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## Sources of resistance to foliar blight of wheat with special reference to *Alternaria* and *Helminthosporium* blight in West Bengal

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Foliar diseases of wheat induced by *Alternaria* spp. and *Helminthosporium* spp. caused extensive damage to plants and reduction in yield. Though wheat rusts are main problematic disease from the global point of view, the several foliar diseases of wheat caused by *Helminthosporium* spp. and *Alternaria* spp. were the main menaces in all over eastern India, specially in West Bengal. To find out the source of resistance in wheat cultivars, a varietal screening was carried out with 130 wheat cultivars, under both natural and artificial inoculation. Among all these varieties 89 varieties were highly susceptible, 19 were susceptible, 7 as moderately susceptible, 12 varieties were moderately resistant and only 3 varieties were resistant.

**Key words :** *Alternaria triticina*, *Helminthosporium sativum*, diseases of wheat

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### INTRODUCTION

In terms of production, wheat (*Triticum* spp.) occupies a prime position among the food crops in the world and is the most important staple food of the world. In India it is the second important food crop, being next to rice and contributes to the total food grain production of the country to the extent of about 25 per cent. In West Bengal this crop has a great potential amongst the cereals. Acreage in production increased from 283 ha in 1980-81 to 367.37 ha in 1997. Consequently production per ha and yield rate (kg) per ha went on increasing (Table 1).

The introduction of a high yielding cultivars of wheat which required changes in the agronomic practices have intensified the problem of a few diseases. In Eastern and coastal parts of India, the foliar diseases caused by *Alternaria* spp. and *Helminthosporium* spp. have created a major problem in current years. The importance of *Alternaria* blight was not realized until the occurrence of this disease in epiphytotic forms at Varanasi and Faizabad during 1964-65 and 1965-66 respectively. Consequently, NP-830 was withdrawn from these regions of UP. Similarly *Helminthosporium* leaf spot was known to occur in India since 1930.

### MATERIALS AND METHODS

During 1996-97 and 1997-98 a large number of wheat cultivars were screened under natural conditions for their reaction against *Alternaria* leaf blight and *Helminthosporium* leaf spot diseases. Each cultivars was planted in one meter row with a gap of 50 cm between each row. The plants were grown under good fertility conditions with proper irrigation, and plants were inoculated with virulent strains of *Alternaria triticina* and *Helminthosporium sativum* separately at 8 weeks of age and at flag leaf stage in the evening with the help of a hand spray. Inoculation was done in the evening to have the proper relative humidity required for infection. In all 130 cvs were screened after inoculation.

The observation for diseases intensity was recorded from 30 days old plants to flag leaf formation stage and varieties were categorized for disease index with the help of a double digit rating scale for leaf blight of wheat (i.e. 0-9 scale) and severity was recorded on the top two leaves of the plant at complete ear emergence to anthesis growth stage following Zodok's scale (introduced by AICWIP). The blight severity was measured in percentage of leaf area covered in the flag and one leaf below flag and

rating was done as follows :

Percentage leaf area covered	Severity Scale
0 - (no disease)	0
1 - 10%	1
11 - 20%	2
21 - 30%	3
31 - 40%	4
41 - 50%	5
51 - 60%	6
61 - 70%	7
71 - 80%	8
> 81%	9

Different varieties of wheat were rated by double digit scoring method and were classified according to their varietal responses. The classification was done under following categories :

I	-	Immune	-	00
R	-	Resistant	-	< 15
MR	-	Moderately resistant	-	< 37
MS	-	Moderately susceptible	-	< 56
S	-	Susceptible	-	< 57
HS	-	Highly susceptible	-	< 79

Besides, a comparative analysis of the symptoms caused by the diseases in the field was made.

## RESULTS AND DISCUSSION

**Table 1 :** Area and production of wheat in West Bengal (area in thousand hactor, production in thousand tons and productivity in kg/ha).

Year	Area	Production	Productivity
1980—81	283.0	473.2	—
1985—86	305.1	738.7	—
1990—91	269.1	530.2	1970
1991—92	248.1	557.5	2247
1992—93	272.1	587.3	2158
1993—94	306.9	632.1	2060
1994—95	325.6	774.5	2286
1995—96	337.8	725.3	2147
1996—97	351.1	839.0	2390
1997—98	367.374	810.480	2206

Foliar blight symptoms caused by two major diseases caused respectively by *Alternaria* spp. and *Helminthosporium* spp. may be confused. For this reason it is often difficult to properly identify the

disease and the correct diagnosis is a basic need.

**Table 2 :** Comparative symptoms of foliar blights caused by *Helminthosporium sativum* and *Alternaria trititica*.

Infection starts at seedling phase.	Infection starts after 40-45 days of age of the plant.
Small lesions first appear at the foot region of the plant and intensity of spotting increases with increase in age of the plant.	Symptoms develop as brown oval spots on upper leaves.
Spots are variable in size and shape, minute light brown dots, increases gradually and size 2 - 3 × 4 - 8 mm.	Spots are irregular accompanied by a bright yellow margin around the spots.
Spots often coalesce to form blotches covering large area of the leaf blade.	Several spots coalesce covering the leaf partially or completely giving a blighted appearance.

Nema and Joshi (1971) described marked differences in the symptoms and diagnosis of spot blotch caused by *Alternaria* spp. A comparative account of the symptoms of the two diseases under study is presented in Table 2. All the cvs, after disease assessment were categorised into different groups (highly susceptible to resistant) and the results are presented in Table 3.

**Table 3 :** Disease reaction of wheat cultivars to two foliar diseases of wheat.

Varieties which are highly susceptible (HS)	: HS-371, HS-364, HS-369, VL-768, VL-772, VL-773, K-9408, K-9423, K-9443, K-9451, K-9464, HUW-467, HUW-482, NW-1014, HP-1781, HDR-180, HD-2662, UP-2398, GW-279, HI-1433, HI-8498, HD-2668, HD-2669, HD-3002, HD-2667, HD-2680, MACS-2788, NIAW-129, MACS-2846, HPW-93, HPW-143, HPW-147, HS-240, HS-365, HPW-42, Sonalika, HD-2687, PBW-435, PBW-438, HD-2329, HD-2285, PBW-175, PBW-299, PBW-396, WH-542, Raj-3765, K-9531, K-9507, K-9527, K-9533, K-9555, HP-1811, UP-2447, HUW-484, HUW-485, HUW-489, HP-1731, HUW-486, HUW-234, HP-1633, HP-1744, NW-1014, GW-1092, GW-1139, HI-1454, HI-1456, GW-173, LOK-1, Raj-1555, GW-273, AKW-3294, MACS-3018, HD-2189, HD-4502, NIAW-34, HD-2501, DWR-195, NIAW-5439, Bijaga yellow, HUW-318, HW-1085, Raj-3777, HD-2285, HALNA, KRL-1-4, K-65, A-9-30-1.
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The varieties which are susceptible (S)	: HS-361, HS-375, VL-775, UP-2338, RL-10-12, GW-190, PBW-414, HI-8498, PBW-251, NIDW-15, WH-912, MACS-2496, WH-913, HP-1529, UP-2425, JOB-666, Raj-6516, K-9441, HW-2023.
The varieties which are moderately susceptible (MS)	: PDW-245, VL-738, K-9508, HD-2690, K-9107, HUW-206, NW-1012.
The varieties which are moderately resistant (MR)	: TL-2877, UPD-52, PBW-343, PBW-377, C-306, K-9545, K-9546, NW-1038, RW-3448, K-8027, HI-8381, DWR-1005.
The varieties which are resistant (R)	: NW-1043, DWR-225, UPD-60.

So, in this study of leaf blight screening, 3 varieties revealed themselves resistant, 12 varieties moderately resistant, 7 varieties moderately susceptible, 19 varieties susceptible and 89 varieties highly susceptible. There is no immune responses observed in any of the varieties.

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