Indian J. Pl. Genet. Resources 6(1): 85-88, 1993
Short Communication

IDENTIFICATION OF SOURCES OF RESISTANCE TO FOLIAR BLIGHTS (*HELMINTHOSPORIUM SATIVUM* AND *ALTERNARIA TRITICINA*) IN WHEAT GERMPLASM

Param Jit Singh, H.S. Dhaliwal[1], S.S. Aujla[2] and S.K. Sharma

Punjab Agricultural University,
Regional Research Station, Gurdaspur 143 521 (Punjab)

Key words : Wheat germplasm, foliar blights, sources of resistance

Foliar blights of wheat caused mainly by *Helminthosporium sativum* and *Alternaria triticina* have become important in reducing wheat yields in this region but so far they have received very little attention of the pathologists and the breeders. None of the wheat varieties grown has adequate resistance to these pathogens and yield losses ranging between 7.5 to 23.3 per cent are caused in different varieties of wheat cultivated in this region (Singh *et al.*, 1991). It is, therefore, essential to identify resistant sources in wheat germplasm for utilization in breeding disease resistant varieties.

2749 accessions of wheat germplasm comprising 2194 lines of bread wheat (*Triticum aestivum*), 329 lines of durum wheat (*T. durum*) and 198 lines of triticale (*X. triticosecale*) were screened under natural infection in the field at Punjab Agricultural University, Regional Research Station, Gurdaspur from 1986-87 to 1989-90 crop seasons. Each line was sown in a 1 m row length and the row to now spacing was kept at 25 cms. The disease severity usually is very high under natural field conditions at Gurdaspur, particularly when there are late rains at heading stage which facilitates screening of germplasm.

The wheat lines which consistently gave resistant reaction (0-3 score) on a rating scale of 0-9 (Saari and Prescott, 1975) under natural infection in the field. Inoculum of *H. sativum* and *A. triticina* was multiplied separately on autoclaved sorghum seeds in 250 ml conical erlenmeyer flasks at 25°C for 2-3 weeks. The conidial suspension of these pathogens prepared in water (10-20 conidia/microscopic field) were mixed together and used for spray-inoculations

[1]Director, Biotechnology Centre, PAU, Ludhiana 141 004
[2]Addl. Director Research, PAU, Ludhiana 141 004

in the field to create a severe epiphytotic conditions. The data on disease severity (% leaf area infected) on flag leaf and flag leaf^{-1} (i.e. the leaf immediately below flag leaf) were recorded and the lines showing upto 10 per cent leaf area infected were marked as resistant. The reaction of these lines to black point, grain shrivelling, yellow and brown rusts (artificial infection) and *Fusarium* head scab caused by *F. moniliforme, F. subglutinans* under natural infection was also studied. The data on disease incidence and severity of *Fusarium* head scab was recorded on 0-5 scale in a double digit system wherein the first digit indicated the per cent infected heads and the second digit indicates the per cent spike area infected. Thus, per cent infected heads 0 = free infection; 1 = 0.1 - 10 per cent infected heads; 2 = 10.1 - 25 per cent infected heads, 3 = 25.1 - 50 per cent infected heads : 4 = 50.1 - 75 per cent infected heads; 5 = 75.1 - 100 per cent infected heads and per cent spike area infected : 0 = free from infection; 1 = upto 10 per cent spike area infected 2 = upto 25 per cent spike area infected, 3 = upto 50 per cnet spike area infected; 4 = up to 75 per cnet spike area infected and 5 = 100 per cent spike area infected. The severity of yellow and brown rusts was scored according to the modified Cobb scale.

Results of screening of wheat germplasm to foliar blights are given in Table 1 and 2. Among the 2749 lines of wheat germplasm screened under natural infection from 1986-87 to 1989-90, only 77(2.8%) lines were found to be resistant. Of these 68 out of 2194(3.1%) were of bread wheat, 5(1.59%) in durum wheat and only 4(2.09%) lines in triticale which showed resistance to foliar blights. These lines were further tested under artificial infection in the field during 1990-91 and 1991-92. Only 8 lines (Acc. Nos. 8231, 8397, 8448, 8450, 8470, 8527, 8528, 8672) of bread wheat (Table 2) which showed a

Table 1 : Number of wheat germplasm accessions resistant to foliar blights (*H. sativum* and *A. triticina*) under natural and artificial infection in the field

Species	Number of accessions screened	Number of resistant accessions (Natural infection)			Number of resistant accessions	
		1986-87	1987-88	1989-90	(Artificial Inoculation)	
					1990-91	1991-92
Triticum aestivum	2194	549	416	68(3.1%)	21	8
T. durum	329	27	22	5 (1.5%)	0	-
X. *triticosecale*	198	21	15	4 (2.0%)	0	-
Total accessions	2749	598	453	77(2.8%)	21	8

promising level of resistance to foliar blights were finally chosen. The incidence of black point and grain shrivelling was also very low in these lines as compared to the cultivated wheats. None of the bread wheat lines was found to be free (immune) from foliar blights. Efforts are being made to trace the pedigree of these resistant lines. All the *durum* and triticale lines which exhibited resistance under natural field infection, became susceptible after artificial inoculation. The reactions of these lines to yellow and brown rusts and *Fusarium* head scab (FHS) are given in Table 2 which clearly show that these lines have multiple disease resistance to rusts and *Fusarium* head scab which is becoming an important problem in this area during the last 2-3 years. These lines appear to be potential sources of resistance to foliar

Table 2 : Reaction of promising accessions of *Triticum aestivum* resistant to foliar blights caused by *H. sativum* and *A. triticina* to other diseases

Acc. No.	Area infected (%)		Black point (%)		Shrivelled grains(%)		FHS (0-5 scale)	Rust severity	
	Flag leaf	Flag^{-1} leaf	1990-91	1991-92	1990-91	91-92	91-92	YR	BR
8231	T	-	0.4	1.1	1.8	16.7	33	0	0
8399	T	-	0.6	4.0	5.4	1.4	11	0	0
8448	T	-	0	2.8	2.0	2.0	11	0	0
8450	T	-	1.0	4.6	0.8	4.0	11	0	0
8470	T	T	1.2	1.2	3.6	8.4	11	TS	TS
8527	T	T	0.4	2.5	3.6	1.6	11	0	0
8528	T	10	0.2	1.8	3.0	0.8	0	0	0
8672	T	20	1.6	2.3	4.2	3.8	11	0	0
Cultivated wheats									
PBW 222	70	100	2.0	4.2	10.6	28.0	44	TS	60S
PBW 154	20	40	4.6	3.5	6.2	30.0	32	20S	40S
HD 2329	40	100	1.8	9.0	7.0	12.9	43	20S	60S
PBW 138	30	100	3.0	5.0	8.0	29.0	21	10S	60S
PBW 34	40	60	5.6	4.0	5.0	7.2	33	0	0

T = Traces; TS = Traces susceptible.
FHS = Fusarium head scab
Yr = yellow rust
Br = Brown rust

blight pathogens and can be utilized for improving resistance to foliar blights in breadweaht. However, the results clearly indicate that the level of resistance

to foliar blights (*H. sativum* and *A. triticina*) is very low in wheat and there is a need to search for resistance in related species of wheat such as *Aegilops* and wild *Triticum* species for enhancing genetic protection in wheat to foliar blights.

REFERENCES

Saari, E.E. and J.M. Prescott. 1975. A scale for appraising the foliar intensity of wheat diseases. *Plant Dis. Rep.* **59**: 377-380.

Singh, Param jit, H.S. Dhaliwal, S.S. Bains and S.S Aujla. 1991. Wheat foliar blight pathogens: Potential impact on yield sources of resistance and chemical control. Paper presented in *Helminthosporium* leaf Blight (HLB) Workshop held at CIMMYT, Regional Office, Kathmandu (Nepal), December 2-3 1991.