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Incidence of spot blotch of wheat in Eastern Uttar Pradesh

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Abstract

Bipolaris sorokiniana was mainly responsible for causing spot blotch of wheat in Eastern Uttar Pradesh. The disease appeared 5 to 8 weeks after wheat sowing and the symptoms advanced after heading stage and spreaded very fast. The dark brown necrotic spots (boat shaped) occurred on the leaves, crowns and stems with or without yellow halo around these. Lesions on the leaves in the beginning were few mm in size and extended as elongated dark brown spots and later on coalesced resulting into blight. In severe cases, at flowering stage 60 to 80 per cent leaf areas was turned into necrotic lesions. Intensity of spotting increased with the increase in the age of plants and reached maximum between boot to maturity stage of the crop. Minute spots were also observed on leaf sheaths, nodes, internodes and the glumes. Survey of five districts were conducted in Eastern Uttar Pradesh, clearly indicate that dominant pathogen responsible for causing spot blotch of wheat is *Bipolaris sorokiniana* because nearly eighty per cent of sample yielded *Bipolaris sorokiniana* in both the years. Maximum *Bipolaris sorokiniana* was recorded in Jaunpur 27&23 in the years of 2018-2019 respectively and minimum *B. sorokiniana* was recorded in 9&6 in Faizabad districts in the years of 2019-2020 respectively.

Keywords: *Bipolaris*, *sorokiniana*, blotch, wheat

Introduction

Wheat (*Triticum aestivum* L.) belongs to family Graminae, is one of the oldest and most important cereal crops. Since antiquity, wheat was cultivated in Mohanjo- Daro and Harappa nearly 5000 years back (Pal, 1966) ^[1]. In India, three species of wheat are cultivated, *Triticum aestivum*, *T. durum*, and *T. dicoccum* (Gupta, 2004) ^[5]. Bread wheat accounts for approximately 95 per cent of the wheat grown, while 4 per cent is *durum* wheat and 1 per cent is *dicoccum* wheat (Gupta, 2004) ^[5]. Wheat is believed to have originated in South-west part of Asia. Some of the earliest remains of the crop have been found in Syria, Jordan and Turkey (Feldman, 2001) ^[3].

The world's major wheat producing areas are Northern China, Northern India, Northern USA and adjoining areas of Canada, Europe, Russia, Latin America and Africa. Globally, total area under wheat production is 222.16 million hectares with production 752 million tonnes and productivity of 3380 kg/ha (USDA, 2017). Wheat is the second most important food crop of the India after rice and has played vital role in stabilizing the food grain production in the country. Wheat contributes nearly one third of the total food grain production in India and one tenth of the global production is contributed from India. Wheat cultivation has traditionally been dominated by the Northern region of India and mostly grown during winter season. India has emerged as the second largest producer of wheat in the world by harvesting a record production after China with an area of 30.71 million hectare with production of 97.44 million tonnes and productivity of 3172 kg/ha, covering 12 per cent of world production (FAO Statistics Division, 2017) ^[2]. Uttar Pradesh, Punjab, Haryana, Madhya Pradesh, Rajasthan, Bihar and Maharashtra are the major (80 per cent) wheat growing states in the country from the point of both area and production.

Spot blotch is caused by *Bipolaris sorokiniana* (Sacc.) Shoem. Syn. *Drechslera sorokiniana* (Sacc.) Subram., and Jain, [Syn. *Helminthosporium sativum*, teleomorph *Cochliobolus sativus*] *Cochliobolus sativus*, *Drechslera* ex Dastur [anamorph *Bipolaris sorokiniana* (Sacc.) Shoem.] and several synonyms of the anamorph have been used like *Helminthosporium sorokinianum*, *Drechslera sorokiniana* and *Helminthosporium sativum* (Maraite et al., 1998) ^[10].

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Bipolaris sorokiniana is a hemibiotrophic, phytopathogenic fungus and prevalent in warmer and humid wheat growing regions of the world. This has special significance in the Eastern Gangetic Plains (EGP) of South Asia, which includes India, Nepal and Bangladesh (Joshi *et al.*, 2007). Spot blotch pathogen has a worldwide distribution and is particularly aggressive under high relative humidity and temperature associated with imbalanced soil fertility (Sharma and Duveiller, 2004) [12].

Wheat in the warmer parts of the world is mainly affected by many diseases and among these diseases, spot blotch or foliar blight caused by *Bipolaris sorokiniana* (Sacc.) Shoem. is one of the most concerning disease in warm and humid regions of India and other South Asian countries due to its wide spread prevalence and increasing severity (Joshi *et al.*, 2002) [8].

Maraite *et al.*, (1998) [10] analysed 360 wheat leaf blight samples collected during 1993-96 from Bangladesh, China, India, Nepal, Vietnam, Morocco, South Africa, Mexico, Bolivia and Argentina, and reported that *D. sorokiniana* was involved in 81 per cent of the samples and it was associated with leaf blight in hot and humid areas.

Goel *et al.* (1999) [4] monitored foliar blight of wheat and reported that *Helminthosporium sativum* was the most predominant pathogen in India. Chaurasia *et al.* (1999) [1] reported that in Eastern India, foliar blight pathogen is a complex of *Alternaria tritricina* and *B. sorokiniana* and growth stage as well as environmental conditions both determines their relative dominance. In the early growth stages *A. tritricina* dominates, but *B. sorokiniana* becomes dominant at crucial later stages.

Singh *et al.* (2000) [13] reported distribution of wheat foliar blight pathogens in India for a decade (1989-90 to 1998-99) with an overall frequency of occurrence of 59.75 per cent and 37.17 per cent for *B. sorokiniana* and *A. tritricina*, respectively. Frequency of occurrence *B. speciferum* and *Drechslera tritici-repentis* was 2.34 percent and 0.74 per cent respectively. Narayan (2004) on the basis of two year (2000-01 and 2001-02) data from five districts in Bihar reported that dominant pathogen responsible for foliar blight of wheat was *Helminthosporium*. Shazia and Iftikhar (2005) [5] isolated *Alternaria alternata*, *Pyrenophora tritici-repentis*, *Bipolaris sorokiniana*, *Stemphylium* spp. and *Cladosporium* spp from leaf samples collected from Punjab in Pakistan. Iftikhar *et al.* (2006) [6] isolated *Alternaria alternata*, *Bipolaris sorokiniana*,

Curvularia lunata and *Drechslera spicifer* 2 from the spot blotch samples of wheat and concluded that most prominent fungus was *Bipolaris sorokiniana*. *Bipolaris sorokiniana*, has been reported by many workers as the cause of leaf blotch in wheat (Krishnendu *et al.* 2011; Singh *et al.* 2012) [9, 14].

Material and Method

Survey of spot blotch of wheat in Eastern Uttar Pradesh

An extensive survey was conducted in five districts of Eastern Uttar Pradesh, viz. Sultanpur, Jaunpur, Bahraich, Basti and Faizabad to collect the diseased leaf sample during *Rabi* 2018-19 and 2019-20

Collection of disease sample

A number of diseased leaf sample of wheat showing characteristic symptoms of spot blotch were collected from the wheat fields representing five districts, namely Sultanpur, Jaunpur, Bahraich, Basti and Faizabad, during *Rabi* season 2018-19 and 2019-20. Numbers of the samples collected have been given in Table 1.

Table 1: Number of leaf samples collected during *Rabi* 2018-19 and 2019-20

Districts	Number of leaf sample collected	
	2018-19	2019-20
Sultanpur	20	16
Jaunpur	32	25
Bahraich	24	17
Basti	16	14
Faizabad	12	11
Total	104	83

Experimental finding

Status of spot blotch disease of wheat in Eastern Uttar Pradesh

To ascertain the status of spot blotch disease of wheat in Eastern Uttar Pradesh, an extensive survey was conducted in five districts of Eastern Uttar Pradesh, viz. Sultanpur, Jaunpur, Bahraich, Basti and Faizabad to collect the diseased leaf samples during *Rabi* 2018-19 and 2019-20. A total of 104 and 83 leaf samples were collected during 2018-19 and 2019-20, respectively. Isolations were made as per methods described in the preceding chapter. Data obtained have been presented in Table 2.

Table 2: Per cent recovery of *Bipolaris sorokiniana* from leaf samples of wheat

District	No. of leaf sample collected		<i>Bipolaris sorokiniana</i> sample		Per cent recovery	
	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20
Sultanpur	20	16	17	11	84.00	72.33
Jaunpur	32	25	27	23	83.37	87.46
Bahraich	24	17	19	15	78.16	82.33
Basti	16	14	11	10	67.75	70.42
Faizabad	12	11	9	6	74.00	59.00
Total	104	83	83	65	78.80	77.31

Data presented in Table 2 clearly indicates that on an average 78.80 per cent samples yielded *B. sorokiniana* and only 21.20 per cent samples showed other pathogens during *Rabi* 2018-19. In Sultanpur, Jaunpur, Bahraich, Basti and Faizabad districts, respectively, 84.00, 83.37, 78.16, 67.75 and 74.00 per cent leaf samples yielded *B. sorokiniana* whereas only 16.00, 16.63, 21.84, 32.25 and 26.00 per cent leaf samples yielded other pathogens, indicating that in all the five districts, predominant fungus was *B. sorokiniana*.

During *Rabi* 2019-20 also majority of samples yielded *B. sorokiniana* indicating that dominating pathogen was *B. sorokiniana*. On an average 77.31 per cent leaf samples showed *B. sorokiniana* while remaining 22.69 per cent leaf samples showed other pathogens. Sultanpur, Jaunpur, Bahraich, Basti and Faizabad districts, respectively, 72.33, 87.46, 82.33, 70.42 and 59.00 per cent leaf samples shows *B. sorokiniana* whereas 27.67, 12.54, 17.67, 29.58 and 41.00 per cent leaf samples shows other pathogens.

Two-year survey data of five districts clearly indicate that in Eastern Uttar Pradesh, dominant pathogen responsible for causing spot blotch of wheat is *B. sorokiniana* as majority of samples yielded *B. sorokiniana*.

Discussion

Finding of present studies, in which survey of five districts was conducted, clearly indicate that in Eastern Uttar Pradesh, dominant pathogen responsible for causing spot blotch of wheat is *Bipolaris sorokiniana* as nearly eighty per cent of sample yielded *Bipolaris sorokiniana* in both the years. At all the five locations in Eastern Uttar Pradesh and in both the years *Bipolaris sorokiniana* was dominant pathogen responsible for causing spot blotch of wheat. Present findings are in accordance with a number of previous findings reported by various workers. Krishnendu *et al.* (2011)^[9] and Singh *et al.* (2012)^[14] have reported *B. sorokiniana* as the cause of leaf blotch in wheat. Earliar, Singh *et al.* (1997) have also reported that *B. sorokiniana* was the main causal pathogen of foliar blight complex in India. They have also reported *Bipolaris sorokiniana* as the predominant leaf blight pathogen in Bihar and West Bengal. Chaurasia *et al.* (1999)^[1] reported that in Eastern India foliar blight pathogen is a complex of *Alternaria trititica* and *B. sorokiniana* and growth stage as well as environmental conditions both determines their relative dominance. In the early growth stages *A. trititica* dominates, but *B. sorokiniana* becomes dominant at crucial later stages. It has been established that the causal agent of leaf blight of wheat in the NEPZ of India is the spot blotch pathogen *Bipolaris sorokiniana* (Joshi and Chand, 2002; Joshi *et al.*, 2004)^[7, 5]. In Pakistan also, Iftikhar *et al.* (2006)^[6] have concluded that most prominent fungus was *Bipolaris sorokiniana*. Our present finding confirms that even today *Bipolaris sorokiniana* is the predominant fungus responsible for causing spot blotch of wheat in Eastern Uttar Pradesh.

Conclusion

In Eastern Uttar Pradesh, dominant pathogen responsible for causing spot blotch of wheat is *B. sorokiniana* as majority of samples collected during two year (2018-19 and 2019-20) from five districts, yielded *B. sorokiniana*.

The disease appears 5 to 8 weeks after wheat sowing and the symptoms advance after heading and spread very fast. The dark brown necrotic spots (boat shaped) occur on the leaves, crowns and stems with or without yellow halo around these. Lesions on the leaves in the begging as a few mm that extend as elongated dark brown spots and later on coalesce resulting into blight. In severe cases, at flowering stage 60 to 80 per cent leaf areas turn into necrotic lesions. Intensity of spotting increases with the increase in the age of plants and reaches maximum between boot to maturity stage of the crop. Minute spots were also observed on leaf sheaths, nodes, internodes and the glumes.

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