1970. *Philipp. Ent.* 1 (6): 453-463

AMBITHION HIGH-VOLUME SPRAYS, GRANULAR PHORATE, PHORATE/BHC, AND CYTROLANE TREATMENTS FOR THE CONTROL OF RICE STEMBORERS[1]

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Wet and dry season experiments were conducted to assess the effectiveness of the treatments against rice stemborers and other insect pests of rice. Three stemborer species (Tryporyza incertulas, Chilo suppressalis **and** Sesamia inferens) **and the rice leaf-whorl maggot** (Hydrellia philippina) **were encountered. The single most important insect pest was the yellow stemborer,** T. incertulas.

The treatments that gave a satisfactory overall control of the stemborers in both wet and dry season trials as reflected by the yield of rough rice were Ambithion (1.5 kg/ha applied 5 times, phorate/BHC (1.5, 2.0 and 2.5 kg/ha applied 3 times), gamma-BHC, Sevidol and phosphamidon. Yield increases of up to 57 and 45% were obtained for the wet and dry seasons, respectively.

Methyl parathion and phorate gave erratic performances, showing a highly satisfactory control of the borers in one trial but not in the other.

Experiments conducted in Central Luzon indicated that the proprietary materials Ambithion and Cytrolane (E.I. 47470) were promising insecticides against rice stemborers (Ferino *et al.* 1968 and Sanchez *et al.* 1969). Also, studies at Los Baños and Maligaya showed significant borer control using phorate alone and in combination with gamma-BHC (Calora *et al.* 1967 and 1968; Ferino *et al.* 1968). The use of granular phorate and phorate/BHC significantly controlled the rice leaf-whorl maggot and the yellow rice stemborers (Sanchez *et al.* 1969).

This experiment was conducted with the following objectives: 1) To assess the effectiveness of the different rates and timing of high-volume Ambithion sprays and granular phorate, phorate/BHC and Cytrolane treatments in comparison with standard materials in the control of rice stemborers and other insects damaging to rice; 2) To determine the stemborer species composition and to establish which species can be controlled by the different treatments; 3) To evaluate the effects of the different treatments on the yield.

MATERIALS AND METHODS

Both the wet and dry season trials were conducted using randomized complete block designs with four replications. In both experiments each

[1] Contribution No. 40; supported by a grant-in-aid from Cyanamid (Far East) Limited. Received for publication 26 Aug. 1970.

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replicate consisted of thirteen 5 x 7 meterplots, twelve treated and one control. Further details regarding the experimental layout used were published elsewhere (Sanchez *et al.* 1969).

In both experiments, ecological plots (160 sq. m.) were provided adjacent to the experimental plots to give an assessment of stemborer species composition during certain stages of plant growth. Due to possible differences in susceptibility between the different species of rice stemborers, information on species composition may help explain the kind of control obtained with certain treatments.

Twenty-one-day-old rice seedlings of IR-8 were used during both the wet- and dry-season plantings. The seedlings, which were raised by the dapog method, were planted in straight rows at a distance of 20 x 25 cm. The plants were fertilized at the rate of 60 kg N each at planting and at about the booting stage. Weed control was performed, as often as necessary, by hand weeding.

Spray applications were made with compressed air sprayer using a spray volume of 1.4 liters per plot and the granular formulations were applied by hand broadcasting. The accepted water management procedures used with granular materials were observed.

The insecticides used during the wet-season experiment were: Ambithion 1000E (a 50/50 per cent mixture of fenitrothion (Accothion) and malathion), phorate (Thimet) 10G, phorate/gamma-BHC 10G, diazinon (Basudin) 10G, gamma-BHC 6G, Sevidol 16G (8 percent carbaryl and 8 percent gamma-BHC), and emulsifiable concentrates of phosphamidon (Dimecron) 20E and methyl parathion. The rates and schedule of applications are shown in Table 1.

All the insecticides used in the wet-season experiment were used again in the dry-season trial plus Cytrolane (E.I. 47470) [2-(diethoxyphosphinylimino)-4-methyl-1,3-dithiolane]. The rates and schedule of treatments are shown in Table 2.

The system of assessment used to determine the extent of damage caused by borers was by Oñate (1965). Infested tillers were uprooted after each observation to prevent their inclusion to the succeeding observation and to give an indication of the progress of infestation. Rice leaf-whorl maggot damage was based on the total number of plants in each plot.

The yield evaluation was based on the yield of 320 hills from each plot. Weights of rough rice (14% moisture content) were taken after the usual cleaning operation of threshing, winnowing and drying.

The data from both the wet and dry season experiments were processed by the Los Baños Computing Center as reported elsewhere (Sanchez *et al.* 1969).

TABLE 1. **Rates and timing of treatments for the Ambithion and phorate/BHC trial on rice. Maligaya, Wet Season 1969.**

Treatments	Total kg. a.i./ha	No. of applications	Active ingredients in kg/hectare/application at indicated number of days from transplanting				
			10	25	40	55	70
1. Ambithion 1000E	5.0	5	1.0	1.0	1.0	1.0	1.0
2. Ambithion 1000E	6.25	5	1.25	1.25	1.25	1.25	1.25
3. Ambithion 1000E	7.5	5	1.5	1.5	1.5	1.5	1.5
4. Phorate/BHC 10G	4.5	3	1.5		1.5		1.5
5. Phorate/BHC 10G	6.0	3	2.0		2.0		2.0
6. Phorate/BHC 10G	7.5	3	2.5		2.5		2.5
7. Diazinon 10G	6.0	3	2.0		2.0		2.0
8. Gamma-BHC 6G	6.0	3	2.0		2.0		2.0
9. Phorate 10G	6.0	3	2.0		2.0		2.0
10. Sevidol 16G	6.0	3	2.0		2.0		2.0
11. Phosphamidon 20E	5.0	5	1.0	1.0	1.0	1.0	1.0
12. Me-Parathion 50E	5.0	5	1.0	1.0	1.0	1.0	1.0
13. Untreated Control	—	—	—	—	—	—	—

TABLE 2. **Rates and timing of treatments for Ambithion and Phorate/BHC trial on rice. Maligaya, Dry Season 1970.**

Treatments	Total kg. a.i./ha	No. of applications	Active ingredients in kg/ha/application at indicated number of days from transplanting				
			10	25	40	55	70
1. Cytrolane	3.0	3	1.0		1.0		1.0
2. Cytrolane	6.0	3	2.0		2.0		2.0
3. Ambithion 1000E	7.5	5	1.5	1.5	1.5	1.5	1.5
4. Phorate/BHC 10G	4.5	3	1.5		1.5		1.5
5. Phorate/BHC 10G	6.0	3	2.0		2.0		2.0
6. Phorate/BHC 10G	7.5	3	2.5		2.5		2.5
7. Diazinon 10G	6.0	3	2.0		2.0		2.0
8. Gamma-BHC 6G	6.0	3	2.0		2.0		2.0
9. Phorate 10G	6.0	3	2.0		2.0		2.0
10. Sevidol 16G	6.0	3	2.0		2.0		2.0
11. Phosphamidon 20E	5.0	5	1.0	1.0	1.0	1.0	1.0
12. Me-Parathion 50E	5.0	5	1.0	1.0	1.0	1.0	1.0
13. Untreated Control	—	—	—	—	—	—	—

RESULTS

Wet Season, 1969

Insect pests observed: Only the yellow rice stemborer, *Tryporyza incertulas* (Walker) and the rice leaf-whorl maggot, *Hydrellia philippina* Ferino were important during the wet season trial. The latter was only serious during the first four weeks after transplanting.

Effect of treatments on leaf-whorl maggot infestation: As shown in Table 3, diazinon and Sevidol provided the best protection against the rice leaf-whorl maggot. The other treatments that showed some activity against the pest were phorate/gamma-BHC at the three levels tested, phorate and phosphamidon.

Effect of treatments on stemborer infestation: The mean percentages of plants damaged (those with dead hearts and white heads) by rice stemborers are shown in Table 3 and 4. All the treatments have significantly reduced borer infestations based on the second and third dead heart and white-head counts except methyl parathion which did not differ with the control during the second dead heart count. The failure of the three phorate/BHC treatments and phorate in effecting a satisfactory control of borers two weeks after the first treatment (first dead heart count) is difficult to explain. A possibility may be that the granules were slowly releasing the toxicant such that only a small amount is available for insect control in the intervening period.

Effect of treatments on yield: All the treatments significantly increased the yield (up to 57 per cent), except methyl parathion as shown in Table 4. However, the better treatments were phosphamidon, all the three phorate/BHC treatments, Sevidol, gamma-BHC and Ambithion (1.5 kg/ha applied 5 times).

Dry Season, 1970

Insect pests observed: Only the rice stemborers were important during the dry season. Of the three species encountered, the yellow rice stemborer, *T. incertulas* was the most damaging throughout the observation period (Table 5). The striped borer, *Chilo suppressalis* Walker and the pink borer, *Sesamia inferens* Walker were encountered only at 70 days after transplanting and in much lower number than the yellow borer.

Effect of treatments on stemborer infestation: Tables 6 and 7 show the effectiveness of the different treatments in reducing the damage of stemborers as measured by dead heart and white head counts. All treatments consistently showed significantly reduced infestation compared to the control except at the third count when Cytrolane (1.0 kg/ha applied 3 times), wo phorate/BHC treatments (1.0 and 1.5 kg/ha applied 3 times), and phorate did not differ with the control. The uneveness in infestation brought about by a declining borer population may have played a role in the failure of the treatments to show significant control of the borers.

TABLE 3. **Mean percentage of plants damaged by the leaf-whorl maggots and rice stemborers. Maligaya, Wet Season 1969**

Treatments	Percent rice plants damaged by rice seedling maggots 26-VIII-69		Percent Dead Hearts					
			First Count 11-IX-69		Second Count 25-IX-69		Third Count 8-X-69	
	Actual	Transformed[a]	Actual	Transformed[a]	Actual	Transformed[a]	Actual	Transformed[a]
1. Ambithion 1000E	12.63	20.79 d	0.15	2.05 ab	0.25	2.74 a	0.28	3.02 ab
2. Ambithion 1000E	11.39	19.62 d	0.10	1.55 a	0.28	2.99 a	0.29	3.05 ab
3. Ambithion 1000E	12.10	20.55 d	0.10	1.45 a	0.16	2.15 a	0.19	2.32 ab
4. Phorate/BHC 10G	6.68	14.21 c	0.71	4.38 bcd	0.50	3.66 a	0.33	2.74 ab
5. Phorate/BHC 10G	5.59	13.60 c	0.76	4.70 cd	0.30	2.90 a	0.18	2.35 ab
6. Phorate/BHC 10G	5.79	13.69 c	0.53	3.92 abcd	0.54	3.90 a	0.18	2.12 a
7. Diazinon 10G	1.89	7.58 a	0.41	3.63 abc	0.31	3.10 a	0.72	4.77 b
8. Gamma-BHC 6G	5.98	13.64 c	0.15	2.11 ab	0.24	2.62 a	0.25	2.62 ab
9. Phorate 10G	4.71	12.47 bc	0.67	4.66 cd	0.66	4.17 a	0.53	3.72 ab
10. Sevidol 16G	2.59	9.18 ab	0.24	2.14 ab	0.20	2.32 a	0.07	1.29 a
11. Phosphamidon 20E	6.60	14.78 c	0.19	1.73 a	0.26	2.68 a	0.22	2.07 a
12. Me-Parathion 50E	11.19	19.49 d	0.11	1.67 a	0.76	4.69 ab	0.51	3.80 ab
13. Untreated Control	14.55	29.66 e	0.23	6.14 d	1.59	6.64 b	1.96	7.80 c

[a] Means not followed by the same letter differ significantly at the 5% level (Duncan's multiple range test).

TABLE 4. **Mean per cent white heads caused by rice stemborers and yield in kg based from 320 hills/sample. Maligaya, Wet Season 1969.**

Treatments	Per cent white heads		Yield of rough rice			Yield increase over Control (%)
	17-XI-69		320 hills[1] kg/	Metric tons/ha[2]	Cav/ ha.[3]	
	Actual	Transformed				
1. Ambithion 1000E	1.800	1.50 d	6.43 ab	4.02	91.3	30.8
2. Ambithion 1000E	0.820	1.12 bc	6.49 ab	4.06	92.2	32.1
3. Ambithion 1000E	0.970	1.17 c	7.14 a	4.47	101.5	45.4
4. Phorate/BHC 10G	0.404	0.73 a	7.27 a	4.54	103.3	48.0
5. Phorate/BHC 10G	0.008	0.71 a	7.53 a	4.71	106.9	53.2
6. Phorate/BHC 10G	0.040	0.74 a	7.23 a	4.52	102.6	47.0
7. Diazinon 10G	0.380	0.94 abc	6.54 ab	4.09	92.9	33.1
8. Gamma-BHC 6G	0.005	0.71 a	7.14 a	4.46	100.7	44.3
9. Phorate 10G	0.180	0.82 ab	6.34 ab	3.97	90.1	29.1
10. Sevidol 16G	0.030	0.71 a	7.39 a	4.62	105.0	50.4
11. Phosphamidon 20E	0.690	1.07 bc	7.71 a	4.82	109.6	57.0
12. Me-Parathion 50E	0.780	1.12 bc	5.49 bc	3.43	78.0	11.7
13. Untreated Control	3.330	1.92 d	4.91 c	3.07	69.8	—

[1] Means not followed by the same letter differ significantly at the 5% level (Duncan's multiple range test).
[2] Based on 200,000 hills per hectare and extrapolated from the yield of 320 hills.
[3] Based on 44 kilograms of rough rice per cavan.

TABLE 5. **Composition of stemborer species in ecological plot. Maligaya, Dry Season 1970.**

Date	Days after transplanting	Hill samples	% infested tillers	Total larvae	Total pupae	Percent of Total					
						T. incertulas		*C. suppressalis*		*S. inferens*	
						Larva	Pupa	Larva	Pupa	Larva	Pupa
Feb. 25/70	55	50	16.88	11	2	95.24	4.76	0	0	0	0
Feb. 9/70	40	50	42.94	20	1	84.62	15.38	0	0	0	0
Mar. 11/70	70	50	13.89	15	0	56.25	0	31.25	0	12.5	0

TABLE 6. **Mean percentage of plants damaged by rice stemborers. Maligaya, Dry Season 1970.**

Treatments	Percent Dead Hearts					
	First Count		Second Count		Third Count	
	25-I-70		9-II-70		10-III-70	
	Actual	Transformed[1]	Actual	Transformed[1]	Actual	Transformed[1]
1. Cytrolane	25.93	5.17 c	13.09	3.73 bc	5.78	2.47 bc
2. Cytrolane	21.46	4.70 bc	9.28	3.16 bc	0.83	1.43 ab
3. Ambithion 1000E	27.21	5.33 c	9.74	3.25 bc	2.20	1.78 ab
4. Phorate/BHC 10G	23.62	4.96 bc	11.85	3.55 bc	1.19	1.46 ab
5. Phorate/BHC 10G	19.24	4.43 abc	12.44	3.59 bc	4.40	2.07 bac
6. Phorate/BHC 10G	15.83	4.03 ab	8.24	2.98 abc	0.85	1.35 ab
7. Diazinon 10G	27.76	5.33 c	12.28	3.59 bc	5.28	2.31 abc
8. Gamma-BHC 6G	16.73	4.20 ab	6.82	2.77 ab	1.65	1.58 ab
9. Phorate 10G	27.57	5.32 c	14.61	3.87 c	3.74	2.02 abc
10. Sevidol 16G	12.36	3.59 a	3.80	2.14 a	0.58	1.26 a
11. Phosphamidon 20E	19.39	4.46 abc	9.06	3.14 bc	1.55	1.55 ab
12. Me-Parathion 50E	21.19	4.67 bc	12.81	3.74 bc	1.39	1.60 ab
13. Untreated Control	46.84	6.79 d	26.11	5.16 d	8.72	2.99 c

[1] Means not followed by the same letter differ significantly at the 5% level (Duncan's multiple range test).

TABLE 7. **Mean percent white heads and yield in kg of rough rice based from 320 hill samples.**

Treatments	Percent white heads 20-IV-70		Yield of rough rice			Yield increase over control (%)
	Actual	Transformed	kg/ 320 hills[1]	Metric tons/ha[2]	Cavans/ ha[3]	
1. Cytrolane	0.62	1.27 bcd	10.10 bc	6.31	143.5	21.9
2. Cytrolane	0.25	1.11 ab	9.77 bcd	6.11	138.8	17.9
3. Ambithion 1000E	0.76	1.32 d	10.99 abc	6.87	156.1	32.6
4. Phorate/BHC 10G	0.53	1.24 abcd	10.87 abc	6.79	154.4	31.2
5. Phorate/BHC 10G	0.37	1.17 abcd	11.01 ab	6.88	156.4	32.9
6. Phorate/BHC 10G	0.44	1.20 abcd	12.03 a	7.52	170.9	45.2
7. Diazinon 10G	0.58	1.25 abcd	9.17 cd	5.73	130.3	10.7
8. Gamma-BHC 6G	0.30	1.14 abc	10.97 abc	6.85	155.8	32.4
9. Phorate 10G	0.69	1.29 cd	10.66 abc	6.66	151.4	28.6
10. Sevidol 16G	0.23	1.11 a	11.16 ab	6.98	158.5	34.7
11. Phosphamidon 20E	0.63	1.27 bcd	10.61 abc	6.63	150.7	28.0
12. Me-Parathion 50E	0.49	1.22 abcd	10.76 abc	6.72	152.8	29.8
13. Untreated Control	1.44	1.56 e	8.25 d	5.16	117.7	—

[1] Means not followed by the same letter differ significantly at the 5% level (Duncan's multiple range test).
[2] Based on 200,000 hills per hectare and extrapolated from the yield of 320 hills.
[3] Based on 44 kilograms of rough rice per cavan.

This argument is supported by the observation that the 2.0 kg/ha of phorate/BHC controlled the borers while the 2.5 kg/ha rate did not.

Effect of treatments on yield: All the treatments except Cytrolane (2.0 kg/ha applied 3 times) significantly increased the yield compared to the control. The best treatment was phorate/BHC (2.5 kg/ha applied 3 times) which gave a yield increase of 45 per cent over the control. However, it did not differ significantly with the other compounds with good performance except Cytrolane (1.0 kg/ha applied 3 times).

It is interesting to note that Cytrolane at 1 kg/ha had a higher yield than the 2 kg/ha rate. This could be caused by phytotoxicity at the higher rate which consequently depressed the yield.

DISCUSSION

The yellow rice stemborer, *T. incertulas* was the most damaging insect pest encountered in both the dry and wet season trials. However, insect damage was more serious during the dry season when tiller infestation went up as high as 46.8 per cent in the control plots 25 days after transplanting.

In terms of overall performance as reflected in the yield of rough rice during the two cropping seasons, the better treatments were Ambithion (1.5 kg/ha applied5 times), the phorate/BHC treatments (1.5, 2.0 and 2.5 kg/ha applied 3 times), gamma-BHC, Sevidol and phosphamidon. In the case of the phorate/BHC treatments, there seems to be no practical advantage in using a rate higher than 1.5 kg/ha. Methyl parathion and phorate gave erratic performances, showing a highly satisfactory control of the borers in one trial but not in the other.

ACKNOWLEDGMENT

Deep gratitude is expressed to Director Eliseo Carandang, BPI, Manila, Superintendent Esteban Cada and Entomologist Roman Abalos, both of the Maligaya Rice Research and Training Center, for their cooperation which enabled the authors to perform the experiment.

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BOOK REVIEW

PESTS OF THE COCONUT PALM by R.J.A.W. Lever. 1969. FAO Agricultural Studies No. 77, ix + 190 p., 106 tex-figs., ₱3.50 (or at floating rate at the Modern Book Company, 928 Rizal Avenue, Manila). Paperback.

This publication should be welcomed by Filipino entomologists especially the beginners, considering the dearth of compiled information on coconut in this country. If only for the obvious fact, which is taken for granted by most, that the Philippines is the number one exporter of copra, it should remind us once more that the coconut is indeed an important crop. This is fully recognized by the FAO, and its Agricultural Studies section has consistently provided reports and proceedings of value to coconut workers, and this reference adds to the long list that has been issued for the past decade.

This is a handbook with a somehow misleading title. One is led to expect a world compilation of all the pests of coconut. On the contrary, it contains brief information of 110 species of insects which attack the palm in the field. In addition, those that attack copra in storage as well as various pests other than insects are also included. Other pests which have been "recorded over many years in the literature as coconut pest" which are "merely casual feeds or cause only minor and occasional damage" have been intentionally omitted "in order to avoid overloading the text with names whose value in the present context is doubtful." Thus, the author is successful in presenting as brief as possible "an account of the principal species – both invertebrate," chiefly "intended for use of research workers, personnel of plant protection services and growers."

To serve his purpose, Lever briefly described the morphology of the coconut palm. In addition, a tabulated classification of insect orders and families and their characteristics plus some practical aspects of pesticide classification are also furnished. The chapter on the insect pests of copra is supplemented with provisions on the preparation of copra, storage hygiene and chemical control. The principal pests mentioned are insects, birds, rats, and bats. Other mammalian pests are summarily cited. Each pest is presented with a brief description of the adult and early stages, biology, economic importance, type of damage caused, and geographic distribution. The illustrations are mostly in black and white photographs and the line drawings, although inferior, are effectively presented.

An addendum is appended to furnish supplementary data up to 1968. Bibliographical references covering thirteen pages are a 'selection' from a very large number of published works on the pests of coconut. Notable in this, is the presence of less than 10 papers dealing on Philippine coconut pests. Philippine records barely grace the list which reflects perhaps the depth of research done in the Philippines or that the author simply had less concern on the information gathered by workers coming from a region that produces the greatest copra export. In any case, for whatever omission this handbook suffers from, it still is a good handbook.

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Reprinted from *PAE Bulletin* 2(3):9 (1970)