

Preface

Genetics has come a long way from the time Mendel discovered the laws of inheritance. Mendel's experiments illustrated that properly planned field experiments could give clues to theoretical propositions and establish hypotheses. Over time, a number of similar and improved crop experiments followed worldwide. Eventually a class of quantitatively measurable traits defining characteristics of individuals came to be known as quantitative traits (QTs). Research intensified to understand variation in QTs. The model $P = G + E$ came into being. Variation in the measured phenotypic values, or the phenotypic variance, was partitioned into genetic and environmental components. Plant breeding strategies were refined to improve genetic evaluation. Advances in genetics, often synchronizing with advances in experimental statistics, designs of experiments and computational biology, widened the scope of QT improvement and plant breeding.

Such a progress served as a major initiative for further research worldwide. Varied facets of research were initiated across countries. A fundamental contribution to Quantitative Genetics was made by Kenneth Mather in the United Kingdom. He expressed the QT values of the 3 genotypes governed by a single diallelic gene in terms of population mean, m and deviation of QT values from m . This beginning gave rise to a number of impressive results through further work. The book *Biometrical Genetics: The Study of Continuous Variation* by Mather encompassing the results came out in 1949. Continued research led by Mather and joined then by the illustrious John L. Jinks and others elevated Quantitative Genetics to a new plane. An advanced book bearing the earlier title, *Biometrical Genetics: The Study of Continuous Variation* was published by Mather and Jinks in 1971.

Concurrently, Douglas S. Falconer and his group were pursuing research on Quantitative Genetics in Edinburgh. Their approach was simple devoid of complex theory; they drew examples mostly from animal breeding. Amplification of their results could provide practical avenues to breeding. The book *Introduction to Quantitative Genetics* by Falconer published in 1960 is a tribute to Falconer's contribution and a boon to plant breeding. As would be expected, it became immensely popular. It ran several editions, and the recent ones with his coworkers.

Theoretical advancement and practical applications became so momentous that Quantitative Genetics became a fundamental course in postgraduate schools and universities. The demand for books catering to varying needs grew.

Students and researchers in plant breeding and molecular applications, and those interested in innovative biological research realized the need for comprehensive knowledge in Quantitative Genetics. They have sufficient proficiency in biology, botany or agriculture, their major subjects in graduate curriculum. But their knowledge of mathematics and

statistics fall usually short of requirement. Supplemental courses are hardly tuned to blend with Quantitative Genetics; clear comprehension of the subject continues to remain evasive.

Standard books usually have large contents. Later editions enlarge it further, in general making them heavier. Despite voluminous information they contain, they are held more as a source of reference than as a companion. This does not mean that size alone indicates the importance or popularity. Quality, brevity, clarity and content in addition to persuasive presentation promoting comprehension would equally count as relevant indicators.

Such books should be a regular guide for researchers to attempt high quality experiments. The profundity of contents should promote purposive and innovative experimentation.

Teaching Quantitative Genetics course over three decades to M.Sc. and Ph.D. students, and also interns in reputed agricultural research institutes including agricultural universities in India made it clear that emphasis should be on essential fundamentals and practical application of theoretical concepts. The preference is for a comprehensive coverage of important topics. Constricted coverage of a wide range of topics has a narrow appeal.

With advances in molecular biology impacting plant breeding, Quantitative Genetics has grown fast and wide in content. Software packages have also grown concomitantly providing ready-made path to analysis of data generated. But users feel despondent as their knowledge is deficient to understand the logic or process steps in such software. They want more knowledge in Quantitative Genetics and seek quality books.

This book aims to answer those needs. Its organization and coverage of content differ from the pattern in well-known books on the subject. The book is distinct in its lucid and pristine presentation backed by a variety of examples from field experiments.

A number of topics like, genotype x environment interaction, stability analysis, augmented design, molecular biology-oriented applications and so on, are not covered to keep the size of the book optimal for encouraging even the hesitant to read the book in full.

I believe the book in its current format, would attract the unattracted, enthuse the diffident and mainstream the anxious. The book would have served its purpose if more researchers professing breeding, biology and genetics find its reading a rich experience and get encouraged to practice quality experimentation.

The novel and dedicated work of students, I had the privilege of guiding for their M.Sc. and Ph.D. degrees of various universities, has added value to the book. The persuasive appeal of those who attended my lectures gave an impetus to complete this book. Though I gave a rough shape to the book years ago, for various reasons it could be completed only this year. In my career as a scientist at the Indian Agricultural Research Institute, my colleagues encouraged me and took part willingly in trying new avenues of research. Though it would be space-intensive to name them all, I express my gratitude for their support and suggestions. A special mention is due to Dr. Vinod Prabhu for caring support and Dr. Sujata Vasudev for considerate comments, positive criticism and enthusiastic fillip which were timely to complete this book.

This book would not have taken a shape but for the affectionate encouragement of my wife Rajalakshmi, my daughter Lavanya and other members of my family for their compassionate tolerance of my long hours at work at the cost of time I would have otherwise shared with them.

Last but not the least, I sincerely acknowledge the painstaking efforts by Viva Books for bringing the book to this shape.

I am conscious that the book could have shortcomings and errors, and scope for improvement. I shall be grateful if they are brought to my notice (vaiiarunachalam@yahoo.co.in).

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