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Secretary-General: G. Mathys, I, rue Le Nôtre, 75016 Paris (France).
1. Main results and research prospects for the introduction and acclimatization of beneficial organisms in the IBSC/EPFR Member Countries.

G.V. Gusev

Main results and research prospects for the introduction and acclimatization of beneficial organisms in the USSR, with special reference to practical plant protection.

A. Kalinov

Introduction and acclimatization of entomophages in Bulgaria.

E. Nemčík

Principles and requirements for the introduction of entomophages for pest control in orchards in Poland.

G.A. Baglyazov

Results and prospects for the introduction and acclimatization of predatory insects of the family Pterostichidae in the USSR.

J. Semik & R. Litovets

Prospects for the introduction and acclimatization of predatory beetles of the family Carabidae in Poland.

V.A. Tryapilzyn

Potential for the introduction into the USSR of parasitic chalcids—natural enemies of agricultural and forest pests.

M. Tonev & U. Pelov

Present situation and prospects for the introduction of Chalcidoidea into Bulgaria.

O.V. Kovalov

Biological control of weeds in the USSR.

D. Zilbermann

Use of pesticide-resistant beneficial organisms in integrated plant protection systems (introduction and acclimatization of resistant acarophages).

3. Introduction and Practical Utilization of Beneficial Organisms for the Control of Quarantine Pests.

T.S. Velychka

Introduction and practical utilization of beneficial organisms for the control of quarantine pests in the USSR.

W. Wegner & S. Pruszyńska

Research situation on the introduction of natural enemies of Colorado potato beetles (Leptinotarsa decemlineata) into Poland.

V.A. Yanosev

Review of mothphages introduced to combat forest and grapevine pests in the USSR.


N.V. Bondarenko

Situation and prospects for the use of predators and parasites under glasshouse conditions in the USA.

V. Nasinkova

Use of Encarsia formosa Gah. in glasshouses in Bulgaria.

U.A. Baglyazov & V.V. Lebedev

Data on the biology of Encarsia — a parasite of the glasshouse whitefly.

Z.M. Kuytina & G.N. Tsytyna

Results on Encarsia formosa Gah. and Macrospilus sp. under glass.

R.I. Chuchik & T.V. Mykhaylovskaya

Results on Encarsia formosa Gah. and Macrospilus sp. under glass.

S. Pruszyńska

Introduction of Pseudococcus pentadactylus Aliakherbaeva and its use in controlling spider mites in Poland.

V. Nasinkova

Possibilities for determining the efficiency of aphidophages under field conditions.

2.2. Western Hemisphere Regional Section

Joint US/USSSR Conference on Microbial Insecticides

The joint US/USSSR Conference on Microbial Insecticides, "Characterization, Production, and Utilization of Entomopathogenic Viruses", was held in Clearwater Beach, Florida, USA, from January 7 to 10, 1980. The Conference was part of the continuing activity in Project V, "Microbiological Control of Insect Pests", of the US/USSSR Joint Working Group on the Production of Substances by Microbiological Means, under the US/USSSR Agreement on Cooperation in Science and Technology.

The objectives of the Clearwater Beach Conference were to:

1. Review past work and determine the current status of the use of entomopathogenic viruses for controlling insect pests in both the USA and USSR, especially as it relates to production, selection specificity, standardization, delay and epizootiology of entomopathogenic viruses.
2. Define specific research objectives for collaborative research.
3. Identify interested scientists to participate in collaborative research.
4. Develop a joint working document to institute in implementing research objectives.

The fifteen papers presented, 8 by USA scientists and 7 by Soviet scientists, covered both basic and applied research on the feasibility of developing viruses for control of insect pests. Research in both countries has concentrated on viruses associated with aphidoparasites (Aphidoletes, Bacillus, Helicoverpa, Lepidoptera, Mammata, Odonata) and a hymenopteran (Dysmicus). As a consequence of this conference, scientists of the USA and USSR will exchange notes, utilize techniques, share resources, and develop joint research projects.

The proceedings, edited by Curtis M. Ignoffo, Mauro E. Martignoni, and James L. Vaughan, are available from the National Technical Service, Springfield, Virginia 22161.

Dr. C.M. Ignoffo
USDA-ARS-BCR, Columbia, Missouri, USA.

2.3. West Pacificaregional Section


The report of the meeting of the West Pacific apid sub-group held in Colmar, France, 14-15 Nov., 1979 comprises some 13 papers, three of which are in French and the remainder in English. The meeting was attended by 24 participants from 9 countries. The sub-group was founded in 1975, with the main aim of developing programmes based on ecological studies. The papers are as follows:
E. obtusa is of importance mainly in limiting populations of Slubian avenue. E. obtusa only develops late in residual colonies.

II 11.17. G. Leitner & J. Desatin, Effects of fungi and hymenopterous parasites on populations of Slubian avenue (F.) and Metopophorus fieberrii (Wagl.) in experimental sites at Milorad in 1978 and 1979. The Slubian avenue population dynamics in 1978 and 1979 are summarised. Levels of parasitism were also recorded. Porrca vernalis was the most common parasite recovered. Although absent at the start of observations, E. obtusa was later found in up to 39% of A. disthurnus and 2% of A. avens. Moreover, the E. obtusa epiphenon developed too late to prevent M. disthurnus populations reaching high densities. Only few eucercoids were recorded.

II 19.23. J.P. Latge & D.F. Perry, The utilisation of an Examenophorus obtusa resting space preparation in biological control experiments against cereal aphids. E. obtusa has been shown for use in biological control against cereal aphids due to its high pathogenicity and its convenient resting space production and germination. The known characteristics of 5 other resting space producing Examenophorinae are also reviewed. Industrial production of E. obtusa resting spaces, their subsequent germination, conservation and formulation is being investigated. The application of resting spaces on cereal fields will be described using 3 treatments of treatments based on seasonal changes and the life cycle of E. obtusa.

II 27.29. B. Fijalov & J.P. Latge, On the pathogenicity of Examenophorus obtusa Hall & Dunm against cereal aphids. Virulence comparisons of strains of E. obtusa against Sitobion avenae f. avenae using a method for determining L.50. The results of studies on cereal aphid populations. The authors discuss the value of the LD 50 as a criterion for assessing the activity of a strain. The phenomenon of "multiplication ability" is introduced. Strains likely to be used in biological control are those possessing a low LD 50, a high multiplication ability and a short selection cycle.

II 33.47. G. Deno, A.M. Dewar, W. Powell & N. Wright, Integrated control of cereal aphids. This paper is an explanation of the events that led up to the development of a "plague" aphid populations on a wheat crop at Rothamstead. It is largely an account of the results of a cooperative experiment originally designed to compare methods of biological and chemical control of cereal aphids and other pests, with a view to developing an integrated approach to the control of all components of the insect pest complex in cereals. However, since neither biological nor chemical agents prevented aphid populations reaching extremely high levels in 1979, results which help to explain these failures have been extracted from other comparable experiments at Rothamstead.

II 59.73. E. Binda, Aphids in winter wheat: abundance and limiting factors from 1976 to 1978. The abundance of Metopophorus fieberrii (Walker) and Microcotylus (Slubian) avenue (F.) the most important aphids of winter wheat in the Rhone-Maas area, is described, followed by a discussion on the role of predators, parasites and fungal pathogens as well as weather in limiting populations. While Chrysoperla and Coenobitella are only important in certain years, the most reliable predators are larvae of the hover fly Epistropheus ater (Birula) and Syrphidae. The most reliable parasites are Ammoseilus rubricauda (Linn.), A. apicalis and Eretmocerus albipunctatus (Hartig). A. avell达成bability, Porrca vernalis (Hartig), and fungal pathogens, mainly Pseudophora aptera (Roths.) and E. obtusa Hall & Dunm, may play an important role as antagonists when weather conditions are suitable.

II 69.41. S.C. Hand, Overwintering of cereal aphids. The aims of this work was to obtain information on how and where the winter cereal aphid species survive the winter. Both amblypheid and holocyclic overwintering are described.

II 65.66. C.T. Williams, Low temperature mortality of cereal aphids. In numerous adults exposed in a cold chamber for 6 hours, mortality of P. parki was much greater than that of M. disthurnus and A. avens. Small nymphs of A. avens were significantly less cold hardy than other stages. Without A. avens nymphs were exposed to ‘“dry” controls. A. avens and M. disthurnus nymphs survived when the larvae of summer grown winter wheat seedlings in which they were feeding were frozen.

II 67.14. Th. Basidov, Studies on the ecology and control of the cereal aphids in Northern Germany. R. palli first infested fields of spring oats and, from there, spread to the edges of winter wheat. This aphid is holocyclic in this area. Coenobitella larvae were not generally effective as predators until the milky stage when wheat. Fields exposed to flowering with parathion-ethyl to control K. avenae were soon reinfested, while an early spray of oxamyl-25EC, although effective against A. avens, did not prevent late infestation by M. disthurnus.

II 55.95. K.D. Southern, D.L. Stice & C.A. Edwards, The role of polyphagous predators in limiting the increase of cereal aphids in winter wheat. In 3 out of 4 experiments, an inverse relationship between numbers of predators and aphids was found in spite of differences in the density and dominant species of aphid.

II 59.98. N. Corrier & R. Rubbins, Simulation models of the population development of Slubian avenue. Two models simulating the population development of Slubian avenue are described. The output results from the models are compared with field observations from the Netherlands and England over a number of years. The agreement between the models and field results is not always good but in several years the date and size of the peak density is accurately predicted. The models are reliable enough to be used for short-term predictions.
3. Review of Some Interesting Developments in Plant Protection

3.1. Annual Research Reports

Annual Report 1978-1979, Division of Entomology, CSIRO, Canberra, Australia, 77 pp


This section includes work on control of the following weed species: Eleuchthera crusipes, alligator weed Alternanthera philoxeroides, the aquatic fern Salvinia, dandelion Taraxacum officinale and E. quinquenata, skeleton weed Chlorophila sinuata, heliotrope Heliotropium europaeum, St. John's-wort Hypericum perforatum, Fatson's couch Echinops ritro, ragwort Senecio jacobaea, bachelor's button Ratibida columnae.


Activities in South Africa, Europe and Australia are summarised. Australia has a substantial complement of native dung beetles but only few species adapted to the changed environment of cleared forestland and large dung pods dropped by cattle. The aim of the dung beetle programme is to breed selected Old World species to Australia to spread their destruction and dispersal of dung and thereby reduce the pest status of dung-boring flies such as burying and buffalo. The following work in Australia is described: breeding releases and recoveries, survey of Norfolk Island, study of both fly control, States associated with dung beetles (these predatory bugs feed on the eggs and larvae of flies, dung destruction, synthesis dung beetle attractant (to stimulate fresh dung).

2.2. Guidelines


This guideline has been established following two seasons of successful trials work on control of red spider mite by Phytotheinae parasitoids and includes brief paragraphs on the importance of monitoring, the use of compatible chemicals, suitable fungicides and insecticides are listed, the technique.

2.3. Symposium Proceedings


Fourteen papers were presented at this seminar under the auspices of the Irish National Committee for Biology at the Royal Irish Academy, Dublin, on 17-18 Feb. 1977, including:

Robinson, D.W. Biological control of weeds. [7-31];
Kavanagh, T. Biological control of plant pathogens: 52-56;
Seaby, D.A. Possibilities of using Triatoma sanguisuga for the control of Hemorrhagia annulata on canter eggs: 57-72;
Stevenson, W.P. Biological control of viruses in tomato crops using cross protection sections: 95-75;
Cunningham, P.C. Perspectives of biological control of some seed-borne plant pathogens from studies of take-all decline: 170-205;

3.4. Recent Symposium

The Beltsville Agricultural Research Center sponsored a Symposium on Biological Control in Crop Protection, on May 19-21, 1980. Subject matter was presented as invited lectures and contributed papers, with lectures to be published in the BARC Symposium Series 13th Volume. The Session were as follows:

Session 1: Reference of ecological theories to practical biological control
Session 2: Concepts, principles and mechanisms of biological control of pests
Session 3: Recent advances in mass production of biological control agents
Session 4: Strategies of biological control.

Larvae of the satinn moth were successfully controlled when a B. thuringiensis suspension applied by means of a helicopter. The outbreak occurred over an area of 100 ha in western Switzerland. Folage was sprayed with the spore suspension to give from 1.4 to 10.3 x 10^6 spores/ha. Mortality due to parasitism before treatment was 9%. It rose to 92% a week after treatment.


This article reviews previous work and the present status of biological control of insect pests with viruses. There is a step-by-step description of the procedures and practical problems associated with establishing insect cell lines and producing baculoviruses. The advantages and disadvantages of viral insecticides are discussed. Applications of the technique to specific problems as well as future applications are briefly mentioned.


Although Pseudococcus girveus is a serious threat to the local banana industry, the establishment of A. erizanum and C. erizanum greatly reduced the importance of the pest. The parasites were effective in controlling widespread, heavy infections and were also effective in preventing serious damage from developing in situations of low host density. Later infections had just begun to be noticed. As a result there were many lepidopterans in the State where severe damage had previously threatened families of bananas.


In Victoria 44 species of phytophagous insects and two species of mites were found to attack endemic and introduced Rubus spp. Most insects were phytophagous and ectoparasites and half were of some economic importance to crop plants. Only one host-specific insect was found on endemic Rubus spp. European blackberries appear to have been introduced into Australia free of its most important pests and the possible use of one of these as a biological control agent is mentioned.


The European seed-head flies, Urophora affinis and C. quadricincta were introduced into British Columbia for the biological control of Consumerus diffusus and C. maritimus. The fly populations were monitored over a ten-year period. Both species increased and spread rapidly to reach a combined population plateau determined by the receptive area in the knapweed stand. Within ths
population plateau, the abundance of the two flies has tended to fluctuate inversely.


Soil suppressive to Rhizoctonia solani was generated by monoculture planting of successive crops of radishes at 5-week intervals in soil infested with the pathogen. Numbers of Trichoderma spp. propagules in the soil increased as suppressiveness increased, whereas inoculum density of R. solani was inversely proportional to the density of these Trichoderma spp. following radish monoculture. Successive plantings of cucumber also generated suppressiveness which was associated with population of Trichoderma spp. propagules. Suppressiveness did not develop with Trichoderma was undetectable in sugar beet, alfalfa, and wheat monoculture. Trichoderma was isolated with high frequency from mycelial mats of R. solani incubated in suppressive soil, but only occasionally from those inoculated in conducive soil. Finally, isolates of Trichoderma added to conducive soil, at the same density found in suppressive soil, induced suppressiveness and the same species could be reproduced from mycelial mats of R. solani incubated in the soil. Among the antagonists tested, T. harzianum, isolated from Fox Collins clay loam, was more effective in inducing suppressiveness. Suppressiveness during adult monoculture development more rapidly in soils than in alfalfa soils. The suppressive effect persisted longer in soils with low negative matrix potential.


Metz fine sandy loam soil from the Salinas Valley in California was suppressive to the Fusarium spp. which induce wilts of flax and carrots. Suppressiveness to Fusarium oxysporum f. sp. danonis was transferred to conducive soil by the addition of fine sandy loam. The inoculum of Fusarium oxysporum f. sp. danonis was 50% of the suppressive effect. Lowering of pH levels of the Metz fine sandy loam from 8.0 to 6.5 in unit increments eliminated the suppressive effect. Bacteria were isolated from mycelial mats of Fusarium oxysporum f. sp. danonis in the suppressive soil and conducive soil. T. harzianum from suppressive soil introduced into conducive soil at 10^4 cells per gram of soil significantly reduced disease incidence of Fusarium of Metz loam. The more effective of those isolates inducing suppressiveness was a pseudozymon strain VP6. This strain is effective on Fusarium infestations and may be accomplished through introduction of appropriate species of bacteria into conducive soil.

4. Review of interesting Developments in Vector Biology and Control
4.1. Information Documents/WHO Division of Vector Biology and Control

Anyone wishing to receive copies of the documents recently issued by WHO on biological control research and biological control agents should request them from the WHO Division of Vector Biology and Control, 1211 Geneva 27, Switzerland.


Research on vector control in the Special Programme is centered on biological control both in the form of biocontrol agents that will reduce vector density or in some other way interfere with the vector-virus-host cycle and on chemical control of vectors. The objective of the special programme on BCV is to identify, evaluate and develop biological control agents for the safe and effective control of vector-borne diseases transmitted by mosquitoes and intermediate hosts of human diseases covered by the Special Programme, with special emphasis on fungi, bacteria and arthropods, and secondly to support those objectives by identifying and selling institutional needs for strengthening research and educational capacity. As resources do not permit proceeding with the simultaneous evaluation of many biological control agents, it was proposed that first priority be given to the following organisms:

**Bacteria**
- Bacillus thuringiensis, serotypes 2 and 5
- B. thuringiensis, serotype H 14

**Fungi**
- Cladosporium spp.
- Alternaria alternata

**Protists**
- Neospora ovinae
- Ascaris lumbricoides

Second priority to be given to studies on:

**Fungi**
- Monosporium roseum
- Lagenidium giganteum

**Nematodes**
- Oxyuris vermicularis

A summary of research and development reviewing worldwide activities, both within and outside the Special Programme, is given in the annual report of the Special Programme on BCV for 1977-78. In addition, the following reports have been published:


Progress made in this field since September 1979 was reviewed. Recommendations broaden the scope of the reviews to include parasitoids, predators, competitors, biological agents for soil control and reared agents were noted. The list of candidate biological control agents to be given priority in the research plan have been updated and extended. The following sequence of practices was recommended: within a priority group agents are tried alphabetically.
Under laboratory conditions, 2nd, 3rd and 4th larval stages of Calliphora vicina proved readily susceptible when exposed to B. sphaericus strain 1593 primary powder (M/V 718, Sinarofi Chemicals) for 4 hours, with LD 50% of between 0.09 and 0.12 mg/l. However, Aedes aegypti, Aedes aegypti and Aedes vexans were much more resistant, with LD 50% of 40 mg/l. Equitoxic results were obtained for Aedes aegypti. In a field trial against Aedes aegypti, concentrations equivalent to 5-10 kg ha were needed for adequate kill. Such applications would not be economically feasible in practice.

b Bacillus thuringiensis ssp. H 14


The variation in susceptibility to B. thuringiensis toxin of about 15 strains of Aedes aegypti was investigated. In view of the variation both within and between species in susceptibility, it will be necessary to strictly standardize experimental parameters, and to use large numbers of larvae per concentration, when titrating the amount of active ingredient in formulations of B. thuringiensis.


In the short-term at least, B. thuringiensis did not appear to have any deleterious effects on the non-target aquatic fauna, while it exerted excellent larvicidal activity against the blackfly, Simulium damnosum, the vector of onchocerciasis. These field tests were carried out in the Ivory Coast.


A primary powder of B. thuringiensis ssp. de Barjac was produced on an industrial scale and evaluated as a blackfly larvicide in a small river in the southern Ivory Coast, West Africa. Coopitive kill of larvae immediately downstream of the dosing point was obtained with concentrations equivalent to 0.2 mg/l primary powder for 10 minutes. It is hoped that these extremely encouraging results can be improved with formulations specifically developed for blackfly control.


A primary powder of B. thuringiensis ssp. de Barjac, together with three experimental formulations derived from a 15% water dispersible powder (wp), 10% water-based concentrate, and 5% emulsifiable concentrate were evaluated simultaneously as blackfly larvicides. Efficacy at a given concentration was inversely proportional to the size of the particles, the water-based concentrate being ineffective and the wp being markedly less effective than the primary powder itself. Studies are underway to determine whether the influence of particle size is related to the amount of primary powder ingested by blackfly larvae, to the differential solubilisation of inert ingredients and to the surface activity of particles, or both.
The results obtained in the biological determination of the activity of B1 formulations vary in relation to the original and physiological state of the insects as well as with the experimental conditions under which the tests are carried out. These variations can be reduced by incorporating a reference powder of the active B1 serotype to trials to evaluate a new B1 formulation; the biological efficiency of novel formulations evaluated may be readily quantified by assigning an arbitrary titre to the reference powder in «International Units» of effectiveness. The paper gives details on the preparation, storage, distribution and use of the reference formulation based on serotype H 14 (IPS 71 (International Pasteur Standard 1978).


Safety of the primary powder R 153 78 and two experimental formulations derived from it (R/53, WP & 5% EC) was evaluated using laboratory infections. Studies were made of coleopeteran larvae and adults (Dorion sp.), coccopods (Coccyx sp.), Chlordane (Diptera monilis), dipterous larvae (Gordia sp.), shrimps (Artemia vulgaris adult), chironomid larvae (Chironomus sp.), chaobrid larvae (Gordia sp.) and crabs (Oncopsis saltarum). The formulations appeared to have a very large safety margin excepting for chironomid.


In most cases, the LD 50's and LD 90’s observed for the 2nd/3rd early instar larvae of wild-caught Aedes aegypti, Aedes albopictus and Culex pipiens were comparable with those obtained using conventional larvicides. Between-species variation in results warrants further in-depth studies, in order to determine the critical concentrations at which mosquitoes may develop resistance to the entomocides, as well as to define application rates for use in the field. This variation might be of considerable significance if evaluation of the larvicidal activity of commercial preparations of A1 will be exclusively based on biological trials simultaneously determining the LD 50's obtained with commercial formulations and the IPS 78 reference formulation.


The preliminary development of a standardized bioassay method using serotype H 14 is outlined. On the basis of these findings, it may be necessary to finalize a method and recommend it in general use. However, a number of conclusions are listed, and these are briefly summarized below.

No difficulties are no greater than those overcome for iteration of formulations of serotypes H 1 and H 10, already in use, although more difficult to handle and difficult to contain than dusts in the larva, 2nd instar larva are easier to mass produce, and can be exposed for longer periods without any adverse effect. 3rd instar larva take a long time to produce, synchronously mass-production is difficult. 3rd instar larva were used, and it is hoped that their results will help to the development of an international agreement to standardize method for evaluating commercial formulations of B1 homologues.


The reference formulation IPS 78 and the WHO bioassay method for determining the susceptibility of mosquito larvae to insecticides were used to assess the active ingredient content of the experimental primary powders R 153 78 and ARG 1104 against Aedes aegypti and Culex pipiens. Each population of each mosquito species gave a different titre.

No. 153 78 = 3 100 IU for Cx. pipiens and 4 200 IU for Aeg aegypti.

ARG 1104 = 6 000 IU for Cx. pipiens and 1900 IU for Aeg aegypti.

The need to standardize both the experimental insecticide and the mosquito strain used is emphasized.


The primary powder R 153 78 and derived formulations were evaluated in small field plots against larvae of Aeg aegypti and Cx. pipiens. The effectiveness of the primary powder was not exceeded by the other formulations. The residual concentration ensuring complete mortality was 0.1 mg/l against Aeg aegypti and 0.4 mg/l against Cx pipiens, equivalent, respectively to 3 400 and 3 160 IU litre. There was almost no residual larvicidal effect despite the chemical stability of the delta endotoxin in neutral and soil water.

This report on progress in research by the University of California Division of Agricultural Sciences, includes the following articles: B. a new potent biological weapon: G. Garcia et al. A. Novakova, A. Garcia: Other mosquito predation (bupis, hydra, flavomaras C. Coss: Mosquito fish - an established method (G.A. Ellis et al. Genetic manipulation of mosquitoes (D. C. Armour et al. Using stimuli to reduce mosquito numbers (D.R. Anderson & M. Ammon Fung) show promise in biological control (A.R. Federik & A. N. Marinos as biological control agents (E.G. Pflaeze).


Extensive studies on the potential of the new species (B. thuringiensis var. No. Bacillus thuringiensis characterized as B. var. thuringiensis (B. thuringiensis) have been conducted by the University of Heidelberg (DIE) since 1976. The present study was aimed at developing high-level UV-inactivation of B. thuringiensis spores and to evaluate the effects of temperature on the transmission of B. thuringiensis to insect pests and parasitic insects. The study was initiated to determine some of the attributes of this parasite longevity, life cycle, number of larvae attacked, area of host destruction.

R.A. Latierhalske, J.P. Pedrignani & D.E. Watson, Northeastern Forest Experiment Station, Forest Service, USDA, Brown Field, Hanford, Connecticut. Natural occurrence of the bacilliformicid virus of the gypsy moth, Laminaria dispar (Lam.: Laminarid). in wild birds and mammals. Three species of birds and 5 species of mammals were captured in the wild from 2 plots in which mortality occurred from naturally occurring bacilliformicid virus (NPV) among gypsy moths, Laminaria dispar, larvae. It is concluded that birds and mammals can passively transport infectious gypsy moth NPV in the wild.