# INSECT SCIENCE AND ITS APPLICATION

The International Journal of Tropical Insect Science

Editor: Thomas R Odhiambo

International Centre of Insect Physiology and Ecology (ICIPE)





# **PERGAMON PRESS**

OXFORD · NEW YORK · TORONTO · SYDNEY · PARIS · FRANKFURT

# **Insect Science and its Application**

### The International Journal of Tropical Insect Science

Sponsored by the International Centre of Insect Physiology and Ecology (ICIPE), and the African Association of Insect Scientists (AAIS)

### Editor-in-Chief

# Thomas R. Odhiambo

International Centre of Insect Physiology and Ecology (ICIPE), P.O. Box 30772, Nairobi, Kenya

### **Editorial Advisory Board**

- F. T. Abu Shama, Khartoum,
- P. L. Adkisson, Texas, U.S.A.
- J. C. M. Carvalho, Rio de Janeiro,
- R. Galun, Jerusalem, Israel
- T. Hidaka, Kyoto, Japan
- H. Hirumi, Nairobi, Kenya
- V. Landa, Praque, Czechoslovakia
- R. Levins, Boston, U.S.A.
- M. Locke, Ontario, Canada
- F. G. Maxwell, Texas, U.S.A.
- J. Meinwald, New York, U.S.A.
- P. L. Miller, Oxford, England
- J. Mouchet, Bondy, France
- A. S. Msangi, Dar-es-Salaam, Tanzania
- M. D. Pathak, Manila, The Philippines

- K. N. Saxena, Delhi, India
- H. Schmutterer, Giessen. F.R. Germany
- L. M. Schoonhoven, Wageningen, The Netherlands
- J. E. Treherne, Cambridge, England
- D. F. Waterhouse, Canberra, Australia
- A. Youdeowei, Ibadan, Nigeria

### **PUBLISHED QUARTERLY**

Publishing, Subscription and Advertising Offices: Headington Hill Hall, Oxford OX3 0BW, U.K. [Tel. Oxford (0865) 64881] Annual Subscription Rate 1984

For libraries, university departments, government laboratories, industrial and other multiple-reader institutions, US\$105.00; two-year rate (1984-85) US\$199.50 (including postage and insurance). Specially Reduced Rates for Individuals: In the interest of maximizing the dissemination of the research results published in this important international journal we have established a two-tier price structure. Any individual whose institution takes out a library subscription may purchase a second or additional subscriptions for personal use at a much reduced rate of US\$30.00. Members of the International Centre of Insect Physiology and Ecology (ICIPE) and the African Association of Insect Scientists (AAIS) may purchase a subscription at the special rate of US\$20.00. Subscription enquiries from customers in North America should be sent to: Pergamon Press Inc., Maxwell House, Fairview Park, Elmsford, NY 10523, U.S.A., and for the remainder of the world to: Pergamon Press Ltd, Headington Hill Hall, Oxford OX3 0BW, U.K.

Application forms for Membership of the AAIS (subscription US\$20.00) may be obtained from: Hon. Secretary, African Association of Insect Scientists, P.O. Box 59900, Nairobi, Kenya.

Microform Subscriptions and Back Issues

Current subscriptions are available on microfiche simultaneously with the paper editions and on microfilm on completion of the annual index at the end of the subscription year.

### Copyright © 1983 Pergamon Press Ltd

It is a condition of publication that manuscripts submitted to this journal have not been published and will not be simultaneously submitted or published elsewhere. By submitting a manuscript, the authors agree that the copyright for their article is transferred to the publisher if and when the article is accepted for publication. However, assignment of copyright is not required from authors who work for organizations which do not permit such assignment. The copyright covers the exclusive rights to reproduce and distribute the article, including reprints, photographic reproductions, microform or any other reproductions of similar nature and translations. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic electrostatic, magnetic tape, mechanical, photocopying, recording or otherwise, without permission in writing from the copyright holder.

Photocopying Information for Users in the U.S.A.

The Item-Fee Code for this publication indicates that authorization to photocopy items for internal or personal use is granted by the copyright holder for libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service provided the stated fee for copying beyond that permitted by Section 107 or 108 of the United States Copyright Law is paid. The appropriate remittance of \$3.00 per copy per article is paid directly to the Copyright Clearance Center Inc., 21 Congress Street, Salem, MA 01970. The copyright owner's consent does not extend to copying for general distribution, for promotion, for creating new works, or for resale. Specific written permission must be obtained from the publisher for such copying. In case of doubt please contact your nearest Pergamon

The Item-Fee Code for this publication is: 0191-9040/83 \$3.00  $\pm$  0.00

### PERGAMON PRESS

HEADINGTON HILL HALL OXFORD OX3 0BW, U.K.

MAXWELL HOUSE, FAIRVIEW PARK ELMSFORD, NY 10523, U.S.A.

# **CONTENTS OF VOLUME 4**

# VOLUME 4 NUMBER 1/2

T. R. Odhiambo	1	Preface
K. V. Seshu Reddy	3	Studies on the stem-borer complex of sorghum in Kenya
C. M. Warui and J. N. Kuria	11	Population incidence and the control of maize stalk-borers Chilo partellus (Swinh.), C. orichalcociliellus Strand and Sesamia calamistis Hmps. in Coast Province, Kenya
D. T. Ho and K. V. SESHU REDDY	19	Monitoring of lepidopterous stem-borer population by pheromone and light traps
M. A. SAMPSON and R. KUMAR	25	Population dynamics of the stem-borer complex on sugar-cane in Southern Ghana
K. Ogwaro	33	Intensity levels of stem-borers in maize and sorghum and the effect on yield under different intercropping patterns
B. AMOAKO-ATTA and E. O. OMOLO	39	Yield losses caused by the stem-/pod-borer complex within maize-cowpea-sorghum intercropping systems in Kenya
B. Amoako-Atta, E. O. Omolo and E. K. Kidega	47	Influence of maize, cowpea and sorghum intercropping systems on stem-/pod-borer infestations
J. D. MUMFORD and C. W. BALIDDAWA	59	Factors affecting insect pest occurrence in various cropping systems
D. T. Ho, J. J. NJOKAH and J. G. KIBUKA	65	Studies on rice stem-borers in Kenya with emphasis on Maliarpha separatella Rag.
J. B. OKEYO-OWUOR, P. O. AGWARO and C. O. J. SIMBI	75	Studies on the legume pod-borer Maruca testulalis (Geyer)—V. Larval population
R. S. OCHIENG and D. O. M. BUNGU	83	Studies on the legume pod-borer <i>Maruca testulalis</i> (Geyer)—IV. A model for mass rearing: rearing on artificial diet
J. B. Suh and C. O. Simbi	89	Studies on the legume pod-borer, Maruca testulalis (Geyer)—VIII. Cowpea phenology and yield loss assessment: effect of loss of leaves, shoots, flowers and pods on cowpea yield in Western Kenya
P. T. WALKER	97	The assessment of crop losses in cereals
E. O. Omolo	105	Screening of local and exotic maize lines for stem-borer resistance with special reference to <i>Chilo partellus</i>
Z. T. Dabrowski and E. O. Nyangiri	109	Some field and screenhouse experiments on maize resistance to Chilo partellus under Western Kenya conditions
Z. T. DABROWSKI and E. L. KIDIAVAI	119	Resistance of some sorghum lines to the spotted stalk-borer Chilo partellus under Western Kenya conditions
R. S. PATHAK and J. C. OLELA	127	Genetics of host plant resistance in food crops with special reference to sorghum stem-borers
A. M. Alghali	135	Relative susceptibility of some rice varieties to the stalk-eyed fly Diopsis thoracica West
Z. T. Dabrowski, D. O. M. Bungu and R. S. Ochieng	141	Studies on the legume pod-borer, Maruca testulalis (Geyer)—III. Methods used in cowpea screening for resistance
C. A. MACFOY, Z. T. DABROWSKI and S. OKECH	147	Studies on the legume pod-borer, <i>Maruca testulalis</i> (Geyer)—VI. Cowpea resistance to oviposition and larval feeding
C. J. DEN OTTER and H. M. KAHORO	153	Taste cell responses of stem-borer larvae, Chilo partellus (Swinhoe), Eldana saccharina Wlk. and Maruca testulalis (Geyer) to plant substances

S. M. WALADDE	159	Chemoreception of adult stem-borers: tarsal and ovipositor sensilla on Chilo partellus and Eldana saccharina		
R. O. Abasa-	167	Current and future pest management strategies in polycultural systems in East Africa		
Е. Н. Ѕмітн	173	Integrated pest management (IPM)—specific needs of developing countries		
D. G. BOTTRELL	179	Social problems in pest management in the tropics		
M. G. Jotwani	185	Chemical control of cereal stem-borers		
D. G. CAMPION and B. F. NESBITT	191	The utilisation of sex pheromones for the control of stem-borers		
L. E. N. JACKAI and S. R. SINGH	199	Varietal resistance in the integrated pest management of cowpea pests		
W. R. Ingram	205	Biological control of graminaceous stem-borers and legume pod- borers		
W. A. OTIENO, M. O. ODINDO, J. B. OKEYO-OWUOR and D. M. SABWA	211	Studies on the legume pod-borer, Maruca testulalis Geyer—VII. Field surveys on pathogenic microorganisms		
S. B. Sagnia	217	Possible integrated pest management tools for the effective control of cereal stem-borers in The Gambia		
S. S. MLAMBO	221	The status of cereal stem-borer and legume pod-borer research in Zimbabwe		
VOLUME 4 NUMBER 3  A Manistricia and L. E. Rhopes. 223 Bioassay of various formulations of insecticides on the egg and				
A. Mansingh and L. F. Rhodes	223	Bioassay of various formulations of insecticides on the egg and		
T. D. O	227	larval stages of the coffee berry borer Hypothenemus hampei Ferrari (Scolytidae: Coleoptera)		
T. R. ODHIAMBO, E. D. KOKWARO and L. M. SEQUEIRA	227	Histochemical and ultrastructural studies of the male accessory reproductive glands and spermatophore of the tsetse, Glossina morsitans Westwood		
M. J. MUTINGA and J. N. NGOKA	237	Investigation of animal reservoirs of visceral leishmaniasis and the isolation of <i>Leishmania major</i> in Marigat, Baringo District, Kenya		
E. D. Kokwaro	241	Oocyte development in the adult fleshfly, Sarcophaga tibialis Macquart (Diptera: Sarcophagidae), during the first reproductive cycle		
E. D. KOKWARO	247	Egg-chamber development in the ovarioles of the fleshfly, Sarco-phaga tibialis Macquart (Diptera: Sarcophagidae), during the first reproductive cycle		
M. J. MUTINGA, J. B. KADDU, J. O. Olobo, F. M. Kyai and D. M. Omogo	253	Studies on vectors of kala-azar in Kenya: <i>Phlebotomus heischi</i> (Diptera: Psychodidae) Kirk and Lewis, a new male record in Kenya		
K. Honda	255	Evidence for <i>de novo</i> biosynthesis of osmeterial secretions in young larvae of the swallowtail butterflies ( <i>Papilio</i> ): deuterium incorporation <i>in vivo</i> into sesquiterpene hydrocarbons as revealed by mass spectrometry		
H. S. QORRO and J. R. MAINOYA	263	Effects of farnesol on the corpora allata and accessory reproductive glands morphometrics in <i>Cataloipus cymbiferus</i> Krauss (Acrididae: Orthoptera)		
J. B. ACKONOR	267	The nest and nesting habits of the ant Cataulacus guin- eensis F. Smith (Hymenoptera: Formicidae) in a Ghanaian cocoa farm		
P. O. Lawrence	285	Age-specific fecundity and offspring survivorship in the Caribbean fruit fly, <i>Anastrepha suspensa</i> , after diflubenzuron treatment		

M. O. Odindo	291	Epizootiological observations on a nuclear polyhedrosis of the African armyworm Spodoptera exempta (Walk.)				
M. F. B. CHAUDHURY	299 301	Book Review  Blackflies: The Future for Biological Methods in Integrated Control, Ed. by LAIRD M.  New patents				
VOLUME 4 NUMBER 4						
S. N. Okiwelu	305	Further observations on the resting site preferences of the tsetse, Glossina palpalis gambiensis Vanderplank (Diptera: Glossinidae), in Mali				
J. MACFARLANE	309	Observations on trail pheromone, trail laying and longevity of natural trails in the termite, Macrotermes michaelseni				
S. K. N. ATUAHENE and D. SOUTO	319	The rearing and biology of the mahogany shoot borer Hypsipyla robusta Moore (Lepidoptera: Pyralidae) on an artificial medium				
A. G. L. DELOBEL	327	Influence of temperature and host plant condition on preimaginal development and survival in the sorghum shootfly Atherigona soccata				
I. FAGOONEE and V. TOORY	337	Preliminary investigations of host selection mechanisms by the leafminer Liriomyza trifolii				
W. F. Snow	343	Effect of size of cattle bait on the range of attraction of tsetse and mosquitoes				
P. EINYU and R. W. KAPAATA	345	Mating behaviour in relation to sexual maturation of male Glossina morsitans centralis (Machado 1970) (Diptera: Glossinidae)				
B. Amoako-Atta	351	Observations on the pest status of the striped bean weevil Alcidodes leucogrammus Erichs. on cowpea under intercropping systems in Kenya				
P. SINGH	357	A general purpose laboratory diet mixture for rearing insects				
H. C. SHARMA and R. A. AGARWAL	363	Factors affecting genotypic susceptibility to spotted bollworm Earias vittella Fab. in cotton				
H. C. SHARMA and R. A. AGARWAL	373	Oviposition behaviour of spotted bollworm, Earias vittella Fab. on some cotton genotypes				
J. KAGAN, JP. BENY, G. CHAN, S. N. DHAWAN, J. A. JAWORSKI, E. D. KAGAN, P. D. KASSNER, M. MURPHY and J. A. ROGERS	377	The phototoxicity of some 1,3-butadienes and related thiophenes against larvae of the mosquito Aedes aegypti and of the fruit fly Drosophila melanogaster				
J. MARGALIT and Z. EVENCHIK	383	Mosquito and copepod host range tests with Coelomomyces psorophorae (Blastocladiales, Chytridiomycetes)				
A. A. Adesiyun	387	Some effects of intercropping of sorghum, millet and maize on infestation by lepidopterous stalk-borers, particularly Busseola fusca				
W. LWANDE, T. GEBREYESUS, A. CHAPYA, C. MACFOY, A. HASSANALI and M. OKECH	393	9-Acridone insect antifeedant alkaloids from Teclea trichocarpa bark				
G. K. Karnavar	397	Studies on the population control of Pieris brassicae L. by Apanteles glomeratus L.				
A. K. Chakravarthy	401	Relative abundance and distribution patterns of field bean (Lablab niger Medick) pod-borers Adisura atkinsoni Moore				
B. U. SINGH, B. S. RANA, B. B. REDDY and N. G. P. RAO	407	Host plant resistance to stalk-borer, Chilo partellus Swin., in sorghum				

# List of Contents, Author and Subject Index for Volume 4, 1983

J. N. MKHIZE	415	Susceptibility of <i>Tribolium confusum</i> Jacquelin Duval to an insect growth regulator with juvenile hormone-like effects
		Book Review
H. HOOGSTRAAL	417	Physiology of Ticks. Edited by Obenchain F. D. and Galun R.
K. P. Srivastava	421	Obituary
	423	New Patents