RTV infection. Such symptoms were most common.

The disease is transmitted by brown planthopper *Nilaparvata lugens*. The incubation period of the causal agent in the insect was 5-21 days, usually 6-8 days. Five to 30% of the insects were active transmitters. The disease was not transmitted by sap, seeds, or soil or by 368 green leafhoppers *Nephotettix virescens* used to inoculate about 3,000 seedlings.

Disease symptoms were observed 7-14 days after inoculation of 7-day-old Taichung Native 1 (TNl) seedlings. Infected plants were yellow or pale yellow, even when fertilized adequately. TN1 plants infected at 2 months had RTV-like symptoms similar to those of naturally infected plants.

Although the unknown disease is similar to GSV, the two diseases differ: 1) the RTV-like symptom has never been described for GSV; 2) the disease is often lethal, particularly when plants are infected at early growth stages; and 3) *Oryza nivara,* the source of the resistance gene against GSV, is susceptible to the unknown disease (Table 1). Consequently, IR varieties with *O. nivara* genes for resistance to GSV are also susceptible (Table 2). These differences indicate the unknown disease may be a new virus disease or a strain of GSV. □

Table 1. Reaction of *Oryza nivara* to grassy stunt (GSV) and to the unknown disease, IRRI.

Trial	GSV			Unknown disease		
	Plants (no.)		Infection (%)	Plants (no.)		Infection (70)
	Inoculated	Infected		Inoculated	Infected	
I [a]	10	0	0	14	14	100
II [a]	11	0	0	11	9	82
III [b]	84	2	2.4	31	29	93.5

[a] Inoculated at 3 weeks old using 15–20 insects/seedling. [b] Inoculated using the mass screening method for GSV.

Table 2. Reaction of IR varieties to grassy stunt (GSV) and to the unknown disease, IRRI.

Variety	GSV [a]			Unknown disease [b]		
	Plants (no.)		Infection (%)	Plants (no.)		Infection (%)
	Inoculated	Infected		Inoculated	Infected	
IR28	380	127	33.4	83	72	86.8
IR29	183	48	26.2	73	66	90.4
IR30	309	81	26.2	77	64	83.1
IR32	548	156	28.5	87	78	89.7
IR34	489	101	20.7	65	59	90.8
IR36	4467	1546	34.6	97	87	89.7
IR38	367	73	19.9	75	65	86.7
IR40	308	57	18.5	58	49	84.5
IR42	4225	1363	32.3	191	183	95.8
IR43	203	37	18.2	64	53	82.8
IR44	388	72	18.6	94	81	86.2
IR45	175	16	9.1	85	82	96.5
IR46	587	114	19.4	87	78	89.7
IR48	342	35	10.2	77	67	87.0
IR50	560	91	16.3	92	81	88.0
IR52	264	27	10.2	75	69	92.0
IR54	41	3	7.3	72	69	95.8

[a] Combined data for GSV screening for 1980 and 1981. [b] Total of 2 trials (2 replications/trial).

Pest management and control INSECTS

Leaffolder outbreak in tarai belt of Nepal

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The rice leaffolder *Cnaphalocrocis medinalis* Guenée has recently become a serious rice pest in Nepal. In 1977, it became epidemic in some tarai districts and in hilly areas. In 1978, leaffolder incidence was high at Janakpur, Bara, and Parsa, and in some hilly areas around Kathmandu Valley. In 1979-80, infestation was high in the first crop at the Parwanipur Station and in adjacent areas.

The insect first appears in May and stays until November. Its life cycle is generally completed within 25-30 days; cycles can be observed by the appearance of large moth populations at 1 -month intervals. In a rice season, 4-5 generations are comp1eted. A June 1980 field survey showed pest incidence in most of the tarai; "hot pockets" were Janakpur, Kankai, Bara, and Parsa. Leaffolder incidence was heavy at Hardinath Agricultural Farm and in surrounding areas in Janakpur where about two-thirds of the leaves in infested fields were folded. Most of the fields were totally white and papery because the chlorophyll of the rice plants was completely eaten off. In some fields about 90% of the leaves were folded.

Attack at early tillering stage was serious and the extent of the yield reduction it caused should be studied.

Brown planthopper resurgence on IR36 in Mindanao, Philippines

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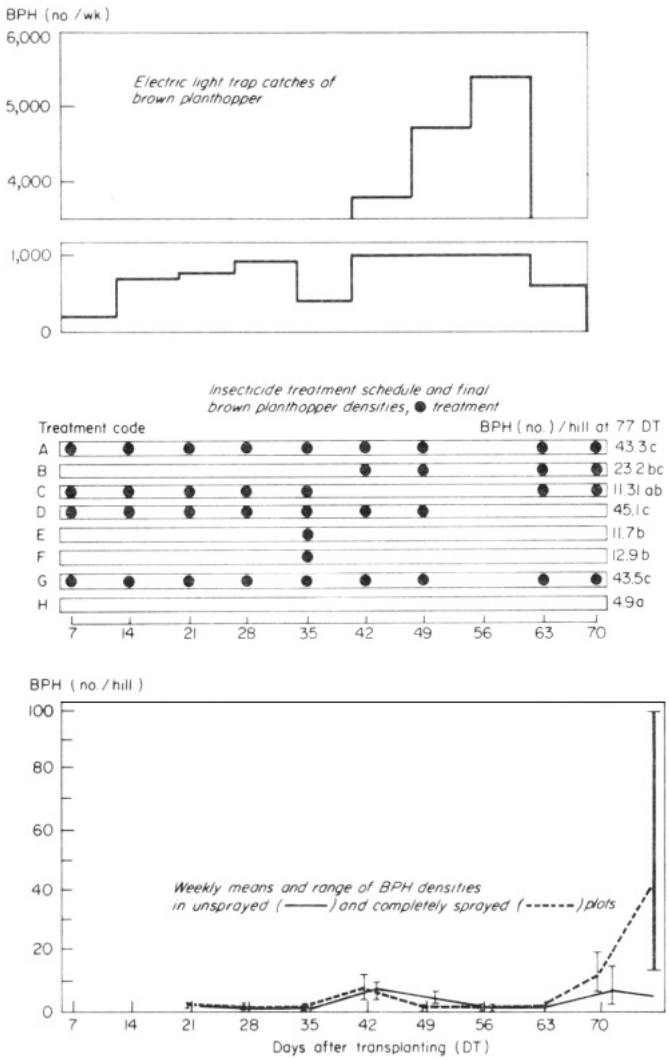
During a baseline field trial for insect control recommendations in Sultan Kudarat Province, up to 5% brown planthopper (BPH) hopperburned hills



BPH data from Mindanao, Philippines, show BPH resurgence on IR36.

were observed in some nearly mature plots of IR36. IR36 is BPH resistant. The following data were collected from light traps, weekly field counts, and insecticide use records (see figure).

Light trap data showed BPH numbers peaked 7 to 9 weeks after transplanting Final field counts showed that all plots sprayed with the recommended mixture of chlorpyrifos and BPMC during this peak (treatments A, B, D, G) had higher BPH population densities than those not sprayed. Plots sprayed before and during the peak (A, D, G) had higher densities than those sprayed either before or during the peak (B, C, E, F). Mean population density exceeded 95 BPH/hill in one field. Other studies showed that neighboring farm fields contained 15 predators and parasite species known to feed on BPH.

We concluded that destruction of natural enemies allowed BPH to flourish in sprayed plots. Populations in unsprayed plots never exceeded the 20/hill economic action threshold.

This is the first report of BPH resurgence and subsequent hopperburn on certified IR36 after 6 years of widespread planting in the Philippines, indicating the evolution of a host plant resistance-breaking phenotype. The heavier the insecticide use the higher the multiplication of BPH able to feed on IR36. This may contribute to biotype emergence.

Cytological variations among brown planthopper biotypes 1, 2, and 3

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Cytological studies of the meiotic chromosomes of brown planthopper (BPH) biotypes 1 and 2 maintained as stock cultures at IRRI for several years revealed that meioses I and II were reductional and equational for all components of the species' genome. Similar phenomena were observed for biotype 3. Investigations used primary spermatocytes of newly emerged brachypterous males to characterize the nuclei and chromosomes and determine their morphometrics and behavior during the sequential stages of the first meiosis.

Salient variations in nuclear and chromosomal measurements of biotypes 1, 2, and 3 during substages of *prophase I* are shown in the table.

During *metaphase* I chromosomal behavior showed clumping or clustering of highly condensed and shortened autosomes at the equatorial portion of the reproductive cell and separation of the highly heterochromatic synapsed sex chromosomes from the autosomal grouping. The following variations in the three biotypes were noteworthy:

1. Biotype 1 had the highest number of *metaphase I* cells; biotype 2 had the least cells.
2. Biotypes 1 and 3 had two kinds of *metaphase I* cells – cells with sex chromosomes isolated from autosomes and cells with both chromosome types grouped together; biotype 2 had only the first type of cells.
3. The average distance of the sex chromosomes from autosomal grouping was greatest for biotype 2, almost twice that of biotype 1, while biotype 3 ranked next.
4. More cells with combined autosomes and sex chromosomes were observed in biotype 1 than in biotype 3. Intra- and interchiasmatic connections were higher in biotype 1 than in biotype 3 homologues.
5. Sex chromosomes of the three biotypes varied in length and width.