EFFECTS OF WATER QUALITY ON INSECTICIDE PERFORMANCE FOR THE CONTROL OF TARNISHED PLANT BUG, *LYGUS LINEOLARIS*, IN COTTON AND CORN EARWORM, *HELICOVERPA ZEA*, IN SOYBEANS

T.A. Harris
G.M. Lorenz
B.C. Thrash
N.R. Bateman
M. Mann
W.A. Plummer
C.A. Floyd
C.R. Rice
S.G. Felts
T.B. Newkirk
A.Y. Whitfield
Z.K. Murray
University of Arkansas Cooperative Extension Service
Lonoke, Arkansas

Abstract

Insecticide efficacy often varies from location to location and year to year. Many factors can influence an insecticides' efficacy, but an often-overlooked factor is the quality of water in an insecticide solution. Multiple experiments were conducted to evaluate the impact of water on insecticide efficacy. In the first experiment, Transform 1.5 oz/a, Orthene 0.75 lb./a, Bidrin 8 oz/a, and Centric 2 oz/a, were each mixed in three waters with hardness's of 10.9, 178, and 430 ppm, then applied to cotton for tarnished plant bug control. No differences in control were present between differences in the tested waters. In the second experiment, leaf dip assays were conducted with chlorantraniliprole (Vantacor) on corn earworm using soybean leaves. Serial dilutions were used to achieve a concentration of 0.06ng/ml of Vantacor, in 4 waters with hardness's of 10.9, 20, 178, and 430ppm. Larvae were place on leaves after drying and larval mortality was rated at 24 hours and 48 hours. Results from the first experiment showed no differences in treatments at 3 and 7 days after application when compared to the untreated check. In the second experiment, very hard water reduced the control of Vantacor at 24 and 48 hours when compared to soft and very soft water.

Introduction

Most insecticides used in agriculture are required to be dissolved or suspended in water. A spray solution is often 95% or more water. Water is commonly seen as a clean input and its quality is commonly overlooked. Measures of water quality consist of hardness and pH. Water hardness is the amount of dissolved calcium and magnesium in water. Spray solutions containing hard water have the potential to cause antagonism. This may reduce the degree or speed of the activity of pesticide or reduce active ingredient uptake. Water hardness in the Mid-south ranges from very soft to very hard. The pH of water is how acidic or alkaline the solution is. Water at various ranges of pH in a spray solution may affect how long the molecule in the pesticide stays intact. Most pesticides perform best in slightly acidic water. The objective of this study is to evaluate the impact of water hardness on tarnished plant bug insecticides in cotton and corn earworm insecticides in soybean.

Materials and Methods

Two field trials were conducted in Marianna, AR at Lon Mann Cotton Research Station. In this experiment Transform 1.5 oz/a, Orthene 0.75 lb./a, Bidrin 8 oz/a, and Centric 2 oz/a, were each mixed in three waters with hardness's of 10.9, 178, and 430 ppm, were sprayed on cotton for the control of tarnished plant bugs. Plot size was 12.5 ft. (4 rows) by 40 ft. Both trials were arranged as randomized complete block with 4 replications. Samples were conducted at 3 and 7 days after applications. The sampling method used was a 2.5ft shake sheet with two samples per plot for a total of 10 row ft. Tarnished plant bug nymphs and adults were counted. Data was combined from both trials and analyzed using PROC GLIMMIX with SAS v 9.4 at an alpha level of 0.05.

A soybean leaf dip assay on Vantacor used to control the corn earworm was conducted at the University of Arkansas Lonoke Research and Extension Center. The assays consisted of 5 treatments including the untreated check. Water at

hardness's of 10.9ppm, 20 ppm, 178ppm, and 430ppm were mixed with Vantacor .06 ng/ml. Leaf discs with a diameter of 1.5 were dipped in each treatment. The leaves were dried and placed in a 100mm petri dishes with a damp cotton pad and a third instar larva. The larva was observed at 24 and 48 hours for mortality.

Results

The tarnished plant bug trial showed no differences at 3 days after application when compared to the untreated check. There is a trend to show a decrease in efficacy of Acephate but for Bidrin and Centric the trend increases. (Figure 1). There were no differences in tarnished plant bug densities at 7 days after application when compared to the untreated check. (Figure 2). In the leaf dip assay soft and very soft water had a higher percent mortality than the very hard water at both 24 and 48 hours after treatment (Figure 3).

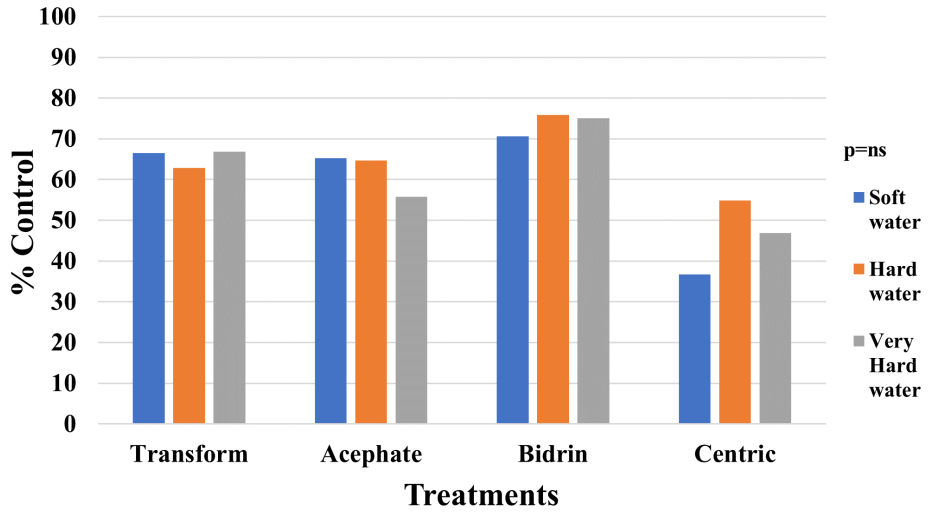

Figure 1. Percent control of cotton insecticides for the control of tarnished plant bugs 3 days after application

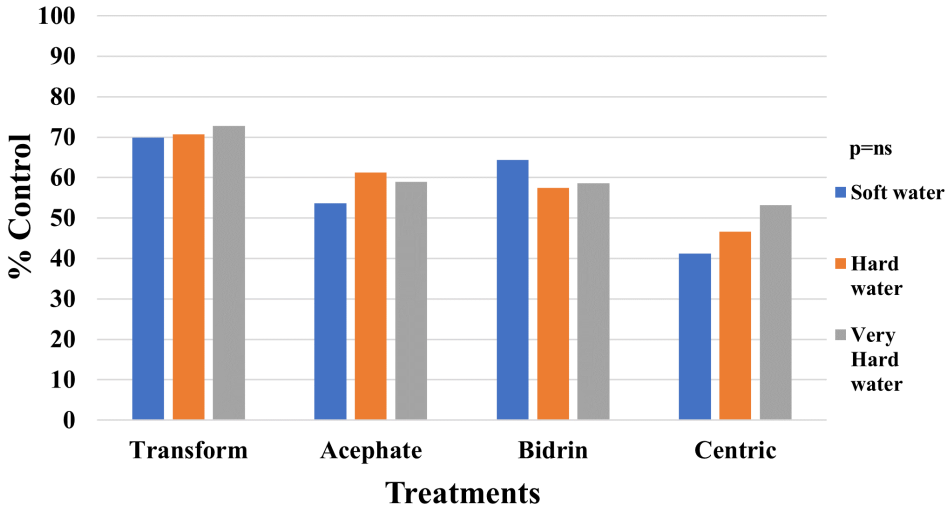

Figure 2. Percent control of cotton insecticides for the control of tarnished plant bugs 7 days after application

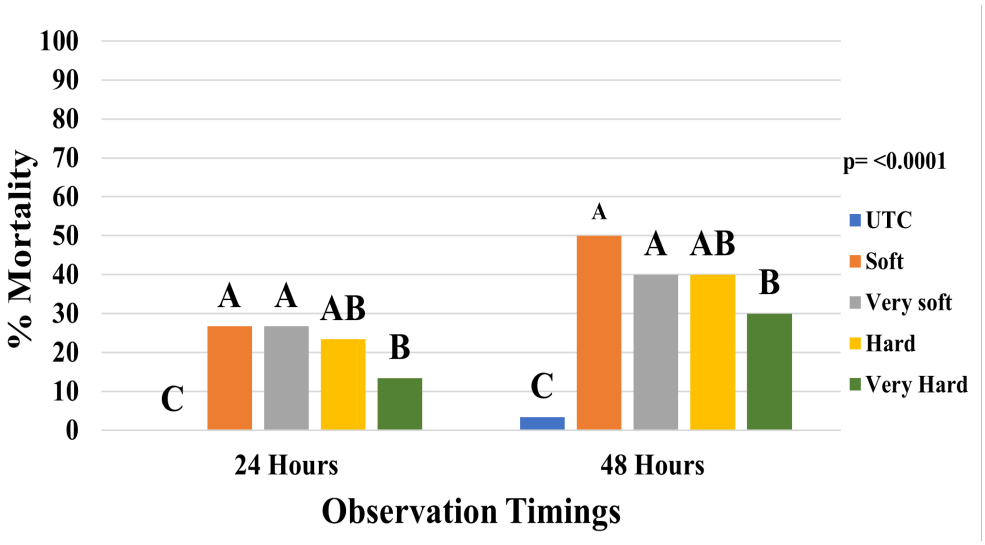

Figure 3. Percent Mortality observations of Vantacor treatments for control of corn earworm

Summary

Data suggests that water hardness has a negative impact on the efficacy of Vantacor for the control of the corn earworm. The expectation in the field is that there will be no initial differences in the mortality of the corn earworm but that there will be a reduction in residual control. Experiments will continue to evaluate the impact of water hardness on cotton insecticides and the impact of pH will also be evaluated in future trials. Field and lab research will continue to see the potential effects of water hardness and pH on Vantacor.

Acknowledgments

We would like to think Arkansas Soybean Promotion board for funding along with the Cotton State Support Committee, and Helena.