Adult brachypterous BPH *Nilaparvata lugens* were collected from pots and anesthetized with chloroform. Haemolymph was collected in 0.01 M phosphate buffer by pressing the BPH under a cover glass. Clumped cells and plasma were separated and homogenized in 0.01 M phosphate buffer. The homogenate contained prophenol oxidase.

The effect on prophenol oxidase of insecticides BHC and carbaryl and known activator chymotrypsin (Sigma) was observed. We incubated 100 μl of the enzyme source with 100 μl of the insecticides (1 mg/ ml dissolved in 0.01 M phosphate buffer). The reaction mixtures were incubated for 30 min and 100 μl of 10 mM substrate dihydroxy phenyl alanine (Sigma) was added. Enzyme activity was measured at 480 nm after adding 1.7 ml of 0.01 M phosphate buffer. An appropriate blank and control were maintained. BHC, chymotrypsin (1 mg/ml), and carbaryl were tested separately for activation capacity.

BHC had greater activating capacity than carbaryl, and chymotrypsin more than the insecticides (see table). Thus, a preliminary defense mechanism is set up against the stress caused by insecticide application.

Prophenol oxidase activation by carbaryl, BHC, and chymotrypsin, Coimbatore, India.

Activator	Prophenol oxidase activity (OD/mg protein per 30 min)
Carbaryl	0.186
BHC	0.244
Chymotrypsin	0.337

[a] Values were confirmed by 3 different determinations.

Mass rearing *Tyrophagus palmarum*

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Tyrophagus palmarum Oudemans (Acaridae: Astigmata) mite infests rice seedlings and leaf sheaths in the nursery and field. We developed a mass rearing technique to provide enough *T. palmarum* mites for biological studies.

Oatmeal agar (OMA) medium with 4% oatmeal, 2% agar agar, and 2% sucrose was prepared and autoclaved at 15 lb pressure for 30 min. Ten ml of the medium was poured into sterile 5-cm petri plates. Each petri plate was inoculated with *Fusarium moniliforme* and kept at room temperature (26±3°C). When petri plates were covered with fungus mycelia, two newly emerged female mites were released on the fungus and incubated in darkness at 85 ± 3% relative humidity and room temperature 26 ± 6°C. F1 progeny developed after 12 d and adults and juveniles were counted. Two subsequent generations also were counted (see table).

The mite generally reproduces parthenogenetically and produces mostly females. Mite population was highest in the 2d generation and declined thereafter, as more fungus was eaten. The culture can be continued by inoculating freshly prepared fungi in the petri plates.

To select the best growth medium and standardize the rearing technique, we screened 10 culture media: oatmeal agar 2% and 4%, peptone 2% and 4%, malt extract 2% and 4%, potato dextrose agar, nutrient agar, Elliott's agar, and Czapek's Dox agar. Oatmeal agar 4% was the most suitable medium for fungus and mite multiplication. *F. moniliforme* produced higher mite populations than *Curvularia* sp., *Alternaria padwickii, Aspergillus niger,* and *Helminthosporium oryzae.*

Cultured mites were tested for the ability to infest. When adult mites were released on l0-d-old potted Karuna seedlings, symptoms (yellowing and drying) developed 15 d later and were similar to those that developed under natural conditions.

Juvenile and adult populations[a] of *T. palmarum* mite in 3 generations, Cuttack, India.

Generation no.	Eggs (no.)	Larvae (no.)	Nymphs (no.)		Adults (no.)
			Protonymphs	Deutonymphs	
1	36	8	10	24	167
2	153	73	46	96	864
3	28	12[b]	93[b]	641[b]	3

[a] Av of 10 replications. [b] Inactive forms.

Host plant range of the planthopper *Nisia atrovenosa*

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The planthopper *Nisia atrovenosa* lives on weedy bunds of irrigated transplanted rice in Koronadal, South Cotabato, Mindanao. Its host range is unknown; its pest status is not understood. We studied the growth and longevity of *N. atrovenosa* on different weed species and rice. Growth was measured as the percentage of nymphs that reached adulthood and their growth period.

N. atrovenosa has a limited host range. It was successfully reared on *Cyperus rotundus* and *C. iria* (see table). More nymphs reached adult stage on *C. rotundus* than on *C. iria,* suggesting that *C. rotundus* may be the planthopper's main host. Development stopped at the first nymphal instar on *Digitaria ciliaris, Brachiaria distachya, Cynodon dactylon, Leersia hexandra, Paspalum distichum,* and *Leptochloa chinensis,* and at the second nymphal instar on *Fimbristylis miliacea, Echinochloa glabrescens, Eleusine indica,* and *Oryza sativa.* On *C. compressus* and *C. brevifolius,* it developed to a late nymphal stage but did not reach adulthood.

Results suggest that *N. atrovenosa* is not a rice pest. This was further

Development of *N. atrovenosa* on different host plants[a], South Cotabato, Philippines, 1985.

Host plant	Nymphs becoming adults (%)	Developmental period (d)	Nymphal longevity[b] (d)
C. rotundus	85	18	10.3 a
C. iria	40	19	18.7 a
C. compressus	–	–	13.7 b
C. brevifolius	–	–	12.6 b
Fimbristylis miliacea	–	–	4.5 c
Echinochloa glabrescens	–	–	5.0 c
Eleusine indica	–	–	5.3 c
Digitaria ciliaris	–	–	1 d
Brachiaria distachya	–	–	1 d
Cynodon dactylon	–	–	1 d
Leersia hexandra	–	–	1 d
Paspalum distichum	–	–	1 d
Leptochloa chinensis	–	–	1 d
Oryza sativa	–	–	4.7 c

[a]Av of 4 replications, 10 1st instars/replication. [b]Separation of means by Duncan's multiple range test at the 5% level.

confirmed in a trial where it died on 200 rice varieties from IRRI's germplasm collection. *N. atrovenosa* may significantly reduce *C. rotundus* growth, and has potential as a biocontrol agent for that weed.

The International Rice Research Newsletter and the IRRI Reporter are mailed free to qualified individuals and institutions engaged in rice production and training. For further information write: IRRI, Communication and Publications Dept., Division R, P. O. Box 933, Manila, Philippines.

Field evaluation of commercial insecticides for controlling yellow stem borer (YSB) in the Philippines

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Most modern rices have low to moderate resistance to YSB *Scirpophaga incertulas*. Insecticides are needed to control high YSB populations. We evaluated commercial insecticides for YSB control in the IRRI greenhouse, and then tested them in fields at the MRRTC, which is a YSB hot spot in dry season (Dec-Mar).

In 1980, we evaluated 15 foliar sprays and 8 granular insecticides on susceptible IR29. A foliar spray of chlorpyrifos + BPMC controlled deadhearts most effectively; and endosulfan and azinphos ethyl effectively controlled whiteheads (Table 1). Granular treatments showed fewer deadhearts with carbofuran (Table 2). Diazinon also was effective up to 20 d after treatment. No treatment significantly decreased whiteheads.

In 1981, 15 insecticides were applied as sprays and 4 as granules. Carbofuran granules prevented deadhearts most effectively and triazophos effectively controlled whiteheads (Table 3).

Table 1. YSB control with 15 foliar sprays, MRRTC, Philippines, 1980 DS.[a]

Treatment[b]	Deadhearts (%)		Whiteheads (%)
	20 DT	40 DT	115 DT
Chlorpyrifos + BPMC 3 1.5 EC	6.9 a	2.8 a	4.8 ab
Monocrotophos 16.8 EC	7.3 ab	12.8 cd	3.2 ab
Endosulfan 35 EC	9.1 abc	14.9 cde	2.6 a
Fenthion 50 EC	9.8 abc	12.6 cd	3.6 ab
Carbophenothion 40 EC	9.9 abc	17.0 cdef	4.4 ab
B. thuringiensis	10.2 abc	18.1 def	5.6 ab
Diazinon 20 EC	10.5 abc	15.8 cdef	2.6 a
Phosphamidon 50 EC	10.7 abc	7.7 b	3.3 ab
Phosmet 50 WP	10.9 abc	19.7 ef	4.9 ab
Azinphos ethyl 40 EC	11.1 abc	11.1 bc	2.5 a
Fenitrothion 30 EC	11.1 abc	12.1 bcd	4.6 ab
Metalkamate 23 EC	11.3 abc	15.3 cdef	6.7 b
Dimethoate 40 EC	12.2 abc	16.7 cdef	5.2 ab
Untreated check	13.1 abc	22.6 f	3.9 ab
Methomyl 19.8 EC	13.4 abc	17.0 cdef	3.0 ab
BPMC 50 EC	14.4 c	14.6 de	5.2 ab

[a]Av of 4 replications. Separation of means in a column by DMRT at the 5% level. DT = days after transplanting. [b]All insecticides were applied at 0.75 kg ai/ha except *B. thuringiensis,* which was applied at 0.4 kg formulation (600 IU/mg) per ha. Insecticides were applied at 10, 25, 45, 60, and 75 DT.

Table 2. YSB control with granular insecticides,[a] MRRTC, Philippines, 1980 DS.

Treatment[b]	Rate (kg ai/ha)	Deadhearts		Whiteheads (%)
		20 DT	40 DT	115 DT
Carbofuran 3 G (SI)	1.0	1.4 ab	0.2 a	3.7 a
Carbofuran 3 G	1.0	1.0 ab	0.7 a	3.0 a
Gamma BHC + carbaryl 6 + 6 G	1.0	3.5 bc	11.6 d	4.6 a
Diazinon 5 G	1.0	0.6 a	5.4 bc	4.2 a
Gamma BHC + MIPC 6 + 4 G	1.0	1.9 ab	7.2 cd	5.0 a
Carbofuran 3 G	1.5	0.3 a	0.1 a	3.2 a
Gamma BHC + carbaryl 8 + 8 G	1.5	5.6 c	5.9 bc	3.4 a
Diazinon 5 G	1.5	0.9 a	3.5 b	4.4 a
Gamma BHC + MIPC 6 + 4 G	1.5	4.7 c	5.6 bc	3.0 a
Control	–	6.1 c	18.0 e	3.8 a

[a]Av of 4 replications. Separation of means in a column by DMRT at the 5% level. [b]All treatments were applied to field water, except one treatment of carbofuran, which was soil incorporated (SI) before transplanting. Insecticides were applied at 10, 25,45, 60, and 75 d after transplanting (DT).