

**M. Freeling
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Editors**

The Maize Handbook



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Editors

The Maize Handbook

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The Maize Handbook

Preface

The Maize Handbook represents the collective efforts of the maize research community to enumerate the key steps of standard procedures and to disseminate these protocols for the common good. Although the material in this volume is drawn from experience with maize, many of the procedures, protocols, and descriptions are applicable to other higher plants, particularly to other grasses.

The power and resolution of experiments with maize depend on the wide range of specialized genetic techniques and marked stocks; these materials are available today as the culmination of nearly 100 years of genetic research. A major goal of this volume is to introduce this genetical legacy and to highlight current stock construction programs that will soon benefit our work, e.g. high-density RFLP maps, deletion stocks, etc. Both stock construction and maintenance are relatively straightforward in maize as a result of the ease of crossing and the longevity of stored seeds. Crossing is facilitated by the separate staminate (tassel) and pistillate (ear) flowers, a feature almost unique to maize. On the other hand, many of the genetic methodologies utilized with maize, including the precision of record keeping, can be adapted to other plants.

Facile communication and a spirit of co-operation have characterized the maize genetics community since its earliest days. Starting in the 1930s, institutions such as annual Maize Genetics Cooperation Newsletter, the Maize Genetics Stock Center, and the annual maize genetics meeting provide continuity to the field. Each of these institutions allows geneticists to exchange information, to critique each others work, and to benefit from the enthusiasm, experience and expertise of others in their field. *The Maize Handbook* is clearly an extension of this desire on the part of maize geneticists, and embraced by nongenetical maize researchers as well, to share and to aid the progress of others; in modern times, the view that other scientists are cooperators rather than competitors is unusual, but it is a key part of the maize community of scholars.

The Maize Handbook covers five areas: cell biology, developmental morphology, genetic manipulations, tissue culture techniques, and molecular biology techniques. In consultation with expert section editors—Professors Jim Birchler, Ron Phillips, R. Scott Poethig, Anne Sylvester, and Sue Wessler—we developed a chapter outline and suggested authors. Without exception, each potential author contacted agreed to provide the materials requested.

We have tried to make *The Maize Handbook* comprehensive in its coverage. There are several reference books that complement this volume. Chief among these is the annual edition of the Maize Genetics Cooperation Newsletter (MNL) in which new genetic map information and reports on gene isolation, gene action and genetic methodologies are reported in a “from the notebook” format. Maize research is a dynamic field, and it is impossible to be well informed without access to the Newsletter. For subscription

information, contact Dr. E. H. Coe, Editor, Maize Genetics Cooperation Newsletter, USDA-ARS, Curtis Hall, University of Missouri, Columbia MO 65211.

A group of inexpensive books (total cost about \$400) would also be part of a robust personal or laboratory library, but should certainly be in an institutional library for easy reference.

1. The new edition of *Mutants of Maize*, by M. G. Neuffer, E. H. Coe, and S. Wessler due from Cold Spring Harbor Press in 1994. Color illustrations of visible mutants (naked eye polymorphisms) and cytogenetic stocks; molecular maps of cloned genes are also included.
2. *Corn and Corn Improvement*, 1988, third edition, G. F. Sprague and J. W. Dudley, eds. American Society of Agronomy, Madison WI. This volume contains comprehensive genetic and cytogenetic information as well as more practical chapters on corn diseases, pests and agronomic practice.
3. *Discussions in Cytogenetics*, second edition, 1992, by C. R. Burnham, Alpha Editions, Edina MN, 55435. Classical text with a dateline of about 1959. Maize research is highlighted, and presented in detail, with complete citations.
4. *Modern Corn Production* by S. R. Aldrich, W. O. Scott and E. R. Leng, 1975, second edition. A & L Publications, Champaign, Illinois. Useful reference on field practices with color illustrations.
5. *Maize Diseases* by D. C. McGee, 1988. APS Press, St. Paul, Minnesota. Paperback book with color illustrations on disease and nutritional deficiencies.
6. *The Structure and Reproduction of Corn*, 1949, by T. A. Kiesselbach. Nebraska Agric. Exp. Station Research Bulletin. Observations of the plant and its developmental stages are illustrated with light micrographs and camera lucida drawings. A short but classic paperback.
7. *Anatomy of Seed Plants*, second edition, 1977, by K. Esau, John Wiley & Sons, New York. Maize is among the featured species.
8. *Compilation of North American Maize Breeding Germplasm*, 1993. Authors: J. T. Gerdes, C. F. Behr, J. G. Coors, and W. F. Tracy. Editors: W. F. Tracy, J. G. Coors, and J. L. Geadelmann. Published by Crop Science Society of America, Madison, Wisconsin. This paperback lists the history of lines, and is useful in determining the likelihood of shared parentage in genetic stocks.
9. *The Discovery and Characterization of Transposable Elements*, 1987, by B. McClintock. The collected papers of Barbara McClintock. Garland Publishing, Inc., New York.

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