About the Authors

Dr Vijay Kumar *is a distinguished academic and researcher specialising in Genetics and Plant Breeding. He holds a B.Sc. (Agriculture) from A.S. College, Lakhaoti (CCS University, Meerut), followed by an M.Sc., M.Phil., and Ph.D. in Genetics and Plant Breeding from CCS University, Meerut, Uttar Pradesh. With 22 research publications, 15 conference presentations, 12 book chapters and 18 popular research articles, as well as membership in several scientific societies. Dr Kumar has made significant contributions to agricultural science. He has also delivered guest lectures and training sessions, earning accolades such as the Young Scientist Award, Dr B.P. Pal Award and Young Student Award.*

Professionally, he has served as an assistant professor at JBIT College of Applied Sciences, Dehradun (Feb–May 2018), and Mata Gujri College, Fatehgarh Sahib, Punjab (July 2018–May 2022). Since May 2022, he has been contributing to School of Agricultural Sciences, IIMT University, Meerut, mentoring future scientists and advancing agricultural research.

Dr. Kumar's expertise and dedication continue to drive innovation in agriculture and plant genetics, inspiring the next generation of researchers.

Miss Amarjeet Kaur *is an accomplished academic and researcher specialising in Genetics and Plant Breeding. She completed her B.Sc. (Agriculture) from Mata Gujri College, Fatehgarh Sahib, Punjab, followed by an M.Sc. (Agriculture) in Genetics and Plant Breeding. With 3 research publications, 2 conference presentations, 3 book chapters and 4 popular research articles, she has contributed to agricultural science and has also delivered guest lectures and training sessions to share her expertise.*

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PREFACE

The field of plant breeding has undergone remarkable advancements in recent decades, driven by our growing understanding of genetics and the development of powerful new tools and technologies. This book, "Genetics and Plant Breeding: Principles and Methods", aims to provide a comprehensive overview of the fundamental concepts and cutting-edge techniques that underpin modern plant breeding efforts.

Plant breeding plays a crucial role in ensuring food security, enhancing crop yields, and developing plants resilient to biotic and abiotic stresses in the face of a rapidly growing global population and changing climate. By harnessing the power of genetics, plant breeders can develop improved varieties with desirable traits such as higher nutritional value, resistance to pests and diseases, tolerance to drought and salinity, and enhanced yield potential.

This book is designed to serve as a valuable resource for students, researchers, and practitioners in the fields of plant science, agriculture, and genetics. It covers a wide range of topics, from the basic principles of genetics and inheritance to advanced breeding strategies and molecular marker-assisted selection. Readers will gain a solid foundation in classical Mendelian genetics, quantitative genetics, and population genetics, as well as an understanding of the latest developments in genomics, bioinformatics, and gene editing technologies such as CRISPR-Cas9.

The book is organized into several sections, each focusing on a specific aspect of plant breeding. The first section introduces the fundamental concepts of genetics and their relevance to plant breeding. Subsequent sections delve into topics such as germplasm resources, breeding methods, marker-assisted selection, genomic selection, and the application of biotechnology in plant breeding. The final section explores the societal and ethical implications of modern plant breeding, including intellectual property rights, regulatory frameworks, and the role of plant breeding in addressing global challenges such as climate change and food security.

Throughout the book, emphasis is placed on bridging theory and practice, with numerous examples, case studies, and practical exercises to reinforce key concepts. By providing a solid grounding in both the principles and methods of genetics and plant breeding, this book aims to equip readers with the knowledge and skills needed to contribute to the development of improved crop varieties and advance the field of plant breeding in the 21st century.

Happy reading and happy gardening!

Authors……

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