

Industry News

Dicarboximide Research and Management Goals and Their Implementation in North America. Bryan R. Delp, BASF Corporation, Parsippany, NJ 07054

The following research and use management goals for dicarboximides in North America reflect the consensus of discussions held during the North American Fungicide Resistance Workshop and Conference (Plant Disease, Vol. 71, p. 1156). These goals and the recommendations for implementing them are not presented in a specific order implying importance or sequence of execution, since many activities are related and interdependent. Non-North American experiences have been incorporated into the goals and should be included in future considerations.

1. Identify the most effective use strategies to delay or prevent resistance development. (A) Determine the effects of rate, timing, and spray deposition on resistance development on strawberry, stone fruit, grape, and greenhouse crops. (B) Determine the efficacy of dicarboximides in the presence of various proportions of resistant strains. (C) Explore the effects of companion materials on resistant population dynamics and disease control. (D) Develop and implement distinct regional strategies. (E) Develop models of population dynamics to integrate the above factors and help anticipate the effects of resistance management strategies.

2. Characterize field populations of dicarboximide-resistant strains of Botrytis and Monilinia. (A) Identify the genetic control and biochemical mode of resistance. (B) Determine the levels of resistance and their relative virulence. (C) Further define the overall fitness and fitness factors of resistant populations selected from the field relative to wild-type (sensitive) populations. (D) Determine the effects of dicarboximides and/or companion fungicides on the pathogenicity of selected resistant isolates. (These studies are more meaningful to strategy development if field-resistant isolates are used, but development of field resistance in experimental plots or introduction of laboratory- or greenhouse-derived resistant isolates into the field must be avoided.)

3. Establish comprehensive monitoring programs. (A) Simplify monitoring techniques to be more rapid, less expensive, and less labor-consuming. (B) Establish resistance monitoring programs for Botrytis in strawberry, grape, and greenhouse crops and for Monilinia in stone fruit. (C) Validate monitoring methods. (D) Link some product uses to monitoring programs.

4. Incorporate nonfungicide disease control measures with dicarboximide use. (A) Recommend cultural practices and resistant varieties to reduce disease pressure. (B) Integrate resistance models with other systems that predict disease, pests, plant growth, etc. (C) Integrate a resistance monitoring system into other management/monitoring practices.

5. Promote interindustry cooperation and industry/regulatory agency/academia communication. (A) Establish guidelines for cooperation. Traditionally competitive companies must determine how and when they will act in concert and agree to adhere to consensus decisions. (B) Establish common use patterns for dicarboximides. (C) Develop common label statements to warn of resistance and restrict the use of other dicarboximides with cross-resistance. (D) Establish a North American, dicarboximide, FRAC working group. (E) Communicate to regulatory agencies the importance of their cooperation in resistance management. (F) Provide educational material about resistance management. (G) Promote presentations and discussion sessions on resistance at professional meetings.

Although many of these goals also apply to other fungicide classes, they are particularly important to the management of dicarboximide resistance in North America. Successful implementation of these goals relies on the constant awareness and cooperation of all involved with fungicide use---from the manufacturer to the end user. The ultimate solution is careful and responsible use of dicarboximides in an effective manner that will preserve their usefulness for future needs.

Instructions to Authors

General. Submit the original and two copies of the manuscript on 8 1/2 × 11 in. (216 × 279 mm) line-numbered paper and three sets of each figure. All material must be typed double-spaced: title, by-line, abstract, text, literature cited, figure legends, and tables. In the upper right corner of each page, type PLANT DISEASE, the author(s) name(s), and the page number. Number the pages consecutively. Acknowledgments follow the text, then literature cited, figure legends, and tables (each table on a separate page). Authors are encouraged to deposit voucher cultures and specimens documenting their research at recognized institutions and to cite the place of deposit. Manuscripts from symposia at annual meetings of The American Phytopathological Society may be submitted. Chairmen of symposia are responsible for contacting the Editor-in-Chief before the symposia are presented. Symposia manuscripts are subject to the review process and to the policies, procedures, and charges applied to articles submitted for the Research and the New Diseases and Epidemics sections. Guidelines for electronic processing of manuscripts accepted for publication are available from the PLANT DISEASE Editorial Office.

Format. Consult the Research and the New Diseases and Epidemics sections of current issues for arrangement of heads and subheads, use of capital letters, etc.

Title. The title should reflect the important aspects of the article and be as concise as possible.

By-line. Authors' names should be followed by affiliations and addresses.

Abstract. Solid lines should separate the by-line material from the abstract and the abstract from the text. The complete citation for the article should appear between the word "ABSTRACT" and the text of the abstract. The abstract should be as brief as possible—100 words or fewer for Research articles and 50 words or fewer for New Diseases and Epidemics articles. Content should be limited to major findings and conclusions.

Text. The major sections after the introductory statements are MATERIALS AND METHODS, RESULTS, and DISCUSSION; RESULTS and DISCUSSION may be combined. Subheads may be used, but excessive fragmentation of the text should be avoided. Footnotes are not permitted. Tables and figures must be cited in numerical order.

Disease Notes. The Disease Notes section is intended to encourage early reporting of new diseases, significant outbreaks or changes in geographic location of diseases, new pathological races and hosts, and other important observations. The main objectives are 1) to provide a repository for observations of the sort important to diagnosticians, field advisors, and researchers and 2) to encourage condensed reporting of disease observations while preserving integrity and prestige of the reports. A brief statement explaining the significance or newsworthiness of the report must accompany each Disease Note; submit the original and two copies of both the report and the statement. The report—title, authors and affiliations, text, and references—must be typed double-spaced within the prescribed space (16.5 × 17.5 cm, 20 typewritten lines) on the Disease Note form (available from the PLANT DISEASE Editorial Office); tables and illustrations are not used. The title should include disease, pathogen, host, and, when appropriate, geographic location. In the text, authorities should be provided for all scientific names of pathogens and hosts. A maximum of two journal references may be included and should be cited by number in the text; the abbreviated format precludes references to publications other than journals. For reports of new diseases or new hosts, the rules of proof of pathogenicity (Koch's postulates) should be completed when appropriate and the

causal agent identified to species. For style and format, consult current issues of PLANT DISEASE.

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Figures. Illustrations must be originals and of high quality. Glossy prints should be clear and cropped at right angles to show only essential details. A 1:1 (same-size) reproduction is preferred, particularly for electron micrographs. The widths for same-size reproductions are: one column—55 mm (2 3/16 in.); two columns—117 mm (4 5/8 in.); three columns—178 mm (7 in.). The maximum depth, including figure caption, is 250 mm (10 in.). A scale bar should be included on the photo. Composite photographs should be mounted on hard cardboard, with the edges in contact (thin spaces will be inserted between photographs during processing). Composites should be matched for similarity of contrast, background density, and content; line drawings and photographs should not be combined. Line drawings should be made by a competent draftsman and be either originals or glossy prints. Ordinates and abscissas should be marked with index lines. Same-size line drawings save time, labor, and production costs. Numbers and lettering (uppercase and lowercase) on same-size illustrations should be in 10 pt sans serif type, except figure designations (A, B, C, etc.), which should be capital letters in 18 pt sans serif type; the lettering is available in art supply stores. Prints with poor alignments, blurred lines, or out-of-focus letters and symbols will not be accepted. By special arrangements for illustrations in which detail is extremely important, high-quality photographs can be printed on glossy paper. Requests for this special printing must be made when the article is submitted; costs for the extra handling will be determined on an individual basis.

Each illustration should be labeled with the figure number, author's name, and PLANT DISEASE. Figure captions should be fully descriptive so that the illustrations are understandable when considered apart from the text.

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Editorial style. After acceptance for publication, manuscripts are edited for style, grammar, clarity of presentation, and preciseness and conciseness of statements. Preferred spellings are according to *Merriam-Webster's Dictionary*. Helpful reference books are *CBE Style Manual* and *The ACS Style Guide*.

The metric system is required; alternate units may be given in parentheses after the metric. Use numerals before standard units of measurement, e.g., 1 g, 9 hr; otherwise use words for numbers one through nine and numerals for larger numbers. Nonstandard abbreviations that facilitate comprehension may be used; at the first use, spell out the term and enclose the abbreviation in parentheses. Words to be italicized should be underlined. The scientific names of higher plant taxa should be given with the authorities at first mention in a manuscript; the list of plant names prepared by Terrell et al (8) is helpful. It is recommended, but not mandatory, that authors use the proposed common names of plant diseases (PLANT DISEASE 69:649, 1985). A fungicide should be listed by the approved common name, followed, if desired, by the trade name in parentheses (the common name is used thereafter in the text); the chemical name is used only if a common name is not

available. Ambiguous characters—e.g., the letter O and the number 0, a prime sign and an apostrophe, the letter l and the number 1, the multiplication symbol \times and the letter X—should be clearly identified in the left margin of the text.

Statistical methods. The *appropriate* statistical procedure should be used for analyzing and summarizing data. The analysis should be carefully selected after considering the original experimental design, the treatment design, and all factors that may have affected the experiment, e.g., missing data. Several procedures are appropriate for separating treatment means (1,2), and several uses of mean separation procedures are inappropriate (3-7). The following (from *Agronomy Journal* 75:1059) are considered inappropriate:

1. Using multiple range tests or other pairwise procedures when treatments have an obvious structure and/or when planned single degree of freedom contrasts were built into the experiment;

2. Using multiple range tests or other pairwise procedures to compare means from quantitative treatments such as rates of fertilizer, plant density, seeding rates, or time [plant pathologists would include fungicide rates, temperature ranges, etc.];

3. Comparing factorial treatment combinations by multiple range tests without consideration of the estimation of main effects and interactions.

In the words of W. H. Swallow (7): "Which mean separation procedure one elects to use—when it is appropriate to use one—is *far* less important than knowing when they are *all inappropriate*. The key to deciding when they are all inappropriate lies in the treatment design."

LITERATURE CITED

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