EFFICACY OF MALATHION ULV ON THE COTTON BOLL WEEVIL UNDER SIMULATED COOL TEMPERATURE REGIMES

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Abstract

The efficacy of malathion ulv (ultra low volume) was tested on laboratory reared boll weevils under simulated temperature regimes. The treatment rates were one, three and five (29 micrograms per droplet) droplets applied to the laboratory reared adult boll weevils. Temperature regimes of 55 and 35, 60 and 40, and 65 and 45 degrees F. were compared to a constant 85 degree F. temperature. These temperature regimes were for a high temperature for 20 hours and then the low for 4 hours. This was reversed for the same temperatures but with the low temperature for 20 hours and high for 4 hours. These temperature regimes with 3 dosage rates resulted in 21 treatments. Each treatment was composed of at least 12 replicates of 10 boll weevils each. Untreated replicates were held for the same periods. Malathion ulv efficacy on the boll weevil was significantly different between several of the lower temperature rates at one droplet and the constant after 48 hours but all had 70% or more mortality with the constant at 99.7%.

Introduction

The ultra low volume applications of malathion ulv are the standard insecticide treatment of the Boll Weevil Eradication Programs. This has evolved for economic, control efficacy and worker safety reasons. The fall diapause control program for boll weevils (Brazzel, 1961) starts in the late season period of cotton production with malathion ulv applications. Applications of insecticide continue until a killing frost or no cotton food source is available to the boll weevil. This has meant treating cotton under cooler conditions than those normally encountered during the growing season when crop protection insecticides are tested. For that reason this test was conducted to determine control efficacy of malathion ulv on adult boll weevils under temperature regimes simulating some of the more unusual fall conditions.

Methods and Materials

Boll weevils used in this test were mature adults reared at the USDA ARS Gast Rearing Laboratory at Mississippi State University. All treatments consisted of 12 replicates. Each replicate consisted of 10 boll weevils (mixed-sex) which were held after treatment in 1.5 X 90 cm. petri dishes and fed artificial diet pellets (Haynes, 1992).

Treatments consisted of three droplet rates of malathion ulv (Fyfanon ULV, 95% a.i. malathion, Cheminova - Lemvig - Denmark) with no additives. There were one, three and five drops applied with a 5 microliter pipet. The weight of each drop was 29 micrograms. A 6 replicate calibration test was done before starting treatment applications. Calibration was checked by weighing pipet with and without malathion ulv. During treatment applications no more than 90 drops were applied before weighing and refilling. The first drop was applied on the dorsum of the prothorax of each boll weevil. The other drops were placed in order first to the proximal area of each elytra and then the distal area of each. The one drop rate is the closest probable rate to field application conditions.

For each rate there were 7 temperature (degrees F.) regimes; which were (1) 35 for 4 hours and 55 for 20 hours, (2) 55 for 4 hours and 35 for 20 hours, (3) 40 for 4 hours and 60 for 20 hours, (4) 60 for 4 hour and 40 for 20 hours, (5) 45 for 4 hours and 65 for 20 hours, (6) 65 for 4 hours and 45 for 20 hours and (7) the standard, 85 degree constant. Droplets were applied to the boll weevils which were then exposed to the high temperature period of each treatment. The astandard or 85 degree constant temperature at all droplet rates was duplicated with each of the other 6 temperature regimes. A twelve replicate untreated control was also done with each temperature regimes.

Mortality counts were made at 24 and 48 hours after application. Statistical analysis included use of ANOVA with LSD for treatment means separation (SAS Institute, 1990).

Results and Conclusions

The mean percent mortality is shown in Table 1 for each treatment at 24 and 48 hours after application. The untreated control averaged 2.5 percent mortality with a range of 0 to 4.2 percent of the 72 replicates. Since this would have less than a 1 percent effect on control mortalities, no adjustments using Abbott's formula (1925) were made. The results (Table 1) of these tests show an extreme, significant difference in control efficacy for the first 24 hours after application between all treatments and the standard (85 degree constant). This difference while

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 2:719-720 (1996)
National Cotton Council, Memphis TN

still significant between some of the treatments and the standard at 48 hours is no longer extreme. The lowest percent mortality is above 70 and that is for the one drop rate at the lower temperatures. Data in Harris et al (1966) would tend to confirm that these mortalities levels are adequate for the experienced fall temperature environment in relation to boll weevil development. Also a malathion ulv application controls boll weevils for several days under dry field conditions (Jones et al, 1996) giving added residual effects. The Boll Weevil Eradication Program would, therefore, get effective control in the late cotton season with malathion ulv applications if use was necessary under these lower temperature conditions.

TABLE 1. Efficacy of three droplet rates of malathion ulv (Fyfanon ulv, 95% a. i.) on boll weevils held under simulated cold temperature conditions in the laboratory and compared to an 85 degree F. constant temperature after 24 and 48 hours.

PERCENT MORTALITY BY MALATHION ULTRA LOW VOLUME							
TEMPERA-TURE REGIME		ONE DROP		THREE DROPS		FIVE DROPS	
20 HRS	48 HRS	24 HRS	48 HRS	24 HRS	48 HRS	24 HRS	48 HRS
35°	55°	25.0	73.3	42.5	85.0	46.7	95.8
55°	35°	24.2	70.8	23.3	80.8	30.0	89.2
40°	60°	37.5	90.8	57.5	95.8	65.8	99.2
60°	40°	27.5	75.0	46.7	90.0	46.7	91.7
45°	65°	71.7	96.7	94.2	100.0	100.0	100.0
65°	45°	39.2	85.0	73.3	95.8	75.0	97.5
85°	85°	98.2	99.7	99.9	99.3	99.6	99.3
LSD .05		12.97	10.56	11.54	6.66	10.84	5.27

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