

PESTICIDE FORMULATIONS

and Application Systems

**Thirteenth
Volume**

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Pesticide Formulations and Application Systems: 13th Volume

*Paul D. Berger, Bala N. Devisetty, and Franklin R.
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Foreword

This publication, *Pesticide Formulations and Application Systems 13th Volume*, contains papers presented at the symposium of the same name, held in Miami, FL on 18–19 Nov 1992. The symposium was sponsored by ASTM Committee E-35 on Pesticides and its Subcommittee E-35.22 on Pesticide Formulations and Application Systems. Paul D. Berger of the Witco Corporation in Houston, TX, Bala N. Devisetty of Abbott Laboratories Research Center in Long Grove, IL, and Franklin R. Hall of the Ohio State University in Wooster, OH presided as symposium chairmen and are editors of the resulting publication.

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Overview

The 13th Symposium on Pesticide Formulations and Application Systems was composed of 34 papers of which 30 will be reproduced in this Special Technical Publication (STP). The symposium provided a gathering place for those involved in the industry to exchange ideas and improve their understanding of various issues they are currently faced with or will be faced with in the future. We were pleased to have in attendance and on the program several foreign guests who shared their views with the audience. The subjects covered at the Symposium and in this volume involve a wide range of disciplines that will be of interest to formulators, basic pesticide manufacturers, applicators, and suppliers to the agrochemical industry. It is a compilation of the latest developments emerging from industrial and academic research, government regulatory agencies, and ASTM subcommittee task force groups. Many of the papers relate to safer and more efficient uses of pesticides. This is in keeping with the objectives of ASTM Committee E-35 on Pesticides and its Subcommittee E35.22 on Pesticide Formulations and Application Systems who were the sponsors and organizers of the symposium and the 12 others that preceded it.

Several of the papers presented at the 13th Symposium and not included in this volume involved various aspects of government regulations. Dr. John McCarthy, Vice President of Global Scientific and Regulatory Affairs for the National Agricultural Chemicals Association discussed the impact of the European Common Market on technology and regulations in his keynote address to the more than 275 attendees. Dr. McCarthy described the attempt of the various European nations to form uniform standards pertaining to the regulation of pesticides and inert ingredients. Inerts are to be redefined as coformulants or adjuvants. Synergists and safeners will be considered active ingredients and subject to a more stringent regulatory and approval process.

Dr. David L. Schertz, Chief Agronomist for the U.S. Department of Agriculture, Soil Conservation Service, described the impact of conservation compliance and crop residue management. Dr. Schertz explained how new government policies on soil conservation, most notably no-till practices, will effect the way pre-emergent formulations are developed and applied to the soil. He cited several examples of dramatic improvement in soil erosion control, moisture loss control, and soil quality improvement brought about by crop residue management.

Dr. James S. Namnath spoke of fire safety of emulsifiable liquids. He addressed methods of evaluating solvents for potential fire hazards and the interpretation of flash point data by different regulatory agencies. Also, the economic impact of various new packaging, transportation, and warehousing rules were discussed.

This volume will be divided into four main sections: (1) Formulation Technology, (2) Spray Droplet Characteristics and Application Technology, (3) Water Dispersible Granules, and (4) Controlled Release Technology.

Formulation Technology

This section includes papers on the properties and advantages of various ingredients and methods of optimizing and evaluating formulations. Kassebaum describes a means of obtaining low-foaming glyphosate formulations using acetylenic surfactants as defoamers. Leung

and Webster describe a field trial using two adjuvants to determine rain-washing characteristics of glyphosate formulations. Rebmann and Fiquet describe a means of studying and optimizing pyrethroid microemulsions using ternary phase diagrams. Bothast, Schisler, Jackson, VanCauwenberge, and Shninger present a method they developed to improve the storage and efficacy upon spraying biocontrol agents using nutrient amendments and pregelatinized starch. Narayanan, Singh, and Chaudhuri show how copolymers of vinyl pyrrolidone and methyl vinyl ether maleic acid esters can be used in formulations to reduce the leaching of herbicides such as atrazine, dicamba, and metolachlor into soil. Hazen reintroduces guar gum as an ingredient to be considered for the control of formulation rheology. In another study involving rheology, Dexter and Szamosi discuss the relation of the pourability of suspension concentrates to their viscoelasticity. The rinsing properties of several systems are also considered with implications to container disposal. Memula, Jimenez, and Berger discuss their studies on the effect of polyethylene glycol on the adsorption of large block copolymers at the surfaces of suspended solids and the implications of this phenomena on the stability of concentrated suspensions. Skelton shows how fatty acid methyl esters can be used to produce high active microemulsion concentrate formulations and also how these esters can replace some or all of the solvent that would normally be used in these formulations. Sandler and Verbelen discuss the effect of various commonly used agricultural solvents on container material. This work serves as a guide to selecting the proper solvent/container pair for optimum performance, stability, and safety. Becher uses statistical methods to design experiments aimed at optimizing the formulation of a dry herbicide.

Spray Droplet Characteristics and Application Technology

This section includes papers on the selection of the proper equipment for spray application and the fate of droplets in-flight and after impinging on their target. Several studies relating the effect of surfactants on droplet characteristics are also described. Berger and Berger have developed a method of measuring droplet sizes and interfacial tensions for oil/water systems under dynamic conditions. Their paper describes how surfactants and mixing order effects droplet size. Ozkan, Reichard, Zhu, and Akerman evaluate the effect of drift-retardant compounds on droplet size, drift, and spray patterns. Their work is of use in evaluating the importance of these new adjuvants and selecting the one that is most effective. Hall, Thacker, and Downer discuss the effect of in-flight evaporation, equilibrium, and dynamic surface tension for a series of adjuvant solutions on their spreading characteristics. Downer, Hall, Escallon, and Chapple look into the effect of various concentrations of insecticide in oil on their atomization properties using electrostatic atomization. Salyam reports on his study involving the degradation of fluorescent dyes used to monitor spray applications. Sundaram, Leung, and Devisetty report on the rain fastness on various *Bacillus thuringiensis* formulations deposited on conifer foliage. Taylor, Chapple, and Hall have developed a simulation model for dose transfer of insecticides that may help improve the efficiency of application techniques by providing a better understanding of the underlying factors involved. Sanderson, Hewitt, Huddleston, Devisetty, Melchoir, and Ross have applied wind-tunnel studies on *Bacillus thuringiensis* formulations to predict droplet size spectra. Wang, Zhang, Slocombe, and Kuhlman have measured the uniformity of sprays using Fast Fourier Transform (FFT) spectra and have found good agreement with visual observation. Krishnan, Seemans, Gottfried, and Kemble have used process control charts to evaluate the performance and degradation of spray nozzles. Their work is useful in predicting useful nozzle lifetime.

Controlled Release Technology

This section describes recent advances in the development of materials and processes to control the release of agrochemicals to the environment or intended target Wing, Carr, and Doane describe a continuous method for producing starch-encapsulated herbicides Latheef, Dailey, and Franz have used sulprofos microencapsulated with various polymers to study the efficacy of each polymer system against tobacco budworm on cotton Levy, Nichols, and Miller describe the use of superabsorbent polymer/pesticide compositions for use against aquatic and household insects Meyers, Greene, and Springer have developed unique microcapsules to control the release of pesticide and reducing leaching These polymers are designed to release their contents through seasonal changes in soil temperature

Water Dispersible Granules

This section contains studies on means of improving the formulation techniques and measuring the effectiveness and physical properties of water-dispersible granules Delli Colli describes a unique method of screening WDGs employing coated glass plates to determine relative wettability and dispersibility Gerety provides a review of the current practices for making WDGs Munie describes advances in formulating non-traditional pesticides such as low melters and highly volatile technicals into WDGs Haggard describes a method of determining the dynamic granular dispersibility of WDGs using a laser particle size instrument Fu, Chaudhuri, and Narayanan have developed graft and copolymers of vinyl pyrrolidone that are designed to be used as binders for water-dispersible granules

I believe the reader will agree that the papers described above provide adequate support that the 13th Symposium on Pesticide Formulations has met its objectives I extend my thanks to all the authors, moderators, and reviewers and to Drs. B. Devisetty and F. Hall, my cochairmen, for making the Symposium a success and this STP a reality

Paul D. Berger

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chairman and editor

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