

# **Sustainability in Plant and Crop Protection**

## **Series editor**

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Editors

# Termites and Sustainable Management

Volume 2 - Economic Losses and  
Management

 Springer

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# Foreword

Termites are the most important component of the living world accounting for about ten per cent of animal biomass in tropics and subtropics. Besides the essential roles played by termites in organic matter decomposition, nutrient cycling, soil airing, and draining, they are an important pest of temperate and tropical regions. They are responsible for massive loss to agricultural crops, forests, commercial plantations, and wooden structures in buildings, and billions of dollars are spent on its control.

Traditional termite control methods involve injecting hundreds of liters of synthetic insecticides to the soil or the use of termite bait products containing insect growth regulators. The former poses risk to both man and environment and the latter is relatively expensive. There is increasing general recognition of the need to improve termite management practices and reducing the harmful environmental effects. This led to a paradigm shift in the termite management strategies being practiced. In this juncture, it is praiseworthy to have a book comprising of different methods for sustainable management of this notorious pest.

The current volume should prove a very timely action in this direction. Different chapters in this book provide valuable information in this regard. The editors of this volume together with the authors of the individual chapters have made a remarkable contribution in collating the up-to-date information on sustainable and ecofriendly management against termite pest.

This information could be useful for researchers, educators, students, and industry persons for understanding and developing ecofriendly and sustainable termite management strategies. This book comprehensively addresses various methods related to sustainable management of termite pest through the expertise of leading authors worldwide. Finally, this book in the series Sustainability in Plant and Crop Protection is highly innovative in covering both basic information and effective management of termite pest.

I congratulate the editors and the various authors of this volume for such a splendid contribution on this notorious pest.

Bengaluru, India

S. Ayyappan  
NABARD Chair Professor &  
Former Director General (ICAR)

# Preface

This is the second volume on termites presented in the series *Sustainability in Plant and Crop Protection*. The previous one dealt with biology, social behaviour and economic importance of these pests. In the present volume, the editors and authors focus on many applied aspects of this important group of insects, including biological factors underpinning the economic losses they induce and related management issues. The volume unravels the many facets of this fundamental and often hidden side of the forest and soil ecology, with particular attention to the tropics. The role of termites in environment construction and maintenance is also examined, considering not only the soil and crop ecology but also the many issues related to anthropic space and activities.

The volume considers many aspects, starting with termites biology, fungus-growing species and the damages observed on tropical crops. Management issues are afforded and reviewed in subsequent chapters, dealing with forest and agricultural systems. The following contributions include reviews or experimental data, with methods and applied technologies dealing with indoor and outdoor pest control.

Today, biodiversity conservation and environment protection represent unavoidable strategies in any sustainable management plan. In this view, several types of eco-friendly approaches in termite control are examined in chapters spanning from organic agriculture and biological control to the use of botanicals and other products.

As for many other pests, human-induced changes (first of all agriculture and deforestation) that permanently modified the environment are indeed part of the problem. In this view, termite problems should be considered the result of a mismatch between the original, pristine environment (with all its builders, food webs and organisms) and the growing human needs, such as land required for food production and space needed for lodging. This situation may be ultimately viewed as a conflict between two different types of social species, that is termites and humankind.

This aspect led to the identification and adoption of solutions to the termite problems, such as the use of physical barriers or chemical compounds. Being external to

the microcosm in which termites coevolved with their food sources and environment, external factors produce a significant, immediate pressure on the pests' biology and dynamics, as well as on the surrounding environment. These issues are revised in the final chapters that also offer the reader a clear view about the impact of termites on human activities and actual possible solutions.

Being complex in their nature, studies of this kind are, therefore, welcome, and their results should be added to the progress and knowledge already achieved. The scientists who edited and contributed to the volume have a long-term experience in the field, for which they represent a leading edge, producing innovative and updated research efforts. The reader may look with interest at the informations provided, which are supported by rich bibliographies.

We hope that these data will provide us a clearer insight on the complexity of the ecology and role of these insects, in order to coexist with them with minimal damage to the environment, on human activities and our future social needs.

Aurelio Ciancio  
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SUPP Series Editor

# Preface

Termites are among the most successful group of insects on earth and contribute significantly to most of the world's ecosystems. Their economic importance is two-fold, both extremely beneficial as well as extremely injurious to man. Termite species gain pest status when they damage building materials or agronomic and forestry commodities. As pests, they have been associated with crops since immemorial times. They can damage right from sowing till the harvest of the crops. Billions of dollars are spent annually throughout the world to control and prevent termite infestation. The cryptic nature and social organization of termites explain why infestations can be difficult to study and control. In the past, attention was mainly directed towards their biology, systematics, sociality and symbioses. It is therefore imperative to study applied termite biology and control.

Chemical control is the most popular and effective method. About two thirds of treatments by pest control companies rely on the use of liquid insecticides in soil. However, the deleterious effect of continuous usage of chemical termiticides is a serious concern, and many of the most effective chemical agents are now banned under environmental regulations. So, there is a dire need to develop termite management strategies with the least possible cost and harm to non-target organisms, present in the environment.

This volume comprises 13 chapters in an attempt to bring all available information on sustainable and eco-friendly termite management. The previous volume considered the biology, social behaviour and economic importance of these insects. Chapters in this book dealing with damage and specific management of fungus-growing termites provide a review on most recent methodologies used for management. Termites damage crops from sowing till harvest. As it is difficult to detect damages in the field, usually it is too late when the symptoms are noticed. A separate chapter on issues related to Indian agriculture and the contemporary practices being followed by majority of the Indian farmers is quite informative. Similarly, a case study for termites infesting Malaysian forests constitutes an important contribution. Various issues related to integrated and eco-friendly termite management in tropical conditions have been addressed comprehensively. Potential role of microbes has also been discussed in detail in other chapters. The information contained under

these chapters should help termite management in a way that natural resources can be used and maintained for the generations to come. Similarly, the chapter on physical barriers contributes a wealth of information that can be useful all over the world where termite is a problem. Emphasis has been laid on reviewing contribution of synthetic chemical insecticides in termite management. A separate chapter dealing with standard norms in wood protection constitutes a significant step in this direction. A further chapter throws light on the potential of biotechnology as a tool in management.

Present volume covers several facets of termites with a focus given on eco-friendly means of management. We hope that it will be helpful to students, teachers, researchers and industry technicians. We are highly grateful to all the authors for providing their expertise in the form of stimulating contributions. Thanks are due to the Head of the Biology Department and Dean of the Faculty of Science, Jazan University, Jazan, for their constant support. We are grateful to Dr. Aurelio Ciancio, Bari, Italy, for including these two volumes dealing with termites and sustainable management in the Springer series “Sustainability in Plant and Crop Protection”. We extend our thanks to the Springer International team for their generous cooperation at every stage of the book production. Md. Aslam Khan acknowledges the Research Centre for Environmental Studies, Jazan University, KSA, for the financial assistance CERS 7/2013.

Professor Wasim Ahmad is thankful to the Dean of Faculty of Life Sciences and the Vice Chancellor of Aligarh Muslim University for the encouragement and support.

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