

A stylized map of the Asian continent is shown in yellow, set against a red background. The map includes the Indian subcontinent, Southeast Asia, and East Asia.

Brown planthopper :

THREAT TO RICE PRODUCTION IN ASIA



International Rice Research Institute

Brown planthopper:

**THREAT TO
RICE PRODUCTION
IN ASIA**

1979

INTERNATIONAL RICE RESEARCH INSTITUTE
LOS BAÑOS, LAGUNA, PHILIPPINES
P.O. BOX 933, MANILA, PHILIPPINES

The International Rice Research Institute receives support from a number of donors including the Ford Foundation, the Rockefeller Foundation, the European Economic Community, the United Nations Development Programme, the United Nations Environment Programme, the Asian Development Bank, the International Development Research Centre, the World Bank, and the international aid agencies of the following governments: United States, Canada, Japan, United Kingdom, Netherlands, Australia, Federal Republic of Germany, Iran, Saudi Arabia, New Zealand, Belgium, Denmark, and Sweden.

The responsibility for this publication rests with the International Rice Research Institute.

Contents

Foreword	v
PROBLEM	
The brown planthopper problem <i>V. A. Dyck and B. Thomas</i>	3
TAXONOMY AND ECOLOGY	
Taxonomy and biology of <i>Nilaparvata lugens</i> (Hom., Delphacidae) <i>O. Mochida and T. Okada</i>	21
Ecology of the brown planthopper in temperate regions <i>E. Kuno</i>	45
Ecology of the brown planthopper in the tropics <i>V. A. Dyck, B. C. Misra, S. Alum, C. N. Chen, C. Y. Hsieh, and R. S. Rejesus</i>	61
OUTBREAKS AND MIGRATION	
Forecasting brown planthopper outbreaks in Japan <i>J. Hirao</i>	101
Brown planthopper migration <i>R. Kisimoto</i>	113
Economic thresholds, nature of damage, and losses caused by the brown planthopper <i>K. Sogawa and C. H. Cheng</i>	125
CHEMICAL CONTROL	
Chemical control of the brown planthopper <i>E. A. Heinrichs</i>	145

VARIETAL RESISTANCE

Screening methods and sources of varietal resistance <i>Seung Yoon Choi</i>	171
Varietal resistance to brown planthopper in India <i>M. B. Kalode and T. S. Khrishna</i>	187
Breeding for resistance to brown planthopper and grassy stunt virus in Indonesia <i>Z. Harahap</i>	201
Status of varietal resistance to the brown planthopper in Japan <i>C. Kaneda and R. Kisimoto</i>	209
Varietal resistance to the brown planthopper in Korea <i>S. Y. Choi, M. M. Heu, and J. O. Lee</i>	219
Varietal resistance to the brown planthopper in the Solomon Islands <i>J. H. Stapley, YinYin May-Jackson, and W. G. Golden</i>	233
Varietal resistance to the brown planthopper in Sri Lanka <i>H. Fernando, D. Senadhera, Y. Elikawela, H. M. de Alwis, and C. Kudagamage</i>	241
Studies on varietal resistance to the brown planthopper in Taiwan <i>C. H. Cheng and W. L. Chang</i>	251
Varietal resistance to the brown planthopper in Thailand <i>S. Pongprasert and P. Weerapat</i>	273
Studies of varietal resistance in rice to the brown planthopper at the International Rice Research Institute <i>M. D. Pathak and G. S. Khush</i>	285
Factors governing susceptibility and resistance of certain rice varieties to the brown planthopper <i>R. C. Saxena and M. D. Pathak</i>	303

GENETICS OF RESISTANCE

Genetics of and breeding for resistance to the brown planthopper <i>G. S. Khush</i>	321
--	-----

BIOLOGICAL AND CULTURAL CONTROL

Biological control of the brown planthopper <i>Shui-chen Chiu</i>	335
Cultural control of the brown planthopper <i>Ida Nyoman Oka</i>	357

Foreword

The brown planthopper has become a serious threat to rice production throughout Asia. The increase in severity of the insect appears to be associated with the technology used in modern rice culture. On 18–22 May 1977, leading rice scientists met in a symposium at the International Rice Research Institute to discuss research results and to develop plans for brown planthopper control. The objectives of the symposium were to bring together all the known information on the brown planthopper, to identify research areas that should be given priority, and to strengthen communication and collaboration among scientists involved in research on this pest.

Until recently we believed that planting of resistant rice varieties and use of insecticides were satisfactory means of controlling the brown planthopper. Just as IR8 was a simplistic solution to the problems of tungro virus control, the brown planthopper resistant variety IR26 was thought to be a simplistic solution to the brown planthopper problem. We were alarmed, however, when we heard that IR26 was susceptible in India, indicating the presence of a different brown planthopper biotype from that of the Philippines. A few years after IR26 was introduced in Indonesia and the Philippines, a brown planthopper biotype capable of destroying IR26 became abundant. To compound the problem, resurgences of the brown planthopper population occurred where insecticides were used.

Our experience has indicated that the simplistic approach to the control of this particular insect is not adequate. In rice entomology, the brown planthopper presents the most outstanding example of a need to develop an approach in which varietal resistance, biological and cultural control, and insecticides should be integrated to develop an economically and ecologically suitable means of control. That will require a thorough understanding of the interaction between the rice plant and the pest. It is apparent that the battle against the brown planthopper will not be won without an interdisciplinary approach that includes international collaboration.

The IRRI symposium covered the taxonomy, biology, and ecology of the brown planthopper and its control through the use of cultural methods, varietal resistance, insecticides, and natural enemies. A selected group of rice entomo-

logists and breeders from most Asian countries participated. This proceedings includes papers prepared for the symposium by entomologists and plant breeders who are the world's leading authorities on brown planthopper. It is the only book dealing exclusively with all the aspects of brown planthopper research for both the tropical and temperate regions. It is hoped that this book will serve as a guide in the setting of research priorities, and as an aid in the writing of proposals for brown planthopper research, and thus serve as a stimulus to accelerate the development of suitable control methods.

N. C. Brady
Director General