California Environmental Protection Agency
Department of Pesticide Regulation
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PROTOCOL FOR MONITORING SPINOSAD (GF-120 Fruit Fly Bait) IN FRUIT FLY AERIAL TREATMENT PROGRAMS
STUDY 216

December 2002

I. INTRODUCTION

The California Department of Food and Agriculture (CDFA) in cooperation with the San Diego County Department of Agriculture may use ground and aerial treatments of spinosad to eradicate Mexican fruit fly infestations in the Valley Center area of San Diego County. The Department of Pesticide Regulation (DPR) will conduct monitoring of these treatments to provide information on the concentrations of the insecticide in various matrices that may include mass deposition, surface water, storm runoff, air, foliage, fruits, and spray tanks. Additionally, DPR may monitor dissipation of the insecticide in foliage and fruit. Previous fruit fly eradication programs monitored by DPR depended on aerial treatments of malathion bait (Ando et al., 1996; Bradley et al., 1997; Segawa et al., 1991; and Oshima et al., 1982). The monitoring program described in this protocol is based on the previous protocols developed for the malathion bait monitoring programs.

The current treatment area consists of approximately 25 square miles in San Diego County with avocado and citrus as the predominant crops. GF-120 Fruit Fly Bait, with a 0.02% active ingredient of spinosad, will be used a rate of 20 fluid ounces per acre and may be used on organically grown crops. Twelve aerial application events are scheduled beginning in late December 2002 with sequential applications every 14 to 21 days.

II. PERSONNEL

This study will be conducted by the Division of Enforcement, Environmental Monitoring, and Pest Management & Licensing, under the general direction of Doug Okumura (Assistant Director). Key personnel are listed below.

Project Leader: Randy Segawa
Senior Scientist: Bruce Johnson
Field Coordinator: Dave Kim
Laboratory Liaison: Carissa Ganapathy
Analyzing Laboratory: CDFA, Center for Analytical Chemistry

All questions from the media should be directed to Glenn Brank, (916) 445-3974, e-mail gbrank@cdpr.ca.gov. Other questions concerning this monitoring program should be directed to Randy Segawa, (916) 324-4137, fax (916) 324-4088, e-mail rsegawa@cdpr.ca.gov.

III. OBJECTIVES

The objectives of this monitoring are to: 1) provide quality control for the applications by measuring the amount of spinosad in the spray material and reaching the ground during application; 2) measure concentrations in air; 3) determine concentrations in surface water immediately after application and in runoff water following storm events; and 4) determine concentrations and dissipation in fruit.

IV. MONITORING PLAN

This monitoring plan will be followed for 6 to 12 of the aerial application events. Some matrices may not be sampled for each application event.

OBJECTIVE 1: To measure the amount of spinosad in the spray material and reaching the ground (mass deposition). These results will be used to determine if the proper amount of spinosad is applied.

Spray Material – GF-120 contains 0.02 percent (by weight) of spinosad active ingredient. For this eradication program, CDFA will mix GF-120 with water so that the diluted material will contain 0.008 percent (by weight) of spinosad. DPR or County Agricultural Commissioner staff will collect samples of GF-120 and the dilute spray mixture to ensure each contains the proper amount of spinosad. Samples will be collected in glass or plastic bottles and kept on ice or refrigerated until transported to the laboratory for analysis. DPR will collect one sample of each lot of GF-120 used for this eradication program. DPR or the County Agricultural Commissioner will collect the following number of samples of the dilute spray material for each application event monitored.

1 to 2 samples

Mass Deposition – CDFA will apply GF-120 at a rate of 20 fluid ounces per acre, equivalent to 0.005 avoirdupois ounces per acre or 35.1 micrograms per square meter or 3.26 micrograms per square foot of spinosad active ingredient. Deposition sheets (measuring 1 ft^2) will be set out prior to application at 10 – 30 sites within the treatment area. Sites will be located in open areas away from obstructions to reduce the interference with spinosad droplet deposition. Additionally, final site selection will be reviewed to avoid locations on the edges of the treatment area. The cards will be collected approximately 30 minutes following application and will be used to determine the amount of spinosad reaching the ground. Samples will be stored on dry ice until transported to the laboratory for analysis. DPR will collect the following number of samples for each application event monitored.

10 to 30 sites x 1 sample/site = 10 to 30 samples

OBJECTIVE 2: To measure the amount of spinosad in outdoor ambient air. There are no health standards for pesticides in air. DPR uses screening levels to evaluate the possible health effects of exposure to a chemical, based on a chemical's toxicity. A concentration that is below the screening level is not considered to represent a significant health concern and would not generally undergo further evaluation, but also should not automatically be considered “safe.”

Similarly, a concentration that is above the screening level does not necessarily indicate a significant health concern, but indicates the need for a further and more refined evaluation. DPR's screening level for spinosad is 160 micrograms per cubic meter ($\mu g/m^3$).

Air – Spinosad is a non-volatile pesticide, so little or no spinosad should be detectable in air once the spray settles. Spinosad's lack of volatility makes it difficult to develop a method to detect it in air. DPR will monitor air concentrations if a suitable method can be developed. Two to six sites located throughout the treatment area will be sampled to measure outdoor ambient air concentrations of spinosad. Sites must be accessible at all hours, protected from any direct spray, and have electrical power to run the samplers. The samples will be collected for a period prior to application (background), during application, and from 24 to 48 hours after application in 24-hour intervals. All air samples are stored on dry ice until transported to the laboratory for analysis. If a suitable method can be developed, DPR will collect the following number of samples for each application event monitored.

2 to 6 sites x 3 to 4 sample periods x 1 sample/site = 6 to 24 samples

OBJECTIVE 3: To measure the concentrations of spinosad in surface water immediately following application and in runoff water following storm events. These results will be used to determine if spinosad may adversely affect aquatic organisms. Spinosad is slightly toxic to moderately toxic to aquatic organisms, with lethal concentrations ranging from 0.1 to 100 parts per million (ppm), depending on the organism.

Surface Water – Flowing waterways that traverse the spray zone will be monitored to determine the concentrations due to aerial deposition. A background water sample will be collected prior to each monitored application at an inflow site upstream of the treatment area boundary and at an outflow site immediately below the application boundary. After application, a sample will be collected from the outflow site. If an impounded water body (i.e., ponds, lakes, and reservoirs) is located within the spray zone, a sample will be taken from the impounded water body prior to and after the application. Water samples are collected and stored in one liter amber bottles with Teflon® lined lids. Samples are stored on wet ice or in a 4^o C refrigerator until transported to the appropriate laboratory for analysis. DPR will collect the following number of samples for each application event monitored.

2 to 6 sites x 1 to 2 sample periods/site = 3 to 12 samples

Surface Water Runoff – Surface water will be monitored during storm runoff events to determine spinosad concentrations due to wash off from exposed surfaces. The first storm event will be sampled, and samples will be collected at points of discharge and/or at areas of concern for aquatic organisms. The California Department of Fish and Game (CDFG) will assist in the selection of sites. The number and frequency of samples collected will depend on intensity and duration of the runoff. When practical, automatic samplers will be used to collect runoff water samples. DPR will collect the following number of samples for each application event monitored.

20 to 50 samples (estimated)

OBJECTIVE 4: To determine concentrations and dissipation of spinosad residue in fruit. These results will be used to determine if effective and legal concentrations are achieved. The application rate for spinosad is low. Current monitoring methods may not detect spinosad concentrations lethal to fruit fly larvae. The maximum legal concentration (tolerance) for spinosad in most commodities is 0.3 ppm.

Fruit - Fruit samples will be collected from one or two species (e.g., grapefruit and/or avocado) at two to five sites within the treatment area to determine efficacy of the spray program. Background samples will be collected prior to application events. Samples will be collected after applications with a minimum of two samplings: day after application and day prior to the next application. Each sample will be a composite of several fruit collected from a single field or orchard. DPR will collect and analyze whole (unpeeled) fruit and identify the sampled fruit as ripe or unripe. DPR will collect the following number of samples for each application event monitored.

1 or 2 species x 2 to 5 sites x 2 to 5 sample periods = 4 to 50 samples

IV. CHEMICAL ANALYSIS/QUALITY CONTROL

CDFA's Center for Analytical Chemistry will perform the laboratory analysis for spinosad (spinosyns A and D). The laboratory will attempt to analyze for breakdown products if standards can be obtained. Quality control measures will include analysis of samples containing known amounts of spinosad (spikes) to check the accuracy and precision of the methods, and samples containing no spinosad (blanks) to check for contamination, as described in Segawa et al. (1995). The quality control samples will comprise approximately 10% of the field samples.

V. DATA ANALYSIS

Mass deposition on deposition cards will be presented as micrograms of spinosad per area ($\mu g/m^2$); concentrations of spinosad in air will be reported as both micrograms per cubic meter ($\mu g/m^3$) and parts per trillion (ppt), water concentrations will be reported as both micrograms per liter (µg/L) and parts per billion (ppb), fruit samples will be reported as parts per million (ppm). When sample size permits, means, percentiles and frequency histograms will be presented. The mass deposition results will be compared to the target application rate. Air concentrations will be compared to the screening level. Water concentrations will be compared to aquatic toxicity levels. Fruit concentrations will be compared to effective levels and tolerances. Samples used for tolerance purposes must be at the harvest stage, and in its unpeeled, natural form.

VI. REFERENCES

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