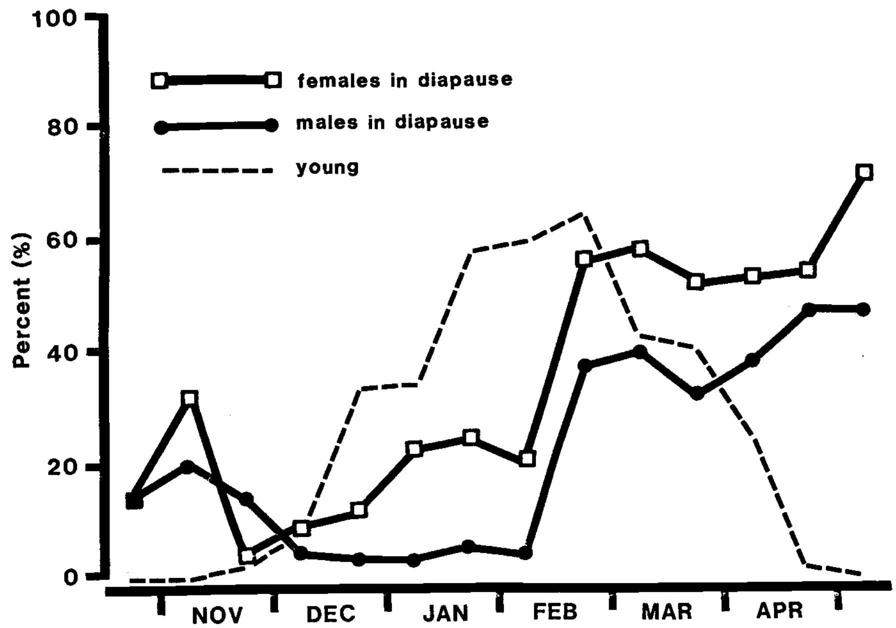

Figure 3. Percentages of male and female boll weevil adults in at least intermediate diapause and young adults in bi-monthly grandlure-baited trap collections from late-October, 1981 to late-April, 1982 near Cotton Center, AZ.

Toxicity of several insecticides to the boll weevil in Arizona

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Summary

Adult boll weevils, Anthonomus grandis grandis Boheman, emerging from bolls collected near Eloy, AZ were treated topically with 13 insecticides and relative susceptibilities were compared. The toxicity of the organophosphate insecticides in descending order of toxicity were: methyl parathion, azinphosmethyl, profenophos, EPN, methidathion, and phosmet. The synthetic pyrethroids exhibited similar toxicity to the boll weevil, making field application for control of this insect questionable, based upon their higher cost factor. Sulprofos, malathion, and acephate were also tested, but concentrations comparable to the other phosphates failed to yield sufficient mortality for which LD_{50}'s could be calculated.

Introduction

The boll weevil has now become established in Arizona; it has recently been reported in California. Screening of available and future insecticides against the boll weevil is necessary to identify effective materials for chemical suppression. The first step is laboratory screening to determine materials that have potential for field testing.

Methods and Materials

Infested cotton bolls were collected near Eloy, Arizona during early December, 1982. They were returned to the Department of Entomology Cotton Insects Laboratory, Tucson, and placed in cages. Emerged adults (unsexed) weighing an average of 18.3 mg. were topically treated on the dorsal surface with technical grade insecticides dissolved in acetone. Insecticides used were acephate, azinphosmethyl, BAY FCR 1272, cypermethrin, EPN, flucythrinate, fluvalinate, malathion, methidathion, methyl parathion, permethrin, phosmet, profenofos, and sulprofos. Likewise, adults collected from grandlure-baited pheromone traps in Avra Valley, Arizona, during this same period of time were treated with azinophosmethyl, EPN, and methyl parathion. Controls were treated with acetone. Treated insects were placed in petri dishes, 15 per dish; this equalled one replicate. At least 4 replicates at each of 4-6 concentrations were employed for each insecticide. Dishes were held in the laboratory at room conditions. Mortality counts were made at 24, 48, and 72 hours. Insects were considered dead if they did not respond to repeated prodding with a blunt probe. Incapacitated insects with slight movements were considered "moribund"; these insects were observed for 7 days and recovery was not noted. LD_{50}'s were computed from eye-fitted logarithm-probit lines based on the 48 hour dead plus moribund counts.

Results and Discussion

Toxicities of the insecticides in terms of LD_{50}'s determined in the laboratory are reported in Table 1. Of all insecticides tested, methyl parathion was the most toxic, exhibiting an LD_{50} of 4.1 for emerged weevils. The toxicity of the organophosphates in descending orders of toxicity were: methyl parathion, azinophosmethyl (Guthion ^{R}), profenofos (Curacron ^{R}), EPN, and methidathion (Supracide ^{R}).

Three of the organophosphates were tested on boll weevils collected in pheromone-baited traps. These insects were approximately twice as susceptible to these chemicals than emerged weevils; however, the order of toxicity remained the same. Perhaps this merely reflects an increased stress placed on these trapped weevils which had remained in the traps from one to several days without food or water.

Except for flucythrinate (Pay-Off ^{R}) with an LD_{50} of 32.8, the toxicities of the pyrethroids were comparable to the organophosphates. BAY FCR 1272, an experimental material, exhibited the highest toxicity, followed by cypermethrin, permethrin, and fluvalinate (Mavrik ^{R}). Unless there are benefits additional to boll weevil suppression, the field use of these materials is questionable based upon the higher cost of pyrethroids versus an organophosphate such as methyl parathion.

Acephate (Orthene ^{R}), malathion, and sulprofos (Bolstar ^{R}) were also tested, but concentrations comparable to the other organophosphates failed to yield sufficient mortality to compute LD_{50}'s. This would mean that LD_{50}'s, if determined, would be much higher than any of those reported here.

Table 1. Toxicity of several insecticides applied topically to adult boll weevils that either emerged from field-collected bolls or were collected in pheromone-baited traps 1/

Insecticides	LD_{50} 2/	
	Emerged	Trap-collected
Organophosphates:		
methyl parathion	4.1	1.8
azinophosmethyl	12.6	4.9
profenofos	12.6	
EPN	13.7	7.1
methidathion	14.7	
Pyrethroids:		
BAY FCR 1272	6.0	
cypermethrin	13.1	
permethrin	15.8	
fluvalinate	17.5	
flucythrinate	32.8	

1/ Minimum of 4 replicates of 15 weevils each and 4-6 concentrations of each insecticide.

2/ Mg. of insecticide/gm body weight; LD_{50}'s derived from eye-fitted curves.