Some common predators associated with the brown planthopper in Malaysia

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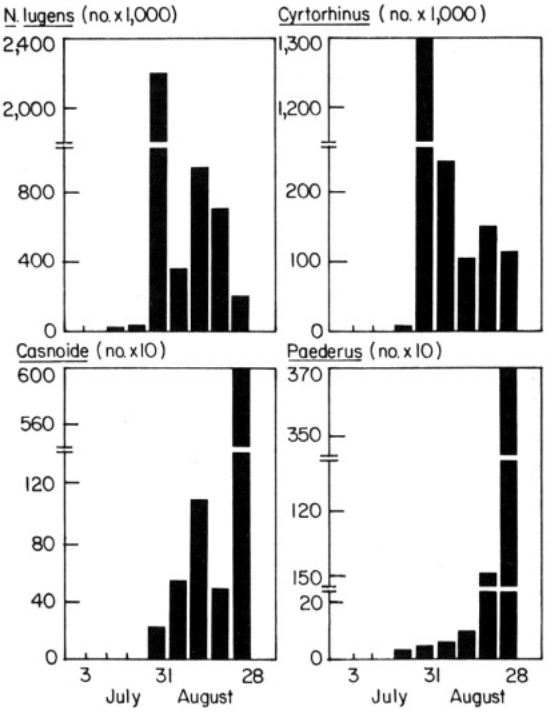
In mid-1977, the most serious brown planthopper (BPH) outbreak recorded in Malaysia in at least a decade occurred in Tanjung Karang, Selangor. About 1,620 ha were severely affected.

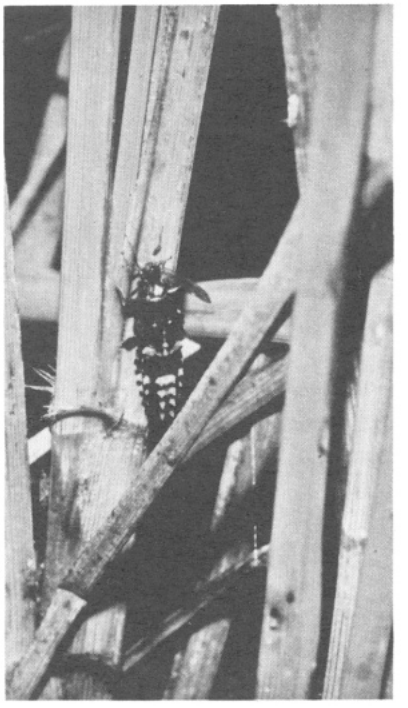
An integrated control approach, adopted to combat the outbreak, included continual surveillance, suitable insecticide application (spraying, mistblowing, fogging, and granular application), light trapping, and cultural methods. Such an approach appeared to be the most appropriate because natural enemies were numerous among the BPH; predators were most active.

The mirid bug *Cyrtorhinus lividipennis,* an effective predator of BPH in Southeast Asia, Australia, and the Pacific islands, was important in Malaysia. A light trap in the area of the outbreak monitored the abundance of *C. lividipennis* and BPH. A sharp increase in light-trap catches showed an explosive and sudden outbreak in July, closely associated with a corresponding increase in *C. lividipennis* catches (see figure).

Two other predators — *Casnoidea interstitialis (Coleoptera: Carabidae)* and *Paederus fuscipes (Coleoptera: Staphylinidae)* — were also common in the rice fields. Their sudden increase in the light trap suggests that they may also be active predators of BPH. The coccinellid *Coccinella arcuata,* an active predator of BPH, occurred in large numbers toward the end of the outbreak. Larvae of the predator were observed feeding voraciously on adult BPH (see photo). *C. arcuata* has been reported as the most common coccinellid predator of BPH in India, Fiji, Australia, and Papua New Guinea.



Weekly light-trap catches of *Nilaparvata lugens* and its common predators at the Malaysian Agricultural Research and Development Institute Rice Research Station, Tanjong, Karang, Malaysia, 1977.



Cocinnella arcuata feeding on an adult brown planthopper.

Serious attempts were made to conserve the major predators during the outbreak. The controlling effects of the predators, together with those of other supplementary measures, helped decrease the BPH population rapidly. The outbreak was suppressed and fully contained by September.

Brown planthopper situation in Bangladesh

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During the 1978 boro, 6 Bangladesh districts — Dacca, Comilla, Tangail, Noakhali, Chittagong, and Chittagong Hill tracts — reported brown planthopper (BPH) outbreaks. Two unconfirmed reports of outbreaks were received from Mymensingh and Dinajpur districts.

The first BPH outbreak was observed during April–May1976 in the boro crop near Sher-e-Banglanagar, north of Dacca City. The second was in October 1976 at BRRI farm in a transplanted aman crop. In 1977, BPH spread to more boro areas. Outbreaks were also reported in the transplanted aman crop from Rajshahi district in northwest Bangladesh.

In Dacca district, BPH outbreaks occurred mainly in the single-rice area in places that remained flooded from June to October. Generally the crop had luxuriant growth, which suggested that the soil was heavily or excessively fertilized. The macroclimate during April–Mayand October remains almost rain free, sunny, and hot. The microclimate inside rice fields during the time remains humid. Long-duration or late-planted varieties IR8 and BR3 were mainly affected. Short-duration varieties Chandina and Purbachi were harvested more than a week before the pest population peaked. Hopperburn occurred at flowering to hard dough stage. In hopperburned plots the estimated crop loss was 50-100%.

In several hopperburned fields, the whitebacked planthopper (WBPH) population was also high. But the total area with hopperburn caused by WBPH was negligible compared with that with BPH-caused hopperburn. Comilla and Dacca districts also reported hopperburn

from WBPH in 1963, 1967, and 1977.

Light-trap collections at BRRI farm indicated two major BPH peaks in a year (April–May and Oct.–Nov.); the population has increased 3–7 times since 1976. It appears that BPH may spread to more districts where varieties with high yield potential are cultivated and may ultimately threaten rice production in Bangladesh. BPH has become the most serious rice pest in Bangladesh.

Resistance of the brown planthopper to carbofuran at IRRI

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Carbofuran has been used for about 7 years at IRRI. In 1977 it failed to control the brown planthopper (BPH) *Nilaparvata lugens* in an experiment where carbofuran granules had been applied repeatedly at 2-week intervals in continuous crops over a 3-year period. In a nearby plot, carbofuran at the rate of 6 kg active ingredient/ha applied as a broadcast treatment to paddy water also failed to control the hopper.

Brown planthoppers collected from those plots were reared in the greenhouse for four generations. The susceptibility to carbofuran of the field strain was compared with that of a greenhouse strain never exposed to insecticide. Two application methods were used: in the contact toxicity study, insecticide was sprayed directly on adult hoppers; in the paddy-water test, carbofuran granules were applied to the paddy water and hoppers were allowed to feed on the treated plants.

In the contact toxicity study, the field strain was significantly more resistant to carbofuran than the greenhouse strain at all rates tested (see table). In the paddy-water test, 6 kg/ha was required to kill 98%) of the field strain while 1 kg/ha killed 100% of the greenhouse strain. LD_{50} studies indicated that the field strain was seven times more resistant than the greenhouse strain (see article, this issue).

Comparison of the resistance of a field strain and a greenhouse strain of the brown planthopper to carbofuran.[a] IRRI greenhouse, 1977.

Rate (kg a.i./ha)	Mortality (%)		
	Greenhouse strain[b]	Field strain[c]	Difference[d]
	Contact toxicity[e]		
0.025	25 a	Sa	20*
0.050	68 b	9 a	59*
0.100	83 c	29 b	54*
0.250	100 d	56 c	44*
0.500	100 d	59 c	49*
	Paddy-water application		
0.5	67 b	21 c	46*
1.0	100 a	32 c	68*
4.0	100 a	77 b	23*
6.0	100 a	98 b	2 ns

[a] Means within a column followed by a common letter are not significantly different at the 5% level.

[b] Cultured in the greenhouse for about 30 generations.

[c] Collected from field plots that had received repeated application of 2 kg a.i. carbofuran/ha over a 3-year period and reared in greenhouse culture cages for 4 generations.

[d] An asterisk indicates a statistical difference between the greenhouse and field strains at the 1% level.

[e] Applied with Potter's spray tower.

Residual activity of acephate sprays on rice as influenced by spreader-stickers

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Spreader-sticker compounds are rarely mixed with insecticides, in spite of the common assumption that frequent showers during the tropical rainy season wash insecticide spray deposits off rice foliage. In 1977 a preliminary study was conducted to determine whether various spreader-sticker compounds mixed with acephate had any beneficial effect on the amount of the initial deposit and on residual activity of the insecticide.

Acephate at the rate of 0.75 kg a.i./ha was applied in combination with each of four different spreader-stickers at a concentration of 0.5%. Leaves were analyzed at 1, 5, and 10 days after treatment (DAT) by gas chromatography. At 1 DAT all treatments with spreader-stickers had higher amounts of acephate, the Citowett treatment having the highest (see table). At 5 DAT the Adhesol treatment had the largest amount of acephate, but at 10 DAT the differences among treatments were slight. In the treatments with spreader-stickers the initial deposit of acephate on the leaves was larger but the residual activity was not significantly longer than that in the treatment with acephate alone, as indicated by the acephate residues at 5 and 10 DAT.

The mortality of caged brown planthopper *Nilaparvata lugens* and green leafhoppers *Nephotettix virescens* in the various treatments at 1, 5, and 10 DAT indicated that the spreader-stickers did not prolong residual activity.

Residues of acephate on leaves of IR22 rice treated with foliar sprays containing spreader-sticker. IRRI, 1977 wet season.

Treatment[a]	Residues (ppm)[b]		
	1 DAT	5 DAT	10 DAT
Acephate	19.5 b	4.3 cd	0.09 cd
Acephate + Adhesol	26.1 b	21.3 a	0.11 bcd
Acephate + Triton B-1956	37.2 ab	7.5 bc	0.08 cd
Acephate + Tenac	38.2 ab	12.6 b	0.14 bcd
Acephate + Citowett	51.2 a	7.8 bc	0.34 a
Control	nd[c]	nd	0.00 d

[a] Spreadersticker applied at a concentration of 0.5%; foliar sprays at 0.75 kg a.i./ha.

[b] Figures are averages of 4 replications. In a column, any 2 means followed by a common letter are not significantly different at the 5% level.

[c] nd = none detected (< 0.005 ppm).