SPINOSAD AS A BAIT SPRAY TOXICANT FOR THE CARIBBEAN FRUIT FLY, *ANASTREPHA SUSPENSA (LOEW)*

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Florida citrus fruit exported to foreign countries and certain domestic areas must meet quarantine requirements to prevent the spread of the Caribbean fruit fly (CFF), *Anastrepha suspensa* (Loew). The FLORIDA CARIBBEAN FRUIT FLY PROTOCOL is a body of regulations that allows fresh citrus fruit to be certified free of the Caribbean fruit fly and shipped to Japan, California, Texas, Bermuda, and Hawaii without methyl bromide fumigation or other treatment. One option of this protocol requires the application of a malathion (182,000 ppm) bait spray ever 7 to 10 days during harvest to eradicate adults. Problems with the use of malathion bait spray, such as concerns with potential human health problems and property damage, indicate that an alternative bait is needed. The present work was performed to test spinosad, a naturally produced product extracted from a species of bacteria (Actinomycetes, *Saccharopolyspora spinosa)*, as a bait spray toxicant.

The flies used in the tests were from a colony maintained at the ARS station at Miami, FL since 1971. The flies were reared as larvae on an agar-based diet and as flies on a mixture of yeast hydrolysate and sugar. Tests were carried out in an environmental chamber (28-30 °C, 85-95% RH, photoperiod 14:10 L:D) over a 48 h period. Two week old male or female flies (9 to 12) were placed into a cage (0.16 m^3) for each dose tested.

Bait was prepared by dissolving 40 g sugar in 25 ml water, adding 10 g yeast hydrolysate, and stirring to form a homogeneous mixture. A sample of spinosad containing 45.9% AI, supplied by the manufacturer (DowElanco), was used for all tests. Dilutions were prepared so that 0.1 ml portions added to 5 g bait samples would give the test dosages of 0, 0.1, 0.5, 1, 2, 4, 7, 10, 25, and 50 ppm. The bait was manually spotted on the bottom of 15 cm petri dishes (20-30 drops, 0.15-0.16 g) and allowed to air dry about 24 h. For each test a petri dish was placed into each cage (droplet side down) and supported 2 cm above the cage floor.

Five replications were carried out for each sex using 2 replications of each dose tested, i.e. 10 replications at 10 dose levels for each sex. Each test was done on a different date and used a different generation of flies from the colony. Visually assessed irreversible knockdown was determined after 24 and 48 h exposure. Probit analysis (SAS Institute) was used to calculate effective concentrations (EC) for various EC values.

Adult flies were observed to feed on the bait at all concentrations of spinosad tested with no apparent repellency. The EC_{50} and EC_{99} values predicted from probit analysis for female flies were 4.6 and 23.8 ppm at 24 h and 2.6 and 9.4 ppm at 48 h, respectively. The EC_{50} at 24 h for males (3.4 ppm) was slightly lower than that calculated for females and the EC_{99} (27.1 ppm) was slightly higher but the differences cannot be considered significant because the fiducial limits overlap.

Compared to the present protocol which requires 182,000 ppm of malathion in bait for the Caribbean fruit fly-free spray program, spinosad offers a promising alternative since a dose of only 100 ppm is an order of magnitude greater than that required for an EC_{99} for females or males. Preliminary information from the manufacturer indicates that the product has low mammalian toxicity and an environmental half-life of only a few days. Low dosage requirements and favorable environmental considerations justify field test to determine the concentration of spinosad that will be effective under grove conditions for the control of the Caribbean fruit fly.

Plans for future work include the testing of spinosad and abamectin under field conditions. Both compounds will also be tested against the Mediterranean fruit fly, *Ceratitus capitata* (Wiedemann), the Mexican fruit fly, *Anastrepha ludens* (Loew), and other fruit flies depending on time and opportunity. Testing of naturally occurring chemicals from higher order plants for insecticidal activity will also continue as time permits.