



JOINT PROCEEDINGS



TROPICAL REGION

**21st Annual Meeting
of the Caribbean Food Crops Society
and
32nd Annual Meeting of the American Society for
Horticultural Science — Tropical Region**

technology for agricultural development

**Hilton Hotel, Port of Spain, Trinidad
8 - 13 September 1985**

Host Institutions

- Caribbean Agricultural
Research and Development
Institute
- Ministry of Agriculture, Lands
and Food Production, Trinidad
& Tobago
- Faculty of Agriculture,
University of the West Indies

Published by the Caribbean Food Crops Society, Box 506, Isabela, Puerto Rico 00662

TOWARDS AN IPM PROGRAM FOR CABBAGE PESTS IN TRINIDAD

M. Yaseen

Commonwealth Institute of Biological Control
Gordon Street, Curepe, Trinidad, W.I.

ABSTRACT

Cabbage is an important crop in Trinidad. It is severely damaged by *Plutella xylostella*, *Hellula phidilealis* and *Trichoplusia ni*. Two parasites *Apanteles plutellae* and *Tetrastichus sokolowskii* were introduced for control of *P. xylostella* in 1970s. These are established, but are adversely affected by chemical pesticides applied against the other pests. *T. ni* has a fairly large complex of natural enemies which may well exert considerable control if chemical pesticides are not used. There is a dearth of natural enemies of *H. phidilealis* and farmers have to rely on chemical pesticides. It requires investigations to develop a pest management system with little disruption of the agroecosystem. It is suggested to establish trials with known parasites of other species of *Hellula*, diseases and manipulation of wild hosts of *H. phidilealis* in cultivations.

RESUMEN

El repollo es un cultivo de importancia en la isla de Trinidad. Es severamente dañado por el *Plutella xylostella*, *Hellula phidilealis* y *Trichoplusia ni*. Dos parásitos *Apanteles plutellae* y *Tetrastichus sokolowskii*, fueron introducidos con el objeto de controlar al *P. xylostella*, en los años de 1970. Estos parásitos fueron establecidos pero a la vez fueron afectados adversamente por pesticidas químicos los cuales fueron utilizados para combatir otras plagas fuera de las mencionadas. La plaga *T. ni* tiene un amplio complejo de enemigos naturales, los cuales pudiesen ejercer un control considerable si es que no se utilizarían pesticidas químicos. Existe una escasez de enemigos naturales del *H. phidilealis*, por lo cual los agricultores no tienen más alternativa que depender de pesticidas químicos. Se requiere llevar a cabo investigaciones con el objeto de desarrollar un sistema de manejo de plagas, el cual disrumpie en lo mínimo el agro-ecosistema. Se sugiere el establecimiento de ensayos, utilizando parásitos conocidos, de otras especies del *Hellula*, enfermedades de la misma y de manipulaciones de huéspedes silvestres de *H. phidilealis*.

Cabbage is an important vegetable crop in Trinidad. It is severely damaged by three lepidopterous pests: the diamondback moth *Plutella xylostella*, the cabbage budworm *Hellula phidilealis* and the cabbage looper *Trichoplusia ni*. Farmers resort to frequent applications of chemical pesticides which render the crop uneconomical, produce harmful side-effects and in some instances fail to provide adequate control.

Plutella xylostella was first reported from Trinidad in 1945 (Lamont & Callen), but has attained pest status during the last 15 or so years. The life cycle is remarkably short; a generation may be completed in 14–16 days. The egg, larval and pupal stages last for 2, 8–10 and 3–4 days respectively. Oviposition commences a day after emergence and eggs are laid singly or in groups, usually on the lower leaf surface. Young larvae mine the leaves and, as they grow, riddle the leaves with numerous holes, each about a quarter inch in diameter and several reach the heart of the cabbage.

Yaseen (1974 & 1978) reported the naturally occurring parasites, *Apanteles aciculatus*, and *A. sp. (glomeratus group)* from larvae, *Spilochalcis hirtifemora* from pupae and *Trichogramma brasiliensis* from eggs, playing an insignificant role in reducing the pest populations and hence, in co-operation with the Ministry of Agriculture, the Commonwealth Institute of Biological Control introduced two exotic parasites *Apanteles plutellae* and *Tetrastichus sokolowskii* and these have become established. However, as cabbage in Trinidad also suffers from damage from *Hellula* and *Trichoplusia*, farmers blanket the crop with chemical pesticides which adversely affect the introduced parasites. This results in the absence or scarcity of *A. plutellae* in the pre-harvest fields. However, since its firm establishment, it becomes abundant in post-harvest fields to an extent that it appears to be controlling outbreaks of *Plutella*.

Trichoplusia ni: Larvae feed on leaves; they are very voracious and strip the plant of foliage. Its outbreaks are sporadic. Yaseen *et al.* (1977) have reported native egg parasites, *Trichogramma brasiliensis*,

T. perkinsi, *T. exiguum (=fasciata)* and an undescribed trichogrammatid, the egg-larval encyrtid parasite, *Litomastix truncatellum (=Cupidosoma truncatella)*, the larval tachinid parasite *Euceletoria bigeminata*, the braconid *Apanteles marginiventris* (solitary) and *Apanteles sp.* probably *virtripennis* group (gregareous), which may well exert considerable control if chemical pesticides are not used.

Hellula phidilealis: The eggs are laid singly near the mid-rib of young leaves and hatch in 4–6 days. The young larvae feed for a short duration on the surface of the leaf before burrowing into the growing point of young plants or into the mid-rib or axil of a leaf, tunnelling downward into the stalk. In young cabbage plants, the larva bores into the growing point and may cause mortality or retarded growth and frequently there is a proliferation of small heads which are not marketable.

Bennett (pers. comm.) has collected *Bracon thurberiphagae* and *Charops uncinatus*, but there is a dearth of effective natural enemies attacking the pyraustid in cultivated crucifers. Yaseen *et al.* (1977) introduced *Bracon hebetor* from India, but it was not recovered. *Hellula* is known to attack *Cleome* spp. (Family Capparidaceae) which grow wild in and around cabbage fields. Alam (1982) has reported *Apanteles sp.*, *Chelonus sp. nr. mexicanus*, *Eiphosoma annulatum* and an unidentified tachinid from *Hellula* attacking *Cleome* spp. in Barbados.

In the absence of effective natural enemies of *Hellula* in cabbage, farmers have to rely on chemical pesticides. In order to obtain the maximum benefit of the introduced parasites of *Plutella*, and to allow native, natural enemies of *Trichoplusia* to exert their maximum control potential, the use of chemicals against *Hellula* should be very judicious in that they should be chosen in such a way as to minimize interference with natural enemies. This gives an opportunity for investigations to develop a pest management system with little disruption of the agroecosystem. In order to achieve this objective,

firstly efforts should be made for the biological control of *Hellula*. Thompson (1946) and Herting (1965) and other sources record several parasites and predators of *Hellula undalis* and *H. rogatalis* (Table 1). Recent investigations at the Pakistan Station CIBC have revealed three parasites – *Apanteles midas*, *Chelonus rufus* and *Bracon* sp. – from *H. undalis*. Secondly, to explore possibility of the use of diseases against *Hellula*, the key pest of cabbage. In this regard, in cooperation with CIBC, the Institute of Virology, Oxford made lab tests with several viruses against *Hellula* to select the one which does not disturb beneficial organisms in the cabbage ecosystem and selected the nuclear polyhedrosis virus of *Autographa californica* (AcNPV) for field trials.

Field trials were made in Trinidad by the Institute of Virology, in cooperation with the Ministry of Agriculture and CIBC in Trinidad, in 1984. Small (1984) reported achievement of protection of cabbages against *H. phidilealis* using the baculovirus, AcNPV. The best protection was achieved in nursery beds. Virus control in the field was not satisfactory because of the heavy pest pressure from surrounding, infested areas and the comparatively small experimental plots. It also involved high concentrations of virus to instigate any form of control. These preliminary field trials suggest further investigations, including the search for a more efficient virus that should be effective against both *Hellula* and *Plutella*, which now seem to have become resistant to several

Table 1. Parasites and predators of *Hellula* spp. and their distribution

Natural enemies	Host	Distribution
PARASITES		
Trichogrammatidae		
<i>Trichogramma "minutum"</i>	<i>Hellula undalis</i>	Australia
Ichneumonidae		
<i>Camponotus facilis</i>	<i>H. rogatalis</i>	USA
<i>Cremastus tibiator</i>	"	USA
<i>Eiphosoma annulatum</i>	<i>H. phidilealis</i>	Barbados
Braconidae		
<i>Apanteles hellulae</i>	<i>H. undalis</i>	Senegal & Cameroon
<i>A. midas</i>	"	Pakistan
<i>A. saegeri</i>	"	West Africa
<i>A. sp.</i>	<i>H. phidilealis</i>	Barbados & Guyana
<i>Atanycolus</i> sp.	<i>H. undalis</i>	West Africa
<i>Bracon hellulae</i>	<i>H. phidilealis</i>	Brazil
<i>Bracon hebetor</i>	"	Trinidad
<i>Bracon ? thurberiphagae</i>	"	Barbados
<i>Bracon</i> spp. (2)	"	Mexico
<i>Bracon</i> sp.	<i>H. undalis</i>	Pakistan
<i>Chelonus rufus</i>	"	Pakistan
<i>Chelonus</i> sp. nr. <i>mexicanus</i>	<i>H. phidilealis</i>	Barbados
<i>Chelonus</i> sp.	"	Brazil
<i>Meterorus levivertris</i>	<i>H. rogatalis</i>	USA
Bethylidae		
<i>Goniozus (=Parisierola) sp.</i>	<i>H. phidilealis</i>	Barbados
Tachinidae		
<i>Nemorilla pysti</i>	<i>H. rogatalis</i>	USA
<i>Nemorilla</i> sp.	<i>H. phidilealis</i>	West Indies
<i>Stomatomyia</i> sp.	<i>H. rogatalis</i>	USA
PREDATORS		
Sphecidae		
<i>Stictiella serrata</i>	<i>H. rogatalis</i>	USA
Afriopidae		
<i>Neoscona doenitzi</i>	<i>H. undalis</i>	Japan
Thomsidae		
<i>Misumena tricuspidata</i>	<i>H. undalis</i>	Japan

insecticides, and the development of more effective spray equipment.

Because of the relative abundance of natural enemies of *H. phidilealis* in *Cleome* spp., in contrast to their paucity in cruciferous crops, Bennett (1981) considers it possible that *H. phidilealis* has transferred from *Cleome* spp. to crucifers rather than vice versa. Until satisfactory control of *Hellula* becomes possible by natural enemies or viruses, *Cleome* spp. should be destroyed from the cultivations and the surrounding areas to reduce the chances of the pest invading cabbages. Search should also be made for other wild hosts of *Hellula* in areas in the neighbourhood of cabbage fields and these reservoirs of *Hellula* should also be destroyed before the latter moves to cabbage. However, if biological control is achieved *Cleome* spp. and other wild host plants in the surrounding areas may prove useful when cabbages are not in the field, by providing *Hellula* for survival of the introduced parasites.

References

Alam, M.M. (1962) Cabbage pests and their natural enemies in Barbados W.I. *Proc. 18th Ann. Mtg. Carib. Food Crops Soc.* Barbados, 307-320.

Bennett, F.D. (1981) A note on the distribution, host range and natural enemies of *Hellula phidilealis* (Walker) (Pyralid-

ae) a potential pest of crucifers in Mexico. *Paper presented at the Ninth National Biological Control Meeting, Oaxaca, Mexico.*

Herting, B. (1965). *A catalogue of parasites and predators of terrestrial arthropods. Section A Host of Prey/Enemy Vol. VI Lepidoptera Part (Microlepidoptera)* Commonwealth Agricultural Bureaux, England, 218 pp.

Small, D.A. (1984) *The use of baculovirus for control of cabbage pests. Report on a field study in Trinidad*, Institute of Virology, Oxford, UK 143 pp.

Thompson, W.R. (1946) *A catalogue of the parasites and predators of insect pests. Sectional part 7 Parasites of the Lepidoptera (G.M.)*. Imperial Parasite Service, Belleville, Canada. 385 pp.

Yaseen, M. (1974) Biology, seasonal incidence and parasites of *Plutella xylostella* (L) in Trinidad and the introduction of exotic parasites into the Lesser Antilles. In: C.W.D. Braithwaite, R.H. Phelps and F.D. Bennett (eds.) *Crop protection in the Caribbean*. The University of the West Indies, Trinidad 237-244.

Yaseen, M. (1978) The establishment of two parasites of the diamond-back moth *Plutella xylostella* (Lap. Plutellidae) in Trinidad W.I. *Entomophaga* 230 111 - 114.

Yaseen, M. Barrow, R.M., Katwaru, G.S. (1977) Preliminary studies in the development of a pest management programme for cruciferous crops in Trinidad and Tobago. *Proc. 14th Mtg. Carib Food Crop Soc.*, Guadeloupe & Martinique 493-501.