

The total nymphal periods for each generation differed greatly (12–14 to 36–37 days); however, the oviposition period did not (4–6 to 9–11 days). The fecundity per female of each generation

also differed to a large extent (64 to 306 days). The total life-span of each egg-laying female of the different generations ranged from 17–23 to 49–56 days. □

## Occurrence and control of the whitebacked planthopper in the Punjab of Pakistan

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### Damage to rice grains by stem borer attack

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The proportionate distribution of larvae of the five types of stem borers that attack rice in this area is: *Tryporyza incertulas*, 61.2%; *Chilo partellus*, 37.3%; *Sesamia inferens*, 1%; and *Chilo traea auricilia* and *C. infuseatellus*, 0.5%. This study was conducted to determine the extent to which early instars of borers damage the rice grains at the flowering stage.

Grains were counted from randomly collected earheads. The significance of

varieties in the incidence of borer attack was determined by the chi square ( $\chi^2$ ) test.

The overall damage rates to the aman, aus, and boro rice crops were 18.0, 4.0, 5.7%, respectively (data compiled from Table 1). Furthermore, the incidence of chaffiness due both to direct borer attack on grains and indirect attacks (on stems) was found to depend on the varieties of aman rice (Table 2). For both direct and indirect attacks, the calculated  $\chi^2$  value was much higher than the table value of  $\chi^2$  at the 1% level of significance.

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The whitebacked planthopper (WBPH) *Sogatella furcifera* has long been known to occur in the Punjab as a sporadic and minor rice pest. But the WBPH struck in epidemic proportions in 1978 because the monsoon season was prolonged with intermittent rain and farmers used nitrogen heavily. Three districts that comprise 60% of the rice area in the Punjab — Sialkot, Gujranwala, and Sheikhupura — were badly affected. Although WBPH were present in varying populations in those areas, typical hopperburn symptoms were not always noticeable.

All varieties except IR6 (which headed in the last week of August) were attacked. (Punjab farmers seldom apply insecticide to IR6 because they plant it earlier in the season to protect it from a serious attack of the stem borer (the major insect pest)). WBPH affected about 15% of the area, reducing yields by 4 to 5% and, sometimes, by 40 to 50%. In applied research trials conducted by the Agricultural Research Council, the plots treated with Furadan G completely escaped WBPH attack — one dose incorporated into soil before transplanting protected IR6 throughout the season. In another preliminary trial, application of Mipcin 50% W.P. spray at 1.0 kg a.i./ha and of Sevin 10% dust at 2.0 kg a.i./ha in the maturing crop effectively controlled the pest. □

**Table 1. Extent of grain damage by stem borers in three kinds of rice. Kalyani University, West Bengal, India.**

Season	Randomly examined earheads (no.)	Grains (no.)	Borer-damaged grains	
			No.	%
<i>Completely chaffy earheads<sup>a</sup></i>				
Aman	949	4,538	1,111	24.5
Aus	694	2,889	70	2.4
Boro	570	1,731	90	5.1
<i>Partially chaffy earheads<sup>b</sup></i>				
Aman	106	7,641	1,082	14.2
Aus	62	7,285	342	4.7
Boro	53	2,034	126	6.2

<sup>a</sup> Because of simultaneous attack of grains and stems.

<sup>b</sup> Because grains were attacked.

**Table 2. Percentage distribution of different categories of damaged grain in varieties of aman rice. Kalyani University, West Bengal, India.**

Varieties	Direct effect (%)		Indirect effect (%)	
	Partial chaffy earheads	Complete chaffy earheads	Partial chaffy earheads	Complete chaffy earheads
Badsabhog	43.3	56.7	0.5	99.5
Tilakkachari	79.0	21.0	32.1	67.3
Kalma 222	33.3	66.7	44.8	55.2
Patnai 23	55.7	44.3	21.2	78.8
Bhasamanik	15.4	84.6	2.4	97.6
Observed $\chi^2$ value (d.f. 4)	161.62		596.11	

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