



# **STRATEGY & APPLICATION OF PLANT BREEDING**

**Dr. Khushboo Chandra  
Dr. S. K. Kaushik  
Dr. Devendra Kumar Payasi**

**Kripa Drishti Publications, Pune.**

# STRATEGY & APPLICATION OF PLANT BREEDING

## Editors

### **Dr. Khushboo Chandra**

Assistant Professor (Genetics & Plant Breeding)  
Bihar Agricultural University, Sabour, Bihar.

### **Dr. S. K. Kaushik**

Senior Scientist (PBG) RVSKVV,  
Gwalior MP.

### **Dr. Devendra Kumar Payasi**

Scientist & In-charge AICRP (Linseed)  
JNKVV-Regional Agriculture Research Station,  
Sagar, Madhya Pradesh.

## Co-Editors

### **Richa Panwar**

Research Scholar  
Department of Genetics & Plant Breeding,  
SGT University, Haryana.

### **Karthik Chittibomma**

Research Scholar,  
Department of Genetics & Plant breeding,  
College of Agriculture Central Agriculture University,  
Imphal, Manipur.

### **Dr. Manoranjan Biswal**

Junior Researcher,  
Department of Genetics and Plant Breeding,  
JNKVV, CoA, Jabalpur.

**Kripa-Drishti Publications, Pune.**

**Book Title: Strategy & Application of Plant Breeding**

**Editors: Dr. Khushboo Chandra, Dr. S. K. Kaushik,  
Dr. Devendra Kumar Payasi**

**Co-Editors: Richa Panwar, Karthik Chittibomma,  
Dr. Manoranjan Biswal**

**Price: ₹675**

1<sup>st</sup> Edition

**ISBN: 978-81-968830-0-3**



**Published: April 2024**

**Publisher:**



© Copyright Dr. Khushboo Chandra, Dr. S. K. Kaushik, Dr. Devendra Kumar Payasi, Richa Panwar, Karthik Chittibomma, Dr. Manoranjan Biswal

All Rights Reserved. No part of this publication can be stored in any retrieval system or reproduced in any form or by any means without the prior written permission of the publisher. Any person who does any unauthorized act in relation to this publication may be liable to criminal prosecution and civil claims for damages. [The responsibility for the facts stated, conclusions reached, etc., is entirely that of the author. The publisher is not responsible for them, whatsoever.]

## **PREFACE**

The agriculture industry has radically transformed over the past 50 years. Advances in machinery have expanded the scale, speed, and productivity of farm equipment, leading to more efficient cultivation of more land. Seed, irrigation, and fertilizers also have vastly improved, helping farmers increase yields. This book covers technologies that are extremely useful for the day-to-day operation of a farm or garden. The potential of new digital technologies in agriculture is astonishing. Linking farmers digitally would allow them to organize and share equipment, facilitate the sharing or exchanging of fields and support alternative supply and production channels, as well as promoting solidarity.

Everything that can be measured can be improved. The agricultural plots are managed on the basis of observation, measurement and action against inter and intra-crop variability. Based on this reflection, agricultural experience is also gradually growing hand in hand with technology. Its smart tools and services enable the development of true precision agriculture. The precision-agriculture approach can also help reduce inefficiencies and waste. It works by refining current practices and does not encourage the exploration of alternatives. This is what scientists call "technological lock-in", with precision approaches reinforcing pesticide use rather than eliminating it. IoT sensors enable precision agriculture, helping farmers use as little water, power, and other resources as possible.

Agriculture is in the early days of yet another revolution, at the heart of which lie data and connectivity. Artificial intelligence, analytics, connected sensors, and other emerging technologies could further increase yields, improve the efficiency of water and other inputs, and build sustainability and resilience across crop cultivation and animal husbandry. Technological innovations have greatly shaped agriculture throughout time.

The technology of drones in agriculture is rising day by day for modifying farming. There are high-technology drones that will help to increase the efficiency and effectiveness of farming. The drone in the agricultural field can monitor the crops, manage the plants, and supports crop-spraying. The role of digitization in agriculture is increasing with the use of ICT and mobiles.

New technologies in the field of agriculture are improving the lifestyle of the farming communities. Main among these are Vertical farming, Aeroponics, pearl culture and permaculture.

Poultry, Goat and Pig farming are the enterprise that are the first priority of farmers to take for their livelihood. It provides handsome income on the investment made by farmers. We have tried to elaborate their scientific rearing to avoid any loss.

Soil testing, composting, Agroforestry and Medicinal and aromatic plants cultivation is providing opportunities to farmers not only to earn more but also to save the environment.

This book will serve as a valuable resource for those who wish to learn about new technologies and equipment in agriculture. It will help the readers to understand the uses of technologies and their benefits.

**Dr. Khushboo Chandra**  
**Dr. S. K. Kaushik**  
**Dr. Devendra Kumar Payasi**

# CONTENT

<b>1. Landmarks and Scope in Plant Breeding - Harsh Vashistha, Khushboo Chandra .....</b>	<b>1</b>
1.1 Introduction:.....	1
1.2 Landmarks in Plant Breeding:.....	1
1.2.1 Pre Mendelian-Era: .....	1
1.2.2 Post Mendel Era:.....	4
1.3 Important Achievements:.....	9
1.3.1 Sugarcane Improvement:.....	10
1.3.2 Hybrid Millets (Maize, Jowar and Bajra Hybrids): .....	10
1.3.3 Hybrid Cottons:.....	10
1.4 References:.....	11
<b>2. Plant Introduction - A Crucial Stage of Breeding - Kota Sai Charitha, Vidadala Rajendra .....</b>	<b>12</b>
2.1 Introduction:.....	12
2.1.1 Historical Context and Role of Plant Introduction in Genetic Diversity: .....	12
2.1.2 Global Relevance of Plant Introduction for Food Security Under Climatic Change: .....	13
2.1.3 Exploring Genetic Diversity for Plant Introduction: .....	14
2.2 Objectives and Purpose of Plant Introduction: .....	15
2.2.1 Chief Objectives of Plant Introduction: .....	15
2.2.2 Purpose of Plant Introduction: .....	15
2.3 Types of Plant Introduction: .....	16
2.3.1 Based on The Type of Plant Material Introduced, The Plant Introduction They are: .....	16
2.3.2 Based on The Level of Introduction, Plant Introduction is of Mainly Two Types They Are .....	17
2.4 National and International Agencies and Organizations Involved in Plant.....	18
2.4.1 International Plant Introduction Agencies:.....	18
2.4.2 National Plant Introduction Agencies: .....	19
2.4.3 Government Regulations and International Treaties for Germplasm Exchange in Plant Introduction: .....	21
2.5 Plant Introduction Procedure: .....	21
2.6 Acclimatization and Adaptation:.....	24
2.7 Utilization of Introduced Germplasm in Breeding Programs: .....	25
2.7.1 Strategies for incorporating introduced germplasm: .....	25
2.7.2 Case Studies Highlighting Successful Utilization in Various Crops: 26	

2.8 Merits and Demerits of Plant Introduction: .....	27
2.8.1 Merits of Plant Introduction: .....	27
2.8.2 Demerits of Plant Introduction: .....	28
2.9 Future Directions and Innovations: .....	29
2.10 Conclusion: .....	30
2.11 References: .....	31

**3. Role of Pollination in Crop Improvement - Harsh Vashistha, Khushboo Chandra..... 33**

3.1 Introduction: .....	33
3.2 Pollination is of Two Types: .....	34
3.2.1 Self-Pollination: .....	34
3.2.2 Cross-Pollination: .....	35
3.3 Methods of Pollination Used in Crop Improvement: .....	36
3.4 Role of Pollination in Plant Breeding: .....	37
3.4.1 Some Roles of Pollination Are There: .....	37
3.5 Reference: .....	38

**4. Reproduction Mechanism in Plants - Himanshi Saraswat, Mayank Tiwari, Dr. D. K. Pyasi..... 40**

4.1 Introduction: .....	40
4.2 Mode of Reproduction: .....	42
4.2.1 Importance of Mode of Reproduction to Plant Breeding: .....	42
4.2.2 Asexual Mode of Reproduction: .....	43
4.2.3 Sexual Mode of Reproduction: .....	47
4.3 Process of Fertilization: .....	52
4.4 Significance of Sexual Reproduction: .....	53
4.5 References: .....	53

**5. Self-Incompatibility in Crop Improvement - Dr. Garima Pathak, Dr. Santosh Kumar..... 54**

5.1 Introduction: .....	54
5.2 Genetic Basis of Self-Incompatibility: .....	56
5.3 Self-Incompatibility's Molecular Base: .....	57
5.4 The Molecular Mechanisms Behind Dominance Relationships Within the Context of Pollen Interactions: .....	57
5.5 Application of Self-Incompatibility in The Hybridization Breeding of Vegetable Crop: .....	58
5.5.1 The Distinguishing Features of Superior SI Lines: .....	61
5.5.2 Applications in Crop Production and Breeding: .....	62
5.5.3 Role of Pollinizers in Orchard Management: .....	62
5.6 Diverse Sources of Self Compatibility: A Beneficial Characteristic for Improving Yield Enhancement .....	63

5.7 Instances in Which Self-Incompatibility is Favoured for Crop Cultivation.....	64
5.8 Self-Incompatibility as A Viable Alternative to Andro Sterility for The Development of Hybrid Varieties .....	65
5.9 The Phenomenon of Self-Incompatibility in Hybrid Breeding Schemes .....	66
5.10 Methods for Attaining Self-Compatibility and Its Significance in Hybridization .....	67
5.11 Conclusion: .....	69
5.12 References:.....	69

**6. Male Sterility in Crop Improvement: Enhancing Agricultural Productivity -  
Karthik Chittibomma, Merugu Ganesh Reddy, C. Sai Vaishnavi.....74**

6.1 Introduction:.....	75
6.2 Male Sterility:.....	75
6.2.1 Factors Behind Male Sterility:.....	76
6.3 Impact on Plant Reproduction:.....	77
6.3.1 Pollen Development:.....	77
6.3.2 Breeding and Hybrid Seed Production:.....	78
6.4 Utilization in Agriculture:.....	79
6.4.1 Hybrid Seed Production: .....	79
6.4.2 Crop Improvement:.....	80
6.5 Genetic Regulation of Male Sterility:.....	81
6.5.1 Advancements of Molecular Mechanisms in Male Sterility: Top of Form.....	82
6.6 Applications in Crop Improvement:.....	83
6.6.1 Hybrid Seed Production: .....	83
6.6.2 Utilization in Different Crops:.....	83
6.7 Challenges in Implementation: .....	84
6.8 Future Perspectives:.....	85
6.9 Conclusion: .....	86
6.10 References:.....	87

**7. Breeding Methods in Self-Pollinated Crops - Richa Panwar,  
Khushboo Chandra .....89**

7.1 Introduction:.....	89
7.2 Breeding Methods in Self-Pollinated Crops: .....	89
7.2.1 Pedigree Method:.....	89
7.2.2 Bulk Method: .....	91
7.2.3 Single Descent Method: .....	92
7.3 References:.....	94

**8. Breeding Methods in Cross Pollinated Crops - Aditya Sahu, Soumya Patel .95**

8.1 Introduction:.....	95
8.2 Population Improvement Methods. ....	96



8.2.1 Methods of Breeding without Progeny Testing:.....	96
8.2.2 Methods of Breeding with Progeny Testing:.....	98
8.3 Hybrid Varieties: .....	103
8.3.1 History: .....	104
8.3.2 Types of Hybrids:.....	104
8.3.3 Development of Hybrid Varieties: .....	106
8.3.4 Merits: .....	108
8.3.5 Demerits: .....	108
8.4 Synthetic Varieties:.....	109
8.4.1 Features of Synthetic Varieties: .....	109
8.4.2 Development of Synthetic Variety:.....	110
8.4.3 Factors Affecting Performance of Synthetic Varieties: .....	111
8.4.5 Merits: .....	112
8.4.6 Demerits: .....	112
8.5 References:.....	113

## **9. Breeding Methods for Cross-Pollinated Crops - *Dr. S. K. Kaushik* ..... 114**

9.1 Introduction: .....	114
9.2 Twentieth-Century Developments: .....	116
9.3 Scope of Crop Improvement: .....	118
9.4 Factors limiting Genetic Improvement of Crop Plants:.....	120
9.5 Population Improvement:.....	122
9.6 Aims of Selection: .....	122
9.6.1 Mass Selection: .....	123
9.6.2 Modifications of Mass Selection: .....	125
9.6.3 Effectiveness of Mass Selection: .....	127
9.7 Selection Schemes with Progeny Test:.....	128
9.7.1 Progeny Selection: .....	128
9.7.2 Applications of Mass and Progeny Selections:.....	130
9.8 Recurrent Selection:.....	132
9.8.1 Simple Recurrent Selection: .....	132
9.9 Comparative effectiveness among Different Recurrent Selection Schemes..	139
9.10 Effectiveness of Progeny Selection Schemes: .....	139
9.11 References: .....	144

## **10. Breeding Method in Segregating Generation - *Poonam Singh, Dr. Santosh Kumar* ..... 146**

10.1 Introduction: .....	146
10.2 Pedigree Method:.....	147
10.2.1 Schematic Representation of Pedigree Method: .....	148
10.2.2 Merits of Pedigree Method: .....	148
10.2.3 Demerits of Pedigree Method: .....	149
10.2.4 Achievements:.....	149
10.3 Bulk Method:.....	150

10.3.1 Pictorial Representation of Bulk Method of Breeding:.....	151
10.3.2 Merits of Bulk Method:.....	151
10.3.3 Demerits: .....	151
10.4 Single Seed Descent (Modified Bulk Method): .....	151
10.5 Backcross Method: .....	153
10.5.1 Pre-Requisites for Back Cross Breeding:.....	153
10.5.2 Application of Back Cross Method:.....	153
10.5.3 Procedure for Backcross Method:.....	154
10.5.4 Merits of Backcross Method:.....	156
10.5.5 Demerits of the Backcross Method: .....	156
10.6 Conclusion: .....	158
10.7 References:.....	158

**11. Inbreeding Depression in Cross Pollinated Crops - Prajwal P.,  
Dr. Santosh Kumar.....159**

11.1 Introduction:.....	159
11.2 Inbreeding: .....	159
11.3 Inbreeding Depression: .....	160
11.4 History: .....	160
11.5 Effects of Inbreeding: .....	161
11.6 Degrees of Inbreeding Depression: .....	161
11.7 Cross Pollinated Crops: Reasons for Inbreeding Depression .....	162
11.7.1 Some Other Things to Think About When It Comes to Inbreeding Depression in Cross-Pollinated Crops: .....	163
11.8 Differential Response to Inbreeding:.....	164
11.9 References:.....	164

**12. Clonal Selection in Crops - M. Dhandapani, T. N. Lakshmi Devamma,  
S. Geethanjali, S. Chitra, S. Arulselvi .....165**

12.1 Definition: .....	166
12.2 Characteristics of the Clone: .....	166
12.3 Clonally Propagated Crops: .....	166
12.4 Genetic Basis of Clonal Selection:.....	167
12.4.1 History of Clonal Selection: .....	167
12.4.2 Clonal Selection: .....	167
12.5 References:.....	169

**13. Heterosis Breeding - Kiruba G., Prasannakumari M., SumithraV.,  
Shanmugam A., Arulmozhi R., Pushpa R. ....170**

13.1 Introduction:.....	170
13.2 Genetic Basis of Heterosis:.....	171
13.2.1 Dominance Model:.....	172
13.2.2 Overdominance Model:.....	173

13.2.3 Pseudo Overdominance Model: .....	173
13.2.4 Non-Allelic Interactions or Epistasis: .....	173
13.2.5 Progressive Heterosis and Dosage Component: .....	174
13.2.6 Hemizygous Complementation:.....	174
13.3 Epigenetics and Epigenomics Role in Heterosis: .....	175
13.3.1 DNA Methylation: .....	175
13.3.2 Small RNAs (sRNAs): .....	176
13.3.3 Histone Modifications: .....	177
13.4 Omics Approach:.....	178
13.4.1 Metabolic Profiling of Heterosis:.....	180
13.4.2 Identification of Metabolic Pathways Contributing to Heterosis: .....	180
13.5 Future Prospects of Heterosis:.....	180
13.6 References:.....	182

**14. Distant Hybridization in Crop Improvement - Manoranjan Biswal, Stuti Sharma, Soumya Patel, Ayushi Soni, Devendra K. Payasi ..... 186**

14.1 Introduction: .....	187
14.2 Types of Distant Hybridization: .....	188
14.3 Examples of interspecific and intergeneric hybridization .....	189
14.4 Key Challenges in The Production of Distant Hybrids: .....	190
14.5 Techniques to Make Wide Crosses Successful: .....	191
14.6 Enhancing Crop Improvement through Distant Hybridization: .....	191
14.7 Enhancements via Interspecific Hybridization in Crop Breeding:.....	192
14.8 Limitations of Distant Hybridization in Crop Improvement: .....	193
14.9 Factors Influencing the Success of Distant Hybridization in Crop Breeding: .....	194
14.10 Successes in Crop Improvement Through Distant Hybridization:.....	194
14.11 References:.....	195

**15. Mutation - Manoranjan Biswal, Stuti Sharma, Soumya Patel, Ayushi Soni, Devendra K. Payasi..... 196**

15.1 Introduction: .....	197
15.2 Characteristics of mutations .....	198
15.3 Classification of Mutations.....	198
15.4 The Spectrum of Genetic Mutants: Classifications and Characteristics .....	200
15.4.1 Spontaneous Mutations: .....	200
15.4.2 Induced Mutations:.....	201
15.4.3 Mutagens: .....	201
15.4.4 Physical Mutagens: .....	202
15.4.5 Chemical Mutagens:.....	203
15.4.6 Molecular Basis of Mutation: .....	204
15.5 Methodology of Mutation Detection Techniques: .....	204
15.6 Methodology of Mutation Detection in Drosophila: .....	205
15.7 Applications in crop improvement .....	207

15.8 Limitations: .....	207
15.9 References:.....	207
<b>16. Breeding for Biotic Stress Resistance - Diksha Thakur, S. K. Singh, Gurbaksh Kaur, Dinanter Pal kaur, Neha Sharma .....</b>	<b>209</b>
16.1 Disease Resistance: .....	209
16.2 Variety Among Fungus-Causing Pathogens: .....	210
16.3 Mechanisms of Disease Resistance: .....	211
16.4 Disease Resistance-Related Factors (Causes of Disease Resistance) .....	212
16.5 Vertical and Horizontal Resistance (Van Der Plank):.....	213
16.5.1 Transverse Resistance: .....	214
16.6 Breeding Techniques for Disease Resistance: .....	214
16.6.1 Precautions: .....	215
16.6.2 Benefits of Disease Resistance Breeding: .....	215
16.6.3 Limitations.....	215
16.7 References:.....	216
<b>17. Breeding for Abiotic- Salt Resistance in Crop - Gurbaksh Kaur, S. K. Singh, Diksha Thakur, H. C. Raturi, Dinanter Pal Kaur.....</b>	<b>217</b>
17.1 Abiotic Stress: .....	217
17.1.1 Characteristics of Abiotic Stresses:.....	218
17.2 Salt Affected Soil: .....	218
17.3 References:.....	223
<b>18. Polyploidy Breeding - Manoranjan Biswal, Stuti Sharma, Soumya Patel, Ayushi Soni, Devendra K. Payasi .....</b>	<b>224</b>
18.1 Introduction:.....	225
18.2 Chromosomal Dynamics in Crop Genetic Enhancement: .....	225
18.3 Genetic Chromosomal Variations and Notations:.....	227
18.3.1 Aneuploidy: .....	228
18.3.2 Autopolyploidy: .....	230
18.3.3 Allopolyploidy:.....	232
18.4 References:.....	236
<b>19. Marker- Assisted Selection - Manoranjan Biswal, Soumya Patel, Ayushi Soni, Stuti Sharma, Devendra K. Payasi.....</b>	<b>237</b>
19.1 Concept: .....	238
19.2 History: .....	238
19.3 Key Objectives of Marker-Assisted Selection in Plant Breeding: .....	238
19.4 Steps of MAS: .....	239
19.5 Conventional Backcross V/s MAS Backcross: .....	240
19.6 DNA Markers:.....	241

19.6.1 Types of DNA Markers: .....	242
19.6.2 Application of Molecular Marker: .....	244
19.7 Technologies Used In MAS: .....	245
19.8 MAS for Biotic Stress:.....	246
19.9 MAS for Abiotic Stress:.....	247
19.10 MAS for Agronomic Traits:.....	248
19.10.1 MAS for Yield: .....	248
19.10.2 MAS for Quality Traits: .....	249
19.10.3 MAS Advantages: .....	251
19.10.4 Disadvantages of MAS:.....	251
19.11 MAS in Breeding Programs: .....	252
19.12 Future Aspects: .....	252
19.13 Conclusion:.....	252
19.14 References: .....	253

**20. Marker-Assisted Breeding Program - Th. Nepolian Singh, D. Biswas, O. Priyadarshini Devi, Y. Sanatombi Devi, D. Durba Saharia ..... 256**

20.1 Introduction: .....	256
20.1.1 Marker-Assisted Selection:.....	256
20.2 Steps in Marker Assisted Selection (MAS): .....	258
20.2.1 Selection of Parents:.....	258
20.2.2 Development of Breeding Populations:.....	258
20.2.3 Isolation of DNA:.....	258
20.2.4 Scoring RFLPs: .....	259
20.2.5 Correlation with Morphological Traits:.....	259
20.3 Applications of Marker Assisted Selection (MAS):.....	259
20.3.1 Advantages of Marker Assisted Selection (MAS):.....	260
20.3.2 Limitations of Marker Assisted Selection (MAS): .....	260
20.3.3 Achievements of Marker Assisted Selection (MAS): .....	261
20.4 Reference: .....	261

**21. Marker-Assisted Selection for Crop Improvement - Vidadala Rajendra, Kota Sai Charitha..... 263**

21.1 Introduction: .....	263
21.1.1 Historical Development and Evolution of MAS Techniques: .....	264
21.1.2 Comparing MAS over conventional breeding: .....	264
21.2 Principles and Techniques of Marker-Assisted Selection: .....	266
21.2.1 Introduction to markers: .....	266
21.2.2 Molecular markers are: .....	266
21.2.3 Salient features of an ideal molecular marker: .....	268
21.2.4 Brief Description of Different Markers: .....	268
21.2.5 Discovery of New Molecular Markers: A Powerful Tool for Plant Breeding: .....	269
21.2.6 Genotyping and its Methods: .....	270

21.2.7 Marker Validation: .....	271
21.3 Marker-Assisted Selection (MAS): .....	272
21.3.1 Principles of Trait Mapping: .....	272
21.3.2 Integration of MAS in Breeding Programs: .....	273
21.4 Different strategies for utilizing MAS in breeding programs: .....	274
21.4.1 Marker-Assisted Backcrossing (MABC): .....	274
21.4.2 Markers assisted Recurrent Selection: .....	275
21.4.3 Marker-Assisted Gene Pyramiding:.....	277
21.4.4 Genomic Prediction:.....	278
21.4.5 Marker-Assisted Heterosis Breeding: .....	278
21.4.6 Targeting induced local lesions in the genome: .....	278
21.4.7 Virus-Induced Gene Silencing:.....	279
21.4.8 Genome Editing (CRISPR): .....	279
21.5 Challenges and Limitations of MAS: .....	279
21.6 Future Prospects and Conclusion: .....	279
21.7 References:.....	280

**22. Plant Ideotype and Climate Resilient Crop - Manoranjan Biswal,  
Ayushi Soni, Soumya Patel, Stuti Sharma, Devendra K. Payasi .....282**

22.1 Introduction:.....	283
22.2 Defining an Ideotype: What and What For? .....	283
22.3 A Method to Design Ideotypes: .....	283
22.4 Ideotype of Some Selected Crops: .....	285
22.5 Merits of Ideotype breeding:.....	288
22.6 Demerits of Ideotype Breeding: .....	288
22.7 Enhancing Abiotic Stress Tolerance: .....	291
22.8 Managing Biotic Stresses:.....	293
22.9 Improving Nutritional Quality in Climate-Resilient Crops: .....	294
22.10 Future Perspectives and Challenges: .....	296
22.11 Conclusion .....	296
22.12 References:.....	296

**23. Participatory Breeding - M. Dhandapani, S. Geethanjali,  
T. N. Lakshmi Devamma, S. Chitra, M. Sangeetha.....299**

23.1 Definition .....	299
23.2 Introduction.....	300
23.3 Scientific Basis of Participatory Breeding:.....	301
23.3.1 Concepts of Participatory Breeding: .....	302
23.3.2 Merits of Participatory Breeding: .....	305
23.3.3 Demerits of the Participatory Breeding.....	305
23.3.4 Future Scope of Participatory Breeding .....	306
23.4 References:.....	306

## Editor in Chief



**Dr. Khushboo Chandra**, Assistant Professor- cum - Junior Scientist of Genetics & Plant Breeding Bihar Agricultural University. She has affluent experience of teaching in Breeding of field and horticultural crops, Genetics, Plant Breeding, Cytogenetic, Seed Production Technology of field and horticultural crops, Crop Improvement, Biodiversity and conservation of field and horticultural crops & Plant Biotechnology. The research thrust area falls under Abiotic stress predominantly in drought stress of cereals and Oilseeds crops, Genetic Diversity analysis at Molecular Level & Plant Tissue Culture (Rice). She has also 6 years of research experience in Abiotic stress predominantly in drought stress of cereals and Oilseeds crops. She had been awarded with University Gold Medalist in field of Genetics & Plant Breeding. She has been awarded with Eminent Scientist Award, Young Scientist award, Best Research Scholar Award, Best M.Sc. Thesis Award, Best PhD Thesis Award Hindustan Harit Kranti Award-2022, Excellence in Research Award-2022 and Dr. B.P.Pal Award (in field of Plant Breeding)-2022. She has published 4 Books, 8 Book Chapters, 6 Review Articles and 17 Research Papers. She has attended about 50 Conferences, Seminars, Training, FDP & Workshop.



**Dr. S. K. Kaushik** completed his Ph. D. (Ag.) degree in the discipline of Plant Breeding & Genetics from R.A.U., Bikaner in 2004. He is working as a Senior Scientist(P.B.G.) at RVSKVV,KVK-Ujjain(MP). He engaged in quality seed production of pulses and Oilseed (Soybean) since last more than 06 years. Since the last 17 years he also engaged in Extension and Research programme of various crops(Soybean, Blackgram, Mungbean, Maize, sorghum, Pigeonpea, Wheat, Chickpea, Mustard, Fenugreek, Linseed, etc.). He wrote >37 research papers in reputed journals, >15 extension literatures, 07 book chapters in ISBN rated books, 08 book chapters in booklets, 08 research articles in highly reputed ICAR Magazines, more than 15 Articles in Popular Agri-Magazines, joined more than 60 National Seminars/ Workshops / Trainings, etc.



**Dr. Devendra Kumar Payasi** working as Scientist (Plant Breeding & Genetics) & Incharge, ICAR-All India Coordinated Research Project on Oilseeds at Jawaharlal Nehru Krishi Vishwa Vidyalaya, Regional Agricultural Sagar, Madhya Pradesh since 2013. He is also acting as Project In charge of Department of Biotechnology sponsored Network Project and Department of Agriculture Cooperation and Farmers Welfare sponsored project NFSM-Seed hub Oilseeds. He has developed 8 linseed varieties and published 35 research and review articles in International and national journals. Under his leadership AICRP oilseeds awarded Certificate of Excellence and best AICRP centre.

## Associate Editor



**Ms. Richa Panwar**



**Karthik Chittibomma**



**Dr. Manoranjan Biswal**



**Kripa-Drishti Publications**

A-503 Poorva Heights, Pashan-Sus Road, Near Sai Chowk,

Pune - 411021, Maharashtra, India.

Mob: +91 8007068686

Email: editor@kdpublishations.in

Web: <https://www.kdpublishations.in>

Price: ₹ 675

ISBN: 978-81-968830-0-3



9 788196 883003