Arthropods in Conservation Tillage Systems

INTRODUCTION

Entomological research on conservation tillage systems will undoubtedly expand rapidly as it is predicted that by the year 2000 over 80% of U.S. cropland will be managed under some form of reduced tillage. In other temperate and tropical countries, the use of conservation tillage practices is also increasing rapidly. While there is a large and growing body of agronomic information on conservation tillage, entomological research in relation to reduced tillage is inadequate. Many management strategies for field crop insects in conservation tillage systems are adaptations borrowed from research in conventional systems. In a number of cases, these appropriated strategies have proven inadequate or ineffective under conservation tillage cropping practices. Tillage intensity directly affects the amount of plant residue left on the soil surface. The surface plant residues of no-tillage systems influence both pest and beneficial arthropods as well as pesticide performance and persistence. Furthermore, the entomological consequences of conservation tillage practices encompass more than soil and residue management, but are influenced by crop rotation schemes, cover cropping, and interplanting, all of which alter arthropod composition and activity.

Our purpose in this symposium volume was: 1) to make available entomological information concerning conservation tillage systems, 2) to suggest future directions for entomological research in these tillage systems, and 3) to propose specific pest management strategies and options for growers using conservation tillage cropping practices. The papers in this volume represent the proceedings of a symposium held at the 1984 Entomological Society of America Meetings, San Antonio, Texas. It was our intention to invite participants who would deal with complimentary topics and yet address the breadth and diversity of issues related to arthropod ecology and conservation tillage agriculture.

The papers by Musick, All, Hammond, and Gaylor and Foster thoroughly discuss the pest complexes in reduced tillage systems and their economic impacts on crops. Although each of these papers focuses on different crops and geographical regions, the authors do converge on a number of points, especially the importance of avoiding generalizations concerning the occurrence of pest problems as a consequence of reduced tillage practices. Rather, these researchers emphasize that each pest species be considered on an individual basis in relation to specific cropping practices. These four papers agree also on the increased importance of predatory arthropods in reduced tillage practices. Nevertheless, much more information exists for pests than for beneficial arthropod species.

Felsot's paper treats the timely subject of pesticide interactions and the complex interplay among physical, chemical, and biological processes that determine the environmental fates of toxicants. This topic addresses currently debated issues over how the increase in the use of conservation tillage practices influences water resources.

House and Stinner's contribution examines the role of soil arthropods in an ecosystem process, specifically nutrient cycling. The approach in this final paper has been to focus on beneficial agronomic and ecosystem-related functions performed by soil arthropods not typically addressed in the agricultural entomology literature.

We emphasize that all the contributed papers raise questions and suggest directions for future research efforts. This pattern indicates that the subject of arthropods in conservation tillage is largely unexplored, and thus provides an arena for addressing entomological questions of a basic and applied nature.

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