Pesticide Resistance: Strategies and Tactics for Management


Agricultural growers, pest control operators, government regulators, and the chemical industry have come to realize that resistance to pesticides is an unavoidable, problematic outcome of man's attempt to suppress pest populations and limit economic losses due to pests. Under the aegis of the National Research Council Board on Agriculture, a 3-day conference was held in November 1984, to provide state-of-the-art presentations on various aspects of pesticide resistance, along with an analysis and recommendations for action. The product of the conference is this volume, which includes 27 symposium papers and a report by the Committee on Strategies for the Management of Pesticide Resistant Pest Populations (Chair, E.H. Glass). The book is organized into six chapters, a preface, glossary (limited), and index. Most significant, for those long on interest and short on time, is the inclusion of a nine-page Executive Summary, which capably alerts the reader to the severity of pesticide resistance, links the management of resistance to the principles of integrated pest management (IPM), and presents 16 recommendations relating to research, detection and monitoring, implementation of IPM, government action, and the development of alternative pest control technology.

The book begins with a comprehensive (and disturbing) chapter on the Magnitude of the Resistance Problem, by G.P. Georgiou. As of 1984, 447 species of insects and mites were classified as insecticide-resistant; 59% were agricultural pests; and 38% medical/veterinary pests. Of interest is the absence of structural insect and forest insect pests from the list. Multiresistance—resistance to different groups of chemicals—has become more common. Almost half of the 447 resistant arthropod species are resistant to two or more classes of chemicals. Indeed, for major pests such as the Colorado potato beetle and the diamondback moth, there are no longer any effective pesticides available.

The remaining five chapters deal with: Genetic, Biochemical and Physiological Mechanisms of Resistance to Pesticides; Population Biology of Pesticide Resistance; Detection, Monitoring and Risk Assessment; Tactics for Prevention and Management; and Implementing Management of Resistance to Pesticides.

In reading the various presentations, one is impressed by the recurring tone of despair expressed by several authors. For example, Frederick Plapp, Jr. concludes his paper on the genetic and biochemical prospects for the future of insecticide resistance by stating that he has "no doubt that, in the long term, life will always overcome chemistry and find ways to persevere. The best that can be said is that if we are lucky (my emphasis), we should be able to suppress resistance to such an extent that we can live with it." What a comment on our collective ability, that for us to hold our own, Lady Luck must be our partner! A measure of the desperation of some situations is the tactic of reintroducing susceptible pest genotypes into an infested area in numbers large enough to swamp the resistant genotype and reduce the likelihood of mating between resistant individuals.

In the chapter on tactics for prevention and management of resistance, the diversity of tactics and their relative success is summarized in table form. The most useful tactics, supported by laboratory trials and/or field experience, appear to be site-specific application, alternation of pesticide applications, and development of new toxiphores with alternate sites of action. Yet the increasing cost of satisfying the health and safety testing requirements of regulatory agencies acts as a major deterrent to development of new pesticide compounds.

Throughout the book, several authors support the increased use of IPM, which by definition implies a reduction in the use of chemical pesticides and presumably a delay in the development of resistance. Yet for IPM to be practical and successful, the user must have a variety of cost-effective alternatives to conventional pesticides. To a very large extent, these alternatives do not exist and thus IPM is still more theoretical than practical. Without them, resistance will continue to intensify as a problem. The subtitle of this book, Strategies and Tactics for Management, leads one to expect long-range strategic plans for overcoming resistance. Although many tactics are described, nowhere does the reader find a truly strategic approach to managing and overcoming pesticide resistance. There is repeated acknowledgment of the enormous challenge presented by resistance to chemical pesticides, the need for expanded use of IPM, including alternatives to chemicals. But the hard reality of today's pest management efforts is that there are very few alternatives available to the grower or operator. The critical importance of research and development directed to alternative pest control technologies is not adequately recognized in the book. Without this effort, it is difficult to develop an effective strategic approach to management of resistance.

Nevertheless, this is a readable, well-organized, state-of-the-art reference that will be of great value to scientists, pest managers, research managers, and growers. It is indeed unfortunate that the future prospects for management of pesticide resistance are so dim.—J.R. CARROW, Faculty of Forestry, University of Toronto, Toronto, Canada M5S 1A1.

The Role of Organic Matter in Modern Agriculture


There has been a growing resurgence in the last decade of research on the role of organic matter in crop production, a role that was long known to farmers but one that has been superseded by the impressive gains of synthetic chemical fertilizer. An increasing concern for ecological, environmental, and economic problems associated with dependence on chemical inputs in modern crop production has resulted in a rediscovery, based on current research techniques, of the benefits offered by careful management of organic matter in the soil-plant-animal system. This book examines, in 12 chapters by some of the foremost authorities in the field, current knowledge of the biological, chemical, and physical properties of organic matter and its management in the production of agronomic and horticultural crops.

The text is organized into a brief introductory chapter by Y. Avnimelech on "Organic Residues in Agriculture." There are