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Effect of temperature and relative humidity on the development of Spot Blotch of wheat caused by *Bipolaris sorokiniana* (Sacc.) Shoem

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The spot blotch disease is one of the most destructive foliar diseases of wheat (*Triticum aestivum* L) worldwide because it can cause marked reduction in grain yield and quality of crop. The experiment was conducted for two consecutive years during *rabi* season of 2008-09 and 2009-10 at Regional Agricultural Research Station, Rajouri (J&K). Ninteen varieties viz. VL-804, VL-738, HS-565, HPW-276, HP-1633, PBH-317, VL-900, HPB-266, HS-295, UP-2694, VL-738, HD-2937, VL-895, UP-2330, WH-2008, DL-7843, PRW-317, PBW-313 and HPW-266 were sown on two different dates at 25 days intervals(20th October and 15th November) with three replications having a plot size of 1x1m using split plot design. The meteorological observations were recorded from sowing to maturity from agro-meteorological observatory at Regional Agricultural Research Station, Rojouri. There was significant difference in varieties and dates of sowing, earlier sown crop (20th Oct.) recorded lower mean disease incidence (15.34%) along with mean grain yield 20.27 q/ha of all cultivars while, crop sown on 25th November had higher disease incidence (48.28%) along with grain yield of 17.24 q/ha. Among all cultivars VL-738 was found resistant than other cultivars recorded least disease incidence in both dates of sowing along with highest grain yield (mean disease incidence 8.57% and mean grain yield 28.17q/ha mean of both dates). However, cultivar WH-2008 was found highly susceptible than other cultivars recorded highest mean disease incidence (54.61%) along with lowest mean grain yield (14.09 q/ha). The disease incidence was higher in year 2008-09 (20th Oct. 16.41% along with 19.34 q/ha grain yield and 25th Nov. 49.64 % along with 16.54 q/ha yield) in comparison to year 2009-10 (20th Oct. 14.26% along with 11.2 q/ha grain yield and 25th Nov. 46.92 % along with 17.94 q/ha yield). It was found that, if the temperature and relative humidity were increased there was a corresponding increase in disease development.

Key words : Spot blotch, grain yield, temperature, Relative humidity, disease incidence

INTRODUCTION

Wheat (*Triticum aestivum* L) is the major and important crop after rice, solely providing food security of India. But the production and productivity of wheat in India are remained stagnant for last few decades which have been attributed partially due to number of diseases. Spot blotch is one of them caused by *Bipolaris sorokiniana*(Sacc.) Shoem, in major growing regions causing grain yield losses up to 50%. In susceptible varieties under hot and humid conditions in India (Singh *et al.*, 1998, Singh et al., 2001 and Singh *et al.*, 2002). In north eastern and north western plains of India the yield losses range from 27%-56.6% during 1998-1999 (Singh *et al.*, 2002), 15% was observed on several farms in Bangladesh (Alam *et al.*, 1994). In addition, it has expanded its area of colonization with the worming of temperature in the temperate areas too (Kaur and Nanda 2001). The losses in popular varieties as PBW 343, PBW 373, RAJ 3765, UP 2425, K 9107, NW 1014, MACS 2846 and NIAW 34 may vary from 2-39% in different agroclimatic zones in India (Singh *et al.*, 2004). Thus surveys indicate that spot blotch become serious disease constraints for wheat cropping in several parts of the world, including eastern India, Bangladesh, Tarai of Nepal, Brazil (Van Ginkel and Rajaram 1998).

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Plants vigour considerably is reduced 10 to 30% due to spot blotch disease (Agrios 2006). The spot blotch disease is one of the most destructive foliar diseases of wheat (*Triticum eastivum* L) worldwide because it can cause marked reduction in grain yield and quality of crop. Saari (1998) has observed that the most widely applied rice-wheat cropping system provided a favourable environment for the survival and multiplication of foliar blight pathogens because rice serves as a host species for the spot blotch and tan spot fungi and rice stubble also may play a role as a substrate for the fungi after rice harvest (Misra, 1973). Crop growth stages and weather, in particular high temperatures and humidity favouring long period in disease development. Such information would be essential to making crop management recommendations that would effectively control spot blotch epidemics in the rice-wheat cropping system in India.

MATERIALS AND METHODS

The experiment was conducted for two consecutive years during *rabi* season of 2008-09 and 2009-10 at Regional Agricultural Research Station, Rajouri (J&K). Ninteen varieties viz. VL-804, VL-738, HS-565, HPW-276, HP-1633, PBH-317, VL-900, HPB-266, HS-295, UP-2694, VL-738, HD-2937, VL-895, UP-2330, WH-2008, DL-7843, PRW-317, PBW-313 and HPW-266 were sown on two different dates at 25 days intervals(20 October and 15 November) with three replications having a plot size of 1x1m using split plot design. Above all cultivars were collected from Directorate of Wheat Research (Regional Station Flowerdale) Shimla 171002. All agronomic practices were given as per package and practices schedule. The disease intensity was recorded on the leaves of randomly selected 10 plants per plot at maturity. The per cent disease incidence was calculated 0-9 scale on flag (F) and one leaf below flag leaf (F-1) developed by Singh and Kumar (2005). The different scores denote the per cent diseased area of leaf as indicated below-0=No disease, 1=1-10%, 2=11-20%, 3=21-30%, 4=31-40%, 5=41-50%, 6=51-60%, 7=61-70%, 8=71-80%, 9=>81% blighted leaf area. Grain yield data of each plot in every replication were recorded and data were analyzed as per suggestion given by Panse and Sukhatme (1989). The meteorological observations recorded from sowing to maturity from agro-meteorological observatory at Regional Agricultural Research Station, Rojouri.

RESULTS AND DISCUSSION

Results indicated from Table 1. that there was significant differences in varieties and dates of sowing. Earlier sown crop (20th Oct.) recorded lower mean disease incidence (15.34%) along with mean grain yield 20.27 q/ha of all cultivars while, crop sown on 25th November had higher disease incidence (48.28%) along with grain yield of 17.24 q/ha. Among all cultivars VL-738 was found resistant than other cultivars and recorded least disease incidence in both dates of sowing along with highest grain yield (mean disease incidence 8.57% and mean grain yield 28.17q/ha). Followed by VL-895(mean disease incidence 15.64% and mean grain yield 23.84 q/ha), while, cultivar WH-2008 was found highly susceptible than other cultivars and recorded highest mean disease incidence (54.61%) along with lowest mean grain yield (14.09 q/ha). However, crop sown on 20th October was less suffered as compare to crop sown on 25th November. The present findings are in accordance with work of Biswas and Srivastava (2010), in the present study disease incidence and grain yield have negative correlation, similar finding observed by Goel (2007).

Table 1 : Pooled data of spot blotch incidence and grain yield(q/ha) of nineteen varieties of wheat on two dates of sowing

Varieties	20th October		15 November		Mean	
	DI (%)	Yield (q/ha)	DI (%)	Yield (q/ha)	DI (%)	Yield (q/ha)
VL-804	13.74	24.13	43.28	18.23	28.51	21.18
VL-738	16.81	21.21	46.64	17.62	31.72	19.42
HS-565	25.04	17.42	56.85	15.30	40.94	16.36
HPW-276	9.31	19.75	36.80	18.43	23.05	19.09
HP-1633	7.79	23.75	31.56	20.73	19.67	22.24
PBH-317	20.63	18.28	67.29	13.39	43.96	15.84
VL-900	15.20	19.52	46.41	16.86	30.81	18.19
HPB-266	16.46	18.93	43.19	14.96	29.82	16.95
HS-295	20.12	15.89	65.27	14.70	42.69	15.29
UP-2694	20.84	16.72	69.65	14.27	45.24	15.50
VL-738	0.00	29.89	17.14	26.45	8.57	28.17
HD-2937	17.37	19.23	63.98	14.94	40.67	17.08
VL-895	10.35	24.91	20.57	22.78	15.46	23.84
UP-2330	8.88	24.28	33.64	20.42	21.26	22.35
WH-2008	33.42	15.51	75.81	12.66	54.61	14.09
DL-7843	22.81	17.55	67.94	14.68	45.37	16.11
PRW-317	7.48	20.33	33.55	18.08	20.51	19.20
PBW-313	11.23	20.61	33.56	17.93	22.39	19.27
HPW-266	13.98	17.25	64.23	15.21	39.10	16.23
Mean	15.34	20.27	48.28	17.24		

CD at 5% Disease incidence = Date of sowing = 0.73, Varieties - 1.37, Date * Varieties - 4.29
Grain yield = Date of sowing - 0.93, Varieties - 1.27, Date* Varieties - 3.89

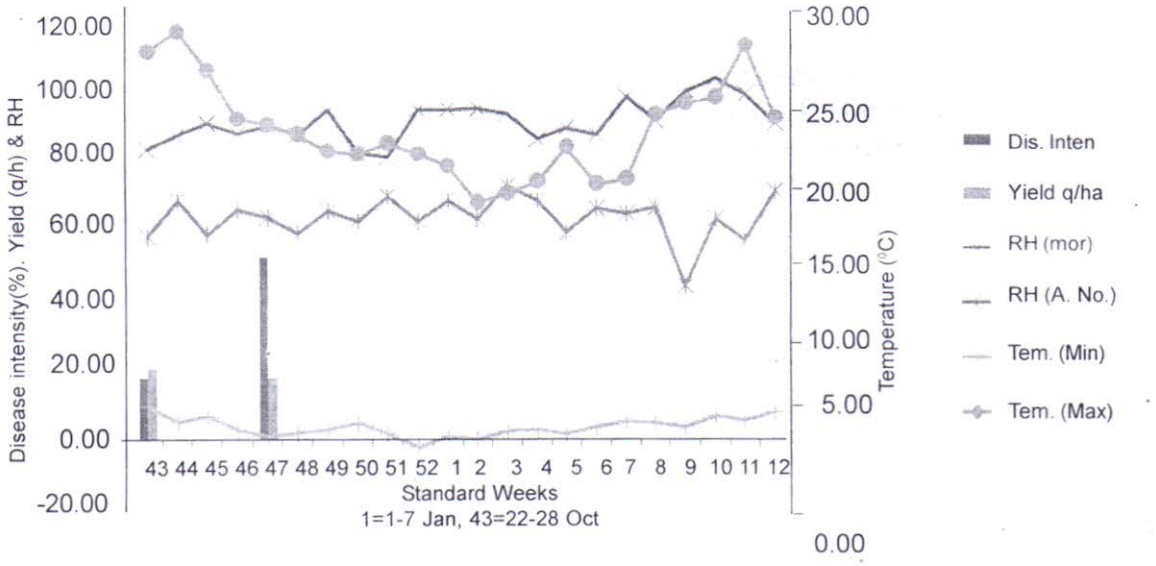

Fig.1: Effect of temperature and relative humidity on spot blotch disease intensity and grain yield during year 2008-09

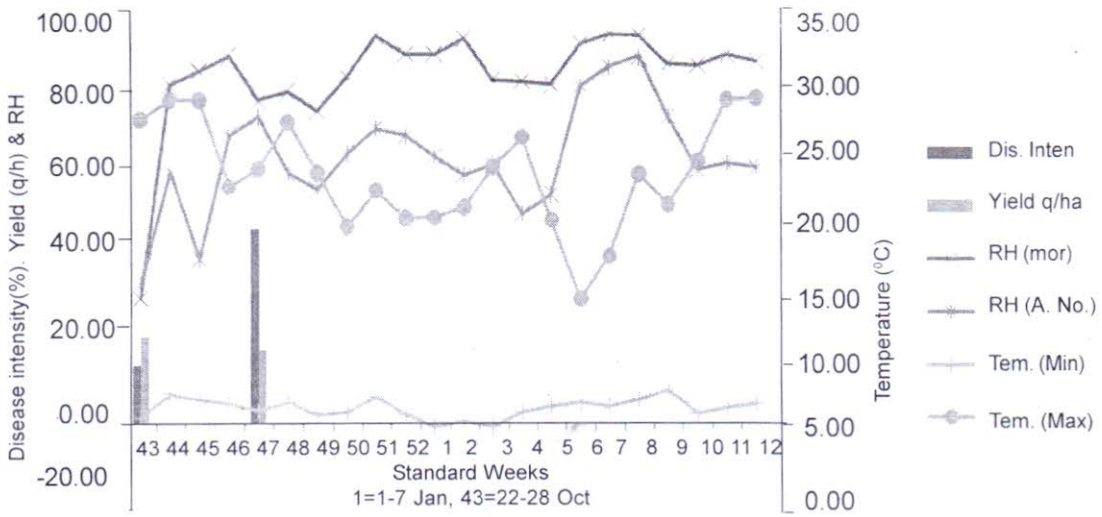

Fig.2: Effect of temperature and relative humidity on spot blotch disease intensity and grain yield during year 2009-10

Results revealed from meteorological data (Fig.1) that temperature was maximum ranging from 18.21-30.57 °C and minimum -2.36 – 8.79 °C and relative humidity 82.86 – 100% during the year 2008-09 which was higher than year 2009-10 (Fig. 2). The maximum temperature was 14.57 -28.57 °C and minimum 0.79 – 8.21 °C and relative humidity was 75.29 -93.71 %. The disease incidence was higher in year 2008-09 (20th Oct. 16.41% along with 19.34 q/ha grain yield and 25th Nov. 49.64 % along with 16.54 q/ha yield) in comparison to year 2009-10 (20th Oct. 14.26% along with 11.2 q/ha grain yield and 25th Nov. 46.92 % along with 17.94 q/ha yield) It was clear that, if the temperature and relative humidity were increased there was a corresponding increase in disease development. Singh and Singh (2006) reported that the late sown wheat kept the spot blotch intensity lowest and grain yield highest, under rice – wheat system, in sub tropical condition even under disease favouring environment. Singh and Chand (1985) found that in Haryana state with peak damage by the end of February to March,

when average maximum and minimum temperatures were 20.2°C and 9 °C and relative humidity was 95-59% morning /evening. Prasad and Singh (2001) observed that average minimum (5-7 °C), maximum (20-21 °C) temperature and high relative humidity (68-78%) were suitable for appearance of the net blotch disease. Biswas *et al.* (2011) found that higher morning relative humidity (>90%) as well as evening relative humidity (>70%) for most of the season facilited in spreading the disease. Malik *et al.* (2010). found that 25 °C temperature and 90% relative humidity was favourable for both, infection and disease development of spot blotch of wheat.

Present findings indicate that wheat crop should be shown in the month of late October to avoid the losses from spot blotch and increase grain yield.

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