

## Losses in rice yield due to kresak (wilt) phase of bacterial blight\*

N. SRINIVASAN<sup>†</sup>

The effect of Kresak (wilt) phase of bacterial blight on yield and important yield contributing factors of rice was studied under natural conditions. The loss in yield was related to the severity of the Kresak. The vigour of the tillers in infected hills was reduced. Under severe Kresak phase, the disease increased the chaffy grains to the tune of 55.59 per cent; reduced the 1000 grain weight by 49.62 per cent; consequently a loss of grain yield per hill as high as 94.18 per cent was observed. The higher Kresak intensity also leads to wilting of hills.

The Kresak (wilt) phase of bacterial blight (*Xanthomonas oryzae* (Uyeda and Ishiyama) Dowson) of rice (*Oryza sativa* L.) is common in tropical countries besides the blight phase. The pathogen infects the growing plants systemically leading to wilting of infected plants which is called as Kresak phase (Yoshimura, 1975). Several workers have assessed the effect of leaf blight phase on yield components. But little has been known for Kresak phase. In India, the wilt causes drying of infected seedlings and has been believed to reduce yield more than the leaf blight phase (Srivastava, 1972). The aim of the present study was to determine the loss in yield exclusively due to kresak phase under natural conditions.

### MATERIAL AND METHODS

The yield loss was studied on the cv. IR 8 during *Kharif* 1977 and 1978 under natural conditions. Twenty five day-old seedlings were trans-

planted in puddled plot (5 x 4 m) at a distance of 20 x 15 cm in the Crop Research Centre of G. B. Pant University of Agriculture and Technology, Pantnagar, Uttar Pradesh. The observations on disease incidence were made from transplanting to harvesting stage of the crop. Twenty five plants were marked in each severity grade of the disease (Srinivasan, 1980) and 25 healthy stools of comparable nature were also marked to study the disease effect. These plants were harvested separately and observations on per cent chaffy grains, 1000 grain weight and yield per hill were recorded.

### RESULTS AND DISCUSSION

The incidence of Kresak phase was comparatively higher during *Kharif* 1977 than *Kharif* 1978. The disease affected yield and yield contributing factors of rice (Table 1). During *Kharif* 1977, 13.12 per cent grains were chaffy when the disease severity was 26.11 per cent. When the disease severity became 72.19 and 96.55 per

\* Extracted from a Ph. D. Thesis, submitted by the author to G. B. Pant University of Agriculture and Technology, Pantnagar-263 145, U.P.

<sup>†</sup> Present address: C.P.C.R.I.-Regional Station, Vittal-574243, Karnataka

cent, the percentage of chaffy grains increased to 36.15 and 55.59 per cent, respectively. At higher disease intensity, total wilting of hills was also observed. The increase in chaffiness was as high as 442.34 per cent over control, followed by 352.68, 122.73 and 28.00 per cent at different disease severity. During *Kharif* 1978, the disease incidence was less, hence, a maximum increase in chaffiness was observed to be 50.41 per cent at 53.48 per cent disease severity.

During *Kharif* 1977, 1000 - grain weight for diseased stools showed maximum reduction of 49.62 per cent at 96.55 per cent Kresek. During *Kharif* 1978 the maximum reduction was 8.04 per cent at 32.80 per cent disease severity.

The deleterious effect of the Kresek phase on the total grain yield was also observed for two seasons. During *Kharif* 1977, when Kresek intensity was 96.55 per cent, the maximum loss of 94.16 per cent was recorded. But when the disease incidence was 26.11 per cent the loss in yield was negligible. During *Kharif* 1978 also, the incidence of disease reduced the grain yield in infected plants depending upon the Kresek severity. The disease reduced the grain yield to a maximum of 71.81 per cent at 53.48 per cent disease intensity. The per cent loss of grain weight per hill at the lesser severity of Kresek was higher during *Kharif* 1978 (31.39 per cent loss at 27.38 per cent disease severity) than at a comparable disease severity of 26.11

per cent in *Kharif* 1977. This discrepancy appeared due to cumulative effect of factors like relatively higher 1000 - grain weight and number of healthy residual tillers, bearing better functional panicles, at mild incidence of Kresek in 1977 leading to only lesser loss in grain yield than 1978.

The results revealed that the yield potential of infected hills were reduced to various degrees depending upon the Kresek intensity which affected important yield contributing factors accordingly. The higher disease intensity generally lead to total wilting of infected hills. Maximum increase in chaffy grains coupled with maximum decrease in 1000 - grain weight was observed at higher Kresek intensity. A positive relationship existed between the severity of the Kresek and loss in grain yield. Poor development of tillers, retarded flowering, irregular ripening of panicles and death of tillers have been reported as possible factors for yield losses under Kresek incidence (Reitsma and Schure, 1950; Yoshimura and Iwata, 1965; Shigemura and Tabei, 1969; Srivastava, 1977; Yoshimura, 1975). But the assessment of yield losses, exclusively due to Kresek phase, has not been done in detail. The present studies revealed that in the rice stools infected with Kresek, the vigour of remaining apparently healthy tiller(s) was reduced, which bore smaller panicle(s) and yield contributing factors, such as number of filled grains and 1000 - grain weight were also affected adversely, as evident by increase in chaffiness and decrease

in 1000-grain weight. The leaf blight phase of the disease has been known to reduce 1000-grain weight, increase chaffiness and reduce yield depending upon the severity of the blight. The present study revealed the seriousness of phase affecting the rice yield and established an apparent relationship between disease intensity (Kresék) and extent of damage.

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Table 4. Effect of Kresék severity on different yield components and yield of rice cultivar IR 8 (Kharif 1977 and 1978).

Disease severity (%)	chaffy grains		100 grain wt or equivalent		grain wt. till	
	%	% increase	wt. (g)	% decrease	wt. (g)	% decrease
<b>1977</b>						
0.00 (H)	10.25	-	27.59	-	75.32	-
26.11	13.12	28.00	27.25	1.23	74.45	0.87
72.19	36.16*	352.68	18.30	33.67	9.40	87.52
72.26	22.83	122.73	22.69	18.09	14.07	81.32
96.55	55.59*	442.34	13.90	49.62	4.40	94.16
<b>1978</b>						
0.00 (H)	9.78	-	28.36	-	78.97	-
27.30	11.18	14.55	27.66	2.41	64.06	31.39
32.80	12.13*	24.28	26.08	8.04	41.76	47.05
53.48	14.68	53.41	26.93	5.04	22.23	71.81

Note: H=Healthy

\* Total wilting of till observed