IOBC Newsletter

n° 31-32, 1984
March

IOBC is affiliated to the International Council of Scientific Unions (ICSU) as the Section of Biological Control of the International Union of Biological Sciences (IUBS)

CONTENTS

Obituary ................................................................. 1
IOBC (Global) Governing Board ................................. 3
Regional Sections’ Governing Boards ......................... 3
IOBC (Global) .......................................................... 4
List of Working Groups ............................................. 4
International Medallists, Biological Control Work Group Newsletter ............................................. 4
Report of the Western Hemispheric Regional Section 6
Report of the West Palaearctic Regional Section .6
Forthcoming Meetings ................................................ 7
A New Journal .......................................................... 7
Selected Abstracts ..................................................... 7
a) Plant Protection .................................................... 7
b) Insect and Plant Control ......................................... 7
c) Control of Plant Pathogens ................................... 16
d) Control of Weeds .................................................. 16
e) Public Health ......................................................... 16
f) Veterinary Entomology ........................................... 19
Abstracts from Entomophaga .................................... 21

Alfred-Serge BALACHOWSKY 1901-1983
Le Président-Fondateur de l’OIBR,
A-S. BALACHOWSKY, vient de nous quitter au terme d’une carrière féconde.
Dans Entomophaga, Pierre GRESON retrace brillamment les principales étapes de sa vie de chercheur, d’éducateur et d’organisateur. Il ne me conviendrait donc d’évoquer quelques-uns des traits les plus attachants et parfois méconnus de l’exceptionnelle personnalité de BALACHOWSKY.

En tout premier lieu, il faut souligner son énorme puissance de travail et son remarquable esprit de synthèse. En 1933, à l’âge de 32 ans il est l’auteur de son ouvrage avec P. MERNIL, dans la préparation d’un ouvrage magistral de 2000 pages in 4°. « Les insectes nuisibles aux plantes cultivées » qu’il remaniéait à publier en 1935-1936. Une phrase de son avant-propos est particulièrement révélatrice du caractère et des aspirations de BALACHOWSKY :

« Seules de paisibles recherches, promouvues avec enthousiasme et optimisme dans le calme et la liberté, peut-être même, en rencontrant les obstacles qui pour le moment paraissent encore infranchissables ». 

En écrivant ces lignes il évoque avec instance cette liberté, imaginait-il le déferlement du nazisme sur l’Europe ?

Dans les années tragiques de la 2e guerre mondiale, son action fut en parfait accord avec sa pensée qui était aussi celle de son grand ami Pierre LECOMTE DU NOUY : la foi en la dignité de l’homme.

Secretary-General : G. MATHYS, 1, rue Le Nôtre, FR-75016 Paris (France)
En 1941, il produisait ses cours d'Entomologie à l'École Nationale d'Agriculture de Grignon, capturant son auditoire par son érudition et son expérience. Dans le même temps, il exerçait les fonctions de chef de secteur dans un réseau de la Résistance armée à la déportation d'hommes dans le réseau de Grignon, il était en liaison régulière avec Léonard et organisait des parachutages d'armes dans la région. Sa petite « Rosegarret » toute seule qui stationnait dans l'Ecole après chaque rendez-vous nocturne nous intrigüait.

Tout en passant ses week-ends à Londres, le réseau Buchan-Prisco était totalement démantelé au début du mois de juillet 1943. Arrêté, emprisonné à Fresne, déporté à Buchenwald, BALACHOWSKY était immédiatement transféré dans l'enfer du Dora où V1 et V2 étaient fabriqués dans le plus grand secret — secret gardé par la mort des détenus.

Des amis de BALACHOWSKY réussirent à l'arrêcher à temps de cet enferr à la faveur de la complicité d'un prisonnier politique allemand anti-nazi qui était devenu assistant du médecin fou et sadique, le SS Dring Schneir, chef de l'Institut d'Hygiène du camp de Buchenwald où l'on faisait du vaccin contre le typhus. BALACHOWSKY, le futur chef du Laboratoire à l'Institut Pasteur, n'était-il pas l'hôtel tout indiqué pour participer à cette fabrication ? Revenu à Buchenwald dans un état suicidaire, il a pu récupérer toute sa vitalité en allant chercher des dispositions autorisées de Marguerite qui avaient servi à la préparation du vaccin. Grâce à son énergie insaisissable, son intelligence, son ménage du danger et ses bons de persuasion, il a réussi à sauver de la pendaison le Wing Commander Forrest Yeo THOMAS, envoyé spécial de Churchill en France, ainsi que plusieurs de ses camarades. Il a dû d'abord entrer dans le bloc des otages humains du médecin fou puis, en leur attribuant l'identité de cadavres, il put les faire transférer dans des camps satellites. Tous au long de sa vie, avec la même persévérance et la même détermination, le Wing Commander Yeo THOMAS a transcrit de son ys eigenen la conquête d'objectifs que d'autres croyaient inaccessibles ; chaque fois il réussit à courber les obstacles, à convaincre ses interlocuteurs et à leur transmettre sa foi dans l'œuvre à accomplir. Aujourd'hui, il peut affirmer que, sans son action persévérante, l'OLI n’aurait jamais vu le jour.

Parallèlement à son travail, il a accompli un travail inestimable dans l'Entomologie au service de l'Homme. BALACHOWSKY est toujours resté fidèle à la passion de naturaliste qui l'avait marqué depuis sa jeunesse. Ses nombreuses missions l'ont conduits en Afrique, en Asie, au Globe, au Japon, à la Birmanie, de l'Éthiopie à l'Iran et au Liban, de la Laponie à l'Afrique équatoriale, des USA au Mexique, à l'Amérique, à la Guyane et aux Caraïbes. L'importance et l'intérêt des matériaux qu'il a récoltés lors de chaque exploration sont attestés par le nombre considérable des publications qui en ont résulté. A sa tête, il a formé de nombreux entomologistes, il a créé la systémique et la biogéographie des coléoptères demeurant l'une des parties les plus riches de son œuvre scientifique.

Chaque fois qu'il en trouvait l'occasion, il n'hésitait pas à s'insurger contre des discours qui le semblent par leur discours systématique au cours des derniers années, alors que la biologie s'engageant de façon trop exclusive vers les voies moléculaires et biochimiques en négligeant ses propres racines. Les États Unis. BALACHOWSKY a été l'un des premiers européens à penser que l'avenir de la biologie pour les futurs biologistes sur l'écologie d'où l'urgence est justifiée par la disparition chaque année d'espèces survivantes qui restent à jamais inconnues, leur élimination résultant de la dégradation accentuée des milieux naturels de notre planète souffrant de l'effet conjugué de la démographie géante et de moyens techniques de plus en plus destructeurs.

L’histoire retiendra le nom de BALACHOWSKY comme celui d’un des figures les plus emblématiques de l’Entomologie française et de l’Entomologie mondiale de ce 20e siècle.

L'OIL rend hommage à la mémoire de son fondateur et patron à sa mémoire. Sante BALACHOWSKY. L'expression de son profond respect.

G. REMAUVIERE
Professeur à l'Institut Pasteur

Alfred-Serge BALACHOWSKY 1901-1983

Le fondateur President de JOC, A-S. BALACHOWSKY, has passed away, as the end of a prolific career.

In Entomology. Pierre GRISON has well recovered the main stages in his life as a researcher, editor and organizer. Here, I will just recall a few of the most engaging and, perhaps, less well known sides of the outstanding personality of BALACHOWSKY.

Firstly, it is necessary to emphasise his tremendous capacity for work and his remarkable powers of synthesis. In 1931, at the age of 32, he was bold enough, with P. MESSILIN, to launch into the preparations of a colossal work of 2600 pages in 4 volumes: « Pen Insulas of Cultivated Plants», which was published in 1935-1936. One sentence in the preface is especially revealing about the character and aspirations of BALACHOWSKY: « Only patient research, undertaken with enthusiasm and optimism, with peace of mind and freedom, with no restraints or pressure, will enable us to overcome obstacles which at the time appear insurmountable. »

When writing these lines where he earnestly evokes this freedom, did he conceive of the unfurling of Nazism in Europe? During the tragic years of the Second World War, his deeds are in perfect harmony with his thoughts, which were those also of his great friend LIECROTE DE NOUY, « Faith in the dignity of Man.»

In 1941, he was presenting his entomology courses at the Grignon National Agricultural School, captivating his audience with his erudition and experience. At the same time, he was carrying on his function as director head in the Resistance thanks to a transmitter hidden in the greenhouse at Grignon. He was in regular contact with London, and organised dropping of arms in the region. His little muddy « Rosegarret » which was parked in the School after each mission could escape unscathed.

Betrayed by a spy in London, the Buchan-Prisco network was completely broken up at the beginning of July 1943. BALACHOWSKY was imprisoned at Fresne, sent to Buchenwald and then immediately transferred to the hell of the Dora tunnel, where V1 and V2 were made; in great secret « secrecy being guaranteed by death of the prisoners. »

BALACHOWSKY's friends succeeded in getting him away from this hell with the help of a German anti-nazi political prisoner, who had become the assistant of the real and sadistic doctor, SS Drig Schneir, head of the Institute of Hygiene, at the Buchenwald camp, where typhus vaccine was being made. Was not BALACHOWSKY, as future head of department of the Pasteur Institute, the obvious choice to make this choice in this production? Having returned to Buche- nwald looking like a skeleton, he regained his health by eating the avoided remains of rations which had been used in the vaccine preparation. Thanks to his unwavering energy, his intelligence, his defiance of danger and his powers of persuasion, he succeeded in saving from hanging Wing Commander Forrest Yeo THOMAS, special envoy of
Churchill in France, as well as many of his friends. He first arranged for them to become honeysuckle-pigs of the maid dragon, and then, passing them off as dead bodies, managed to have them transferred to other camps.

Throughout his long life, with the same perspicacity and insight, BALACHOWSKY addressed himself to problems which others believed to be insoluble; each time he succeeded in overcoming obstacles, and overcoming his peers, imparting to them his faith in the work to be done. Today, we may be sure that, without his actions, IOBC would never have been born. Concurrently with his constant preoccupation to place Entomology in the service of Man, BALACHOWSKY always remained true to the position of being a biologist, to which he had aspired since childhood. His numerous expeditions took him to almost all parts of the world, from Japan to Barmen, India to Zanzibar and Lebanon, from Lapland to equatorial Africa, USA to Morocco, to Amazonia, Guyana and the Caribbean. His considerable number of publications bear witness to the importance and value of the material collected during his travels. In this respect, BALACHOWSKY’s work on the systematics and biogeography of Cicadae will remain one of the pillars of his scientific achievements.

Whenever the occasion arose, he never hesitated to rebel against the discredit brought upon the discipline of systematics during the past 50 years when the emphasis in biology rested on molecular and biochemical studies, neglecting the basic concept: living organisms. BALACHOWSKY will have been one of the most eminent defenders of fundamental studies on fauna and ecology, which are urgently required in view of the disappearance of a great number of innumerable species which will remain to be described: their elimination is resulting in an accelerated degradation of the natural environment of our planet under the combined effects of population explosion and increasingly destructive technical innovations.

BALACHOWSKY will be recorded in history as one of the most eminent figures in French and world entomology in the Twentieth Century. IOBC pays tribute to the memory of its Founder and extends to his widow, Madame BALACHOWSKY, its deepest sympathy.

G. REMAUDPRES
Professor at the Pasteur Institute.

Treasurer
P.D. Bennett
CIBC, Gordon Street, George, Trinidad, West Indies

Regional Sections’ Governing Boards

EPRS Governing Board as of April 1977
President
Y.N. Fadyev
Academy of Agricultural Sciences, Ministry of Agriculture,
Orlikov perëmok 1/11, Moscow 107139, USSR.
Vice-President
E. Lipiec
Institute for Field Plant Protection, Institute for Plant Protection, Ministry of Agriculture, Orlikov perëmok 1/11, Moscow 107139, USSR.
Secretary-General
V.A. Lebedev
Ministry of Agriculture, Orlikov perëmok 1/11, Moscow 107139, USSR.
Executive Committee Members
G. Polytomos
Research Production Association “Certified seeds and planting stock”, Sd. Boler 55, Sofia, Bulgaria
A. Senetilek
All-Union Research Technology, Institute for Quarantine and Plant Protection, Ministry of Agriculture, Orlikov perëmok 1/11, Moscow 107139, USSR.

WPRS Governing Board – 1984
President
J. Barninger
University of Florida, Agricultural Research and Educ. Center, 4000 S W. 240 Street, Horseshoe, FL 33011, USA.
Vice-President
J.E. Allen, 1601 E. Perrywood Dr, Baton Rouge, LA 70806, USA.
H.C. Ching
Dep. of Entomology, Fisheries and Wildlife, University of Minnesota, St. Paul, MN 55108, USA.
Vice-President
E.D. Reiss-Filho
Dep. Entomologia – ESALQ-USP, Caixa Postal 9, 13400 Piracicaba-SP, Brazil
A. Garcia-Escobar
Dirección General de Sanidad Vegetal, Guillermo Pern, Valverde, 137, Coyoacan, 04610 Mexico D.F.
Secretary-Treasurer
J.C. O’Hear
Dep. of Entomology, Texas A&M University, College Station, TX 77843, USA.
Corresponding Secretary
L.T. Kok
Virginia Polytechnic Institute and State University, Dep. of Entomology, Blacksburg, VA 24061, USA.

WPRS Governing Board – 1994
President
M.J. Way
Imperial College, Silwood Park, Ascot, Berks SL7 9PY, England.
Quality Control in Mass-reared Antsprems (Chairman D.L. Chambers)

Heliothis Biological Control (Chairman E.G. King)
International Working Group on Ostrinia (IWOG) (Chairmen P. Angilletta, B. van Lenteren)
Working Group on Struclichs (Chairman V. Lubecky)

International Heliothis Biological Control Working Group Newsletter
The first Newsletter of this group was issued in November 1983, and the second will follow in April 1984. No. 1 is divided into 4 sections: 1) Introduction; 2) Program in biological control (Individual reports and S-59 project); 3) Quotations; 4) List of scientists researches of Heliothis spp.

The primary purpose of the Newsletter is to provide a medium whereby biological control researchers working on Heliothis spp. can communicate. Of particular interest is identification and exchange of natural enemies as well as information. There are 14 brief individual reports on progress in biocontrol of Heliothis, with reference to various parasites and predators: Eupelmus, Coleoptera (beetles), Trichostrongylus, Chrysopa, Conopidae, Cordiola, Heliozoma, Exorista, Cotesia, Cuscuta, Microphys, in various countries: Australia, New Zealand, India, Thailand, Korea, USA, and Europe.

The S-59 Southern Regional Project, « Heliothis spp.: Management Systems for Field Crops », has been in existence for about 10 years. The 1983 Annual Report of the Project is available to the Newsletter, together with a list of participants, progress report, and recent publications on Heliothis spp. by the project. The concept of Cooperative Regional Research is to focus cooperative efforts of state and federal researchers on a problem of broad concern such as Heliothis. The research is funded by the USDA and State Agricultural Stations. The next S-59 meeting will be held in March 1984 at Stoneville, Mississippi, USA.

A series of workshops was initiated as an outcome of the 1982 meeting of S-59. The series was entitled a Strategy and Tactics of Heliothis Population Management. Workshop I emphasized Co-ordinated National and International efforts. Among others, addressed included: management and control of wild hosts; cropping systems in SW, mid-South and SE USA; Heliothis plant interactions; efficacy of cactoblastis cactorum; assessment of cactoblastis cactorum; pathogens, in particular Bacillus, conservation and incorporation of natural enemies. Workshop I was published in late 1984 as a bulletin of the Agriculture Experimental Stations. Workshop II will be held on March 16, 1984, and will emphasize chemical control research, while Workshop III will emphasise plant and genetic control research.

The questionnaire solicits information from each respondent. It asks them to identify locations near Heliothis spp. and the species occur. An example questionnaire, completed by Dr E.G. King and C. Goodpasture, using species of Heliothis in the USA as examples, is attached.

There are 72 persons listed, with addresses, in section D, mainly from the USA, but also from Zimbabwe, Switzerland, United Kingdom, Pakistan, Egypt, Fiji, Malaysia, Poland, China, France, Australia, India, Thailand, Greece, and New Zealand.

East Palaearctic Regional Section (EPERS) was established in 1977. At present, the Section consists of 5 Standing Commissions:

- on publications;
- on entomopathogens and phytophagous insects of weeds;
- on microecological methods of plant protection;
- on integrated systems of plant protection;
- on specific and other new selective methods of plant protection.

Twelve ad hoc parties were set up in the framework of EPERS for solving particular problems in the field of biological control of noxious weeds and weeds.

During 1981-1983, the Section implemented its activities according to the programme approved by EPERS General Assembly at its 2nd session (November 1980, Moscow).

At present, the Section has the objective of summing up results of research and application in practice in EPERS member countries of various methods of biological control development of unified guidelines on application of biological plant protection means, organization of international conferences, meetings, symposia.

EPERS has made up annotated list of entomopathogenic insects, attacking pests of cereal crops, cotton, cooling, moth, Colorado potato beetle, tobacco pests and fall webworm moth. A catalogue of entomopathogenic microorganisms, deposited in research institutions of member countries was published. Also of note is the publication of compiled data on economic thresholds of damage, regulating chemical treatments, as well as information on pesticide sensitivity, which helps to reduce the noxious effects of chemicals.

A search for new Trichogramma species is ongoing, as well as the process of improving methods for its identification. Results of work on developing methods of genetic control of crop pests have been summarized. Research is being done on application of viral and other microbiological preparations for control of forest pests.

During the period under review, the Section held 8 meetings of Standing Commissions and ad hoc working parties, a meeting of chairmen of Standing Commissions, as well as Council and Executive Committee sessions.

1) Meeting of chairman of Standing Commissions (1981, Tashkent, USSR);
2) Meetings of members of Standing Commissions:
   - on publications (1981, Tashkent, USSR; 1983, Prague, Czechoslovakia; 1983, Sofia, Bulgaria);
   - on entomopathogens and phytophagous insects of weeds (1983, Poznan, Poland);
   - on microecological means of plant protection (1981, Prague, Czechoslovakia; 1983, Sofia, Bulgaria);
   - on gene-selective and other new selective methods of plant protection (1981, Poznan, Poland);
   - on integrated systems of plant protection (1983, Moscow, USSR);
3) Meeting of ad hoc working party on taxonomy of Trichogramma (1983, Sofia, Bulgaria).

At these meetings, the reports by chairman on activities of Standing Commissions were discussed, as well as proposals on publications and on the formation of new ad hoc parties. EPERS President, Prof. K. Hagen, took part in the 2nd meeting of chairman of Standing Commissions.

In 1981-1983, 4 symposia were held in the framework of Standing Commission activities:

1) Ecological foundation of genetic control of coding moth and other pests (1981, Poland). Symposium participants discussed 7 reports summarizing work on release of coding moth pests in laboratory and artificial rearing methods as well as physical methods of control of stored product pests.
3) Ecological basis and application of microbial preparations (1983, Bulgaria). Participants at the symposium considered development and application of microbiological preparations. It was pointed out that further effort should be channelled into improvement of technology of their production and application to control pests, potato beetle, vegetable and forest pests. Considerable attention should be paid to the role of naturally occurring diseases in reducing pest populations.
4) Application of Trichogramma in integrated systems of plant protection (1983, Bulgaria). The key problem at present is to develop effective methods of Trichogramma into Crop protection evaluation. Possibilities of mechanization of parasite mass rearing in vast areas are being studied. New Trichogramma species are being identified.

Proceedings of these symposia will be published as separate reports in 1984.

In November 1983, a joint meeting of EPERS Council and Executive Committee took place in Moscow, which considered implementation of the Section’s programme of activity and established 3 of its parties, which will be reporting to the Standing Commission on entomopathogens and phytophagous insects of weeds:

- on preparing a catalogue of parasites and predators;
- on biological control of glasshouse crop pests;
- on introduction of biological organisms.

The Council approves EPERS’ proposal for the establishment of a new Standing Commission on biological control of forest pests. The Council selected staff for the new Commission, developed a draft activity programme for 1984-1986, passed a preliminary agenda for the General Assembly session which will take place in Moscow in April, 1984.

At present, the Section is preparing the 1st session of the Standing Commission chairman, a meeting of members of the Standing Commission on integrated systems of plant protection, and a symposium on the subject ‘Integrated systems of plant protection’.

In 1984, it is planned to hold a joint EPERS/WPERS symposium in the framework of the Standing Commission on genetic and other new selective methods of plant protection. We hope that this activity will be of interest for both sections and will help to establish closer contacts and to find ways for further cooperation. We would welcome such cooperation with other regional sections, in particular, the exchange of information and beneficial organisms, as well as joint work on key subjects of biological control. Results of
the Section’s activity in 1981-1983, as well as its programme for 1984-1986, will be discussed at the 3rd session of the General Assembly, which will be held in Moscow in April 1984.

V. A. Lebedev
Secretary-General

Report of the Western Hemisphere Regional Section

The WHRS coordinates the Global Organization for the Organizing many conferences in the interest of promoting biological control. 2) sponsoring several working groups which conduct significant research and enhance communication among workers at biological control, and 3) publishing newsletters which provide timely information in biological control.

The WHRS, with 178 members in 1983, for its part: 1) held a meeting during the joint meeting of the Entomological Society of America and the Entomological Society of Canada in Toronto, Canada, November 1983, and 2) published 10 issues of Newsletters since July 1979. They were well received. Some discussion is underway to produce a Spanish edition.

The WHRS is very much concerned about the delayed publication of Entomophaga, and its consequent collapse of its subscribers and membership. Some members are also concerned about the quality of the journal. I personally appreciated the interaction with Dr. G. Mathys and Prof. M. Way on the publication issue, and am pleased to learn that corrective measures are being taken.

The WHRS wishes to make the following suggestions for the good of the Organization and the discipline of biological control: 1) the IOBC brochure is a very useful document to publicize the Organization. But the current version is outdated, a new version is urgently needed. If the list of officers is left out, the document will be valid and useful for a longer time. A larger number need to be printed and provided at each Section. They can be distributed during the annual meetings of entomological (and other related) societies in various countries; 2) the Council prepares and sends a letter to major taxonomic units in various countries stressing the need to educate more taxonomists, not only of insects, but also of plants and microorganisms; etc.

Finally, the WHRS looks forward to dynamic leadership and direction of the Organization.

H. C. Chiang
President 1983

Report of the West Palearctic Regional Section

The Section’s activities have continued very successfully with notable new developments, particularly in collaboration with the EC and also in information flow as well as with the New Working and Study Group programmes.

Links with EC

Close collaboration has been maintained between WHRS and EC working groups with common interests. Several successful meetings have been held jointly.

Collaboration between EC and WHRS has led to the development of training courses for young workers concerned with integrated control. The first course was held at Bologna in October/November 1982 and dealt with fruit crops and olives. This course, organised by Prof. G. Biondi, was attended by 18 young scientists and proved very successful. The second course is now under consideration for 1984-1985 and will deal with cereals and related crops or protected crops.

A seminar on Technology Transfer for IPC is being organized jointly with FAO in September or October 1984. This is aimed at people who are interfacing with the farmer and its objective is to discuss and recommend the application of IPC in the West Palearctic region. WHRS is also collaborating with FAO and EC in a symposium on wire pests in 1984.

Publications

In the five years up to 1982, WHRS has published 21 bulletins and brochures mainly in relation to various Working Group activities. Other publications are planned including authoritative texts on aspects of pest management.

Special emphasis is now being placed on publicity for which a newsletter has been prepared and is being distributed.

Information Service

A first copy of »PROFILE« - an internal newsletter for WHRS has now been distributed to Council members, members of Commissions and Working Groups and Institutional Members. This aims to resolve the problem of keeping everybody informed of developments both within Council and, in particular, Institutional Members and members of Working Groups. It is planned to produce »Profile« twice annually under the editorship of Dr. Boliker.

Commission, Working Groups and Study Group Activities

These have continued to flourish. Of particular note has been the reactivation of the Commission on Identification of Entomopathogenic Fungi by Dr. Kinghorn. Several new Working Groups have been established and also a Study Group on Farming Systems Approach to Crop Protection. This Group looks across to many other Working Groups, and the improvement of links between other Working Groups has been initiated by formal arrangements for some common biannual meetings of other Working Groups. This applies particularly to the Working Group on Pesticides and Beneficial Arthropods convened by Dr. Hauser and the Group on Models in Integrated Crop Protection convened by Dr. Rabbetts.

Council Activities

Dr. Ferron has unfortunately had to relinquish the post of Secretary-General and we are glad to report that Mr. Jean-Pierre Basino (France) has agreed to become Secretary-General. Council recognizes that the work of the Secretary-General is extremely onerous and arrangements are being made for some of his activities to be delegated to other members of Council.

General Assembly of WHRS, Stavanger, October 16-18, 1985

Arrangements are well advanced and an excellent programme is being devised by our hosts.

M. J. Way
President

[Emphases: Committee]
In sites of high polychlorinated incident, the osmore led to
harvest population collapse in 3 weeks following disease
outbreak.

R.G. Quinell et al. (1983). Effect of spray-adjacent to
Heliopora sinusr atomic polychlorinated virus efficacy. J.
Ocean. Eco. 76 (1): 162-167

Certain characteristics of fish (Heliopora sinu atomic polychlorinated virus spray adjacent treatments were determined
in an effort to explain or identify properties of the chemistry which inhibited efficacy of the virus against
Heliopora spp. on corals. Neither Coax nor Gentu Adjunct
injected the dosage mortality response of larvae of H
sinu to fish. Laboratory studies into failed to detect
ultraviolet screening properties of the adequates at the rate
tested (2.5 % concentration). Coax and Gentu appeared to
primarily affect efficacy by altering feeding or spray
characteristics. Test-lag H sinu larvae consumed more
cotton seed diets treated with the virus when an adequate was
included in the treatment. Correlation analysis showed
adequate rate to be positively related (r = 0.95) to larval
mortality, although percent concentration of adequate
appeared to be more important than rate in influencing the
spray characteristics of fish examined.

increased resistance to a granulomatous virus in the point
1-8

Serial exposure of a susceptible laboratory strain of
Plathemus opercularis recently obtained from the field to
granulomatous virus over six generations produced a 14-fold increase in 1,520. The evidence suggests that this was due to
a change in frequency of a resistance gene within the
population. An attempt to select for even greater resistance
in an already highly resistant laboratory strain resulted in
only a small increase, due mainly to reduced variability in
response of the population. The implications of resistance to
viral infections developing under field conditions are
discussed.

Y.K. Yuan et al. (1982). Taxis on the society and
pathogenicity of polychlorinated virus from the
granulomatous organ of Heliopora sinu (Bastard, 1870) for verru-
cratos. Microbiology (Wehbergwezue Tungba) 9 (2):
104-105

No abnormalities were observed in seven synthesized
genus Neanoptilimus; rabbit, small, pig, and goldfish (2)
99 and 188 days after injection with the Sidi 4-13
and 9-48 strains of polychlorinated virus.

for microbial and chemical control of fungal sporous
pests on cabbage. J. Econ. Ent. 76 (3): 365-374

Microbial and chemical insecticides provided control of
Plasmodiophora brassicae, and control of Plasmopara brassicae when applied to
field plots based on predesigned densities of eggs and small
and large larvae. In excess of 90 % of cabbage harvested from plots treated with 1.0 ppm formulation of Plasmodiophora brassicae virus, Antrhopathie chamisoleni, or Plasmopara brassicae were marketable. The potential of the crop by microbial insecticides is similar to that in control plots.

The effect of a fungicide with a 9-48 ppm rate on cabbage and control plots.

D.L. Houck et al. (1983). Effect on the fungicide Kocide 101 W/P with 7 % cupric hydroxide. In the naturally occurring entomopathogenic virus Fungus (L. phragmopum) infecting aphid (Gall, 224 ppm infected). A mixture of the incidence of E. phragmopum in Wavel larvae. No difference in the incidence of E. phragmopum occurred between the Kocide-treated plots and the control plots. Mortality rates among Wavel larvae collected from the treated and untreated plots ranged from 83 to 98 %. These

on apple trees with an insecticide mixture of Bacillus thuringiensis after treatment in Wisconsin. J. Econ.
Ent. 76 (3): 1119-1123

In 1981, 1 year post-treatment, densities of Choristoneura fumiferana larvae and levels of defoliation were lower on
buds in Aries balsamata, in plants treated with Thuringia
on Dipel. After treatment of Choristoneura fumiferana, in
apricot, thin in check plots. Visible endophores were
recovered from budm of foliage in four treated plots.
Although total leaf persistence, i.e. percentage of pathogen-
ity, of B. thuringiensis was negative.

W.H. McGeaeh (1983). Compatibility of Bacillus thuringiensis and epizootic when used in a mixture for
controlling wheat ear for control. J. Econ. Ent. 76 (4):
857-858

Captor (Orthocap) is species specific at 8.3 ppm at
a suitable prey concentration of Bacillus thuringiensis (Dipel) toxins but did not kill the species. Upon addition with
water, species that had been inoculated with caption for 4h
persisted and produced colonies on agar plates. Captain had no effect on the toxicity of B. thuringiensis to almond
moths. Captain killed, and only a single 1guggine effect
negatively to insecticidal moths. Posteriorly incorporated, perhaps
because of its effects on the species to which this species
is susceptible. Captain alone was slightly toxic to insect
species, but it did not increase the toxicity of B. thuringiensis in mixture.

tests on the use of Macrophomina phaseolina for the
control of Monanthes nematodes. Bull. ent. Res. 73 (2):
303-315

The insecticidal fungus Metarhizium anisopliae caused heavy mortality in laboratory groups of the
Australian tarantula, Monanthes nematodes, to which infected
workers had been added. Conidia of M. anisopliae started an
epidemic when introduced into field colonies of N. nematodes in
california, irrespective of whether the termites were treated by dusting or spraying in the mesquite bud, or nesting
in nearby feeding sites. In some cases, the disease persisted
for at least 15 weeks, and by this time few healthy termites
could be found in almost half the treated colonies. Samples of
workings taken from treated colonies showed high levels of contamination by Macrophomina, irrespective of the site of
the colony, but the factors that inhibited the completion of
fungi development in the moth are unknown.

D.L. Houck et al. (1983). Effect on the fungicide
Kocide 101 W/P with 7 % cupric hydroxide. In the naturally occurring entomopathogenic virus Fungus (L. phragmopum) infecting aphid (Gall, 224 ppm infected). A mixture of the incidence of E. phragmopum in Wavel larvae. No difference in the incidence of E. phragmopum occurred between the Kocide-treated plots and the control plots. Mortality rates among Wavel larvae collected from the treated and untreated plots ranged from 83 to 98 %. These
results indicate that the use of the fungicide Keade at recommended application rates would not inhibit the expression of  
E. postiae in larval populations of the alfalfa weevil.

D.G. Holdom (1983). In vitro culture of the aphid  
pathogenic fungi Entomophthora postiae and A.  

The isolation and culture of Entomophthora postiae was  
described for the first time. The pathogen was isolated  
in the laboratory and then transferred to solid  
medium where sporulation occurred. Conidia from one  
culture were used successfully to reinitiate aphids.

M.J. Simmonds (1985). Interaction between  
E. postiae and two ant-preparatory insects  
(Calliptamus detritus and A. apicalis) on  

On grape vines at Neubriit, South Africa, there was  
a mutualism between the ant A. apicalis and the  
mealybug Planococcus citri which raised the population  
levels of both. When ants were excluded from half the vines,  
their overall population level also dropped by 50%. Further,  
they moved their nests to be as near as possible to their main  
food source, the honeydew of the mealybug. When  
deprived of their ant mutualists, the mealybugs were  
heavily preyed on by coccinellids such as the ant-predating  
E. postiae. The mutualism between the mealybugs and  
the ants appears to be too strong for the mealybugs to  
be reinitiated.

E.K. Miller et al. (1983). Bacterioid, viral and fungal  

Microorganisms that are pathogenic to insects provide  
the entomopathologist with unique opportunities for  
manipulating and controlling insects. The development  
of biological control agents is being applied to  
many non-target pest species.

W.R. Ingram (1983). Biological control of graminis  
plant pathogens and legume pod-borers. J. Insect  
Sci. Appl. 4 (1/2): 203-209

Graminaceous crops are attacked by legume pathogenic  
stem-borers and legume pod-borers. Chemical  
control of stem-borers is difficult and biological control  
is desirable for sustainable farming systems. The most important  

DD 136 strain of Neospora caninum for control of  
corn rootworm larvae. J. Econ. Ent. 76 (3): 590-592.

Field trials were conducted in 1981 and 1982 to  
determine the effectiveness of the DD 136 strain of  
Neospora caninum in controlling corn rootworm,  
Helicoverpa zea larvae. The corn ears were artificially infested  
with H. zea larvae and subsequently sprayed with nematodes  
at 0, 4 x 10^4 and 4 x 10^4 nematodes/ml suspension.  
Eighty-eight percent control was obtained with  
4 x 10^4 nematodes/ml in early June but less, 80 and 28%  
values.
respectively, was observed in late June and early July. Thus, C. cupreus survived only in some areas with early part of the season. All ears in the treated and control plots received some damage, but damage in all the treated plots was significantly lower than in the control.


In the field, the rate of infestation of corn stalks was significantly higher in the control plots than in the plots treated with nematodes. The nematodes were found in the soil in the early stages of infestation and they had successfully suppressed the pest population. The results show that nematodes can be used as a biological control agent for this pest.


Levels of damage caused by corn rootworms were estimated and compared to the costs of rootworm biological control programs in Missouri. Damage to corn stalks and yield losses were calculated. Results indicated that the cost of rootworm biological control programs in Missouri was lower than the cost of chemical control programs. The results suggest that biological control can be an effective and economically viable alternative to chemical control.


A laboratory-selected strain of the spider mite predator Mecodema acuminatus was released into two southern Oregon pear orchards and a Washington apple orchard in June 1982. The predacious beetle populations significantly increased in the treated areas and the population densities remained high in the treated areas throughout the study. The results indicate that the predacious beetle can be a useful biological control agent for spider mites in pear orchards.


A survey showed that the predacious mite Heteroptera nematodes in the vineyards of the South Carolina Vineyard Study. High temperatures and water temperatures in vineyards during the summer can limit the effectiveness of the predacious mites. The results indicate that high temperatures and high water temperatures can limit the effectiveness of the predacious mites in vineyards. The results suggest that further research is needed to understand the factors limiting the effectiveness of the predacious mites in vineyards.


A study was made at forestry in southern England of the heteropterous predation of the stem-boring larvae of Oulema spp. and Gomphus spp. in perennial grassland plants (Diptera: Chironiidae) taken from abandoned fields in the British Isles. The results indicate that heteropterous predation can be an important factor in the control of stem-boring larvae in grassland plants. The results suggest that further research is needed to understand the factors limiting the effectiveness of heteropterous predation in grassland plants.


Studies in southern England on aphid in cereals and adjacent wasteland included observations on the survival of aphid-specific predators (Coccinellidae and Syrphidae) and the more polyphagous Coccinellidae larvae, with particular reference to their parasites. Colonies were made of all the predator stages found on samples of grass in each plot and, in wheat only, collected with a vacuum sampler. All stages of predators seen were collected and reared in the laboratory to estimate mortality and parasite rates. Overwintering survival of Coccinellidae larvae was studied in partly sheltered and exposed netted cages over grass. At least 90% of predator eggs hatched in the laboratory, and no parasitoids were found in them or their larvae. In cereals, there were significantly fewer larvae from eggs of Coccinellidae, probably because of cannibalism, whereas eggs of larvae of Coccinellidae and Syrphidae (mainly Tetranychus olivaceovirens) in similar numbers. Unlike Coccinellidae, however, there were fewer
coconuts of C. cumana and syrphid pupae on the sheets than expected. Since larval mortality was apparently small, it is suggested that many larve pupate in the soil. Two parasitoid species emerged from coccidial pupae and one from the adult, compared with two species from C. cumana coconuts and nine species from syphid pupae. Parasitoid larvae were killed by mites (35%). More individuals of Coccinellidae survived overwinter in partially sheltered than in exposed cages.


Natural enemies of Acanthoscelides obtectus were counted in seedling-machines taken routinely for 41 months from an orchard of orange trees in the Swanland lowlands, a region where biological control of the scale is difficult. Changes in the population intensity (= the mean number of individuals per leaf) over a period of 4000, 10,000, and 20,000 hours during which the pest was present. The results indicated that the natural enemies were effective in controlling the pest population and suggested that the use of natural enemies for biological control of A. obtectus is feasible.


The rate of movement of Tricholaena bursaformis lower leaf surfaces of soybean, sunflower, bean, and cowpea was measured in the laboratory. Leaves of soybean appeared repellant to wasps and no measurements could be made. The rate of movement on soybean was a third of that on the other 4 species. Observation by wasps on soybean leaves resulted in death of the wasp. The movement was significantly higher in the other 4 species. The movement was higher in soybean than in the other 4 species. It is suggested that the density and length of trichomes inhibit wasp movement and, thus, the effectiveness of T. bursaformis as a biological control agent of T. viridiflora on soybean.


Microphyes congo, a parasitoid of Heliotris larvae, was reared from 9 host plant combinations. In general, parasitoid survivorship was highest in host larvae that were reared on cotton than in those reared on bean or tomato. A higher in N. zeae hosts than in H. congo; and higher in a laboratory; in H. congo; and lower in a wild strain. A series of parasitoid host preference tests showed that wasps laid more eggs in host larvae on cotton plants than on beans and more eggs on cotton than on tomato. However, the wasps did not distinguish between H. congo and H. congo hosts. When compared to host inducements, wasps laid more eggs in host larvae than in other species. These results indicate that the parasitoid host larva in an important factor in determining both the likelihood of parasitoid attack and the probability of successful parasitism.


The insect growth regulators (IGRs) cyromazine 75% N. cyclohexyll (1.2:1) carnauba 2.5% and Ross 13-5225 IE tetrahydro-2(3H)-pyridinone ethyl) carboxan were evaluated for their ability to control Lygus striolus for their compatibility with the endoparasite Chrysoperla carnea plate. These IGRs provided > 80% control of L. striolus; cyromazine acted on larvae within minutes and significantly (P<0.05) reduced larval emergence and pupation compared with the control. In contrast, Ross 13-5225 had no effect on larval emergence and pupation rate, instead, reduced adult emergence significantly (P<0.05) compared with the control. Both IGRs demonstrated compatibility with C. carnea; no significant difference (P>0.05) was detected when parasite emergence was compared from treated and untreated plants.


The rate of movement of Tricholaena bursaformis lower leaf surfaces of soybean, sunflower, bean, and cowpea was measured in the laboratory. Leaves of soybean appeared repellant to wasps and no measurements could be made. The rate of movement on soybean was a third of that on the other 4 species. Observation by wasps on soybean leaves resulted in death of the wasp. The movement was significantly higher in the other 4 species. It is suggested that the density and length of trichomes inhibit wasp movement and, thus, the effectiveness of T. bursaformis as a biological control agent of T. viridiflora on soybean.


Sticholothia chisiangi n. sp.: a predator on aphids infesting Ziziphus mauritiana in Bangladesh. Ent. exp. appl. 34 (1): 76-84.

Microphyes congo, a parasitoid of Heliotris larvae, was reared from 9 host plant combinations. In general, parasitoid survivorship was highest in host larvae that were reared on cotton than in those reared on bean or tomato. A higher in N. zeae hosts than in H. congo; and higher in a laboratory; in H. congo; and lower in a wild strain. A series of parasitoid host preference tests showed that wasps laid more eggs in host larvae on cotton plants than on beans and more eggs on cotton than on tomato. However, the wasps did not distinguish between H. congo and H. congo hosts. When compared to host inducements, wasps laid more eggs in host larvae than in other species. These results indicate that the parasitoid host larva in an important factor in determining both the likelihood of parasitoid attack and the probability of successful parasitism.
span of adults was 13.1 days and sex ratio was 1:1. It changed in time among successively produced offspring. Handling time was about 3 s and was somewhat longer to the fourth instar than in the second. Second and third aphid larvae were predared for oviposition. Functional response was sigmoidal and at an aphid density of 109 aphids per cage, percentage parasitization decreased.


The equation, previously proposed by the author to depict the interaction between pests and their natural enemies, has been extended to take account of self-limitation of the pest by its own density on the growing plant. If during any day in the daily kill by natural enemies, Kp, increases by a factor, p, Kp, and also if the carrying capacity of the plant, Ma, increases by the plant growth rate, r, then a pest population of size w, increasing daily by a factor, q, can be estimated for increasing days by the recursive equation:

\[
\frac{w_{n+1}}{w_n} = q - r - \frac{w_n}{k} + \frac{kw_n}{1 + 0.5w_n/k}
\]

Three examples are given, interpreting experiments with Myzus persicae and Aphis fabae on citrus cultivars, and with Panonychus ulmi and aiothrips sp. in runner beans.


Capture efficiencies and handling times of each instar of S. ribesii and M. scabrum using S. fabae as prey were measured. For each instar, S. ribesii had higher capture efficiencies and shorter handling times than M. scabrum. After encounters with aphids, the rate of forward movement decreased and casting the prey increased. Casting rates were highest in S. ribesii and lowest in M. scabrum.


The gregarious endoparasite, Apanteles gossypii, is specific to the nymphal butterfly, Euphytis annulata, in the British Isles. The synchronisation between host and parasitoid is described at a site near Oxford, England, where both are found. Three regular periods of A. gossypii occur in one generation of the host in this studied population. Relevant features of the biology of A. gossypii and E. annulata are described, including a method of distinguishing the nympha of A. gossypii from their larval hosts using hand cuticle mounted on standardised slides. A single period of E. annulata is reared and the effects of weather on synchronisation with its host are described. The synchronisation of E. annulata with its host is influenced by the number of synchronised aphids and the size of the synchronised aphid population.


The occurrence of the African chrysomelid, Choristega sp., in Australia is described. The impact of this species on the crop Chrysomelidae chalcides/C. crucivora is reported. The spread of the species to Australia is discussed in relation to the known distribution and host associations of the genus.

R.A. Werner et al. (1983). Laboratory and field evaluation of insecticides against the spruce beetle and parasitoids and predators in Alaska. J. econ. Ent. 76 (5): 1144-1147

Nine insecticides were tested by topical application on mass-reared spruce beetles, Ips typographus L. The decreasing order of toxicity to I. typographus was: permethrin, chlorpyrifos, fenvalerate, fipronil, imidacloprid, and carbofuran. Permetrin, chlorpyrifos and fenvalerate were further tested for residual efficacy against white spruce beetles infested with adult beetles. Fipronil at 3% provided the best residual control of emerged and removed spruce beetles but had a high impact on parasitoids and predators, whereas 2% permethrin was almost equally effective, but with the least impact on parasitoids and predators, whereas 2% permethrin was almost equally effective, but with the least impact on parasitoids and predators.


We determined that certain insecticides registered for use on alfalfa may be used in reducing population levels of a pest, the potato leafhopper, Empoasca fabae, while conserving a predator, Rodius americanus. This pattern of effectiveness may occur through relatively reduced toxicity to the predator and through reduced toxicity to a nonpest alternative prey in alfalfa grown for hay, the tarnished plant bug Lygus lineolaris. Toxicities of methylate, azinphos-methyl, carbaryl, methyli, carbofuran, and malathion were determined for adults of the three insect species. LC50 for all six insecticides were higher for A. americanus than for potato leafhoppers, in all but one case. LC50 for tarnished plant bug were intermediate. Saturating levels (of A. americanus over potato leafhoppers were highest for azinphos-methyl and least for carbofuran.


A laboratory bioassay was developed to assess the effects of pesticide residues on adult emergence and paralysis of the egg parasitoid, Trichogramma pretiosum. Tests were conducted on 1, 7, 14 and 21-day greenhouse and field-aged cotton root tips. The effects of eight pesticides on the emergence and paralysis rates of five pest species. These were Bacsil thuringiensis, carbaryl, methyli, methyl parathion and parathion. F. pretiosum was highly sensitive to all the synthetic chemicals; methyl paraathion was the most toxic. Pesticide residues had no adverse effects on parasitoids emergence, but paralysis rates were always significantly reduced. B. thuringiensis sprays, tested in the greenhouse only, did not reduce emergence rates or paralysis of European corn borer (ECB). Oryzaa sativae, egg, Field-weathered carbaryl and methyli residues did not reduce paralysis emergence, but carbaryl residues reduced paralysis rates up to 21 days posttreatment. Parasitism increased over time at the lower dosage rate of methyli.


The impact of four synthetic pyrethroids on major apple pests and natural enemies was studied in Pennsylvania.
Selected Abstracts


This paper reviews progress made in the identification of the sex pheromones of lepidopterous semi-borers and the use of these as a basis for their control. The work includes population monitoring with sex pheromone traps and control by sex trapping and mating disruption, and case histories for Choristoneura filipendula and C. rosaceana are considered in detail to illustrate the problems encountered in applying these techniques. The pheromone blend trap design, trap atraction and post biology are important factors in any monitoring system, and so far little progress has been made in correlating pheromone trap catches with subsequent larval infestations and crop damage by sex-borers. Controlled by mass trapping, using pheromone traps has been little explored, and it has therefore been a particular challenge to provide a satisfactory control technique for any semi-borer. Control by mating disruption has been more extensively examined with encouraging results. The main potential of this technique would seem to lie in controlling pests of rice, maize and sugarcane grown under plantation conditions.


A large-scale mating disruption trial for the control of Pelecinophora gossypiella was carried out in the Fayoum Province of Egypt during the 1981 cotton season. Two areas, each of 50 ha, were sprayed with a microencapsulated formulation of the sex pheromone C.P.1 mixture of 12Z,13E-11-tert-butylacrylate in the in the form means of controlling this pest. Five applications of 10 g/ha were made during the season using fluid-flight aircraft. The pheromone treatments were compared with conventional insecticide spray treatments in two other 50-ha areas of cotton. Field comparisons of treated flowers, percentage


The California red scale, Pissodes strobi, is a pest of economic importance to citrus, stone fruits and ornamentals. It has been controlled by mating disruption by the use of a sex pheromone, 4,9,12,15,18-pentacosapentaene (PP). This compound, synthesized by the California Department of Food and Agriculture, has been used for mating disruption of the pest since 1972. The results showed that, by releasing 50 g/ha of PP in a 15-foot radius, a 95% reduction in scale population was achieved. The use of PP for mating disruption of the pest is now being evaluated in other states.


Field tests were conducted in sparsely infested areas of Tennessee to evaluate the effectiveness of microencapsulation formulations of sex pheromone in disrupting mating of Lycorma delicatula. The incidence of mating of laboratory-reared females placed on treated trees was significantly lower than that in control plots, and the degree of mating disruption was correlated with the amount of pheromone applied. The number of male moths captured in the treated areas was not significantly different from that in the control areas.


The seven-component pheromone of Heliotris versicolor was used as bait in a pheromone trap: monitoring activity in South Carolina. A direct relationship was found between the number of H. viridiana moths captured by using pheromone traps and egg counts in cotton fields. Pheromone traps effectively monitored population fluctuations in H. viridiana during 1979 and 1980.


Ehomas of Eurythema sennae on Pinus ponderosa was significantly reduced 70 to 72% by mating disruption with sex pheromone (4.3 min of 2,9,12,15,18-docosapentaene) released from widely spaced (20 to 50 m) point sources in three Oregon test areas covering 250 ha. Commercially available hescos mounted upon dispensers were as effective as initially prestyled polyvinyl chloride releasers.


Three plant materials that are common in Pakistan, rhizoma of Curcuma longa turmeric, leaves of Azadirachta indica (neem), and leaves of Trachelospermum jasminoides (jasmine), were evaluated for their repellency against the adults of the three species of stored-cereal insects, Tribolium castaneum, Sitophilus oryzae and Rhagonycha ephippiger. The most
effective of the three against S. graminum and R. dominica, and also the most effective of the solvent extracts against T. castaneum. For each plant material, the petroleum ether extracts were more effective than the hexane and ethanol extracts. The petroleum ether extract of fenugreek contained much faster than the similar extracts of turmeric and neem. The petroleum ether extract of neem was the most effective of the three plant materials against pest by R. dominica.


Cotton cultivars with Heliotis spp.-resistant characters (glabrous, necrotic and high gossypol) were grown under Rolling Plains conditions of limited irrigation and low nitrogen inputs. To assess resistance, data were taken on oviposition rates, numbers of larvae, and damage to squares and bolls. In the initial screening studies conducted from 1964 to 1975, larval numbers and damage to squares were lower in the resistant cultivars, "HG-RR-RN", "HCC-6-1-N", "La 17801" and "HG-P-4-3" than in the nonresistant cultivars "Lankari Sel. 611". However, yields were generally the same in all cultivars. These results prompted irrigation management studies in 1979 and 1980. When multiple irrigations were not managed to avoid Heliotis pea evaporation peaks, resistant cultivars did suppress damage in relation to nonresistant cultivars. However, when cotton was grown dryland or when irrigations were managed to avoid oviposition peaks, damage to squares and bolls sustained by resistant and nonresistant cultivars was the same. The resistant cultivars rarely produced higher yields than the nonresistant cultivars in any of the irrigation management schemes.


Control of cotton insect pests has been almost entirely achieved through the use of chemicals by progressive farmers. However, the present farmer has traditionally tended to rely on chance and has only been able to obtain yields that would be profitable. This paper examines the farmer's dilemma and the prospect of using heat plant resistance (HPR) as an adjunct to other control methods in developing a sound integrated pest management of cotton pests. The status of HPR in cotton is reviewed with a view to establish the scope of work which has been made in this respect to the measurement and identification of resistance to formulate an effective integrated pest control program. The difficulties in achieving this are discussed in the light of our present data base and the diversity of cotton pests. J. Ent. Carpeneter et al. (1983). Fall armyworm, inheritance of gossypol-related defoliator effects and potential for pest control. J. econ. Ent. 76 (2): 378-382

Male Spodoptera frugiperda were exposed to sublethal dosages of 0, 8, and 16 mg of gossypol and 125 mg of neem extracts. The inherited defoliation effects resulting from the irradiated F1 males were observed for several generations. Reduced fecundity and egg hatching, together with an increased incidence of larval and adult hemolymph, were indications of the inherited defoliator genes. The data obtained from this study were used in a theoretical model to assess the feasibility of employing these genetically altered insects and their progeny in S. frugiperda control. In this model, a single release of 1000 males produced suppressive action for at least three generations.


During four releases of backcross insects to suppress native population levels of Heliothis virescens on St. Croix, U.S. Virgin Islands, the behavior of backcross insects and their interaction with native insects were studied. Backcross females were observed actively flying, feeding and mating earlier than native females; however, no difference in time of oviposition or preference for oviposition sites was detected. Activity time of backcross and native males appeared to coincide. Mating interaction of backcross males with native backcross insects was verified by an increase in number of native females with increased numbers of released insects. Backcross females with synthetic sperm in their spermathecae were commonly collected.


Males of Phthorimaea operculella less than 24-h old were sterilized with mixed with ethylene dibromide in the laboratory and then released in cages in a potato field in New Zealand. Laboratory-reared sterile males, nonsterile males and females were released in different ratios. Sterile males competed successfully in mating to suppress reproduction between laboratory-reared normal males and females. Laboratory-reared sterile males were also released in different numbers into field cages containing the resident population and additional field-collected males and females. The results showed that the sterile males were slightly less competitive than the normal males, but they were effective in suppressing the population in the cages.

I. Techniques


Methods were refined for encapsulating small units of artificial diets for rearing insect populations in a small volume for effective control of harmful insects. A stirring, heating module, which held diet and encapsulating materials at constant temperature, facilitated production of colonies. Several encapsulating materials and applications were tested. With this method, the media (high or low lipid content) were formed into capsules that had suitable size and wall thickness for feeding several species of immature and adult insects. J.F. Goldstein et al. (1983). Reversing Trichostrongylus naevius on ultraviolet-irradiated eggs of the European corn borer. J. econ. Ent. 76 (4): 965-971

Trichostrongylus naevius may be reared on eggs of European corn borer (ECB). Ovaria naevius, which have been killed by ultraviolet (UV) radiation. A dosage of 30 mm is sufficient to cause 10% mortality in ECB eggs 0 to 4 h old. T. naevius reared for 3 successive generations on dead, UV-irradiated eggs exhibited a slightly shortened life span, but
there were no significant changes in the number of progeny per female, adult emergence, sex ratio and progeny produced per ECB egg.


In 1977, a pilot test was initiated on St. Croix, U.S. Virgin Islands, to test the feasibility of controlling *Melococcus* leafminers by releasing bactrocera insects possessing an inherited male sterility resulting from hybridization. During 1978 and 1980, four separate releases were made with 800,000 males captured. Fewer than 15% were trapped farther than 0.6 km away. Males placed in release cages at pomegranate differed far more than those released as adults. Eggs oviposited by released females were collected at far less than 8 km from the release site as was collected an area release site. Rarities of eggs oviposited by released or native females were similar in pigeon pea, *Centunculus cyanus*, and on *Diascorea sanguinea*: these two important hosts for tobacco budworm on St. Croix. These data show the need for frequent release sites in future suppression programs with bactrocera tobacco budworms.


A major component of the sex pheromone of *Dacus oleae* has recently been identified as a saponacote. The use of this component as a lure for the development of a monitoring trap for this species is described. Polystyrene vials gave a slower release rate of the sex pheromone than rubber septa or microfibrils, but even in polystyrene vials a flushing in excess of 16 mg was required for optimum 20 to 25 mg to obtain catches in delta traps which were comparable with traps. Previously recorded components of the sex pheromone did not prove to be effective when combined with the saponacote. Combined monitoring of *Fauja serpen* and *D. oleae* using their respective pheromones in the same trap, appears to be feasible with both traps.


Studies on the precision levels and efficiencies of available insect suction samplers (D-Vac and PARACOP) were undertaken in the Philippines to determine the best possible sampling procedure to derive absolute population estimates of *Dolichos* ecphoria and their predators in flooded rice. The D-Vac suction sampler when used in conjunction with an electrostatic placed over the rice hill prior to sampling was found to be the most suitable. The sampling procedure adopted in described in detail, and sampling efficiencies for the D-Vac are given for nymphs and adults of the *Dolichos* and *Clepsisida* and their predators. These values could be used by other workers following the sampling procedures described here on modern rice varieties grown under flooded conditions to achieve absolute population estimates.


A fast and simple method of preparing virgin females of *Spodoptera littoralis* for use in the field is described. Low predation rates were achieved by tethering the moths on a short 130 cm pole of cotton thread directly to the plants and by keeping unnecessary daytime exposure to a minimum. Consistently high levels of successful mating were recorded in both control and cotton fields in Egypt, suggesting the suitability of the tethering technique for measuring reduction of mating levels in pheromone control trials.


The difference between the breeding patterns for three *Aphis glycines*, male *Aphis glycines* and *A. craccivora* differed from the genetic homogenate of its main host, *Sitobion avenae*, is described. Parthenogenesis was found to be detectable using any of these enzymes. The differences observed between the breeding patterns for three *Aphis glycines*, *A. craccivora* and *A. craccivora* were separated from the adults of five primary parasitoid species attacking this aphid. *A. craccivora*. *A. craccivora*. *Cytoschiza plasmacera*, *Pseudoedaphus vulgaris* and *Pseudocorynos delatge*, are also described. *Cytoschiza* was found to be the best enzyme for taxonomic differentiation of all aphid species examined. The use of electrophoresis for assessing percentage *Cytoschiza* parasitism in integrated management studies of cereal aphids is discussed.

**v) General: Integrated Pest Management**


The concept and practice of IPM has emerged over the past two decades or more. The primary impetus for its development has come from developed countries. IPM technology transfer to developing countries has followed the earlier pattern of the "green revolution". The technology being proposed requires high energy inputs and an intensive infrastructure to support it. These conditions simply do not exist in most developing countries. IPM programs for developing countries must be based on their own socio-economic situation rather than on simple technology transfer. Better understanding of crop ecosystems must be the keynotes to development of IPM programs. Chemical control should play a secondary role. Cultural and biological control and plant resistance adapted to subsistence farming holds the greatest promise. Little attention has been given to the socio-economic features of studies of traditional agriculture. These practices embrace a wealth of time-honoured ecological wisdom which if unravelled could provide useful tools for modern agriculture. The sequence of steps contributing to this process are proposed.


The current status of the cereal stem-borer problem on various crops in *The Gambia* is discussed. Various control.
strategies that can be properly selected and integrated are identified. These strategies offer promise for an effective and more economical control of stem-borer infestations and their implementation, it is envisaged, would go a long way in reducing losses due to these pests. The implementation of these strategies would not, also, be free of constraints. These constraints are discussed and ways of solving them suggested.

2. CONTROL OF PLANT PATHOGENS


The authors consider the following: Fusarium-sospressive soils, control of Physcionisroot rot of apricots by using bacteria and/or actinomycetes, control of root-knot nematodes by the fungus Entoehlytaii cinnabarinus, antagonists of Scelertia coerulea, the nonpathogenic strain OA-3 of Agrobacterium edaphicus to control A. tumefaciens, take-all decline, cyst nematode decline and chilium blight decline. The physicochemical treatments affecting antagonist or pathogen growth described include soil pH changes, crop sequence/tiltering, soil formation and soil leaching. The key questions to be answered are whether potential biological control is identified are listed. Key experiments to identify the potential effectiveness of a factor can then be conducted. The management of microorganisms in biocontrol systems, and the improvement of biocontrol agents by genetic manipulation are briefly discussed. The authors conclude that the potential for biological control of plant pathogens is great but has yet to be widely exploited.


No abstract.


No abstract.

3. CONTROL OF WEEDS


Harris' scoring system has been used mainly as a model for predicting, shortly before, during, or after initial season, the effectiveness of introduced phytotoxic agents as biological control agents. Harris, however, meant his system to provide a simple method of recognizing potential effective biological control agents, at least eliminating unprofitable candidates, before host-specificity determination began. A revision of this scoring system is offered, that attempts to satisfy better the original, intended use of Harris' system. Four selected agents are rated comparatively under the original and revised systems.

D.P.A. Sands (1983). Identical of Cyrtobagous sp. introduced into Australia for biological control of salvinia (Salvinia molesta) is not C. vagaebus but a closely related, undescribed species.


The two weevils Edulis geographicus and G. larvata, which live and develop on Edulis phaeoagnos (Bergeraniae) in the western Mediterranean region, are potential biological control agents for this plant, which is an important weed in Australia. Adults bite holes in the leaves and petioles, but this damage is not great in comparison with that caused by their larvae, which mines the collar and root, causing massive necrosis and often the death of the plant. C. larvata larvae are found especially in the aerial parts of the collar of the plant, while those of C. geographicus attack principally the rootstocks. Quarantine allergy testing was based on plants selected by the cytoplasm already used for the EDulis leafminer Biochrysophila coarctata, and it was confirmed that the two weevils would be sole and effective agents for the biological control of E. phaeoagnos in Australia.


The biology and host specificity of a South American moth, Arizonac insulae, were studied in quarantine facilities in Australia. In choice tests on the host specificity of A. insulae, slight feeding by larvae occurred on ginger, lettuce, banana, bullrush (Typha orientalis) and water primrose (Ludwigia peruviana) but survival was only waterhyacinth (Eichhornia crassipes) and pickerweed weed (Pontederia cordata) supported complete development. A decrease in larval mortality and increase in crop-season size of A. insulae occurred when a microsporidium, Parnoscopra sp., infecting the cowpea was eliminated, suggesting that these insects may then perform more effectively as biological control agents in Australia than in South America. The damage to waterhyacinth caused by larvae of A. insulae may be complemented by other biological control agents already established in Australia.

b) Public Health


A suspension concentrate of Bacillus thuringiensis serotype I-14 formulation (Techko-B, SAN 90-02) was tested against larvicide treated late third/early fourth instar larvae of Aedes aegypti as well as naturally occurring Malaysian larvae using Hudson kjelland spray at small pints in swampy ditches on Penang Island, Malaysia. Six dosages ranging from 1.1 to 11.40 kg/ha were used in two experiments. Mean dosage/response values at the 50% level for the introduced and natural populations were 0.66 and 1.19 kg/ha, respectively, whereas, the mean dosage/response value at 95% level were 11.02 and 25.98 kg/ha for the introduced and natural populations, respectively. Higher dosages of the B. thuringiensis I-14 formulation were needed to achieve control of the Malaysian larvae when compared with other vector mosquitoes. The heterogeneity of the response of Malaysian population towards B. thuringiensis I-14 was also observed. The comparable
dosage/repause values for introduced and natural populations suggest that aged introduced populations can be used as a biocidal method for Manihot used in the field.


A brackish water lagoon (for 4.5 ha) was treated 6 times, from the last week in June until the first week in August 1983, with a liquid formulation containing Bacillus thuringiensis serotype H-14 toxin. Except during conditions of strong winds, areas of 1.1 to 2.3 kg/ha gave good control of larvae of Amphiolopsidae in the main vector of malaria in the coastal areas of many islands of Indonesia. Adult populations of Aedes aegypti in nearby lighthouses were similarly reduced following successful larvicidal treatments but rapidly increased following a control failure.


A healthy, 18-year-old fatter splashed a solution of Elop & Bacillus thuringiensis in its right eye. While being treated with antiseptic and antiviral ointments, a corneal ulcer developed. B. suscivens to gentamycin 1 mg/ml, given in cultures taken from the ulcer. This is believed to be the first reported occurrence of an infectious disease in a human caused by B. suscivens should be excluded when working with biological nematodes.


This paper was presented at the Memorial Lecture dedicated to the memory of Barry H. Stage. The author briefly examines the accuracy of potential biological control agents for mosquitoes, including viruses, bacteria, fungi, nematodes, protozoa, fish, Toxorhynchites and the related Uroctas. He concludes that genetic control or use of predators such as Toxorhynchites will not be practical. Bacillus thuringiensis is the best route but B. sphaericus eventually may prove to be better prospects. Certain of the mosquitos has comparable potential, but will be more difficult to control in the future. While the first looks promising, biological control at present offers little to alleviate situations from mosquitos.


Data from field collections of third and fourth-stage larvae of Culex larvae and pupae were used to calculate expected frequencies based on the negative binomial distribution. The data was then used to determine the most likely combination that would result in 30.5% of the decision trails for a sequential testing plan were then calculated. Analysis of Bacillus thuringiensis H-14 toxin treated C. tarsalis larvae without producing any detrimental effects to producers. The best control was obtained on a field treated with B. thuringiensis H-14 toxin and methyl alcohol.


An isolate of Bacillus thuringiensis var. drosophilae was treated with preferential toxicity for mosquitos was evaluated in the laboratory against Culex quinquefasciatus, Aedes aegypti, Anopheles subparvus and An. punctulatus. In the LC50 values for 2nd and 4th instar larvae were 0.4, 3.9, 0.0, 4.5, 0.5, 3.3, 0.6 and 0.4, respectively. There was a strong positive correlation between temperature and larvicidal activity against 4th instar Culex quinquefasciatus exposed to 1.6 to 10° C as compared to 18, 24 and 30°C. Second instar Culex quinquefasciatus and Aedes aegypti were approximately 10 x more susceptible to the spore-crystal suspension than were fourth instar larvae.


Bacillus thuringiensis var. israelensis was applied for control of Pseudohemioptera cobaneus larvae in rice fields being flooded for a second rice crop in August and September 1980. Rates of 2 commercial wettable powder formulations applied in a water suspension ranged from 0.25 kg/ha to 0.6 kg/ha. Active ingredients, expressed as the potency value (International Toxic Unit), ranged from 8.1 kg/ton to 15.9 kg/ton. Three applications by air was used in 1980. 1981 and 1982 respectively. The midge was also treated with rice hulls and applied prior to flooding the rice fields or at the time of flooding, and at the same rate as applied in water suspension. The midge resulted in midge control.


Bacillus thuringiensis serotype H-14 was selected in small rice plots and in commercial rice fields. Application rates of 0.5 and 1.0 kg/ha in small plots resulted in 100% mortality of Pseudohemioptera cobaneus at 24-hour post-treatment and slight residual activity 48 h post-treatment (13 and 25% respectively). It was also applied by airplane against 1.50 kg/ha on 2.1 large field plots. Larval mortality of P. cobaneus was 69 and 59% after 24 h exposure in both flooded and drained natural populations of Anopheles quinquefasciatus larval (1st and 2nd stages) were also reduced by 97%.


Isolation of Leptosphaeria graminicola from North Carolina and Louisiana GA by cultivating infected Culex quinquefasciatus larvae at 25 to 29°C. Infection rates below 15°C and above 20°C were modified. Sterilization by the NC isolate in larvae was optimal from 15 to 25°C, inhibited below 15°C and completely absent at 10°C. The isolate was not found in all development of infections in Leptosphaeria graminicola from 15°C to 29°C. At temperatures above 25°C, the infection larvae were killed too rapidly for the fungus to attain multiplication, and the Leptosphaeria was killed. When infections were started with fungal spores were subjected to
1IPC for 4 days and then returned to 25°C, the fungus successfully speculated, but after 10 days at 1IPC, no sporulation occurred upon return to 25°C.


Aqueous suspensions of Culefichromyces claviger spores were applied to 5 different breeding habitats of Culex annulirostris in New York. Spores were suspended in an aqueous buffer and then applied to the water. No effects were observed.


Two isolates (North Carolina and Louisiana) of Lagenphyes manihyi were introduced into a natural freshwater mosquito breeding sites in North Carolina in June 1982 and their establishment and persistence monitored through the remaining mosquito breeding seasons. The North Carolina isolate on agar media was introduced into a flooded woodland that had populations of <Podoptera> ptenopus. Culex annulirostris, Cx. torrentium, Aedes vexans, and Phlebotomus serritnes. A liquid culture of the Louisiana isolate was added to a flooded depression that was a source of An. punctipennis. Cx. torrentium, Cx. torrentium, and Aedes vexans. The fungus was established at both sites remaining at least 2 months. The fungus was not detected in the water samples.


The placement of 300 laboratory-reared pupae into each of 15 such basins in Ontario, Canada, during early July produced a significant reduction of 83% in Culex larvae in treated basins over that in the non-treated basins from August 31 to September 27, 1983. A significant reduction of 74% for the entire season (August-September). In laboratory tests, Culex adults reared from 100 first instar wild larvae in 2 liters of water were reduced by 80-90% by the presence of 4 or more pupae, whereas with 1 planarian, an average of 1.3 adults still emerged. With 80 1000, and 10000 first instar larvae in 12 liters of water, emergence of adults was reduced by an average of 80, 85, and 88%, respectively. With 1970 20000 first instar larvae in 12 liters of water, emergence of adults was reduced by an average of 80, 85, and 88%, respectively. With the planarian, emergence of adults was reduced by an average of 80, 85, and 88%, respectively. With the planarian, emergence of adults was reduced by an average of 80, 85, and 88%, respectively. With 1970 20000 first instar larvae in 12 liters of water, emergence of adults was reduced by an average of 80, 85, and 88%, respectively. With the planarian, emergence of adults was reduced by an average of 80, 85, and 88%, respectively.


Aqueous suspensions of Culefichromyces claviger spores were applied to 5 different breeding habitats of Culex annulirostris in New York. Spores were suspended in an aqueous buffer and then applied to the water. No effects were observed.


Aqueous suspensions of Culefichromyces claviger spores were applied to 5 different breeding habitats of Culex annulirostris in New York. Spores were suspended in an aqueous buffer and then applied to the water. No effects were observed.

The predatory behavior of Marua cornutica was evaluated as an agent for the control of Biomphalaria glabrata. The results show that predation by Marua is influenced both by endogenous and environmental factors. Although some Marua proved deleterious on Biomphalaria eggs and juveniles, a minority did not do so during the experiment. There is evidence that Marua predation tends to increase with experience, onset of maturity. Marua females ingest significantly more eggs than males. Predation is also enhanced by the presence of plant food, which is flow systems but decreased by heterotrophic conditions. The possible cause of these effects is discussed. The above considerations, and the fact that the rate of predation by Marua does not increase with egg density, shows that Marua is not a good predator. The conditions that make Marua only be effective as a predator if it is present at high densities of about 1 per 150-160 cm² is supported by field observations.


To evaluate the potential of Marua cornutica as an agent for the biological control of Biomphalaria glabrata in a small host of human schistosomiasis, various components of their feeding niches were measured when the two species were kept separately and together in competitive situations. The three measurements of the extent to which small Endpoint species of aquatic animals could not compete in competitive situations indicate that Marua is likely to be a better competitor than Biomphalaria and that juveniles of both species are better adapted to adult food items than their adult competitors. This indicates that waterfowl are more adversely affected by interspecies competition than Marua. Possible reasons for the difference between the impact of the two species on novel food items and in competitive abilities are discussed. It is concluded that further field tests to evaluate Marua as a biological control agent would be justified.


The authors describe a highly operational use of the biological control of onchocerciasis. A campaign was initiated in 5 West African countries (Benin, Ghana, Ivory Coast, Mali, Niger, Togo and Upper Volta) with the aid of the WHO and the World Bank, FAD, UNDP and WHO and a group of donors countries, to place, organize, implement and evaluate a programme against onchocerciasis. The biology of the parasite and its blackfly vector are briefly described. The Onchocerciasis Control Programme (OCP) is presently implemented by covering over an area of approximately 720,000 km².

Abras, a 20% emulsifiable concentrate of the organophosphate temephos, is the formulation of choice at present, but two species of the Simulium damnosum have developed resistance. Bioassays throughout H-14, being effective, selective and stable, has been used as an alternative insecticide. Research in West Africa has shown that the best type of formulation for use in fast-flowing water is an aqueous suspension of free bases and crystals. A water dispersible concentrate, Teknar (Gyldendal), is now used.

J.O.A. Oravec (1983). Studies on the natural predators of Culex pipiens and C. torrentium in artificial containers and ponds were studied in southern England, India, and Italy. The natural predators of Culex were collected from pools of water by netting and from nests of birds. The predatory behavior of Culex was observed in the field, and the results of these observations were recorded. The results of laboratory studies indicated that the antipredator response of Culex was potentially more important as a biological control agents than the antipredator response of ponds.
operationally against OP-resistant *Sirentus* populations at a uniform dose rate of 3.6 mg/ml/10 min. Teatim is extremely stable and can be stored for more than 16 months in touch without losing potency. For logistical reasons, mainly related to storage costs, it is not possible to treat, even with high doses of OP, those areas where the OP resistance developed by larvae is unstable. Industry is therefore actively working towards improving the formulation to use, by both increasing endothion concentration and adding agents to delay the loss of toxins to the larval feeding zones. Research should also be intensified to isolate and test new strains. In addition, a better knowledge of feeding behaviour, especially the way in which blackfly larvae catch small particles from 0.3 to 1.0 mm, may lead to a greater understanding of certain physico-chemical properties which could guide industry in the design of better formulations. The use of OP is 10 to 14 in an operation like the OCP, over 12 years after its discovery, is a remarkable achievement. The alternative of B. t. in the dry season and chlorpyrifos in the wet season decreases the selection pressure by chemicals sufficiently to avoid resistance making chlorpyrifos useless; this is an excellent example of the beneficial integration of control methods. 

**O Vertebrate Entomology**


Papua L. cuprina irritated 1 day before emergence caused insignificant activity. A dose of 10 krads produced little injury in females caused 98.5% mortality in males. A dose of 50 krads showed no effect on female but males were still 80.0% irritant. Irritation in nitrogen gave no significant increase in competitiveness. When sterile and untreated flies of both sexes were released in the field, there was no evidence of assortative mating and the mating propensity of irritated males was not less than that of untreated males.


A colony of Glossina morsitans morsitans was established in the laboratory in Tanga, Tanzania. After being expanded to the planned level of 60,000 flies, the stabilized colony was used to target a field trial using surplus males. Cages were sterilized and released. The production system consisted of an adaptation of the in vitro rearing techniques developed at the Malaria Research Laboratories, England. Geared to breed 90% of the population, the balance was fed on rabbits. Techniques were developed to standardize the papal off-slate from stabilized colonies in each of three separate insectary units. Puparia were collected daily and kept separate until 52% emergence had occurred; these emerging flies, mostly females, were used to reconstitute the stock rotatory as needed. Further selection was prevented by clamping the remaining puparia (mostly males) quickly at 4°C and then storing at 10 ± 1°C for up to four days prior to irradiation and shipment to the field. About 68% of the males produced were available for sterilization. During the 15-month period of production as part of the field experiments, 1.5 million puparia were produced. 0.6 million of these puparia were released at a production cost of $5,200 per thousand.


Surplus puparia from a colony of about 50,000 females of Glossina morsitans morsitans provided flies for sterilization and release in an experimental assessment of the sterile insect technique in Tanzania. Excess males were stored late in the puparial stage at 30.1°C for up to four days prior to being irradiated at ambient temperatures in a nitrogen atmosphere with an air flow of 11.1 kg in a radioactive cobalt chamber. Puparia chilled at 4.8°C were transported at the field release area twice weekly for manual release. At the release sites, the adults emerged synchronously within 69 min and were automatically marked as they crawled through sand tumbling fluorescent powder.


Detailed data from a promoted release site in Tanzania were collected preparatory to testing the insect sterility concept against Glossina morsitans morsitans. The site was at Mwaunga Ranch, a north-eastern coastal livestock ranching enterprise, in which about 195 km² was encompassed by a 1,650-m-wide by 1,900-m-wide corridor of an average cost of $37/ha. Weekly surveys of tsetse transects spaced 1 km apart were conducted over a 14-month period. The estimated mean of tsetse was about 2000/ha and for G. pallidipes, 255/ha. The only other species of tsetse found was G. brevipalpis, which was restricted to drainage areas during periods of low rainfall.


As part of a programme to test the sterile insect technique against Glossina morsitans morsitans in Tanzania, two initial applications of endosulfan were applied to a 195-km² test area. The applications were made to provide an initial reduction in the target species prior to the release of sterile males. A Convair 310 aircraft equipped with a rotary motored and operating at night was used to apply the insecticide at a dosage of about 25 g/ha. Transect surveys, within 24 h following the spraying operations, indicated that a 10% reduction of G. m. morsitans adults was achieved in both applications, while G. pallidipes was reduced by 91.5% in the first and 109% in the second.


A field trial of the sterile insect technique was conducted in Tanzania using Glossina morsitans morsitans that were reared, irradiated and packaged at Tanga. The experimental site was a 195-km² area 110 km to the south. Following two applications of endosulfan as an aerial at an interval of 28 days, irradiated puparia of G. m. morsitans...
were released twice weekly at stations distributed throughout the experimental site. Each of the 120 collection stations served every 14 days with puparia which produced sterile adults synchronously within 30 min after placement. Over the 15-month experimental period, an average of 81% control of G. m. morsitans was obtained. Whereas G. p. palpalis against which no resistance was observed, recovered to prepare levels within 5 months. The released sterile insects were found to be tightly competitive and to survive well in the field. Immigrants of indigenous flies from outside the perimeter barrier surrounding the experimental plot provided a continuous influx of fertile flies that provided the needs of the 19% residual population. Under operational conditions, the prevention of migration should result in the elimination of an indigenous G. m. morsitans population subjected to the combined stress of population reduction by two applications of endosulfan aerosol and serial releases of sterile males.

ENTOMOLOGIA, volume 27 (3), 1992
H.D. Burges, A. Kriec, P. Lukh & H. de Barjac. Respectively: Glasneuch Crops Research Institute, Lithicagrique, UK; Institut für biologische Schädlingsbekämpfung, Darmscht, FRG; Eidgenössische Technische Hochschule, Zurich, Switzerland; Institut Pasteur, Paris, France. Guidelines for safety tests and registration of bacterial pesticides.

Guidelines issued for the advice of interested firms and governmental agencies have been formulated for safety tests and registration of new bacterial pesticides. For the registration of a new microbial product, information is required on the identity of the bacteria, its biological properties, production, formulation, quality control, application and efficacy. For safety assessment, a series of tests on infectivity, toxicity and allergenicity, etc. in laboratory animals is arranged in 3 tests.

R. Cartwright, G.W. Angler & R.D. Elkhany. Respectively: Department of Entomology, Virginia Polytechnic Institute and State University, Blacksburg, VA., USDA-SEA, Beneficial Insect Research Laboratory, Newark, FRG; Department of Entomology, Oklahoma State University, Stillwater, OK, USA. Paratocolysis and Baculoviridae (Insecta: Baculoviridae) of indigenous coccecidial hosts and the introduced Crematogaster spp. (Col.; Coccinellidae) with notes on mortality.

Daspate of Coccinella septempunctata by Perilhes coccineus varies seasonally with an 1% overall rate among bodies overwintering which is less than that reported in Europe. P. coccinellus may parasitize C. septem puncta twice yearly.

J. Dani. Dept. of Entomology, University of California, Davis, CA, USA. Predators and parasites of temporary row crop pests: agents of irreplaceable mortality of scavengers occurring prior to other mortality factors.

A study was conducted with the cabbage looper, Trichoplusia ni, to determine: (1) whether native occurring entomophagous arthropods import irreplaceable mortality to the cabbage looper in the field, and (2) whether entomophagous arthropods are present and import such mortality to T. ni eggs and 1st instar larvae when diapause is sensitive to the pest. The majority of T. ni mortality through the larval-sap stage is explained by predators which induce mortality that is not entirely replaceable by predators or adult factors. Naturally occurring predators and parasites of T. ni should be an important part of a cotton IPM program and the use of insecticides not toxic to these entomophagous a desirable.

R. Rothman & B.G. Miltenberger Institute of Zoology, Cell Biology Laboratory, Technical University, Darmstadt, FRG. Cyto genetic studies in mammalian cells after treatment with intact pathogenic versus Bacillus var 

1. In vivo studies with nodules.

These results have demonstrated that NEPs of Anagasta kuehniella and Monarchis domestica in Ceratocystis spp. do not induce cyto genetic disorders or structural chromosome damage in testes under experiment conditions. Numerical aberrations do not occur.


The numerical response of Nasonia plant's insects (Lep.) R. factorin Bursaria (Lep.) lacciferina parasites to varying host densities is described. Response surface analysis showed that high rates of parasitism greater than 19% occurs more frequently at low host densities.

G.G. Soare, Jr. INRA. Situation de Recherches de Liste Biologique, La Manioire, France. Pathogenesis of infection by the hypopharyngeal fungi, Tolygynadium clytopygum in Aedes aegypti and Culex tarsalis (Dipt., Culicidae).

The mode of infection and cycle of development of Telogynadium clytopygum was examined in Aedes aegypti and Culex tarsalis. Larvae were found to be infected through the exhalant canal, the pharynx and the midgut. Blastospores and conidia were both infective, although for equal numerical concentrations blastospores proved more virulent.


Tachinid larvae was imported from Australia in 1978 and released in California during 1978-1980. Laboratory and field studies evaluated aspects of D. tarsalis biology considered likely to affect establishment. The test indicated that most females became non reproductive during late fall. S. tarsalis also is susceptible to pesticides used to control key pests in almonds. Research to establish this predator were discontinued after 3 years, as S. tarsalis sensitivity to pesticides and its requirement for prey during a winter seem sufficient to account for its failure to establish.

numerous families; egg predators have been found in 13 families representing 3 orders of arthropods.Vegetarian predators of gypsy moth eggs are in 6 families of birds and 3 families of mammals. The authors present the results of a survey for the natural enemies of gypsy moth eggs, and other associated arthropods, in central Pennsylvania, USA, and then a summary of the known enemies of gypsy moth eggs throughout the world.

J.P. Luquet, B. Parietier & L. Sampredo. Institut Pasteur, Paris, France. Aggressiveness of Conotribatus ennomus towards Acanthoscelides obtectus (Hom., Aphiidiidae) & Conotribatus varians on the cuticle before germinal penetration into the host.

Seven strains of Conotribatus were observed in 3 groups depending on their pathogenicity against the pea aphid. Lupins in permethrin treatments on the aphid cuticle were related to differences in pathogenicity of the strains.

B.G. Jethi, S. Sitaraman & G. Ramasubram. Div. of Entomology, Central Tobacco Research Institute, Rajahmundry, India. Field observations on impact of egg parasitic Telenomus remus (Hym., Scelionidae) on tobacco caterpillar, Spodoptera litura (Lep., Noctuidae) in tobacco nurseries in Andhra Pradesh, India.

From the results, it can be concluded that Telenomus remus can effectively reduce the population of Spodoptera when the pest density is high but has limited impact on the pest's rapid multiplication in the field which requires two years to ensure effective control of the population of S. litura in tobacco nurseries.

E. Breitner. Keith Turnbull Research Institute, Dept. of Crown Lands and Survey, Florina, Australia. The host specificity of Harpia alboaculeata (Hym., Scelionidae) and its potential effectiveness in the biological control of European blackberry.

The host specificity of the orchid wasp, Harpia alboaculeata, was studied to determine its suitability for the biological control of European blackberry (Rubus fruticosus) in Australia. Field observations indicated that the insect was specific to R. fruticosus; however, laboratory tests showed that it could attack some cultivated Rubus spp. and garden roses (H. alboaculeata var. japonica).

M.I. Mohamed, M.A. Zohier & M.F. Hassan. Faculty of Agriculture, Cairo University, Cairo, Egypt. Observations on Chondrila cinnamomea, a predator of the tea leaf miner Delia atkinsoniana floridanus.

Aspects of the biology of Chondrila cinnamomea, a predatory mite of the lawn grass pest Delia atkinsoniana floridanus, were studied. The total number of D. floridanus attacked during the predator's life span averaged 223.6 per female and 104.4 per male.

G.D. Butler, Jr. USDA, Western Cotton Research Laboratory, Phoenix, AZ, USA. Development time of Coccinella septempunctata in relation to constant temperatures (Col. : Coccinellidae).

Development times at constant temperatures were determined for the egg, larval and pupal stages of Coccinella septempunctata, recently introduced into USA. These development rates are similar to those reported in the European literature.
other similar vectors of ochrercoliasis in Mexico. B. thurmam was highly toxic, causing up to 96% larval mortality, but only for short distances downstream. Stream treatment with B. thurmam did not cause significant larval mortality because the infective stage nematodes were either not ingested or were injured during ingestion.

T. Hafsvag & E.B. Higay. Agricultural University of Norway, As, Norway. Functional responses in prey density of Ephedra ceratoides (Hom.) Aphydidae, an aphidid parasitoid of Myzus persicae (Hom.) (Hom.: Aphydidae)

The functional responses of the parasitoid Ephedra ceratoides parasitoid Myzus persicae on a paprika plant, were studied for single females at different host densities (1 to 250 aphids per 2.5 cm²) during 3 different time periods (1, 6, 24 h) at 25°C. Although no sigmoid functional response could be demonstrated in this study, E. ceratoides nevertheless controls aphid populations in small glasshouses.

R. Zuparko. John Muir Institute, Berkeley, California, USA. Biological control of Eucoillicus tiliae (Hom.: Aphydidae) in San Jose, Calif., through establishment of Trioxys curvicornis (Hom.: Aphydidae)

Trioxys curvicornis was released in 1978 in San Jose where the aphid was still a pest. Recovery of the parasitoid was made later the same season. Studies in 1979 and 1980 demonstrated that T. curvicornis had become established in San Jose and was exerting a controlling influence on the aphid.

H.S. Sultana, A. Sharaby & M. Ragaer, National Research Centre, Dokki, Cairo, Egypt. Chemical control of the pest Mediterranean fruit fly (Lep.: C. noctula) and its parasitoid Bactrocera thorinae (Bactrocera thorinae) (Lep.: C. noctula) as affected by Bactrocera thorinae (Hom.)

Analyses of the larval symptoms of the larva of Spodoptera littoralis indicated the presence of a group of amino acids, some of which showed an obvious qualitative difference as a result of feeding with Bactrocera thumberi. The increase in the content of some amino acids in infected larvae may be attributed to the possible dissolution of protein crystals of Bactrocera thumberi. B. thumberi was found to affect also the concentration of some ions in the haemolymph of S. littoralis. The pH values of the haemolymph, however, showed no significant differences between infected and uninfected larvae.

D.A. Pillman & W.L. Steeling. Texas Agricultural Experiment Station. College Station, Texas, USA. Killing power of the red imported fire ant (Hom.: Formicidae): a key predictor of the bell weed (Com.: Crotolariad).

The red imported fire ant Solenopsis invicta has been identified as an important pest of the bell weed, Ambrosia psilostachya. The evidence of insecticidal weed mortality due to the bell weed is usually definitive, thus it is possible to estimate the killing power.

Ram/ Krift. Plant Protection Research Institute, Pretoria, South Africa. Functional response to host density by the egg parasitoid Trichogramma pretiosum

The effect of host density on parasitism by Trichogramma pretiosum was studied by exposing groups of 150, 300, 600 or 1200 eggs of potato tuber moth to 2, 4 or 8 female parasitoids per group. Increasing host density had a beneficial effect. The parasitoid exhibited a functional response, became more efficient, parasitized more hosts and produced more female progeny. On the other hand, the efficiency of the parasitoid decreased, fewer females were produced and the proportion and number of female progeny fell.

J.H. Brower. Stored-Product Insects and Development Laboratory, USDA, Savannah, Georgia, USA. Eggs of stored-product Lepidoptera as hosts for Triochogena ovatus (Hom.: Trichogrammatidae)

The study was designed to determine host preference of T. ovatus eggs for 5 species of stored-product pyralid moth and to assess suitability of these hosts for parasitoid development. It appears that insusceptible releases of Trichogramma into commercial stores could play an important role in suppression of stored-product moth populations.

A. Badawi, A. & A. Abou-Awad. National Research Centre. Dokki, Cairo, Egypt. Amblyseius rosaeiventris (Acari: Phytoseiidae) as a predator of the tomato potato virus, Eringyphas (Erichyphas octavina: Eriophyidae)

The predatory mite, Amblyseius rosaeiventris, completed its life cycle when fed on the tomato potato virus, Eringyphas octavina, in the laboratory. The durations of the immature stages and of the adult stage were determined.

B.A. Fiege. The Israel Council for Biological Control, Rehovot, Israel. Effect of a new insect growth regulator, RO 13-5323, on hymenopterans parasites of scale insects

The insect growth regulator, RO 13-5323, did not affect the normal development of immature stages of Mealybugs bariens and Aphis tosakani, parasitoids of Solanum clavatum and Chrysaemus acridium, respectively. Spraying citrus trees had no adverse effect on the activity of other parasitoids.

J. Chauvin. IRSTOM, Nogent, New Caledonia. Two predators of Termitinae in New Caledonia: Stephanostephus exsurrexus n.sp. and Stehnotera exsurrexus n.sp. (Col.: Coccoptilidae)

Stephanostephus exsurrexus and S. exsurrexus are described from Papua New Guinea, with records of their prey and new data on the distribution of Stephanostephus in the Pacific area.

T. Hafsvag & E.B. Higay. Agricultural University of Norway, As, Norway. Supersupparasitism and host discrimination of Ephedra ceratoides (Hom.: Aphydidae), an aphidid parasitoid of Myzus persicae (Hom.)

Myzus persicae at different densities on a paprika plat were exposed in 215% to single females of the parasitoid Ephedra ceratoides during different exposure periods. E. ceratoides discriminated between unparasitized and parasitized aphids. Larvae in superparasitized aphids developed slower than single larvae.

C.B. Houstok, J. Hamal & R.M. Nowakowski, Division of Biological Control, University of California, Berkeley; Montana State University, Bozemam, Montana, USA. Biological control of psyllid, Tribeius terreus in California after twenty years of activity of introduced species

Fifteen years of field tests were conducted in California on 1,200 plots infected with the annual psyllid Tribeius terreus in order to examine the effect of 2 introduced
woorii, Manduareias bennetti and M. hypoleuca, on
puentecura. Since 5 of the 6 series of plots marked a
substantial reduction in visible seed production and punctu-
arm cover, it is suggested that 12 introduced weevils
eliminated the punctecurai populations capacity to compe-
tate in the natural titration and significantly contributed to
the decline in puenteuera density.

M. Mithi & A. Kriwhamorgub, Indian Inrute of
Agricultural Research, Indi. Recover the of two exotic parmaes, Trichiogryllus bennetti and Trichiga-
gramma glaucus (Dipt. = Tachinidae) from Hebds nigrum (Lep. = Noctuidae) in Toonel fields.

Field trials were conducted with 2 exotic parasites, Trichiogryllus bennetti and Eustraelius bennetti in tomato. Both the parasites were recovered from H. nigrum in the fields. Parasitism by T. bennetti ranged from 34.6 to 51.3% by E. bennetti, it ranged from 0.9 to 8.5%.

ENTOMOPHAGA, volume 22(1), 1994
W.L. Sweeney, D.A. Dean, D.A. Fillmore & D. Jones,
respectively. Dept Entomology, Texas A&M University,
College Station, TX, Dept Entomology, Oregon State
University, Corvallis, OR, Dept. Entomology, University of
Kentucky, Lexington, KY, USA. Notes on a newly occurring biological control of the wooly willow
(Cut. = Cuticularidae).

The American leaf miners, Porina americana, affect the
protection of the willow, Artemisia glandulosa, in east
Texas cotton fields. Both weevils caused no economic loss in
11 years due to mortality (starch tissue) to larvae.

J.A. McMurtry, H.G. Johnson & M.H. Bulis, Dept.
Entomology, University of California, Riverside, CA,
USA. Experiments to determine effects of predator release
on populations of Oligoscypha pusilla (Lec-
ane = Tetranychidae) on alfalfa plants in California.

Experiments were conducted to determine if mass
release of certain species of predatory mites could provide
more effective suppression of D. micans than natural
predation of the phytophagous species. In the study, 3 of
the 4 species predation of mites showed marked numerical
responses to increased predation of the pest (D. micans).

S. Sato & T. Tomaki, Dept. Zoology, Faculty of
Science, Kydai University, Kyoto, Japan. Effect of the
number of parasitoids (Apanteles karvius) eggs (Hym.:
Bracidae) on the growth rate of Host (Laricomyia separata)
larvae (Lep. = Noctuidae).

The developmental interactions between Apanteles kar-
vius and host were investigated. The parasitoid laid more
eggs in hosts on average. Host size increased proportionally as the
more advanced, but the number of eggs laid per host did not
increase accordingly. The parasitoid larvae control host
growth in such a way that is the more numerous they are
relative to their host size, the more they contribute to the size
of their host.
A. exclamationis), the growth and the feeding rate of inoculated larvae were investigated. Larvae of Notostigma
punctatus, Philasia phyllina and Spodoptera littoralis but not Agrotis segetum were also susceptible to infection.
This microsporidia is probably insufficiency pathogenic for use in the biological control of moths.
J.A. McHarity, M.H. Buitti & H.H. Johnson, Dept.
Entomology, University of California, Riverside, CA, USA. The broad leaf, Polypropagatum sp., larva, as a
potential prey for phytoseiid mites in California
As an initial step in investigating the potential of
biological control of broad mite in California, various species of native and introduced Phytoseiidae were
tested to determine their ability to develop and reproduce on P. leuca. Of the species tested in the present study, Euseius bipustulatus,
Tychobius rickeri, T. americanus and T. porrectus proved to be the best candidate predators for broad mite in California.
E. Nisar She, J.A. Odebrecht & H.R. Herren, Dept.
Agricultural Biology, University of Idaho, Interna
tional Institute of Tropical Agriculture, Badan, Nigeria. The biology of Hypsaspis jucunda (Col.: Coccinellidae) an exotic predator of the cassava mealybug
Pseudococcus manihoti (Hom.: Pseudococcidae) in Southern Nigeria
The life cycle and some other aspects of the biology of H. jucunda, an imported predator of the cassava mealybug in
Nigeria, were studied in the laboratory. In Latin America, it is a natural enemy of Pseudococcus heravi.
I. Larent-Thiry, S. Halma & H. de Barjac, Service de
Lutte Biologique, Institut Pasteur, Paris, France. Sus-
ceptibility of Culicoides to B-oxoaxone of Bacillus thuringiensis
The B-oxoaxone of B. thuringiensis H-1 acts as a larvicidal
and also adulticide when ingested at high concentrations by Aedes aegypti. Anopheles stephensi or Culex pipiens. Suble-
thal concentrations of B-oxoaxone induce a delay in larval
moulting and steroidal effects on larvae and pupae.
B. Paperculosis, B. Voladon, L. Torres & M. Arnaud. Service de lutte biologique, Institut Pasteur, Paris,
France. Contribution to the study of the specificity of the
termitophilic fungi Leucophaea kudriavzevii (Zygo-
myces, Enteromycetinae)
About 40 strains of Zingiberinthia radicis were isolated in
France from Homoptera, Lepidoptera, Diptera and Hymen-
optera. The pathogenic behaviour of all 8 of these strains was
studied simultaneously on the aphid Acrythosiphon pisum. The 8 strains differed from one another in selectivity and in
their ability to produce conidia and to form hyphae. The results establish quantitatively the existence in Z. radicis of
an adaptation of strains to a host taxonomically related to the host from which the strain was isolated.

Editors and organizers of this issue: G. Mathys and Elizabeth A. Baker.