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ACROLEIN AS A GROUND SQUIRREL BURROW FUMIGANT

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ABSTRACT: Acrolein (Magnicide ®H) is registered in California as an aquatic herbicide. Studies in Alameda and Modoc Counties were conducted to evaluate the field efficacy of acrolein as a ground squirrel burrow fumigant. Applications of acrolein (92%) at 20 ml and 40 ml per burrow were made from a custom built jet gun connected to a hose which ran to a cylinder mounted on a pickup truck. The burrow openings were covered with soil after application. The application rate of 20 ml of acrolein per burrow provided approximately 90% control of ground squirrels. Acrolein applied at 40 ml did not significantly increase efficacy of the treatment.

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INTRODUCTION

Ground squirrels cause serious economic damage to rangeland, agriculture crops and ditch banks in California. The beechey ground squirrel (*Spermophilus beecheyi beecheyi*) is found along coastal California from the Golden Gate and Carquinez Straits south nearly to San Diego. It lives on natural rangeland, pastures, grain fields, slopes with scattered trees and rocky ridges. It avoids thick chaparral and dense woods. They damage a wide variety of crops, including almonds, pistachios, walnuts, apricots, peaches, prunes, apples, oranges and certain vegetable crops and grain.

The Oregon ground squirrel (*Spermophilus beldingi oregonus*) inhabits Modoc, Lassen, and eastern Siskiyou Counties. It prefers meadows and green fields or along their borders. The Oregon ground squirrel causes extensive damage to alfalfa pasture and small grains. The Oregon ground squirrel can reduce alfalfa production by an average of 1,100 pounds per acre of first cutting alfalfa (Sauer 1984). In many cases, the losses are equal to the profit margins for the growers.

Some burrow fumigants that were used in the past for ground squirrels are no longer registered. Carbon bisulfide was banned several years ago as a burrow fumigant, and methyl bromide is currently being phased out. Very few fumigants are being developed and registered for field rodent control. Costs of registration can be prohibitive because of the substantial data required by governmental agencies.

Acrolein (Magnicide ®H) is registered in California as an aquatic herbicide. It is used to control submersed and floating weeds in irrigation canals and drainage ditches. Irrigated water containing acrolein can be directly applied to crops. It is toxic to mammals when inhaled but it has a short life in the environment when applied as a herbicide. Acrolein at low doses is irritating to the throat and eyes so it serves as its own warning agent (Baker Performance Chemicals Inc. 1989).

METHODS

Burrow fumigants are often used to control populations from late winter, following the emergence of the squirrels from hibernation, into early summer, when the ground becomes too dry and gases leak out of the burrow systems due to surface cracks (R. A. O'Connell & J. P. Clark, 1992). Field studies in Alameda and Modoc Counties were conducted in 1992 to evaluate acrolein as

a ground squirrel burrow fumigant. Application rate of 20 ml and 40 ml per burrow were applied in Alameda County while only the 20 ml rate was used in Modoc County. The application equipment consisted of a 30 gallon cylinder of 92 % acrolein (Magnicide ®H) charged with liquid nitrogen to maintain a constant operating pressure of 25 psi. A 50 foot, 0.25 inch diameter braided stainless steel teflon base connected the cylinder to a custom built Spraying Systems Meter Jet Gun. It was equipped with a 36 inch nozzle extension and a positive shut off. The gun was calibrated to release 20 ml of acrolein with one pull of the trigger and 40 ml with two pulls. Current jet gun applicators require two trigger pulls to release 20 ml of acrolein. After the gun's nozzle was inserted into an active ground squirrel burrow, the acrolein was forced into the burrow which was immediately closed with soil.

RESULTS

The application rate of 20 ml of acrolein per burrow provided approximately 90 % control of ground squirrels in Alameda and Modoc Counties. Acrolein applied at 40 ml did not significantly increase efficacy of the treatment.

In July 1992, the California Department of Pesticide Regulation issued a special local need registration for Magnicide ®H. The registrant is the Baker Performance Chemicals, Inc. Magnicide ®H is a restricted use pesticide which can be used by only certified applicators or persons under their direct supervision. The label use is statewide with the crop site being underground burrow systems. The recommended application rate is 20 ml per burrow with a specially designed meter gun provided by the registrant. A label condition requires that the California Department of Fish and Game must be notified 48 hours in advance, of any application of this product. Fish and Game concerns are threatened or endangered amphibians, reptiles or rodents that may utilize underground burrow systems.

DISCUSSION

Currently registered fumigants in California consist only of gas cartridges and aluminum phosphide. Ground squirrel burrow systems often have many openings, and each should be treated when using fumigants. Therefore costs of materials can be expensive. The USDA-APHIS gas cartridge costs 60 cents each with commercially available gas cartridges costing more. Aluminum

phosphide tablets are approximately 15 cents apiece. The recommended application is two to four tablets per burrow opening. Acrolein costs about 14 cents per burrow opening, making it more economical than the other fumigants.

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