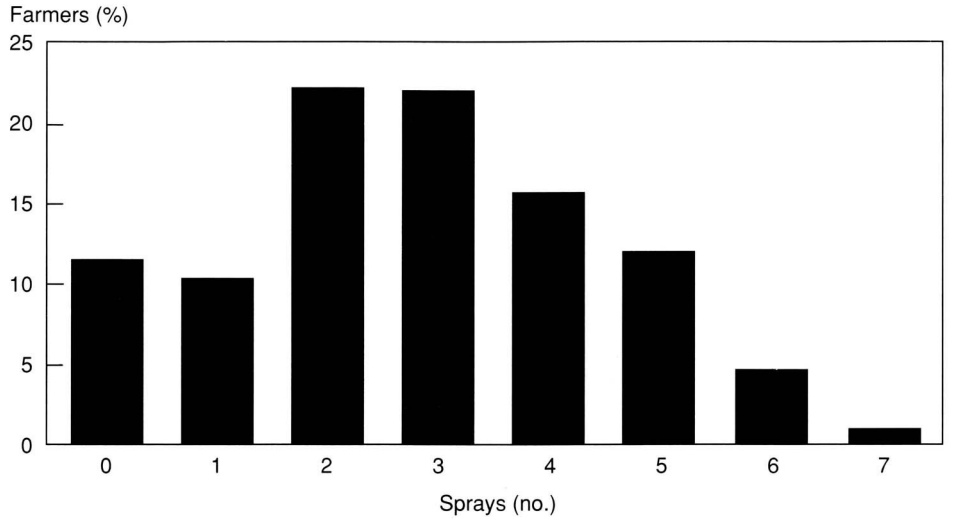
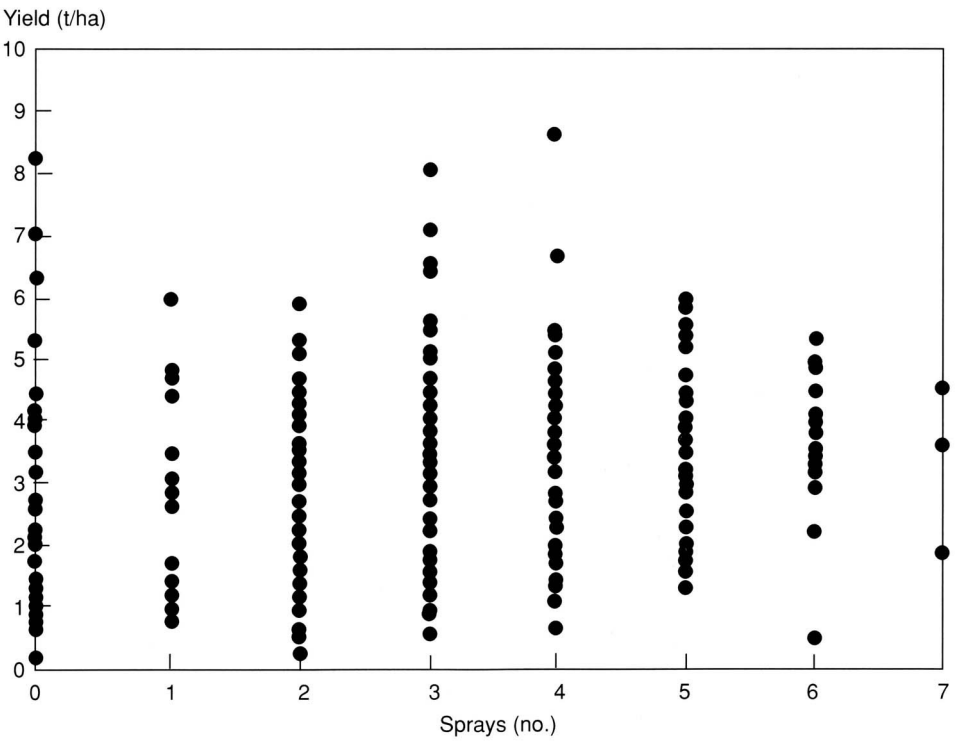


1. Frequency of sprayings. Leyte, Philippines, 1991 wet season.



2. Yield and number of insecticide applications by farmers in Leyte, Philippines, 1991 wet season.

would increase rice yields. Yield data, however, did not show any positive relationship with farmers' spray applications (Fig. 2).

Clearly, farmers tend to overestimate the damage they expect from leaffeeders. They are extremely averse to risk and respond by spraying. Our challenge is to find ways to reduce or eliminate these unnecessary early spraying for leaf-feeding insects. □

Surveys of disease or insect incidence/severity in one environment are useful only if the information is related to other variables (e.g., climatic factors, crop intensification, cultivars, management practices, etc.). By itselt information on incidence in one environment does not increase scientific knowledge.

Relative potency of three insecticides on *Cyrtorhinus lividipennis* and brown planthopper (BPH) *Nilaparvata lugens*

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Insecticides are detrimental to both natural enemies and pest species. Many entomologists argue that insecticides with selective toxicity for pest species would be useful. We evaluated three insecticides commonly used in rice for relative potency on BPH and its egg predator *C. lividipennis.*

We anesthetized 1-d-old female adults of both species with CO_2 and treated them with 0.5 pl of diluted doses of chlorpyrifos and BPMC using an Arnold microapplicator. Mortality was observed 24 h later. Eight batches of 10 insects each were used for each dose. For the molting inhibitor buprofezin, last-instar nymphs in 6 batches of 10 each were used because the chemical has little effect on adults. In all cases, control insects were treated with acetone. The data were subjected to probit analysis using D. Finney's computer program.

The probit lines fit the data well in all cases except for buprofezin on *C. lividipennis* (Table 1). At the concentration of 300 ppm, only 30% mortality was observed, and the probit analysis program estimated the LC_{50} to be >900 ppm. Regression, however, was not significant.

Probit lines for BPMC and chlorpyrifos were parallel. Data were inadequate to carry out parallel analysis for buprofezin. The estimated relative potencies for the three insecticides are given in Table 2.

Chlorpyrifos and BPMC were 2.75 and 1.25 times less toxic to *C. lividipennis* than to BPH. In the case of BPMC, the relative potency ratio was not significantly different from unity,

Table 1. Probit analysis of chlorpyrifos, BPMC, and buprofezin on *C. lividipennis* and *N. lugens*.

Insect	LC_{50} (ppm)	Fiducial limits (95%)	Regression equation
		Chlorpyrifos	
C. *lividipennis*	228.4	191.5 – 273.8	$Y = 1.03x - 0.59$
N. lugens	96.3	75.2 – 118.1	$Y = .091x - 0.86$
		BPMC	
C. *lividipennis*	61.6	47.9 – 75.4	$Y = 0.93x - 1.17$
N. lugens	43.6	32.8 – 55.0	$Y = 0.79x - 2.12$
		Buprofezin	
C. *lividipennis*	>900	–	No regression obtained
N. lugens	0.37	0.02– 1.61	$Y = 0.14x - 5.13$

Table 2. Relative potencies of 3 insecticides on *C. lividipennis* and *N. lugens*.

Insecticide	Relative potency[a]	Fiducial limits (95%)	Parallelism chi-square
Chlorpyrifos	2.75	2.09 - 3.70	3.02 df 1
BPMC	1.25	0.93 - 1.68	1.40 df 1
Buprofezin	>2500	Parallel analysis not carried out	

[a] Relative potency = $\frac{LC_{50} \text{ for C. } lividipennis}{LC_{50} \text{ for } N. \text{ } lugens}$

suggesting that the chemical is equally toxic to both species. But the chances of *C. lividipennis* picking up more chemicals in a sprayed field are higher because it is more mobile in the rice habitat. Insecticide toxicity for *C. lividipennis* under field conditions, therefore, may be even higher and exhibit negligible selectivity.

Buprofezin, on the other hand, is >2500 times less toxic to *C. lividipennis* than to BPH. Negligible effects on *C. lividipennis* are expected at doses that affect BPH. Because of this compound's high selectivity, it may be useful in managing BPH.□

Depression of dispersal of the female green leafhopper (GLH) *Nephotettix virescens* by pipunculid parasitism and ovarian maturation

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Pipunculid flies are important parasitoids at the nymph and adult stages of *N. virescens,* the most efficient transmitter of tungro disease. Pipunculid parasitism is higher on nonmigratory GLH populations inhabiting rice than on immigrant populations that appear in seedbeds and fields within 4 wk after transplanting (WT). This suggests that parasitized adults are less migratory than parasitoid-free ones. We compared the parasitism rate on *N. virescens* females attracted by light and females in ricefields to test this hypothesis. We also measured the difference in the percentage of mature females among samples.

We collected GLH females with a sweep net in Jakarta, West Java, Central Java, Bali, and South Sulawesi, Indonesia, from 1986 to 1990 and dissected them under a binocular microscope. Insects collected at a site on different days were treated as one sample because daily catches were often small. Samples were grouped into three categories: GLH attracted by light at more than 500 m from the nearest ricefields (L1), GLH attracted by light around ricefields (L2), and GLH in ricefields 5-12 WT (RF).

The mean parasitism rate was much higher in RF than in L1 and L2, while the difference between L1 and L2 was insignificant (see table). The percentage of mature females was significantly lower in L1 than in the other categories. These results indicate that pipunculid parasitism depresses even a short-range dispersal of *N. virescens* and that long-distance female flyers are mostly pipunculid-free and immature.□

Comparison of pipunculid parasitism and ovarian maturation in *N. virescens* females attracted by light (L1 and L2) and those in ricefields 5-12 WT (RF). Indonesia, 1986-90.

Sample	Insects examined (no.)	Mean ± SD[a]	
		Parasitism (%)	Mature females (%)
L1	411	1.8 ± 2.1 b	4.1 ± 3.6 b
L2	267	0.9 ± 1.3 b	31.4 ± 13.6 a
RF	604	31.0 ± 15.9 a	28.4 ± 14.7 a

[a] In a column, means followed by the same letter are not significantly different at p = 0.05 by DMRT with arcsin-transfomed values.

Shifts in predator-prey ranges in response to global warming

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Scientists have estimated that global temperatures may increase by 3 ± 1.5 °C within the next 40 yr. When temperature patterns change, the overlap of arthropod species range may also change, due to differences in high temperature tolerance among species. If predator and prey species shift at different rates, rice arthropod communities would dissociate into their component species.

We used a direct assay method to evaluate high temperature tolerance in the brown planthopper (BPH) *Nilaparvata lugens* and its predators *Cyrtorhinus lividipennis* and wolf spider *Pardosa pseudoannulata.* Ten 1-d-old *N. lugens* macropterous females and *C. lividipennis* females were caged in cylindrical (54 × 5.5 cm) mylar cages with a 60-d-old TN1 rice plant trimmed to a single tiller.

In the experiment with *C. lividipennis,* rice plants were exposed to gravid BPH females for 24 h to ensure adequate eggs as food. With the wolf spider, 10 mature BPH females of equal size were introduced into the cages.

Twenty replications of each setup were placed in a growth chamber at 40 °C with 12:12 h illumination and 70% relative humidity. We used this test