LONGEVITY OF MALATHION ULV APPLICATIONS AGAINST BOLL WEEVIL UNDER DIFFERENT WEATHER CONDITIONS IN THE COASTAL BEND OF TEXAS

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Abstract

The efficacy of malathion ULV (Fyfanon® ULV) was tested on laboratory-reared and field-collected boll weevils, *Anthonomus grandis* Bohman, under simulated rain and some natural rain conditions. The efficacy of malathion was not affected when applied to cotton leaves that were subjected to as much as 1" of simulated rain. However, results indicate that rain exceeding 0.125" falling within six hours after application, has reduced the levels of mortality in the adult weevils exposed to treated leave, consequently requiring reapplication.

Introduction

Malathion ULV has been the main insecticide used for boll weevil, *Anthonomus grandis* Bohman, control in the eradication programs across the Cotton Belt (Brazzel, 1961and Burgess, 1965). Field observations have indicated possible rapid degradation of malathion ULV under heavy dew and rain conditions, losing much of its efficacy. In 1996, the boll weevil eradication program was initiated in the South Texas / Winter Garden Zone which includes the upper Coastal Bend of Texas. The Coastal Bend area is known for heavy morning dew and mid to late-day heat showers during the cotton growing season. The primary objective of this study was to evaluate the impact of dew and rain showers on the persistence of malathion and its efficacy against boll weevils.

Materials and Methods

Six commercially-grown cotton fields were selected in Wharton County, Texas to evaluate the impact of the morning dew and rain showers on the efficacy of malathion ULV (Fyfanon® ULV) against boll weevil adult populations. Five fields averaging 26 acres each were designated as treated and a 0.5 acre portion of a plowed field was the untreated control. Each of the treated fields was sectioned into five areas and marked as sampling sites, all of which were at least 50 feet from the edge of the field. Five individual plants were flagged with surveyor's tape within each of the sampling sites.

Dew Immediately prior to the application of malathion, the upper most, largest leaf on the main stem of four of the five plants in each sampling site was subjected to measured amounts of artificial rain. The fifth plant received no rain providing a dry leaf for comparison. Each dry leaf was collected and enclosed in a petri dish, labeled and transported to the laboratory. The four leaves received 0.125", 0.25", 0.50", and 1.0" respectively, of tap water. Simulated rain was applied to the plants using a hand held trigger sprayer bottle that was calibrated to deliver 0.125" of water each time the trigger was pressed. The spray bottle was positioned at a 45°angle and approximately 12" above the cotton leaf as the water was released from the sprayer.

Malathion ULV insecticide was applied to the fields aerially with a Cessna 188 Ag Truck which was equipped with stainless steel (8002 size) nozzles calibrated to deliver 12 ounces per acre at 40 psi pressures. The spray boom was approximately five feet above the canopy during application. One oil-sensitive dye card was placed at canopy height at each of the five sampling locations in each field to check the deposition of insecticide. One glass cylinder 5" rain gauge was also erected at each field in the event of actual rainfall. The sixth field was designated as the control and received no insecticide or simulated rainfall. Leaf sampling was done in the same manner as described above.

Approximately 0.5 hour after insecticide applications were completed, leaves that had received simulated rain were collected, placed in petri dishes, and transported to the laboratory. Five weevils were placed inside the petri dish. One half of the weevils used in this study were received from a laboratory reared colony at the USDA GAST facility, and the other half was field collected weevils. Percent mortality was calculated 24 hours later. Weevils were counted dead when they did not respond with coordinated movement when gentle pressure was applied to the snout with forceps.

Rain Sixteen additional leaves were collected approximately 0.5 hour after application from each of the sampling sites in each field and transported to the laboratory. In the laboratory, leaves from each of the sampling sites were separated into four groups. One leaf in each group received a prescribed amount of artificial rain at 0.125", 0.25", 0.5", and 1.0" respectively, approximately one hour post-application. The second group received the prescribed amount of simulated rain at six hours, the third at 24 hours, and the fourth at 48 hours post the insecticide application. The rain-treated leaves were then placed in the sun only until the surface was dry. When dry, each leaf was placed into the appropriately labeled petri dish and five adult boll weevils were introduced. The dishes were held at approximately 85°F for 24 hours, at which time they were opened and the percent mortality was calculated. Rain gauges were monitored to compare natural rainfall with the simulated rain. On one occasion during the study, a rainfall occurred one time within approximately six hours of insecticide application in two of the five fields. The amount of natural rainfall was measured, leaves were collected,

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taken to the laboratory and allowed to dry before assaying.

All statistical analyses were carried out using "ANOVA" and "RANGE" tests, MSTAT-C statistical software programs (Michigan State University, Copyright 1988).

Results and Discussion

Results are presented in graphic form:

The percent mortality of adult weevils exposed to leaves treated with malathion and received 0.10" of natural rainfall did not differ significantly from leaves that received 0.10" of simulated rain (figure 1).

The percent mortality of adult weevils exposed to leaves that received different levels of simulated rain prior to the malathion application did not vary significantly from leaves that did not receive any rain (figure 2).

The percent mortality of adult weevils exposed to malathion treated cotton leaves that received 0.125" rain after application did not vary significantly from the untreated. The mortality level of weevils exposed to leaves receiving 0.25" or more was significantly less than the untreated (figure 3).

The percent mortality of adult weevils exposed to malathion treated cotton leaves that were subjected to 0.25" of rain or more within one to six hours after application was significantly less as compared to the leaves that received no rain. The mortality levels of adult weevils exposed to leaves subjected to rain 24 hours or more after application, were significantly higher than leaves receiving rain within 24 hours (figure 4).

Conclusion

Based on the above data, it appears that applying malathion while cotton leaves were wet did not diminish or reduce its efficacy against adult boll weevils. However, rain exceeding 0.125" falling within 1-6 hours after application resulted in significant reduction in the efficacy of malathion and reapplication would be required.

Acknowledgments

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References Cited

Burgess, E.D. 1965. Control of boll weevil with technical malathion applied by aircraft. J. Econ. Entomol. 58:414-415.

Brazzel, J. R. 1959. The effect of late-season applications of insecticides on diapausing boll weevils. J. Econ. Entomol. 52:1042-5.

Cleavland, T. C., W. P. Scott, T. B. Davich, and C. R. Parencia, Jr. 1966. Control of the boll weevil on cotton with ultra low volume (undiluted) technical malathion. J. Econ. Entomol. 59:973-76.

Nemec, S.J. and P.L. Adkisson. 1969. Effects of simulated rain and dew on the toxicity of certain ultra volume insecticidal formulations. J. Econ. Entomol. 62:71-73.

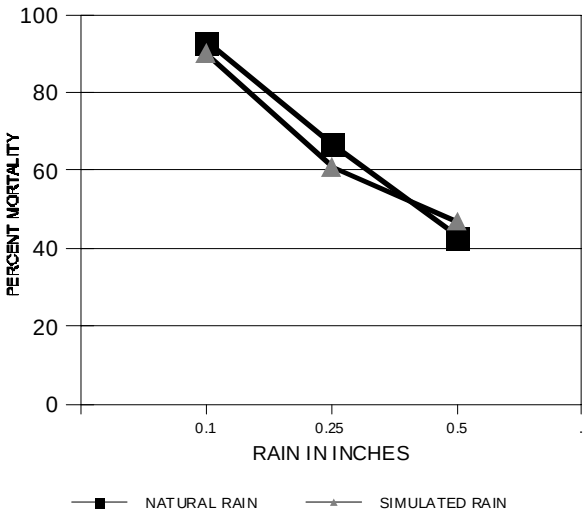
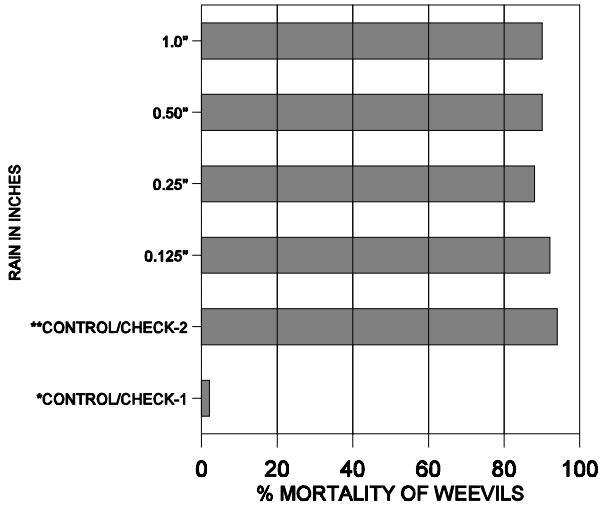
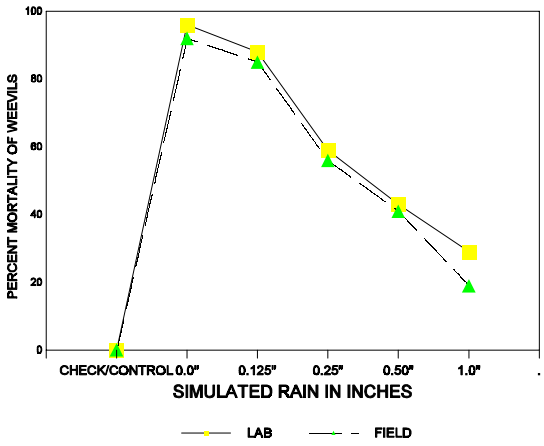


Figure 1. Percent mortality of adult boll weevils after 24h exposure to malathion treated leaves that were subjected to natural and simulated rain 4h post application.



*Control/check-1. *Cotton leaves that were not exposed to either rain or malathion.*
**Control/checkl-2. *Cotton leaves that were exposed to malathion only.*

Figure 2. Percent mortality of lab-reared weevils after 24h of exposure to cotton leaves subjected to different levels of simulated rain prior to malathion application, Wharton Co., Texas, 1996.



*Control/Check. *Cotton leaves that were not exposed to either malathion treatment or simulated rain.*

Figure 3. The overall percent mortality of field-collected and lab-reared weevils exposed to untreated and treated cotton leaves with malathion at various levels of simulated rain, Wharton Co., TX, 1996.

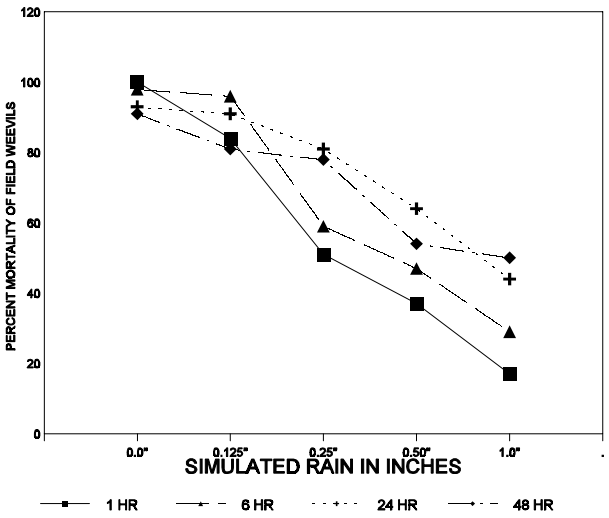


Figure 4. Percent mortality of adult weevils exposed to malathion treated and untreated cotton leaves that were subjected to different levels of simulated rain, Wharton Co., Texas, 1996.