BIOLOGICAL AND CHEMICAL CONTROL OF *OSTRINIA FURNACALIS* GUENEE (LEPIDOPTERA: PYRALIDAE) ON THE MAINLAND OF PAPUA NEW GUINEA

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ABSTRACT

Ostrinia furnacalis *Guenee (Pyralidae) is commonly found on maize in the Markham Valley, Morobe Province, Papua New Guinea.* Trichogramma *sp. appears to be the only parasite controlling populations of* O. furnacalis. *Insecticide trials at two sites in the Markham Valley using monocrotophos, lindane (granules and emulsifiable concentrate) and D.D.T. significantly reduced the number of holes bored and cob damage, but no significant increases in yield over the control were obtained.*

INTRODUCTION

Ostrinia furnacalis Guenee (Pyralidae) has been recorded on maize from New Britain, New Ireland, and the northern side of the Papua New Guinea mainland from sea level to 1189 metres, but not on the southern Papua New Guinea coast. The main host is maize but it has been also recorded from grain sorghum, rice and sugar cane. The taxonomy and distribution of *O. furnacalis* in Asia and the Pacific has been dealt with by Mutuura and Munroe (1970).

Damage by *O. furnacalis* to maize in commercial and experimental plantings in the Markham/Ramu valleys has been slight, although one observation plot at Bubia Research Centre (mean annual rainfall approx. 2790 mm) suffered 797 holes bored/50 stems (Young, unpublished data).

In Thailand and the Philippines eggs and larvae of *O.furnacalis* are preyed on by the earwig *Poreus simulans* Stal. (Dermaptera Chelisochidae), which is found behind leaf sheaths and ear husks (Meksongsee pers. comm.; Litsinger pers. comm.). This niche in Papua New Guinea may be filled by the Pacific earwig *Chelisoches morio* Fab. (Chelisochidae) which has been observed preying on *O. furnacalis* larvae. *C. morio* has been recorded at densities of 5.9 to 47.0 adults/100 maize plants at Bubia, but its significance is not known (Young, unpublished data).

Trichogramma australicum Girault (Trichogrammatidae) is an important egg parasite in Thailand, parasitising up to 90% of eggs (Meksongsee, pers. comm.). A *Trichogramma* sp. has been recorded from the Markham Valley, parasitising up to 98% of egg masses at a mean density of 13.4 egg masses/100 plants (Young, unpublished data).

Two species of parasites have been raised from pupae collected in the Markham Valley; *Brachymeria lasus* Walker (Chalcididae) at levels of 4-5%, and a Tachinidae of indeterminate genus and species at 1-2% (Young, unpublished data).

Yunus and Thian Hua (1969) have reviewed the biology and chemical control of *O. furnacalis* in West Malaysia. O'Sullivan and Bourke (1975) carried out an insecticide trial at Keravat, East New Britain, in which monocrotophos and lindane granules significantly reduced the incidence of *O. furnacalis* in stems and cobs. There were no significant differences between yields from the various treatments, however the average yield of 2208 kg/ha

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Table 1. — Insecticide treatments

Insecticide	Formulation	Application Rate (kg active ingredient/hectare)
DDT	25% w/v e.c.	1.5
Lindane	16% w/v e.c.	1.0
Lindane	6% w/v granule	1.0
Monocrotophos	40% w/v w.s.c.	1.0

Table 2. — Effect of treatments on yield, insect damage to cobs and stems — Marambung

Treatment	Yield kg/hectare	Number of holes bored/50 stems	Per cent insect damaged cobs
Lindane (e.c.)	937 a	2	49.1
Monocrotophos	1827 a	5	30.6
Lindane (g)	1801 a	3	27.6
DDT	1891 a	8	34.3
Control	1838 a	9	22.0
s.e.	±321.8	n.a.	n.a.
(cv%)	(38.8)	(n.a.)	(n.a.)

Treatments followed by the same letter do not differ significantly at $P< 0.01$.
(Results analysed by Student-Newman-Keul test).

Table 3. — Effect of treatments on yield, insect damage to cobs and stems — Mutsing

Treatment	Yield kg/hectare	Number of holes bored/50 stems*	Per cent insect damaged cobs
Lindane (e.c.)	5662 a	10.2 (104) c	10.7 a b
Monocrotophos	5600 a	8.3 (69) b	12.0 a b
Lindane (g)	5371 a	5.7 (32) a	8.5 a
DDT	5177 a	10.8 (117) c	16.3 b
Control	4826 a	15.7 (246) d	14.2 a b
s.e.	±199.7	±0.58	±1.44
(cv%)	(8.4)	(12.9)	(26.07)

* Analysed as square root transformation; figures in brackets are backtransformed values.

Treatments followed by the same letter do not differ significantly at $P< 0.01$ for yield and number of holes bored/50 stems and at $P< 0.05$ for per cent cobs damaged. (Results analysed by Student-Newman-Keul test).

was low and may have been below the level at which *O. furnacalis* begins to limit yield.

Medrano and Raros (1973) in the Phillipines estimated yield loss, by simple linear regression, at 0.95% per borer tunnel and 0.76% per borer from counts made from the basal half of the plant.

In view of the low average yield in the Keravat insecticide trial it was decided to conduct a similar trial at two sites in the Markham Valley, Marambung and Mutsing (mean annual rainfall approx. 1250 and 1600 mm respectively). The trials were carried out from late January to early May, 1977.

MATERIALS AND METHODS

The treatments *(Table 1)* were compared in a 5 × 5 Latin square design at Mutsing and a randomised block design with 4 replications at Marambung. Lindane granules were applied from a jam tin and the emulsifiable and water soluable concentrates were applied by knapsack sprayer at 4, 6, 8, 10 and 12 weeks after sowing. Plots had 6 rows, 90 cms apart and 7 m long which were sown with the variety Metro and thinned to 50,000 plants/ha after 2 weeks. Fertilizer was applied as sulphate of ammonia at the rate of 100 kg nitrogen/ha.

At harvest, yield (dried grain), number of holes bored/50 stems, and percent cobs damaged, were recorded from the middle two rows of each plot. Cobs were examined for the presence of *O. furnacalis* larvae and pupae.

Analysis of variance was carried out on the yield/plot from both sites. Counts on the holes bored/50 stems from the Mutsing trial were transformed to square roots before analysis. In view of the very low levels of stemborer in stems and cobs at Marambung this data was not analysed.

RESULTS AND DISCUSSION

The low yield of the Marambung trial *(Table 2)* was mainly due to a 6 week period of very low rainfall midseason. There were no significant differences between treatment yields. Stemborer damage was negligible. *Heliothis armigera* Hubn. (Noctuidae) accounted for almost all the pupae and larvae found on the cobs at harvest.

At Mutsing *(Table 3)* stemborer infestation became apparent at 6 weeks after sowing and at harvest all the larvae and pupae recovered from cobs were *O. furnacalis.* All insecticide treatments showed significantly lower numbers of holes bored/50 stems than the control, with lindane granules and monocrotophos providing significantly better protection than the other insecticides. This did not result in any significant difference in yield over the control. Cob damage was low, the best treatment being lindane granules. These results are in agreement with findings at Keravat (O'Sullivan and Bourke 1975).

It appears, from the Mutsing trial, that maize can tolerate up to 5 holes bored/stem without loss of yield, although the stage of growth when the infestation occurs may be a critical factor. Present levels of *O. furnacalis* on maize in the Markham Valley do not warrant control.

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