agency as **nonfood uses** of the pesticide when the baits are applied to the soil surface around vegetable crops in field or greenhouse, on the soil around the trees in avocado or citrus orchards, on the soil around blackberry, blueberry, boysenberry, dewberry, loganberry, or raspberry plants, and on the soil around banana plants. Take care to avoid contamination of the edible parts of the plants.

Slugs often feed on ripening **strawberries**, causing serious economic loss to the grower. These pests can be controlled very effectively by applying metaldehyde baits to the ground around the strawberry plants at a rate not to exceed 9.5 pounds of metaldehyde per acre. The bait may be placed in mounds near the plants. Take care to avoid contamination of the edible parts of the plants.

For the control of slugs which attack **bananas**, use a bait containing 2.4 to 4.8 lb of metaldehyde per acre formulated in sufficient bran (or similar carrier) to make 30 lb of bait. Broadcast the bait evenly on the soil under the plants; a cyclone

scuder is an effective means for spreading the bait. A second application should be made 8 to 14 days after the first application to control newly hatched slugs.

Since slugs and snails are nocturnal in their habits, the metaldehyde bait should be spread late in the afternoon or at night. It is best to apply it when the ground is moist or wet as the pests are more active on the soil surface then. If possible, the bait should not be applied just before a rain which may wash it away or at least reduce its effectiveness. Good sanitation and the removal of loose boards, bricks, trash piles, or other material which might offer shelter to the pests will add to the effectiveness of the control measures.

Metaldehyde is relatively volatile and usually disappears in a few days from baits exposed in the field. This weathering is accelerated by rain or by hot, dry conditions. It also should be noted that slugs and snails may feed intermittently rather than every day. For these reasons it usually is necessary to distribute fresh bait at intervals to control the infestation. Metaldehyde does not affect mollusk eggs, so repetitive applications serve to control the newly hatched pests also.

Metaldehyde baits should not be stored or used in areas where they may be found and eaten by children or domestic animals.

DUSTS

Uses of metaldehyde dusts on the soil around vegetable plants are registerable by the Environmental Protection Agency as **nonfood uses** of the pesticide. It is important that the dusts are applied only to the soil and do not contaminate the edible parts of the plants.

Suggested Use on Ornamentals

Metaldehyde baits are most effective against slugs and snails in rather arid sections, or where plants are watered artificially. In flower gardens, greenhouses, and other locations where there is an ample supply of succulent foliage, slugs and snails are less attracted by baits and may do a very considerable amount of damage. Under such conditions metaldehyde is particularly effective when used in the form of dusts or sprays.

On ornamentals the use of a 15% metaldehyde dust is recommended, applied at the rate of 1 to 2 pounds per 1000 square feet. A moderately heavier rate may be necessary where plants are close together. For best results the dust should be applied at night, with at least three applications at intervals of 7 to 10 days.

Although metaldehyde dusts give effective control of slugs, they have not always been satisfactory for snail control. On ornamentals metaldehyde sprays are reported to be more effective against snails than are 20% dusts. Sprays commonly are prepared from wettable powders or concentrated aqueous suspensions which are diluted by the user to contain 3 pounds of metaldehyde per 100 gallons of water. One gallon of this spray material applied with a sprinkling can or sprayer to 30 to 35 square feet usually is recommended. These sprays should be applied, preferably at night, both to the plants and to the ground around them.

Phytotoxicity

Metaldehyde has been applied to a wide variety of plants without injury. The plants treated include red clover, several grasses, seven species of ferns, five species of orchids, cyclamens, dieffenbachias, fittonias, marantas, peperomias, *Primula malacoides*, and many varieties of shrubs. There are indications, however, that open blooms of certain flowers such as Cattleya orchids may be injured by metaldehyde, and it is therefore recommended that the treatments be made when the plants are not in bloom. Take care to see that metaldehyde dusts or sprays are lightly and evenly applied; spotty applications may cause localized burning of the foliage even though the overall rate of application is satisfactory.

Formulation

Metaldehyde is not appreciably soluble in the common organic solvents at ambient temperatures, and is virtually insoluble in water. For pesticide application it usually is formulated into baits, dusts, wettable powders, or aqueous suspensions. Avoid heating metaldehyde during grinding or other processing operations to minimize loss through volatilization of the compound.

In formulating metaldehyde products, it is important that the materials with which metaldehyde is combined are neutral or slightly alkaline. Under acidic conditions, especially in the presence of moisture, metaldehyde depolymerizes to acetaldehyde.

Metaldehyde acts on the nervous system of slugs and snails to cause spasms. If the initial onset of the spasm can be delayed until the animal has ingested sufficient of the poison, recovery is less likely. One patented process claims to avoid premature appearance of the spasms by pre-coating the metaldehyde with a protective substance such as a glue which resists solution in the mouth but is destroyed in the stomach of the mollusk.

The simplest formulation of a metaldehyde bait involves mixing the proper proportion of solid metaldehyde with an appropriate carrier such as wheat bran. Such a bait can be distributed about the plants to be protected in small piles, each containing about a teaspoonful of bait, or it can be spread by broadcasting. Alternatively, the bait can be compressed into pellets to be applied on the soil around the plants.

More elaborate bait formulations may contain apple pomace or similar material as the palatable carrier, with ground nuthulls and clays as bulking agents, and wetting agents or other additives to achieve homogeneity. There have been suggestions that the pellets may be waterproofed by a siloxane or hardened glue coating for longer duration in field use.

Stable aqueous suspensions of metaldehyde may be prepared, as well as wettable powders, for use as spray applications. Metaldehyde dusts containing up to 20% active ingredient have been used successfully.

Toxicity

The acute oral toxicity of metaldehyde to animals has been investigated by several workers. Doses of 0.25-1.0 g/kg have been reported as lethal to dogs, 0.4-0.7 g/kg as lethal to guinea pigs, 0.5-2.5 g/kg as lethal to chickens, and 0.3-0.5 g/kg as lethal to ducks. A CSC-sponsored study of the effect in rats established an oral LD₅₀ of 0.63 g/kg. By oral ingestion, metaldehyde thus is regarded as slightly toxic.

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AND RODENTICIDE ACT
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