PESTICIDE FORMULATIONS and Application Systems

16TH VOLUME

Michael J. Hopkinson,
Herbert M. Collins, and
G. Robert Goss, editors

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Foreword

The Sixteenth Symposium on Pesticide Formulations and Application Systems was held in Norfolk, Virginia, on 14–15 Nov. 1995. The sponsor of the event was ASTM Committee E-35 on Pesticides.

The symposium chairman was Michael J. Hopkinson, CIBA-GEIGY Corporation; the symposium co-chairman was Herbert M. Collins, Stepan Company; and the chairman-elect was G. Robert Goss, Oil-Dri Corporation. All three served as editors of this publication.

Contents

Overview

The annual ASTM Symposium on Pesticide Formulations and Application Technology provides the only regular forum in which many sectors of the Agricultural Chemical industry can meet and exchange ideas, information, and technology. The various groups that attend come from academia, government, and industry. Some of the many specialties represented include application engineering, formulation chemistry, and, of course, the effect on biology of the synthesis of these two disciplines. Also extremely important are the regulatory issues dealing with how pesticides can be safely used and the development of testing methods to ensure product consistency. This annual Symposium is held under the auspices of the ASTM Committee E35 on Pesticides and is held in conjunction with the Fall meeting of the E35.22 Subcommittee on Pesticide Formulations and Application Systems.

The 16th Annual Symposium was held on November 14–15, 1995 in Norfolk, Virginia. As might be expected from such a multi-disciplinary subject, the topics of the presentations were wide ranging. This current STP, containing the papers accompanying some of these presentations, is loosely divided into four sections.

Formulation Technology

These five papers represent some of the more traditional aspects of a formulation chemist's task. Naylor reviews data on the environmental fate of nonylphenol ethoxylates. This also provides a perspective on the importance of the rapidly expanding discussion on the estrogen mimetic activity of various chemicals found in the environment. Frisch outlines the theoretical basis for solubility parameters, discusses some past uses of these parameters, and then shows how they can be applied to developing and optimizing an agricultural chemical formulation. Pallas and Riedemann provide a method of making water extendible suspension concentrates of highly water soluble materials. The last two papers by Becher and by Keeney and Valcore describe various tests and testing methods for formulations. Becher reviews tests used in developing emulsifiable concentrates and Keeney and Valcore describe a test for rainfastness, which is an important property for protective fungicide and insecticide formulations.

Application Technology

The last few years have seen the continuation of some long term trends in the Agricultural Chemical industry. One of these is the development of more highly active, and more highly specific, agricultural chemicals. The majority of these are labelled for post-emergence application. This has placed considerable emphasis on the optimization of the desired effects on the target and the minimization of undesired effects off of the target. Thus the minimization of drift is the theme of this section and the optimization of biological activity is the theme of the last section.

In the first paper, Dexter shows that even low concentrations of polymers that are used for spray drift control can interact with surfactants to cause changes in the extensional viscosity of the polymer solutions. Extensional viscosity has been shown by the Spray Drift Task Force to be a major factor in determining the droplet size spectrum of nozzle sprays. Dexter measures the extensional viscosity of polymer/surfactant mixtures and correlates it with

droplet size spectra. The Spray Drift Task Force also uses the FSCBG computer model to predict aerial spray drift. Teske et al. compare some predictions from this model to actual field trial data. The paper by Gaultney et al. also addresses the question of spray drift control but this time from ground sprayers. Various air-assisted sprayers are compared to conventional equipment. In the last paper in this section, Downer et al. address both spray drift control and optimization of biological activity by use of a novel "double nozzle" configuration.

Formulation Development

This section shows some of the wide variety of considerations needed to convert laboratory studies into finished formulations. The paper by Peterson et al. presents data on the decomposition of an avermectin and the effects of various solvents. The first paper by Keim describes some of the things that need to be considered in developing practical aerosol formulations. In his second paper he then shows how these formulations worked in a real application situation. Combellack outlines some of the difficulties in developing a test for foam markers. The effects of various environmental factors are discussed.

Adjuvants

As mentioned earlier, optimization of biological activity is becoming increasingly more important. The formulation chemist tries to address this issue by making changes in the formulation type and formulation ingredients in order to increase activity. Another approach is to add materials to the spray tank along with the formulation. These materials, which in some way affect ease of application, optimization of biological activity, reduction of environmental risk, etc., are loosely termed "adjuvants". The theme of the four papers in this section is how physico-chemical parameters of adjuvants might affect biological efficacy. Klima and Garst show that in order to predict the spontaneous spreading of liquids on surfaces such as leaves, the approach of Owens and Wendt, breaking down the surface tension into polar and dispersive components is more useful than the approach of Zisman. The first paper by Manthey et al. presents data showing the effect of nonionic surfactants on the spread of spray droplets for various leaf surfaces. Herbicidal activity, increased by the nonionic surfactants, was negatively correlated with droplet spread, showing that there are other controlling factors in the systems described. Nalewaja considers the effect of spray retention, as affected by nonionic surfactants, on herbicidal activity. Results show that while the surfactants greatly influence spray retention, there is no general correlation with herbicidal activity. Finally, the second paper by Manthey et al. shows that solutions of nonionic surfactants themselves can cause foliar injury to crops, cuticle damage, as well as cell membrane disruption. Again there was no correlation of injury to droplet spread data.

EDITORS NOTE: The editors would like to thank the authors, reviewers, and in particular the ASTM personnel who have made this publication possible.

THE EDITORS

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