Pests of Forest Importance and their Management
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Dr. Shri Prakash, Scientist `G' (Associate Director) and head of Entomology Division, DRDE, Gwalior, has been involved in research on management of vectors of diseases using novel techniques. He has been working on insect physiology insect neuroanatomy, Genetic diversity of mosquitoes and molecular entomology. He is associated with the development of various products such as DEPA spray and cream formulations- a multi insect repellent, slow release insecticide paint, Roachtox, Roachline and attracticide for surveillance and control of Dengue and Chikungunya transmitting mosquitoes. He is the recipient of various DRDO Awards. He is a Life Member of Society of Toxicology, India. Society of Neurochemistry India, National Academy of Vector Borne Diseases, India and Society of Comparative Animal Physiology, India. He has 60 research papers to his credit and convectors of 12 patents.
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Dedicated to
Ajita,
Neena &
Rekha
Whose constant support and encouragement are
our source of inspiration.
Foreword

Forest Entomology as a biological science has undergone considerable expansion and development in recent decades especially in post independent era. There has been considerable advancement in ecological and economic aspects of forest insect pests as well as scientific and technical approach in pest management. There has also been considerable advancement in our knowledge on insect systematics especially in the area of nomenclature changes in scientific names of forest insects. Although there had been some sporadic publications of research compilations on sylvan insects, Beeson’s 1941 publication “Ecology and control of forest insects in India and neighboring countries” still remains a monumental book of reference. Therefore the present book “Pests of Forest importance and their management” has fulfilled the long felt need of a publication with recent advancements on different areas of forest entomology.

The present book is published as a tribute in profound honour of (late) Dr. P.K. Sen-Sarma, an Ex Director of Biological Research, Forest Research Institute, Dehra Dun who is considered as great termiologist and forest entomologist. Dr. P.K. Sen-Sarma spent over 35 years in FRI and served the Institute in different positions of responsibility. He had been Forest Entomologist for two terms 1970-1973 and 1976-1982. Since then he worked as Director, Biological Research till he superannuated in 1987. During his career he made tremendous contributions in the field of termiology and other important aspects of Forest Entomology, which earned him international recognition. The commemorative book, which has the articles by the authors who (most of them) had been closely associated with Dr. Sen-Sarma, would be a real tribute to their mentor and doyen of forest entomology.
Apart from updated contributions on important forest insect pests and their management the book also contains articles on, environment, management of sylvan rodents, mites and nematode infestation in forest trees etc. This will make the book more useful to researchers and field foresters as well.

I appreciate the efforts made by the editors, who along with several expert authors, have collected and compiled valuable and updated information pertaining to forest insects and non-insect pests. I am confident that the book will serve as a valuable source of information for the scientists, foresters and farmers alike.

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Forest ecosystem is a very important and unique component of our planet, Earth, which support subsistence directly or indirectly to innumerable organisms, both plants and animals, including of course man, by virtue of provision of a large number of products of economical, pharmaceutical and nutritional value etc. Pests of agro-forestry ecosystem play an important role in prospering the sylvan environment since management and/or control of many of these pests, both invertebrates (mainly the insects) and vertebrates, is inevitably indispensable to regulate the forest ecology. As far as insects alone are concerned, more than 4500 species are believed to infest both indigenous as well as exotic species of plants in India, although this clearly appears to be an underestimate!

Interest in protecting forests from insect, disease, weed and vertebrate pests has increased in recent years. This has come about largely because of (i) increased awareness of the destructive capacities of pests, (ii) the heavy toll they take on supplies of commercial and recreational timber, (iii) environmental concerns, (iv) effects on threatened and endangered species, and (v) availability of new, specific pesticides. Much of the damage caused by pests can be avoided with adequate knowledge of pest identification and biology. Combined with good forestry management practices, it may be possible to prevent or at least reduce losses due to pests which, practically, is immeasurable. Using a combination of prevention and control methods is the best approach to pest problems. The planned strategy of combining the best methods is called Integrated Pest Management (IPM, now considered as part of green chemistry) and is discussed in great detail at different places in this book.

Pest management should be a part of an overall forest management plan. The need for pest control treatments can often be minimized through wise, long-term forestry practices. The pest control method(s) chosen will depend upon the kind and amount of control necessary, balanced with costs and benefits within legal, environmental and other constraints. The most important principle of pest control is to use a control method only when necessary to prevent unacceptable levels of damage. Before making management decisions, managers should evaluate potential pest impacts within the context of the ecosystem in which the organism occurs, as well as the population dynamics of the organism. Will the impact of an organism increase, decrease or maintain its level of damage over time? What part(s) of the tree does the pest affect? How many trees are or will potentially be affected? What will be the long term impact of these organisms? Does the organism cause permanent or only temporary damage? Predictive models can be prepared for important insect pests based on these information. Insects such as the termites damage a larger part of the soft and hard wood and
introduce fungi that almost always cause tree death. In contrast, many foliage destroying insects which also transmit diseases can cause multiple damages to the growth and development of the tree with which the tree under attack may or may not recover depending on the interaction between host plant and pest infestation. Most trees can withstand complete one-time defoliation without significant long term impact on tree health. However, an organism that has the potential to cause multiple defoliations can have a much more detrimental impact on tree and forest health.

Some of the most significant treatises penned on the subject of ‘forest pest control’ in the past few decades are the classics of E.P. Stebbing (1906-1909): *Indian Forest Insects*; A.D. Imms (1911): *A general textbook of entomology*; and C.F.C. Beeson (1941): *The Ecology and Control of the Forest Insects of India and the Neighbouring Countries*. During 1950-70, Dr. M.L. Roonwal made enormous contribution to the subject, which was further expanded with a much greater vigour and diversity by Dr. P.K. Sen-Sarma who had served for long years, truly in the footsteps of the above mentioned geniuses, as the Forest Entomologist at the world famous Forest Research Institute, Dehra Dun.

The “*Pests of Forest Importance and Their Management*”, contributed by experts from both India and abroad, in a lucid and comprehensible language, provides a clear theoretical understanding of pest population dynamics and causes of forest insect outbreaks. Covering pests of both natural forests and plantations, it examines the diversity of tropical forest insects; their ecological functions; the concept of pests; and the incidence and control of pests in natural forests, plantations, and stored timber. It is hoped that this book, contributed by experts from both India and abroad, will offer a comprehensive resource suitable for graduate students and researchers in forestry and tropical forest entomology, as well as for forest plantation managers in the tropics.

30th January, 2008

Dr. B.K. Tyagi
Dr. Vijay Veer
Dr. Shri Prakash
Acknowledgement

Foremost our sincere thanks are due to Dr. S.S. Negi, Director, Forest Research Institute, Dehra Dun for his continued support and help in accomplishing this very unique and significant task.

In bringing about this dedication book in the beloved memory of Prof. Dr P.K. Sen-Sarma we have been helped, literally speaking, in someway or the other by a large number of friends and colleagues at the Forest Research Institute, Dehra Dun, Zoological Survey of India offices at Dehra Dun, Kolkata and Jodhpur, Arid Forest Research Institute, Jodhpur, to whom we remain grateful.

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Editors
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