

# Contents

Industry highlights boxes, vii  
Industry highlights box authors, ix  
Preface, xi  
Acknowledgments, xiii

## Part I Underlying science and methods of plant breeding, 1

### Section 1 Historical perspectives and importance of plant breeding, 2

1 History and role of plant breeding in society, 3

### Section 2 General biological concepts, 16

2 The art and science of plant breeding, 17  
3 Plant cellular organization and genetic structure: an overview, 35  
4 Plant reproductive systems, 55

### Section 3 Germplasm issues, 74

5 Variation: types, origin, and scale, 75  
6 Plant genetic resources for plant breeding, 87

### Section 4 Genetic analysis in plant breeding, 108

7 Introduction to concepts of population genetics, 109  
8 Introduction to quantitative genetics, 121  
9 Common statistical methods in plant breeding, 146

### Section 5 Tools in plant breeding, 163

10 Sexual hybridization and wide crosses in plant breeding, 164  
11 Tissue culture and the breeding of clonally propagated plants, 181  
12 Mutagenesis in plant breeding, 199  
13 Polyploidy in plant breeding, 214  
14 Biotechnology in plant breeding, 231  
15 Issues in the application of biotechnology in plant breeding, 257

### Section 6 Classic methods of plant breeding, 281

16 Breeding self-pollinated species, 282  
17 Breeding cross-pollinated species, 313  
18 Breeding hybrid cultivars, 334

### Section 7 Selected breeding objectives, 351

19 Breeding for physiological and morphological traits, 352  
20 Breeding for resistance to diseases and insect pests, 367  
21 Breeding for resistance to abiotic stresses, 385  
22 Breeding compositional traits and added value, 404

### Section 8 Cultivar release and commercial seed production, 417

23 Performance evaluation for crop cultivar release, 418  
24 Seed certification and commercial seed multiplication, 435

- 25 International plant breeding efforts, 450
- 26 Emerging concepts in plant breeding, 462

Part II Breeding selected crops, 471

- 27 Breeding wheat, 472
- 28 Breeding corn, 485
- 29 Breeding rice, 498
- 30 Breeding sorghum, 509
- 31 Breeding soybean, 519
- 32 Breeding peanut, 529
- 33 Breeding potato, 537
- 34 Breeding cotton, 546

Glossary, 556

Appendix 1: Internet resources, 561

Appendix 2: Conversion rates, 563

Index 564