

**SEED PURITY  
AND TAXONOMY**

# **SEED PURITY AND TAXONOMY**

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*Application of Purity Testing Techniques  
to Specific Taxonomical Groups of Seeds*

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**Doris Baxter *and* Lawrence O. Copeland**

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Finally, we wish to acknowledge the major sources from which much of the information (seed images, keys, seed descriptions, general information, etc.) in this book was taken. These major sources are found in the bibliography near the end of this book and include the following:

- Justice, O. L. (Ed.) 1952. Manual for Testing Agricultural and Vegetable Seeds. PMA, Plant Industry. Agr. Handbook No. 30, illus., Washington, D.C., 441 pp.
- Musil, Albina F. 1963. Identification of Crop and Weed Seeds. AMS Agr. Handbook No. 219, Washington, D.C., illus., 43 Plates, 171 pp.
- Hitchcock, A. S. 1950. Manual of the Grasses of the United States. Misc. Pub. No. 200, Washington, D.C., 1051 pp.
- Reed, Clyde F. 1977. Economically Important Foreign Weeds: Potential Problems in the United States. ARS, Agr. Handbook No. 498, APHIS, illus. Washington, D.C., 746 pp.
- Martin, A. C. 1946. The comparative internal morphology of seeds. *The American Midland Naturalist* (University of Notre Dame, South Bend, IN) 36(3):513-660.

## Seed Images

Over 2,500 seed images appear in this book, most of which represent sketches prepared by U.S. Department of Agriculture artists during the early 1900s. These have appeared in various USDA publications and have become a part of the public domain. A smaller part of the images were scanned from actual seeds by a flatbed scanner and decolorized for use in this book. Others were provided by friends and are identified in the images. A few images were scanned from copyrighted publications and are used by permission from the publisher. In a small number of cases, we have been unable to identify the original source from which these images were obtained. We apologize for any unauthorized use of images where our efforts to identify and recognize original sources were unsuccessful. A complete list of these sources may be obtained by contacting the publisher.

## Abbreviations

While it is recognized that many plant species are important for more than one reason, notations are used following the Latin name in seed lists throughout the text to indicate the principle use or importance of each species discussed as follows:

|    |   |
|----|---|
| *  | economically important foreign weed (introduced into North America) |
| A  | an agricultural species   |
| F  | flower  |
| H  | herb  |
| O  | ornamental  |
| R  | range   |
| S  | shrub   |
| T  | turf  |
| Tr | tree  |
| V  | vegetable   |
| W  | weed (common)   |
| X  | noxious weed  |

## Preface

The original *Handbook of Seed Testing*, or more properly, ‘Testing Agricultural and Vegetable Seeds’ was published as Handbook 30 in 1952 by the Agricultural Marketing Service of the United States Department of Agriculture under the general supervision of Dr. Oren L. Justice. This landmark publication served to inspire and enlighten generations of analysts, students, and laypersons in the science and art of seed testing and is a tribute to Dr. Justice and his team of talented botanists and seed analysts from the United States Federal Seed Laboratory. In addition to its coverage of basic botany, morphology, and physiology, it stood alone for many years as the basic compendium of information on seed testing procedures. Finally, it combined all of this with helpful taxonomical keys and seed descriptions. However, perhaps its most valuable feature has been that it brought together photographic plates containing the drawings of seeds of plant species most likely to be confronted by seed analysts throughout the United States and Canada. These attributes allowed this book to remain the single most helpful educational resource available to seed analysts and the seed testing community for generations.

Notwithstanding the value of the original Handbook 30 in the annals of seed testing, it has been out of date for over 40 years. Thus, there have been many calls for the publication of a comprehensive, up-to-date publication that would fill this void and supply the need for an updated handbook of seed testing. In the meantime, the need has been met in two primary ways. First, the seed testing organizations (AOSA and ISTA) have published a series of single-subject handbooks covering various aspects of seed testing. Second, AOSA and SCST have published a comprehensive Teaching and Training Manual which has helped fill this void. Although it has been designed for the beginning analyst, the updated version promises to be valuable to both beginning and experienced analysts.

The vision for this book (*Seed Purity and Taxonomy*) originated in the early 1970s when it became clear to the authors that Handbook 30 needed to be revised, enlarged, and updated. The senior author was at that time Analyst-In-Charge of the Federal Seed Laboratory at Sacramento, California, and approaching retirement. However, with her long experience in seed testing and her background in botany at the University of Michigan (M.A., Botany), along with her many years of teaching federal seed testing workshops and training analysts, she wanted to pass on her expertise to successive generations of future analysts.

This book is largely an application of purity testing procedures to specific groups (families) of seeds. It presents a taxonomically oriented coverage and incorporates the insights, experience, and special talents developed by the senior author throughout her long career in seed testing. It contains illustrations of most of the crop and weed species encountered in purity testing. This includes most of the drawings originally published in USDA Handbook 30; drawings and photographs available from the public domain; and others contributed by friends in the seed testing community. Special recognition is given to those (some modified) from Deborah Meyer, Laboratory Supervisor and Senior Seed Botanist, and James Effenberger, Senior Seed Botanist, Department of Food and Agriculture Seed Testing Laboratory, whose excellent photographs of seeds are well known to analysts in their teaching workshops. Finally many additional illustrations are included of decolorized flat-bed scans by the method suggested by Dr. Miller B. McDonald of The Ohio State University. The authors hope that this book will help meet the needs of the seed testing community and be valuable to analysts-in-training, to experienced analysts, to students, and other laypersons in and out of the seed industry.

Like most exhaustive references, this book borrows extensively from past publications. Of particular value were the works of Justice (ed), Hitchcock, Munz, and Musil. Although the authors have tried to credit these sources where appropriate, seed images as well as descriptive and geographical information about plants and seeds discussed have been used from these pre-existing references and rearranged to fit the purposes of this book. However, a careful attempt has been made to put these into the context of the purity testing routine, as well as to provide analysts with information about the plants and species tested.

Finally, the authors are indebted to the past work of the team of very talented seed artists, particularly the drawings of F. H. Hillman, Helen H. Henry, Albina F. Musil, and Regina H. Hughes whose drawings have educated and inspired generations of analysts in the art and science of seed testing. It is to their memory that this book is dedicated.