GUEST ARTICLE

SOUTH PACIFIC COMMISSION - GERMAN BIOLOGICAL CONTROL PROJECT - A PROGRESS REPORT

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ABSTRACT

This paper presents the accomplishments of the SPC - German Bioloical Control Project until September 1995. Integrated Pest Management program of cabbage in Papua New Guinea, Fiji, Western Samoa, Tonga, Solomon Islands and Cook Islands, inundative release of the egg parasitoid, Trichogramma plasseyensis *for the control of the Asian cornborer in PNG, and the virus and fungus pathogens for the control of rhinoceros beetle in W. Samoa and Tonga and the classcial biological control of lantana and giant sensitive plant in Solomon Islands, Fiji, W. Samoa, Cook Islands and Niue have either been implemented or are in the process of implementation.*

Key words: Cabbage IPM, biological control, Asian cornborer, bean podborer, lantana, giant sensitive plant, rhinoceros beetle.

INTRODUCTION

To promote biological pest control in agricultural crop production in the Pacific, the South Pacific Commission (SPC) and the Federal Republic of Germany, through its executing agency Deutsche Gesellschaftfuer Technische Zusammenarbeit (GTZ) GmbH agreed to carry out a project. As a result the "SPC - German Biological Control Project" was started in mid 1989 by undertaking an intensive planning process. The Orientation Phase was from March 1991 to August 1993. The First Implementation Phase started in September 1993 and is scheduled to complete in August 1996.

The over all goal of the project is to reduce environmental pollution caused by crop protection measures, and agricultural crop losses due to pests and weeds. The purpose is to increase the use of biological control environmentally safe pesticides in the context of Integrated Pest Management (IPM) in selected SPC member countries.

In the planning, implementation and evaluation of this project a modified logframe approach called ZOPP (Zeilorientierte Project - Planung or Goal Oriented Project Planning) has been used.

TARGET PESTS AND WEEDS

The initial project planning workshop conducted in 1989 recommended to take up the biological control of the following pests.

Diamondback moth (DBM)
- *Plutella xylostella* (L.)

Leaf miners
- *Liriomyza* spp.

Coffee berry borer
- *Hypothenemus hampei* (Ferrari)

Banana aphid
- *Pentalonia nigronervosa* (Coquerel)

Taro planthopper
- *Tarophagus proserpina* (Kirkaldy)

Another planning workshop held in November 1991 shortly after the starting of the two and a half year Orientation Phase with South Pacific Commission as the host organization, recommended to keep only DBM from the previous recommendations and added the following pests and weeds for the biological control target list.

Asian cornborer (ACB)
- *Ostrinia furnacalis* Guenee

Bean podborer
- *Maruca vitrata* (F.)

Melon fly
- *Bactrocera cucurbitae* (Coquillett)

Melon aphid
- *Aphis gossypii* Glover

Lantana
- *Lantana camara* (L.)

Giant sensitive plant
- *Mimosa diplotricha* (C. Wright ex Suavalle (= *Mimosa invisa* Martius ex Colla)

However, the team that evaluated the Orientation Phase conducted a workshop in October 1992 to plan the First Implementation Phase. It recommended deletion of melon fly and melon aphid from the target pests of this project as biological control may not provide satisfactory control for pests of quarantine importance (melon fly) and vectors of plant virus diseases (melon aphid). It also recognized the existence of other projects in the region to tackle these pests. Since it is difficult to achieve significant results, in a short growing period vegetable crop like cabbage that is attacked by many pests, instead of taking up biological control of DBM alone, the team recommended that an IPM approach be adopted.

Biological control of the rhinoceros beetle (*Oryctes rhinoceros* (L.)) was not a part of this present project, however, the project personnel had the responsibility to carry out this task in Western Samoa and Tonga as a follow up phase of previous two bilateral Integrated Pest Management projects with these countries.

In this paper we present the major accomplishments of the project until September, 1995.

Programs

The programs recommended by the 1992 Review Team are given in Table 1. Of these, the bean podborer biological control program was recommended to be deleted

Table 1. **Programs Recommended by the Review Team.**

Asian cornborer	PNG
Cabbage IPM	Cook Islands, Fiji, Solomon Islands, PNG, Tonga, Western Samoa.
Bean podborer	Fiji
Lantana camara	Cook Islands, Fiji, Niue, Solomon Islands
Mimosa diplotricha	Cook Islands, Fiji, Solomon Islands, Western Samoa.

Table 2. Programs intended for the second implementation phase

Country	Crop		Weed Control
	Cabbage	Corn	
Cook Islands	IPM	-	Giant sensitive plant Lantana
Fiji	IPM	-	Giant sensitive plant Lantana
Niue	-	-	Lantana
PNG	IPM	Asian cornborer control	-
Solomon Islands	IPM	-	Giant sensitive plant
Tonga	IPM	-	-
Western Samoa	IPM	-	Giant sensitive plant

from the project by the 1995 Review Team, as this project could not identify a suitable natural enemy of this pest by commissioning a field survey in Columbia, South America and a literature search of all available databases. Current status of the various programs is given in Table 2.

Facilities

This project built biological control quarantine and laboratory facilities in Fiji, Tonga and Cook Islands and equipped them. In Western Samoa, the biological control laboratory that was damaged by a cyclone was renovated. A natural enemy rearing facility was built in the Cook Islands. A *Trichogramma* mass rearing laboratory was set up at Bubia Agriculture Research Centre in Papua New Guinea (PNG).

Integrated Pest Management (IPM) in Cabbage

Occurrence of major pests of cabbage in the South Pacific Countries wherein this project has been implemented is given in Table 3.

This IPM program has been aimed to reduce the use of toxic, broad spectrum and residual pesticides. It recommended application of an insect growth regulator, 'Atabron' and a Bt formulation, 'Delfin' alternately whenever pest damage is observed in the field (Saucke, 1995).

DBM was the major pest of cabbage in the countries selected for implementation of this program. The natural enemies of DBM introduced before the implementation of this project and by this project are shown in Table 4.

Regional workshops on handling, rearing, field releasing and monitoring of natural enemies were conducted to train the biological control research personnel and also workshops on extension methods were conducted for both research and extension personnel in the IPM programs.

Cabbage IPM program has been or is in the process of implementation in Fiji, PNG, Tonga, Cook Islands, Solomon Islands, and Western Samoa. In the second implemen-

Table 3. Occurence of major cabbage pests in the selected South Pacific countries

	Cook Islands	Fiji	PNG	Solomon Islands	Tonga	Western Samoa
DBM	yes	yes	yes	yes	yes	yes
Crocidolomia pavonana	yes	yes	yes	yes	yes	yes
Hellula undalis	yes	yes	yes	yes	yes	yes
Spodoptera litura	yes	yes	yes	yes	yes	yes
Aphids	yes	yes	yes	yes	yes	yes

Table 4. Occurence of DBM parasites in the selected South Pacific countries

	Cook Islands	Fiji	PNG	Solomon Islands	Tonga	Western Samoa
Trichogramma spp.					?	
Cotesia plutellae		xxxx	xxxx ------			xxxx
Diadegma semiclausum		------	------		xxxx	ENK -------
Diadromus collaris	xxxx					
Oomyzus sokolowskii		xxxx				

xxxx Introduced earlier
----- Introduced by the project
ENK Establishment not known

tation phase, control of *Bemisia tabaci* biotype B will be included in the cabbage IPM in the Cook Islands.

Asian cornborer biocontrol

ACB is one of the serious pests of corn in PNG. Detasselling and application of Bt formulations have been recommended elsewhere. However these methods are not practical and economical for the field corn grown in Markham Valley of the PNG (van Harten and Breithaupt 1995).

Inundative release of *Trichogramma* sp. to control ACB has been effective in the Philippines, Taiwan and China (Konig *et al.* 1992, Tseng 1990 and Wang 1988). Breithaupt (1995) recorded 70 to 100% parasitism of ACB eggs in plots that were released with a total of 140,000 to 200,000 *Trichogramma plasseyensis* Nagaraja in PNG. Further, he reported based on his small plot field trials that this inundative release method is most effective in suppressing ACB under Markham Valley conditions.

This project has set up a mass rearing facility at the Bubia Agriculture Research Centre for *Corcyra cephalonica* (Stainton) and *T. plasseyensis*. Large scale field trials with inundative release of *T. plasseyensis* will be taken up at the ERAP Agriculture Centre. It is expected that this mass rearing program will eventually be taken up by the private companies such as SULICON, once this method is proven effective and economical.

Bean podborer control

Bean podborer is one of the serious pests of pigeon pea and cowpea in Fiji. Insecticidal trials carried out with Lannate, Atabron, Neem Azal, and Delfin proved Lannate to be the most effective and cheap (Zerhusen pers. comm.). Efforts to identify a natural enemy that is specific to *M. vitrata* throughout the world, thus far, have proven negative (van Harten and Zerhusen 1995).

Lantana camara biocontrol

Since 1991 *L. cammara* has been a target for biological control in Fiji (Waterhouse and Norris 1987). A list of natural enemies introduced to Fiji is given in Table 5.

Table 5. Natural enemies of *Lantana camara* in Fiji

Natural Enemy	Status
Teleonemia scruplosa	xxxx
Uroplata girardi	xxxx
Hyena strigata	xxxx
Ophiomyia lantanae	xxxx
Salbia haemorhoidalis	xxxx
Thelca bazochi	xxxx
Calycomyza lantanae	Died in Quarantine
Chaidotis pygmaea	In quarantine

xxxx Established before this project was implemented

This project has introduced and established *Teleonemia scrupulosa* Stål in the Cook Islands, Niue, and Solomon Islands and *Uroplata girardi* Pic. in Niue and Solomon Islands. *Octotoma scabripennis* Guerin-Meneville was introduced to Cook Islands, Fiji, Niue and Solomon Islands but it did not establish.

The natural enemies *Calycomyza lantane* Frick and *Charidotis pygmaea* (Klug) Boheman were imported by the project to Fiji from Alan Fletcher Research Station, Queensland. *C. lantanae* died in the quarantine and *C. pygmaea* is still in quarantine.

Giant sensitive plant biocontrol

Giant sensitive plant, *M. diplotricha* is a problem in pastures, plantation crops, and vacant lands. The psyllid, *Heteropsylla spinulosa* Muddiman, Hodkinson & Hollis has been introduced and established in W. Samoa and PNG before implementing this project. *H. spinulosa* was introduced and established in Cook Islands, Fiji, and Solomon Islands by this project. Since Kuniata (1994) reported that the effectiveness of *H. spinulosa* has been enhanced by applying nitrogen to the host plant in PNG, this project is transferring the same technology to W. Samoa, Fiji and Cook Islands for suppressing this weed.

Another natural enemy *Psigida walkeri* Grote was imported from South America, host specificity tested in Australia and distributed to Cook Islands and Western Samoa. In spite of repeated field releases, this natural enemy did not establish in Cook Islands. In W. Samoa the natural enemy culture was lost in the quarantine laboratory. Efforts are being made to bring in this natural enemy from South America once again to introduce to Western Samoa.

The status of establishment of the natural enemies of *M. diplotricha* in the South Pacific is shown in Table 6.

Rhinoceros beetle biocontrol

Rhinoceros beetle population in the infected Pacific Islands has been suppressed by inundative release of *Oryctes baculovirus* inoculated beetles and application of the fungus *Metarhizium anisopliae* (Metchnikoff) Sorokin to the breeding sites.

Even though, both the virus and the fungus have been introduced to W. Samoa and Tonga long before the implementation of this project, there has been a resurgence of this beetle population in recent years. This project arranged new inocula of the virus and the fungus to be brought in from the Philippines to W. Samoa. Field release and monitoring of both the virus and the fungus have resulted in marked reduction of the rhinoceros beetle population. The virus and fungus will be reintroduced to Tonga from

Table 6. Current status of *Mimosa diplotricha* natural enemies

	Cook Islands	Fiji	Niue	PNG	Solomon Islands	Tonga	Western Samoa
Heteropsylla spinulosa	——	——		xxxx	——		xxxx
Psigida walkeri	.....						.....

—— Established
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Psigida walkeri	.....						.....

—— Established
..... Not Established
xxxx Introduced Earlier

W. Samoa.

Training

This project provided graduate training for 2 candidates, one from Fiji and the other from Tonga, to get their MS degrees in biological control. It has organized many workshops for technicians to be trained in biological control activities. Also, workshops were conducted in extension methodologies to extension and research personnel. Training in organizing field days for IPM implementation was also provided.

In general, the SPC - German Biological Control project has provided physical facilities for quarantine, screening, rearing and introduction of biological control agents to selected countries in the South Pacific. Cabbage IPM has been implemented in Western Samoa and Cook Islands. It will soon be implemented in Tonga and Solomon Islands. Mass culturing of *T. plasseyensis* is being carried out at Bubia, PNG. Large scale field trials on inundative release of this parasitoid in corn fields at Markham Valley will be taken up in the near future.

A listing of natural enemies introduced by this project for DBM, lantana and giant sensitive plant are given in Table 7.

The Review Team of September 1995 has recommended discontinuation of the pro-

Table 7. Natural enemies introduced by this project

Natural Enemy	Target Host	Country
Diadegma semiclausum	DBM	PNG, Fiji
Cotesia plutellae	DBM	PNG
Heteropsylla spinulosa	*Mimosa diplotricha*	Fiji, Cook Is., Solomon Is.
Psigida walkeri	*Mimosa diplotricha*	W-Samoa (Died in Quarantine), Cook Is. (Not Established)
Teleonemia scrupulosa	Lantana	Niue, Solomon Is., Cook Is.
Uroplata girardi	Lantana	Solomon Is., Niue
Octotoma scabripennis	Lantana	Cook Is., Fiji, Solomon Is., Niue (Not established)
Calycomyza lantanae	Lantana	Fiji (Died in quarantine)
Charidotis pygmaea	Lantana	Fiji (Still in quarantine)

gram on bean podborer and inclusion of *Bemisia tabaci* biotype B control in cabbage IPM package in the Cook Islands, and, if possible, biocontrol of *Epilachna* spp in W. Samoa and *Chromolaena odorata* in PNG.

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