
PRINCIPLES OF CULTIVAR DEVELOPMENT

VOLUME 2

Crop Species

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Iowa State University

with the assistance of

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*To all plant breeders who contribute to the education of others by
generously sharing their practical experiences in cultivar development.*

Contents

Preface	ix
Contributors	xi
One • General Principles	1
Walter R. Fehr	
Two • Alfalfa	11
Richard R. Hill, Jr.	
Three • Apomictic Grasses	40
E. C. Bashaw and C. Reed Funk	
Four • Barley	83
A. Earl Foster	
Five • Cotton	126
Joshua A. Lee	
Six • Forage Grasses	161
David A. Sleper	
Seven • Forage Legumes	209
Norman L. Taylor	
Eight • Maize	249
Arnel Roy Hallauer	
Nine • Oat	295
C. M. Brown and R. A. Forsberg	
	vii

Ten • Peanut	346
David A. Knauft, Allan J. Norden, and Daniel W. Gorbet	
Eleven • Potato	385
Robert W. Hoopes and Robert L. Plaisted	
Twelve • Rapeseed and Mustard	437
R. K. Downey and G. F. W. Rakow	
Thirteen • Rice	487
Kent S. McKenzie, Charles N. Bollich, J. Neil Rutger, and, Karen A. Kuenzel Moldenhauer	
Fourteen • Soybean	533
Walter R. Fehr	
Fifteen • Sugar Beet	577
Garry A. Smith	
Sixteen • Sunflower	626
Jerry F. Miller	
Seventeen • Tobacco	669
E. A. Wernsman and Rebeca C. Rufty	
Eighteen • Wheat	699
R. E. Allan	
Index	749

Preface

The commercial production of any plant species depends on the availability of cultivars that meet the needs of the producer and the consumer. The quest for new cultivars is a continual process due to the demand for greater productivity, higher quality, more resistance to pests, and other desired characteristics.

To design a strategy for cultivar development that makes the most efficient use of available resources, a plant breeder must choose from an array of alternative breeding methods. The choice is facilitated by learning from the experience of others who have successfully developed superior cultivars. In this book, successful plant breeders share their experiences and that of their colleagues. They provide a step-by-step description of the process of cultivar development for a crop species, discuss the alternative strategies that are available at each step of the process, and describe those strategies that have been used most successfully.

Crop species were chosen for this book to represent the major types of cultivars that are grown commercially. The development of asexually propagated cultivars, pure-line cultivars, synthetics, multilines, and hybrids are described in one or more of the chapters. Collectively, the chapters describe the application of all breeding methods that are currently used by plant breeders for cultivar development.

The initial stimulus for preparing the book was provided by the students in my plant breeding class at Iowa State University. In the class notes that became a part of Volume I of *Principles of Cultivar Development*, some descriptions were included as to how cultivars of several species had been developed. The students indicated that they found the descriptions useful for understanding the entire cultivar development process from start to finish and for understanding the theoretical aspects of plant breeding. They found it helpful to compare different breeding

methods by examining how each was applied in the successful development of a cultivar.

Recent books that describe the methodologies employed in molecular and cellular studies of plants have been a valuable source of information to plant breeders interested in using these means to improve the efficiency and effectiveness of cultivar development. Similarly, *Principles of Cultivar Development* is intended to provide molecular and cellular biologists with detailed information on breeding methodologies they can use to establish research goals that will contribute to the genetic improvement of crop species.

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I am grateful to the many persons who contributed unselfishly of their time to make this book a reality: to the authors, who generously shared their many years of experience in plant breeding, utilized the experience of their colleagues in presenting a broad view of cultivar development for a crop species, patiently used the outline they were asked to follow in preparing their chapters, and gave serious consideration to the suggestions of the persons who reviewed their manuscripts; to the many plant breeders, who graciously provided information to the authors and reviewed the chapters; to the publication editors, Sarah Greene and Gregory Payne, who provided excellent technical assistance to the editor and the authors; and to my wife Elinor and to Holly Jessen, who made major contributions by drafting figures, typing information, indexing, and proofreading the book.

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