EFFECTIVENESS OF LINDANE, DDT AND MONOCROTOPHOS FOR THE CONTROL OF THE CORN BORER *OSTRINIA FURNICALIS* GUENEE (LEPIDOPTERA: PYRALIDAE) IN MAIZE ON NEW BRITAIN

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ABSTRACT

Within Papua New Guinea the corn borer Ostrinia furnicalis *Guen. is a pest of maize in the Gazelle Peninsula of New Britain and on New Ireland. DDT (e.c.), lindane (granules and e.c.) and monocrotophos (w-s.c.) were tested against* O. furnicalis *in maize at the Lowlands Agricultural Experiment Station, Keravat, New Britain. Both monocrotophos as a water soluble concentrate, and lindane granules when applied at* 6, 8, 10 *and* 12 *weeks post planting at the rate of* 1 *kg a.i. per hectare per application significantly reduced the incidence of borer in both stem and cobs. However significant yield differences were not obtained.*

INTRODUCTION

The corn borer *Ostrinia furnicalis* Guen. (synonyms of which include *Pyrausta nubilalis* (Hubner var. *salentialis* Snellen) and *P. damoalis* (Walker) (Mutuura and Munroe (1970)) is an important pest of maize in the oriental region (Jepson, 1954). Within Papua New Guinea, *O. furnicalis* has been recorded from East New Britain, New Ireland, and the Morobe and Northern Districts on the New Guinea mainland from maize, sugarcane and rice.

O. furnicalis damage to maize is often severe in native food gardens on the Gazelle Peninsula of New Britain and also on New Ireland. In 1970, maize introduction plots and yield trials at the Lowlands Agricultural Experiment Station suffered severe but sporadic damage. The first crop of a high lysine hybrid maize variety introduced from Michigan, U.S.A. (NG.6683), suffered heavy damage at the end of its growing period between March and May 1970. The second crop of this variety was sprayed weekly with DDT at the rate of 1.4 kg per hectare. Damage was minimal and confined to infestations in the tassel late in the growing period of the crop.

In a third variety trial, despite weekly applications of DDT at the same rate, stem and cob damage was severe. At harvest, 95 per cent of plants of both NG.6683 and a local variety were infested. Twelve per cent of cobs of these two varieties were damaged and considered unsaleable. In the same variety trial, 80 to 90 per cent of plants of the Queensland introduction QK 37 (NG.6658) were also infested.

In two subsequent variety trials, despite applications of lindane granules, 44 and 81 per cent of plants were infested respectively. The granules were applied at the rate of 1 kg per hectare at 9 and 11 weeks after planting in trial four and at 6 and 8 weeks after planting in trial five.

The biology and chemical control of *O. furnicalis* in Malaysia has been critically reviewed by Yunus and Thian Hua (1969). These authors concluded that the borer "has a life cycle of about four weeks, with an incubation period of three days, a larval period of about 18 days and a pupal period of six days. The larval stage has five instars. Adults live for an average of about six days. There are at least 11, probably 12, generations in one year and the generations overlap in the

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field. The larva spends about nine days in the leaf whorl before boring into the plant. It is then in its 3rd or 4th instar".

The same authors carried out a series of three field trials and one laboratory screening trial. In the first field trial six insecticides, namely BHC, dieldrin, carbaryl, endosulfan, endrin and trichlorphon were evaluated as foliar sprays against the corn borer. BHC and dieldrin were the most effective materials used. In the second trial, four different formulations (dust, granules, emulsion and wettable powder) of BHC and dieldrin were tested. With a total of four applications granules, emulsion and wettable powder were demonstrated to be equally effective. Dust was not as effective as the other three formulations. In another trial, the number of applications, the interval between applications and the time of first application were determined. In this trial 6 per cent BHC granules at the rate of 15 lb per acre were used. It was found that four applications at fortnightly intervals commencing from one month after sowing was most effective for borer control.

In the laboratory trial to evaluate newer chemicals, five insecticides namely phosphamidon, dicrotophos, fenitrothion, Phenthoate (R) and dichlorvos were compared with BHC. Results of this trial indicated that BHC was still the superior insecticide. Dicrotophos was the second most effective chemical.

Consequently a trial comparing DDT (e.c.), lindane (as both an e.c. and a granular formulation) and monocrotophos, a material closely related to dicrotophos, was carried out at Keravat during the period March to July 1971.

MATERIALS AND METHOD

The insecticides, the formulations and application rates tested are shown in *Table* 1.

The treatments were compared in a randomized block with four replications per treatment. Plot size was 9 by 9 metres (0.00836 hectare). Two guard rows separated each plot from its neighbours.

F2 seed of the hybrid NG.6658 was planted in rows 0.9 metres apart and at 30 cm spacing within rows. Three seeds were planted at each position. The crop was planted six weeks after an infested maize crop had been harvested from the same area. Although pregermination tests were carried out, final germination was erratic and some transplanting was required to provide a more even plant distribution within the plots. At five weeks, the seedlings were thinned out to one plant per position and a basal dressing of NPK-Mg (12:12:17:2) compound fertilizer at a rate equivalent to 434 kg/ha was applied to all plots.

The emulsifiable and water-soluble concentrate formulations were applied by knapsack sprayer at an equivalent rate of 750 1/ha at the first application and then at an equivalent rate of 1000 1/ha for the remaining applications.

The granule formulation was applied by hand from a small plastic dispenser. The insecticides were applied at 6, 8, 10 and 12 weeks after field planting. Periodic sampling of levels of infestations were made in each plot by randomly selecting 10 per cent of the total plants in each plot.

All plots were harvested on 7th July, 110 days after planting. Measurement of the level of infestation, the weight of cobs and the amount of cob damage were made from all plants in each harvested block.

RESULTS AND DISCUSSION

The level of infestation of *O. furnicalis* in the various treatments during the growing period of the crop is shown in *Table* 2.

It can be seen that the lowest populations of *O. furnicalis* were maintained in plots treated

Table 1.—Insecticide treatments

Material	Formulation	Application rate (kg active ingredient per hectare)	Cost of treatment per application per hectare
DDT	25% w/v e.c.	1.5	$ 3.76
Lindane	16% w/v e.c.	1.0	$ 9.62
Lindane	6% w/w granule	1.0	$ 7.01
Monocrotophos	60% w/v w-s.c.	1.0	$13.93

Table 2.—Levels of corn borer infestation in each treatment

Weeks from planting	Per cent of plants infested in plots treated with				
	Monocrotophos	Lindane granule	Lindane spray	DDT	Nil
10	8	10	17	43	19
11	14	18	32	36	23
12	8	18	22	40	35
13	9	33	33	33	58
14	10	35	38	35	41
15	7	33	28	32	42

Table 3.—*O. furnicalis* infestation in maize plants at harvest

Treatment	Per cent plants infested				
	Nil infestation*	Tassel only	Single stem	Multiple stem	Total infested* stems—single and multiple
Control	41.3 a b	29.9	13.0	15.8	28.8 a b
DDT	36.0 a	33.1	14.2	16.7	30.9 a
Lindane (e.c.)	45.8 b	26.2	14.0	14.0	28.0 b
Lindane (g)	52.2 c	28.7	12.1	7.0	19.1 c
Monocrotophos	65.6 d	23.2	7.7	3.5	11.2 d

* Treatments followed by the same letter or letters do not differ significantly at p = 0.01 (Result analysed by Student-Newman-Keul Test)

Table 4.—Effect of treatments on insect damage to cobs and on yield

Treatment	Per cent Insect Damaged Cobs*	Yield (kg/ha)
Monocrotophos	4.8 a	2407
Lindane (g)	6.3 a	1917
Lindane (e.c.)	10.9 b	2381
DDT	16.4 c	2032
Control	15.4 c	2303

* Treatments followed by the same letter do not differ significantly at p = 0.01 (Results analysed by the Student-Newman-Keul Test).

with monocrotophos. There was little difference between the levels of infestation in the other treatments.

At harvest each individual plant was examined for *O. furnicalis* damage and classified into one of the following classes; free, single infestation in stem, multiple infestation in stem and tassel only infestation. Results are shown in *Table* 3.

As was to be expected from the data obtained during the growing season (see *Table* 2), the monocrotophos treatment resulted in the lowest level of infestation. Lindane granules were the next best treatment followed by lindane emulsifiable concentrate. Levels of infestation in DDT treated plots were not significantly different from those in the control plots.

All cobs were collected from the harvested plants and examined for insect damage. The cobs were then weighed and yield figures obtained. Results are shown in *Table* 4.

Both monocrotophos and lindane granules significantly reduced the incidence of *O. furnicalis* damage to cobs. There was no difference between the DDT and control treatments.

Surprisingly, there were no significant differences between yields from the various treatments. Agronomically, the average yield of 2208 kg/ha was considered poor for the area.

One other point of interest was that the monocrotophos treatment also provided excellent control of the corn aphid *Rhopalosiphum maidis* (Fitch) which was prevalent in all plots during the initial period of rapid vegetative growth of the crop. Relatively high populations of *R. maidis* were maintained in all other treatments.

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