Biological Forum – An International Journal **13(4): 596-600(2021)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Impact of Climate on Spot blotch of Wheat caused by *Bipolaris sorokiniana* (Sacc.) Shoemaker in Eastern Uttar Pradesh

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(Received 03 September 2021, Accepted 05 November, 2021)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: A Survey was being conducted in ten districts of Uttar Pradesh namely Ghazipur, Balia, Mirzapur, Mau, Azamgargh, Jaunpur, Varanasi, Gorakhpur, Deveria and Basti which were carried out during *Rabi* 2018-2019 and 2019-2020 to know the incidence and severity of foliar blight especially spot blotch disease of wheat caused by *Bipolaris sorokiniana*. Survey work was done in first and third week of March during both the years. As it is well known that the month of March is suitable period for survey work because during this month humidity and temperature favors the foliar blight incidence. The highest incidence of foliar blight was noted in district Gazipur (75.52 per cent) followed by Balia (73.65 per cent), Mirzapur (72.67 per cent), Mau (68.23 per cent), Azamgarh (60.38 per cent), Jaunpur (59.60 per cent), Vanarasi (58.18 per cent), Gorakhpur (57.87 per cent), Deveria (56.74 per cent) and Basti (56.55 per cent) respectively during first year (2018-19) of study. Lowest incidence was recorded (56.55 per cent) Basti district. Thus, district Gazipur became the hot spot for foliar blight. Similar trend was noted during both the years of study. During survey Sonalika variety was found more susceptible than rest varieties. While, variety HD-2967 was least susceptible to spot blight disease of wheat.

Keywords: Incidence, Foliar, Blotch, Survey, Severity and Susceptible.

INTRODUCTION

Wheat is known to be infected with various diseases such as, rusts (brown rust, black rust and yellow rust), loose smut, Karnal bunt, and spot blotch, which ultimately cause substantial reduction in yield as well as deterioration in quality of wheat grains. In this context the important concern would be to manage the spot blotch disease of wheat, which is a major yield limiting factor. Among all the diseases, spot blotch of wheat is considered as one of the most important disease in environments which are characterized by high temperature (coolest month greater than 17°C) and high humidity. Globally, an estimated 25 million hectares of wheat cultivated land is affected by spot blotch disease (van Ginkel and Rajaram, 1998). Due to drastic changes in climatic conditions in the last two or three decades, spot blotch has emerged as a major threat to wheat production in India. Spot blotch is affecting nearly 9 mha of the warm North-Eastern Plain Zone where millions of resource-poor farmers grow wheat after rice (Joshi *et al.,* 2004).

The disease is gradually extending towards the North-West, the major wheat growing areas in the country (Chand *et al.,* 2003). Spot blotch disease of wheat caused by *B. sorokiniana*, a hemibiotrophic, phytopathogenic fungus, prevalent in warmer and humid wheat growing regions of the world (Joshi *et al.,* 2007). *B. sorokiniana* severe infection may also reach the spikes, resulting in low weight shrivelled grains (Kiesling, 1985) with black point at the embryo end of kernels (Chand and Joshi, 2004). The symptoms of spot blotch appear as small, light brown lesions which are scattered throughout the leaves and consequently increase in size with stage advancement. Later, these lesions coalesce and change to large spots (oval to oblong and measuring 0.5 to 10 mm long and 3 to 5 mm wide) After a Week of Infections (Chand *et al.,* 2002).

MATERIALS AND METHODS

A survey of 10 districts of Eastern Uttar Pradesh *viz.* Ghazipur, Balia, Mirzapur, Mau, Azamgargh, Jaunpur, Varanasi, Gorakhpur, Deveria and Basti was carried out to record the incidence of different fungal foliar disease of wheat at flowering stage of the crop. In each district, 5 spots by road side, were selected for sampling. At each location 5-unit area each measuring one square meter, were plotted and plant population in each unit area, counted to find out the number of plants showing specific disease symptoms. The disease incidence was calculated using the following formula:

Disease incidence =

$$\frac{\text{Number of plants showing a specific disease per unit area}}{\text{Total number of plants in the unit area}} \times 100$$

Summary and Conclusion. Survey of ten districts Jaunpur, Varanasi, Gorakhpur, Deveria and Basti were carried out during *Rabi* 2018-2019 and 2019-2020 to know the incidence and severity of foliar blight especially spot blotch disease of wheat caused by *Bipolaris sorokiniana*. Survey work was carried out in first and third week of March during both the years. As it is well known that the month of March is suitable period for survey work because during this month humidity and temperature favours the foliar blight incidence. This time mostly crop attend soft dough stage (Zadoks scale 85) (Zadoks *et al*., 1974). It is evident from summary of data presented in Table 1 that the highest incidence of foliar blight was noted in district Gazipur (75.52 per cent) followed by Balia (73.65 per cent), Mirzapur (72.67 per cent), Mau (68.23 per cent), Azamgarh (60.38 per cent), Jaunpur (59.60 per cent), Vanarasi (58.18 per cent), Gorakhpur (57.87 per cent), Deveria (56.74 per cent) and Basti (56.55 per cent) respectively during first year (2018-19) of study. Lowest incidence was recorded (56.55 per cent) Basti district. Thus, district Gazipur became the hot spot for foliar blight in this year. During 2019-20 survey and surveillance work were also carried out by adopting same route and same pattern. It has been observed that during this year also, the highest incidence of foliar blight was recorded with district Gazipur (75.24 per cent) followed by Balia (73.00 per cent), Mirzapur (72.57 per cent), Mau (67.14 per cent), Azamgarh (63.97 per cent), Jaunpur (58.63 per cent) and Vanarasi (58.03 per cent) respectively. However, lowest incidence was recorded with district Basti (56.12 per cent) followed by Deveria (57.20 per cent) and Gorakhpur (57.91 per cent) respectively.

During study, variety HD2967, PBW343, UP-2338, PBW373, PBW443, NW 102, NW1014, NW2036, NW1067, DBW17, NW5054, RAJ4120, RR-21, Sonalika, UP262, HUW234, HP1731, DBW14, HD2888, HD2643 and some varieties from private agency such as SHRI RAM, GOAL (Mahyco seed company) were found which were commonly cultivated in different districts. Highest severity (91) was recorded in variety Sonalika which was cultivated in some farmer fields of district Balia and Mau, Variety HD 2967 was in variably cultivated in almost all the districts and lowest severity (14-25) was recorded with variety. Variety PBW343 was still cultivated in all the districts but their area of cultivation was not so much. Severity of PBW343 was 48 to 80. Variety DBW262, RR-21, DBW252 and PBW 154 were having the score of foliar blight.

During survey of severity of foliar blight in all location of different districts were recorded during year 2018-19. In district Ghazipur highest and lowest severity was recorded in variety Sonalika (81 per cent) and HD 2967 (25 per cent) during 2018-19. In district Baliya highest severity was recorded on PBW154 (58 %) and lowest HD2967 (14%) respectively. In Mirzapur severity of namely Ghazipur, Balia, Mirzapur, Mau, Azamgargh, foliar blight was ranged between (26 %to 80% in variety HD 2967and RR-21 during 2018-19. Highest severity was recorded with Sonalika (91 %) and lowest severity was recorded in variety HD2967 (14%) during first year in district Mau. More or less similar trends were observed in rest districts during the survey work such as Azamgarh, Jaunpur, Varanasi, Gorakhpur, Deveria and Basti where severity of foliar blight were ranged from 14 (HD2967) to 80(PBW154). All the ten districts were surveyed for foliar blight incidence and severity during 2019-20. Twenty-five spots were observed in each district for recording the severity in double digit scale given by Kumar *et al.,* (1998).

Within Ghazipur district among 25 spots, highest score (91) was observed in variety Sonalika, where lowest severity (15) was recorded with variety HD2967. In Balia district highest severity (71) was recorded with variety PBW154 whereas lowest severity (14) was recorded with HD2967. In Mirzapur highest severity of 91% was recorded with variety RR-21 and lowest severity (15) was recorded with variety HD2967.

Therefore, it was revealed from Table 2 that among all the ten-district survey during 2019-2020 the severity was ranged 14 to 91. It was observed that during 2019-20 foliar blight severity was more than year 2018-2019. It is clear from Table 1 and 2. Spot blotch caused by *B. sorokiniana* and is an important disease of wheat gaining much importance in other parts of the country such as Karnataka because of the occurrence of severe outbreak every year. Singh *et al.,* (2018) surveyed different locations of Jammu sub-tropics during 2015 cropping season. They observed this disease during survey among all the wheat growing area of Jammu sub- tropics with the maximum AIDX (Area infection disease index) observed in Kathua district with the range of 29.55 to 48.15 followed by Samba district ranging from 29.28 to 46.29 per cent. However minimum disease was observed in Jammu district *i.e.,* 30.06 to 45.82 per cent. Singh *et al*., (2012a) surveyed five districts western of Uttar Pradesh *viz*. Agra, Mathura, Firozabad, Mainpuri, and Etah of Agra region revealed that *Helminthosporium sativum* (*Syn. B. sorokiniana*) is most predominant pathogen of wheat followed by *A. triticina* in this region. However, *A. triticina* is less significant. The average incidence of *B. sorokiniana* and *A. triticina* at maturity of crop was 62 per cent and 43 per cent respectively but *Alternaria alternata* showed average incidence of 14.4 per cent in the month of April. Thus, it is very clear that the foliar blight disease is proving a devastating disease in Uttar Pradesh and it is spreading in other part of the country such as Jammu & Kashmir and Karnataka. Earlier it was assumed that foliar blight complex is a disease of warmer areas but on the basis of study of Singh *et al*., (2012b) we can say that it is not only confined to warmer but cooler areas like Jammu is also affected.

Table 1: Per cent disease severity of foliar blight (Spot blotch) among ten different districts of Eastern Uttar Pradesh during 2018-19 and 2019-20.

Sr. No.	District	Spot	Units $1m^2$/spot	Total number of plants		Identified spot blotch plants		Per cent disease incidence of spot blotch	
				2018-19	2019-20	2018-19	2019-20	2018-19	2019-20
1.	Ghazipur	1	5	270	275	205	206	75.93	74.91
		2	5	250	255	188	191	75.20	74.90
		3	5	260	262	198	197	76.15	75.19
		4	5	165	266	125	201	75.76	75.56
		5	5	240	242	179	183	74.58	75.62
		Total	25	**1185**	**1300**	**895**	**978**	**377.62**	**376.19**
		Mean	-	237.00	260.00	179.00	195.60	75.52	75.24
2.	Balia	1	5	250	256	183	186	73.20	72.66
		2	5	282	255	209	186	74.11	72.94
		3	5	235	261	174	192	74.04	73.56
		4	5	266	248	195	181	73.31	72.98
		5	5	261	232	192	169	73.56	72.84
		Total	25	**1294**	**1252**	**953**	**914**	**368.23**	**364.99**
		Mean	-	258.80	250.40	190.60	182.80	73.65	73.00
3.	**Mirzapur**	1	5	235	270	168	197	71.49	72.96
		2	5	261	255	193	183	73.95	71.76
		3	5	272	260	199	192	73.16	73.85
		4	5	245	248	177	178	72.24	71.77
		5	5	262	240	190	174	72.52	72.50
		Total	25	**1275**	**1273**	**927**	**924**	**363.36**	**362.85**
		Mean	-	255.00	254.60	185.40	184.80	72.67	72.57
4.	Mau	1	5	235	255	160	170	68.09	66.67
		2	5	256	245	176	165	68.75	67.35
		3	5	263	258	181	174	68.82	67.44
		4	5	246	252	166	171	67.48	67.86
		5	5	275	235	187	156	68.00	66.38
		Total	25	**1275**	**1245**	**870**	**836**	**341.14**	**335.70**
		Mean	-	255.00	249.00	174.00	167.20	68.23	67.14
5.	**Azamgargh**	1	5	229	240	148	156	64.63	65.00
		2	5	270	238	176	149	65.19	62.61
		3	5	256	275	165	175	64.45	63.64
		4	5	245	245	161	158	65.71	64.49
		5	5	268	248	171	159	63.81	64.11
		Total	25	**1268**	**1246**	**821**	**797**	**323.79**	**319.84**
		Mean	-	253.60	249.20	164.20	159.40	64.76	63.97
6.	Jaunpur	1	5	260	251	157	145	60.38	57.77
		2	5	254	235	152	140	59.84	59.57
		3	5	244	271	145	160	59.43	59.04
		4	5	242	254	142	148	58.68	58.27
		5	5	258	265	154	155	59.69	58.49
		Total	25	**1258**	**1276**	**750**	**748**	**298.02**	**293.14**
		Mean	-	251.60	255.20	150.00	149.60	59.60	58.63
7.	Varanasi	1	5	253	236	146	135	57.71	57.20
		2	5	245	252	143	146	58.37	57.94
		3	5	270	284	156	165	57.78	58.10
		4	5	261	243	152	143	58.24	58.85
		5	5	233	255	137	148	58.80	58.04
		Total	25	**1262**	**1270**	**734**	**737**	**290.89**	**290.13**
		Mean	-	252.40	254.00	146.80	147.40	58.18	58.03
8.	Gorakhpur	1	5	257	260	147	149	57.20	57.31
		2	5	235	276	139	161	59.15	58.33
		3	5	285	257	164	151	57.54	58.75
		4	5	245	238	141	136	57.55	57.14
		5	5	266	250	154	145	57.89	58.00
		Total	25	**1288**	**1281**	**745**	**742**	**289.34**	**289.54**
		Mean	-	257.60	256.20	149.00	148.40	57.87	57.91
9.	**Deveria**	1	5	271	256	154	146	56.83	57.03
		2	5	248	252	141	147	56.85	58.33
		3	5	264	259	150	149	56.82	57.53
		4	5	241	254	136	144	56.43	56.69
		5	5	236	241	134	136	56.78	56.43
		Total	25	**1260**	**1262**	**715**	**722**	**283.71**	**286.02**
		Mean	-	252.00	252.40	143.00	144.40	56.74	57.20
10.	Basti	1	5	252	277	141	158	55.95	57.04
		2	5	242	238	137	133	56.61	55.88
		3	5	266	238	150	132	56.39	55.46
		4	5	275	264	152	147	55.27	55.68
		5	5	229	237	134	134	58.52	56.54
		Total	25	**1264**	**1254**	**714**	**704**	**282.74**	**280.61**
		Mean	-	252.80	250.80	142.80	140.80	56.55	56.12

Table 2: Severity of foliar blight (Spot blotch) among ten different districts of Eastern Uttar Pradesh during 2018-19 and 2019-20.

Sr. No.	Name of District	Name of Variety	Severity	Name of Variety	Severity
1.	Ghazipur	HD2969	25	PBW343	70
		Sonalika	81	HD2967	15
		DBW17	47	UP-2338	38
		PBW343	48	DBW187	27
		UP-2338	37	DBW-17	48
		DBW187	26	Sonalika	91
2.	Balia	HD2967	14	NW5054	49
		NW5054	48	HD2967	14
		PBW154	60	PBW154	71
		PBW550	58	UP-2338	48
		UP-2338	47	HD3086	47
		HD3086	48	PBW550	59
3.	**Mirzapur**	PBW343	59	HD2967	15
		HD2967	26	PBW343	70
		PBW343	60	DBW-17	47
		DBW-17	48	UP-2338	38
		UP-2338	37	RR-21	91
		RR-21	80	PWB550	58
4.	Mau	HD2967	14	HD2733	39
		HD2733	38	HD2967	25
		PBW154	58	HUW234	81
		HUW234	80	Sonalika	91
		Sonalika	91	PBW154	59
		PBW550	47	PBW550	48
5.	Azamgarh	HD2967	15	PBW343	80
		PBW343	49	HD2967	14
		DBW187	47	DBW107	48
		DBW107	58	DBW187	59
		NW1012	47	NW1012	48
		DBW-17	47	PBW343	50
6.	Jaunpur	NW1014	58	PBW154	70
		PBW-154	69	NW1014	58
		K-1317	58	HD2967	16
		HD2967	25	DBW-17	48
		UP-2338	48	UP-2338	47
		DBW-17	47	K-1317	59
7.	Varanasi	WB-2	38	DBW252	48
		DBW252	47	WB-2	39
		HD3086	48	HD3086	47
		UP-2338	47	HD2967	14
		HD2967	14	DBW187	26
		DBW187	25	UP-2338	48
8.	Gorakhpur	HD2967	25	DBW107	27
		DBW107	26	HD2967	26
		PBW154	48	NW5054	28
		NW5054	26	PBW373	70
		DBW252	58	DBW252	60
		PBW373	69	DBW-17	48
9.	**Deoria**	NW2036	38	UP-2338	70
		DBW-17	47	DBW-17	48
		UP-2338	58	NW2036	39
		HD3086	48	HD2086	47
		HD2967	25	HD2967	14
		DBW252	58	DBW252	59
10.	Basti	HD2967	26	NW5054	37
		NW5054	38	HD2967	25
		HD3086	47	DBW-17	59
		DBW-17	58	UP-2338	48
		NW1076	47	NW2036	50
		UP-2338	48	NW1076	48

CONCLUSION

Plant growth characters like plant height, number of tillers, car length. were higher in compared to late sown. Among all the variety HD2967 found best with maximum Plant height, no. of tillers, car length in timely sown 25 November and Plant (tillers), ear length. It may be concluded from the current investigation that wheat variety HD2329 is best recommended against foliar blight and good yield production.

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How to cite this article: Singh, D.K. and Singh, S.N. (2021). Impact of Climate on Spot blotch of Wheat caused by *Bipolaris sorokiniana* (Sacc.) Shoemaker in Eastern Uttar Pradesh. *Biological Forum – An International Journal*, *13*(4): 596-600.