Methyl Parathion and Carbaryl Resistance in *Chrysomela scripta*[1] and *Coleomegilla maculata*[2,3]

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A primary objective of a recent cottonwood leaf beetle, Chrysomela scripta (F.), research project was to identify and to quantitate seasonal occurrence of important predators and parasites (HEAD, 1972). However, a related area of study was to determine the reason for the poor performance of the insecticide, methyl parathio which had been used frequently to combat this insect in the Mississippi Forestry Commission nursery at Winoa in the past. For example, in 1969, poor to moderate control of C. scripta was obtained following the use of 17 foliar applications of methyl parathion. Failure of this insecticide to effectively control this leaf beetle indicated the possibility of resistance by C. scripta or a higher susceptibility in Coleomegilla maculata De Geer, its principal ladybird beetle predator. Prior to 1970 and 1971, the time that these studies were made, the principal and most consistently used insecticide had been methyl parathion. However, in September 1969, one application of carbaryl was made and this was followed by season long use of this material in the nursery during the next 2 years. This investigation was conducted to compare the levels of insecticide tolerance found in populations of C. scripta and C. maculata at Winona to those populations at Stoneville and at Mississippi State where no or little insecticides had been used.

Methods.-- Beetles were collected from the Mississippi Forestr Commision nursery (Winona) and from cottonwood stands at Mississipp State, and Stoneville, MS. Comparisons were made between Winona and Stoneville C. scripta, and Winona and Mississippi State C. maculata Treatment consisted of exposure to residual films of toxicant on filter paper discs in petri dishes. Three concentrations were used for each biotype, with 30 insects at each dosage, for a 24-h period The LD_{50} values were computed by linear regression analysis of log-probit transformed data and are expressed as µg of toxicant residue per square centimeter.

1/ Coleoptera:Chrysomelidae. 2/ Coleoptera: Coccinellidae.
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Bulletin of Environmental Contamination & Toxicology,
Vol. 17, No. 2 © 1977 by Springer-Verlag New York Inc.

Results and Discussion.-- Table 1 gives results of the bioassay. C. maculata from Winona showed 11.2-fold resistence to methyl parathion at the LD_{50} when compared to the Mississippi State biotype, and a slight resistance or cross-resistance to carbaryl. Winona C. scripta showed a 1.8-fold resistance to methyl parathion when compared to the Stoneville biotype, and no resistance to carbaryl. Winona C. maculata showed a slightly higher tolerance to carbaryl than either biotype of C. scripta ; but comparison of the tolerance of the susceptible insects toward methyl parathion shows a 62-fold tolerance in C. scripta. These data could partially account for the failure of methyl parathion to control populations of C. scripta by removal of an important biological control factor. Continued use of methyl parathion undoubtedly will lead to higher levels of resistance in these beetles.

ACKNOWLEDGEMENTS

The investigators wish to acknowledge the cooperation and assistance of the Mississippi Forestry Commission at Winona and U.S. Forest Service entomologists at Stoneville in conducting certain aspects of this study.

REFERENCE

HEAD, R.B.: Studies on the cottonwood leaf beetle, Chrysomela scripta F., with emphasis on reproductive potential, biology, parasites and predators,insecticide resistance and esterase comparisons. Ph.D. Dissertaion, Mississippi State University. (1972).

Table 1.-- Demonstration of resistance to methyl parathion and carbaryl in C. scripta and C. maculata.

Biotype	LD_{50} a/ methyl parathion	LD_{50} a/ carbaryl
C. scripta, Stoneville	1.985	4.02
C. scripta, Winona	3.650	4.02
C. maculata, Mississippi State	.032	2.90
C. maculata, Winona	0.355	4.40

a/ LD_{50} values in µg toxicant/cm^2 for methyl parathion and carbaryl for two biotypes of C. scripta and C. maculata. Treatment consisted of exposure to films of toxicant on filter paper, for a 24-h period. Values were determined by linear regression analysis of log probit.