EVALUATION OF SOME INSECTICIDES MIXED WITH A FEEDING STIMULANT FOR ADULT BOLLWORM

J. D. Lopez, Jr. and C. G. Clemens
USDA, ARS, SPA, SCRL
Areawide Pest Management Research Unit
R. W. Meola
Department of Entomology
Texas A&M University
College Station, TX

Abstract

As part of an intensive research effort to develop adult control technology for the bollworm, *Helicoverpa zea* (Boddie), using feeding attractants and stimulants, various insecticides were evaluated for toxicity to adult bollworms when mixed with a feeding stimulant. The insecticides evaluated included seven organophosphates - DDVP (Vapona ® EM-2), dimethoate (Clean Crop Dimethoate ® 400), profenofos (Curacron ® 8EC), malathion (Clean Crop ® 57 EC), sulprofos (Bolstar ® 6EC), acephate (Orthene ® 90S) and chlorpyrifos (All Pro ® Dursban ® 4E); four carbamates - carbaryl (SureGard ® Sevin ® 80S), methomyl (Lannate ® 90S), thiodicarb (Larvin ® 3F) and oxamyl (Vydate ® L); three pyrethroids - lambda cyhalothrin (Karate ® 1EC), cyfluthrin (Baythroid ® 2EC), and cypermethrin (AMMO ® 2.5 EC and Demon ® WP); and three miscellaneous chemistry insecticides - imidacloprid (Provado ® 1.6F), spinosad (Tracer ®) and endosulfan (Phaser ® 3EC, Phaser ® WP, and Thiodan ® CO). Evaluations were conducted with the insecticides mixed with 2.5 M sucrose on a ppm AI weight:volume basis that were fed to the adults. Mortality data (24 and 48 h) for a minimum of four and up to ten concentrations of the different insecticides were used to calculate the LC_{50}s using POLO-PC (LeOra Software 1987). A replicate consisted of ten moths and there was a minimum of five replicates for each insecticide concentration that was tested. Control moths were fed only 2.5 M sucrose. All the insecticides were evaluated for toxicity to male bollworms captured in sex pheromone-baited traps in the Brazos River Valley between May and October, 1996. To determine if there was a difference in the toxicity of methomyl between female and male bollworms, female and male bollworms captured in blacklight traps, and male bollworms captured in sex pheromone traps in early July 1996 were also evaluated. No significant differences were observed in the LC_{50} values for methomyl to female and male bollworms captured in blacklight traps and males captured in sex pheromone traps which provides evidence that toxicity of the insecticides to female and male bollworms in the adult population is similar. This is important because the adult control technology being developed especially targets the females. The LC_{50} for the wettable powder formulation of cypermethrin to male bollworms captured in sex pheromone traps was significantly higher than that for cypermethrin EC formulation. Similarly, the LC_{50}s for male bollworm of the two EC formulations of endosulfan (Phaser ® EC and Thiodan ® CO) were not significantly different, but were both significantly lower than that for the WP formulation (Phaser ® WP). Differences in the LC_{50}s of the three endosulfan formulations may have been affected by the time during the growing season when the evaluations were conducted due to increased adult exposure to insecticides applied to control various insect pests in cotton during July and August in the test area. Nevertheless, the LC_{50} data for the different formulations of cypermethrin and possibly endosulfan indicate that insecticide formulation may affect the toxicity of insecticides mixed with a feeding stimulant to adult bollworm. This may be especially important in the feeding response of adult bollworms to attracticides applied under field conditions. The LC_{50} for spinosad at 24 h was significantly higher than that for 48 h, indicating the possibility of a delayed lethal effect of this new insecticide. LC_{50}s after 24 h for male bollworms of all the insecticides evaluated were: $LC_{50} \leq 5$ ppm AI - lambda cyhalothrin, methomyl, profenofos, thiodicarb, cyfluthrin, cypermethrin EC, and spinosad; $LC_{50} > 5$ and < 10 ppm AI - acephate, cypermethrin WP, and chlorpyrifos; $LC_{50} > 10$ and ≤ 50 ppm AI - carbaryl, malathion, endosulfan EC and CO, DDVP, and sulprofos; and $LC_{50} > 50$ ppm AI - endosulfan WP, imidacloprid, dimethoate and oxamyl. These categories reflect only the direct mortality effects of the insecticides on male bollworm; no effort was made to evaluate sublethal or other delayed effects of the insecticides on the adults, which may be important in the potential value of some of the insecticides evaluated when used in an attracticide formulation for control of field adult populations, especially the females. In addition, because the insecticides were evaluated at different times during the growing season and the toxicity of different insecticides has been shown to change during the season in response to the extensive use of insecticides, especially applications made to cotton, the LC_{50} values reported should be considered with this reservation. However, these values should still be useful in determining reasonable insecticide concentrations that will kill adult bollworms which feed on attracticides applied for field evaluations.

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