

## AN INTRODUCTION TO FOREST GENETICS

**Eriksson, G. & Ekberg, I.: An Introduction to Forest Genetics.** SLU Repro, Uppsala, 2001, 166 pages. ISBN 91-576-6032-8, price 30 Euro.

An introductory course in forest genetics and tree breeding should include basic knowledge from a large number of topics. The authors of this book have successfully managed to cover them all on only 166 pages. It is intended for undergraduate students of forestry and the management of natural resources, and is a translated and revised edition of a textbook that earlier was published in the Swedish language. I have used the Swedish version as the basic text for a short course for forestry students and can give it my best recommendations.

The book is divided into eleven subject chapters, with the addition of a glossary, a subject and a species index. The first two chapters provide introductions to chromosome cytology and molecular genetics. Both topics are well covered, with examples and applications to forest trees. Qualitative inheritance is presented in the next short chapter, and some basic concepts of population genetics, connected to the Hardy-Weinberg principle, are presented in the short chapters 3 and 4. Chapter 5 deals with the characteristics of quantitative traits. It introduces the concept of QTL and linkage maps at a very early stage, before introducing the basic quantitative genetic parameters of heritability and additive genetic variance. Other topics presented are breeding value, combining ability, genotype x environment interaction, inbreeding, genetic gain and genetic correlation.

Chapter 6 focuses on the principles of evolution and important influencing factors. Natural selection is rather comprehensively covered, while shorter presentations are given of random genetic drift, mutations, gene flow and phenotypic plasticity. The concepts of ecotype and ecocline are discussed and also the requirements for long-term survival of tree species under global climatic change. The chapter ends with a section on coevolution and speciation. Chapter 7, entitled "Genetic variation and provenance research", starts with the presentation of different types of DNA-markers. It then continues with the presentation of results from provenance research, in particular from studies of Scots pine and Norway spruce in Sweden, but also with examples from other boreal and temperate conifers and broad leaved tree species. Variation within populations is covered only shortly. An interesting discussion is made of the distinction between Darwinian and domestic fitness.

Chapter 8, "Tree breeding", covers 25 pages and is the longest in the book. It first presents important considerations to be made at the start of a breeding program and continues with discussions of species selection and principles of long-term breeding. Further on, short presentations are made of selection of plus trees, seed orchards, vegetative propagation, progeny testing and mating designs and how to estimate progress in breeding. Genetic aspects of the present day container cultivation of seedlings and problems with rooted cutting propagation in Norway spruce are treated in a short chapter of two pages. In Chapter 10, "Gene conservation",

three major components of gene conservation are presented: objectives, genetic structure and dynamics, and methods. It is stressed that the methods used should meet the gene conservation objectives. A discussion is given of the relationships between breeding and gene conservation and how the two can be combined. The last short chapter discusses the impact of breeding and silviculture on the progeny generation, largely based on theoretical considerations. The point is made that limited information is available about the consequences of different silvicultural methods and breeding activities on the genetic changes in future production populations.

In addition to the basic and elementary concepts, several topics that may be too advanced for the undergraduate students are shortly presented. The book will therefore be demanding, for both the teacher and the students. Illustrations are frequently used to define concepts and presenting results from experiments. Examples are given both from the early research in genetics and from the most recent findings. Results are presented from Sweden, which has a long tradition in forest genetics research and breeding, and from research and breeding in other parts of the world. The authors clearly demonstrate their broad and long-term experience. They are not afraid of discussing and presenting their own opinions on controversial topics, such as the importance of rare alleles in gene conservation and the concepts of Darwinian and domestic fitness. Each chapter ends with a short summary, which may be very helpful in sorting out the most important and basic concepts. The book has an academic style, and gives little advice of how to practically do things in research or in breeding.

A drawback with this book is the lack of references. When examples are presented, it is valuable to have a chance to look up the original reference. It is not enough to have some suggested further reading at the end of each chapter. Personally I also have some objections to the logical sequence of presentation and the way some topics are presented. QTLs are presented at the beginning of the chapter on quantitative traits and on the basis of molecular markers that are defined 35 pages later in the chapter presenting results from provenance research. I would have spent some more paragraphs on important parameters like additive genetic variance and heritability, to make the students understand their importance and limitations.

Taking these comments into account, I can recommend this book to be used in an introductory course of forest genetics and tree breeding and for biologists as a first introduction to this fascinating field.

*Tore Skrøppa (Ås, Norway)*

The book can be ordered at the Department of Forest Genetics SLU, SE 75007 Uppsala, Sweden; [Lotta.Olsson@sgen.slu.se](mailto:Lotta.Olsson@sgen.slu.se).