

Screening Wheat Cultivars and Genotypes for Resistance to Head Scab

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Abstract

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Nineteen cultivars and 21 genotypes of wheat were evaluated for their reaction to head scab (*Fusarium graminearum*), grain formation and seed infection. Five cultivars (Innia 66, Pavan, Kalyansona, Barkat and Kari) and five genotypes (BKT/Bulbul, KRL-1-4, NK 5, O 4 and TP 2) were free from head scab, but the rest were highly susceptible. Head scab reduced grain weight up to 26.19% and a positive correlation was recorded between ear infection and loss in 1000-grain weight. Seeds from diseased and healthy ears yielded *F. graminearum*, while maximum seed-borne infection of 32% was recorded in KAV 2 with 63.5% head infection.

Key words: Fusarium, grain formation, head scab, seed health, wheat.

Introduction

Wheat (*Triticum aestivum* L.) is one of the most important grain crops as a source of human food, worldwide Fusarium head blight (FHB) of wheat (scab) is an important fungal disease in many areas of the world (8, 11). The disease was first reported in Bangladesh in 1976 (1), but no routine study on it has been carried out. The present research programme was undertaken to determine the effect of head scab on grain formation in wheat cultivars and genotypes under field conditions and investigate the relationship between head and seed infection.

Materials and Methods

The field experiment was conducted during 1996-97 in 2 m x 1.5 m plots following a randomized completely block design (RCBD) with three replications, 19 cultivars and 21 genotypes of bread wheat (*Triticum aestivum* L.) (Table 1). Seeds from Genetics and Plant Breeding Department of BAU were sown at 120 kg ha⁻¹ and fertilized at 200 kg Urea, 200 kg Triple super phosphate, 80 kg Muriate of potash and 20 t cowdung ha⁻¹. Scab intensities were recorded at ripening stage following 0-5 scale of Brahma (3). At full ripening stage, 20 scab showing and healthy looking ears were harvested separately and weight of 1000-grain of healthy and scab showing ear were taken. Four hundred seeds of each sample were assayed following Standard Blotter Method (7). Identification of *Fusarium graminearum* was done following the keys of Booth (2).

Results and Discussion

Five cultivars and five genotypes were found free from scab. The variation of the disease reaction among the

materials tested may be due to variation in genetic constitution. Temperature, rainfall and relative humidity range during flowering to maturity under the present study were 13.76 to 31.35°C, 12.0 to 32.7 mm. and 69.57 to 75.13%, respectively. Liu (8) reported that temperature of 10 to 28°C is required for infection, but Tomasovic *et al.* (9) observed that the occurrence of *Fusarium* spp. is favoured by high temperature (25-30°C) and high relative humidity (above 85%). Brahma (3) recorded upto 100% infection with the grade immune to highly susceptible and found Sonalika as moderately and kalyansona as highly susceptible. In the present study, kalyansona along with other four cultivars (Innia 66, Pavan, Barkat and Kari) and five genotypes (BKT/Bulbul, KRL-1-4, NK 5, O 4 and TP 2) were graded as immune.

Scab showing ears had a 1000-grain weight loss of 3.61 to 26.19%. Positive correlation was found between ear infection and loss of 1000-grain weight ($r=0.531^{**}$ and 0.590^{**} for cultivar and genotypes, respectively). Wong *et al.* (10) and Gilbert *et al.* (5) reported 34% loss in 1000-grain weight, but Hutcheon and Jordan (6) reported 5-19% loss.

The seeds from diseased ears yielded 2 to 32% infection with *F. graminearum*, while 12% seeds from healthy ears were infected with *F. graminearum*. Maximum seed-borne infection was recorded in KAV 2 (32%). Burgess *et al.* (4) observed 38.2% seeds infected with *F. graminearum*. The present study is the first in Bangladesh and its findings are very useful to wheat researchers in the country. Moreover, impact of head scab on grain formation and wheat seed infection was clearly demonstrated.

المخلص

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تم تقويم 19 صنفاً و 21 أصلاً وراثياً من القمح لمرض الجرب الذي يحدثه الفطر *Fusarium graminearum*، وتشكل الحبوب وإصابتها. وتبين أن خمسة أصناف (Innia 66، Pavan، Kalyansona، Barkat و Kari) وخمسة أصول وراثية (BKT/Bulbul، KRL-1-4، NK 5، O4 و TP2) كانت خالية من الإصابة بالجرب، في حين كانت الأصناف والأصول الأخرى عالية الحساسية للإصابة. وأدت الإصابة بالجرب إلى خفض الوزن الحبي حتى 26.19%، ووجدت علاقة ارتباط إيجابية ما بين إصابة السنابل وفقد في وزن الألف حبة. وأمكن عزل الفطر *F. graminearum* من حبوب مصابة و سنابل سليمة، ووصلت إصابة الحبوب ذروتها (32%) في KAV2 مع إصابة 63.5% من مساحة السنبل.

كلمات مفتاحية: فيوزاريوم، تشكل الحبوب، جرب السنابل، صحة البذور، القمح.

Table 1. Occurrence of head scab and its effect on grain formation and seed infection of wheat

Cultivars/ genotype	Disease reaction	1000-grain weight (g)		Loss in 1000 grain weight (%)	<i>Fusarium graminearum</i> infected seeds (%)	
		Healthy ear	Diseased ear		Healthy ear	Diseased ear
Cultivars						
Sonalika	HS	46.14	44.21	4.18	6.00	20.00
Aghrani	HS	50.04	44.09	18.65	5.00	8.00
Innia 66	I	42.59	–	–	9.00	27.00
Pavan	I	36.12	–	–	6.00	–
Kalyansona	I	38.87	–	–	3.00	–
Barkat	I	44.77	–	–	3.00	–
Sawghat	HS	50.76	43.39	14.52	9.00	29.00
Akbar	HS	47.72	35.22	26.19	5.00	2.00
Protiva	HS	51.36	48.87	4.85	5.00	8.25
Kanchan	HS	51.62	49.53	4.05	4.25	17.00
Kari	HS	43.32	–	–	4.00	–
Sebia	HS	46.51	42.94	7.68	5.00	18.75
Anza	HS	37.11	33.53	9.65	8.00	27.00
Bulbul	HS	42.53	32.89	22.67	5.00	26.00
Peacock	HS	53.57	45.84	14.43	2.75	4.25
Opata	HS	39.27	35.97	8.40	4.00	4.00
Rawati 87	HS	50.39	48.57	3.61	8.00	18.00
Wuhan	HS	48.81	41.73	14.51	2.00	4.00
Seri 82	HS	40.21	33.92	15.64	9.00	13.00
LSD(p=0.01)		11.78	8.21	11.27	1.16	2.26
Genotypes						
BKT/Bulbul	I	43.52	–	–	4.50	–
BL 1020	HS	50.43	48.50	3.82	6.00	11.00
BL 1022	HS	51.33	48.73	5.65	3.50	6.00
D 141	HS	38.19	33.56	12.12	8.00	25.25
DSN 29	HS	48.14	41.87	13.02	12.00	15.25
DSN 33	HS	44.53	41.73	6.29	5.00	29.00
DSN 73	HS	38.98	35.11	9.93	11.00	26.75
DSN 113	HS	43.23	39.94	7.61	3.25	5.00
HT 7	HS	34.20	30.69	10.26	5.25	8.75
KAV 2	HS	37.79	32.63	13.65	7.00	32.00
KRL-1-4	I	53.61	–	–	2.00	–
NC 3	HS	41.77	38.32	8.26	9.00	16.00
King 8317	HS	53.40	49.85	6.64	6.00	6.00
NK 5	I	42.86	–	–	3.00	–
O 4	I	43.69	–	–	3.50	–
PF 70334	HS	39.22	36.05	8.08	2.25	4.50
SA 2	HS	42.85	39.01	8.96	11.00	26.00
SA 92	HS	44.64	39.03	12.57	5.00	13.50
SA 93	HS	47.79	44.01	7.91	10.00	19.75
SA 008	HS	43.63	40.58	6.99	2.50	4.00
TP 2	I	44.72	–	–	3.50	–
LSD (p=0.01)		5.10	4.83	7.91	2.32	1.80

I = Immune, HS = Highly susceptible and – = scab showing ear not found

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