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Evaluation of Cultivars and Date of Sowing on Yield Response against *Bipolaris sorokiniana* (Sacc.) caused Spot Blotch Disease of Wheat (*Triticum aestivum* L.) in Bihar

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ABSTRACT: The spot blotch disease caused by *Bipolaris sorokiniana* (Sacc.) Shoemaker, is one of the most important foliar fungal disease of wheat crop. This disease appears in almost all wheat growing regions of world including the state of Bihar in India constantly lead to substantial yield reduction, posing a considerable constraint on wheat production in the region. Especially witness condition of Bihar faced to more vulnerable to spot blotch disease of wheat so, present study, conducted during the winter (*Rabi*) seasons of 2021-22 and 2022-23 at the research farm of Bihar Agricultural University in Sabour, Bhagalpur, aimed to assess the impact of different wheat cultivars (DBW-316, PBW-833, DBW-187, HD-3118, HI 1563, PBW-723 and PBW-179) sown on two different dates (5th November, as timely and 10th December, as late sown). The objective was to understand the influence of sowing times on yield potential and determine the optimal timing for sowing to mitigate the effects of spot blotch disease. Disease incidence, per cent disease index (PDI), AUDPC was lowest and highest grain yield (q/ha) was for (D_1) timely sown treatment (5th Nov. 2021-22 and 2022-23) as compared to (D_2) late sown (10th Dec. 2021-22 and 2022-23). No disease appearance at flowering stage in timely sown condition so PDI was not recorded. At hard dough stage, the minimum DI and PDI (34.61 & 35.40% and 5.74 & 6.52%) were recorded with PBW-833 at timely sown condition, respectively. In case of D_2, the minimum DI and PDI (62.07 & 62.79 % and 36.30 and 37.04 %) from PBW-833 recorded, respectively. The minimum AUDPC (40.81 and 44.87) recorded from PBW-833, respectively at timely sown cultivars. However, the maximum AUDPC (604.07 and 659.81) was recorded from cultivar PBW DBW-316 and minimum AUDPC (288.43 and 315.65) recorded at late sown condition, respectively. The maximum grain yield (41.83 and 41.13 q/ha) was recorded from PBW-833 at timely sown cultivar whereas, maximum grain yield (32.58 and 32.37 q/ha) recorded from PBW-833 at late sown cultivar, respectively. These findings underscore the importance of timely sowing in disease management and crop productivity, with PBW-833 emerging as a promising cultivar.

Keywords: Wheat, Spot blotch, Date of Sowing, Cultivars and Yield.

INTRODUCTION

The eastern Indo-Gangetic plain is a significant region for winter cereal cultivation, primarily dominated by wheat, sowing to its fertile alluvial soils. This area has the potential for high wheat yields, but a substantial yield gap exists, primarily attributed to delayed sowing and the use of late-sown varieties. In Bihar, the total area under wheat is approximately 2.2 million hectares, producing 6.34 million tones (mt) with productivity rate of 2855 kg/ha (Directorate of Economic and Statistics, GOI, 2021). The tropical and sub-tropical climate in the region is characterized by a distinct wet rainy season (*kharif*) from June to September and a dry winter season (*rabi*) from October to April. Wheat is typically sown after the kharif crop is harvested, starting from the last week of October to November, extending into December for late-sown crops. Wheat cultivation in

Bihar follows an irrigated double-cropping pattern, often in rotation with rice or other crops like pulses, mulching and fodder crops. However, in some areas of Bihar, wheat is grown in an annual rotation with rice. The concern for the long-term sustainability of food production systems in northern India arises due to the intensive grain production systems. Issues such as declining soil fertility, the depletion of groundwater tables at a rate of 20-30 cm per annum, and poor fertilizer management contribute to environmental challenges (Gill, 1994; Timsina and Connor 2001). Challenges like delayed clearing of rice plots, limited farm mechanization, and inadequate adoption of zero-tillage wheat sowing equipment further impact the efficiency of wheat cultivation. Late establishment of the crop after the optimal sowing time results in a yield reduction of approximately 1% per cent per day. Considering the global demand for wheat, estimated by the FAO to reach 840 million tonnes (mt) by 2050 (FAO, 2021). Coordinated efforts are essential to enhance research for increasing production per unit area in an ecologically and economically sustainable manner. This is crucial to meet future demands while mitigating the adverse impacts of climate change on wheat production. The conventional rice-wheat cropping sequence has faced challenges from both biotic and abiotic stressors, leading to adverse effects on crop yield (Villareal *et al.,* 1995). Notably, economically significant fungal, bacterial, and viral diseases have played a major role in causing severe losses in wheat production. In the Bihar agro-climatic region, particularly in environments characterized by high temperature and humidity, spot blotch disease caused by *Bipolaris sorokiniana* (*Cochliobolus sativus*) has emerged as a major threat.

Spot blotch disease has become a significant constraint in wheat production due to the widespread adoption of high-yielding varieties that are susceptible to biotic stress conditions. The spot blotch disease reduces the photosynthetic area of leaves, causing a decrease in carbohydrate assimilation during grain filling, ultimately resulting in lower yields. The quality of the harvested grain is also compromised, with reported yield losses ranging from 20 to 85 per cent in India (Kumar *et al.,* 2018). The average annual yield losses due to Spot blotch in India were reported to be 15.5 per cent (Dubin and Van Ginkel 1991) and 17 per cent (Saari, 1998), even the grain yield losses ranging from 17.63-20 per cent under favorable conditions (Goel *et al.,* 2006). In India, losses due to diseases may be 10 to 50 per cent which can be devastating for farmers in the Eastern Gangetic Plains (EGPs) and depends on the level of resistance in a cultivar against leaf blight and weather conditions. The disease severity affects more than 10 million ha of wheat in Gangetic plains (Nagarajan and Kumar 1998) and reduce grain yield up to 25 per cent in the affected areas (Saari, 1998). In eastern India, the yield losses can reach up to 100 per cent under severe conditions (Pandey *et al.,* 2005). Narayan (2004) reported that yield losses due to foliar blight of wheat at Pusa, Bihar, varied between 2 to 30 per cent and loss in 1000-grain weight between 3 to 26 percent depending upon the disease severity. The widespread use of chemicals for disease management is acknowledged, but their detrimental impacts on the environment, wildlife, human well-being, and plants are concerning. Despite this awareness, the application of chemicals, particularly contemporary third-generation fungicides characterized by a broad spectrum and dual protective and curative modes of action, remains highly effective. However, the changing of the sowing date and resistance/tolerant cultivars is deemed crucial for escaping spot blotch disease. This strategic alteration in the timing of sowing significant factor in disease management, potentially reducing the reliance on chemical interventions and mitigating the environmental impact associated with their used. The research was conducted at the landscape level for two consecutive wheat seasons. Another purpose of this work was to generate evidence on the comparative performance of wheat cultivars for two different planting dates.

METHODS AND MATERIAL

The present study was carried out at the research farm of Bihar Agricultural University, Sabour, Bihar during winter (*Rabi*) season of 2021-22 and 2022–23 in a split plot design with three replicates with effect of two different date of sowing on seven wheat genotypes *viz.*, DBW-316, PBW-833, DBW-187, HD-3118, HI 1563, PBW-723 and PBW-179 on two dates *viz.*, 5th Nov. (Timely sown), 10th Dec. (Late sown) The net plot size (11.2 sq. meter), row-to-row distance of 20 cm. with three replications in split plot design. All packages of practices were followed for conducting the experiment as per standard agronomic practices.

Observations were recorded at three different growth stage *viz.,* flowering, dough and hard dough and randomly selecting 1 m^2 area of each treatment for calculation of Numbers of plants/m^2, no. of infected plant/m^2 were recorded. For the disease incidence, five plants were randomly tagged in each treatment and data were recorded, total number of plant and the total number of infected plant ((flag and flag-1 leaves) in 1 m^2 area and were calculated by the given formula (Singh and Dube 1978).

[Disease incidence = (No. of infected plant/Total No. of plant) × 100]

Per cent Disease Index were recorded by using 0-9 rating scale. PDI was recorded on each plant using a single digit score scale developed to assess spot blotch diseases of wheat by visually scoring. The percent disease area on the flag (F) and penultimate (F-1) leaves (Saari and Prescot 1975).

[PDI= (Sum of all disease rating/Total number of leaves observed × maximum rating scale) × 100].

Estimating Area Under Disease Progress Curve (AUDPC) will be calculated in order to know the progress of disease. AUDPC for flag leaf (F), Penultimate leaf (F-1) and single-digit scoring was calculated separately and categories genotypes based on values of AUDPC; 0-285 (Resistance), 285 -355 (Moderate Resistance), 356-425 (Moderate susceptible), 426-495 (Susceptible) and >495 (Highly Susceptible) by Das *et al*. (1992).

[AUDPC = n ∑ i=1 (Yi=1 + Yi) 2 (Ti=1 − Ti)]

The grain yield obtained from each net plot was recorded in kilograms and the grain yield per plot was converted into quintal per hectare (q/ha). Further, statistical analysis was performed using software OPSTAT with P = 0.05% level of significance.

RESULTS AND DISCUSION

Disease incidence, per cent disease index (PDI), minimum AUDPC was lowest and highest grain yield (q/ha) was for (D_1) timely sown treatment (5th Nov. 2022 and 2023) as compared to (D_2) late (10th Dec. 2021-22 and 2022-23). At flowering stage of timely sown treatment there were no disease appearance so, no DI and PDI recorded. At dough stage, the maximum DI (24.49 and 25.56%) was recorded from genotype PBW-179 and minimum DI (13.54 and 14.85 %) recorded from PBW-833 which was statistically at par with DBW-187 (14.46 and 16.22 %). At hard dough stage, the maximum DI recorded (58.52 and 60.66%) from PBW-179 and minimum DI (34.61 and 35.40%) with PBW-833 which was statistically at par with DBW-187 (39.11 and 40.03%) at hard dough stage, respectively. In case of D_2 (10th Dec. 2021-22 and 2022-23) date of sowing with the maximum DI recorded (33.08 and 34.11%) from cultivar DBW-316 and lowest DI (19.65 and 20.77%) with DBW-833 recorded respectively. At dough stage, the maximum DI recorded (38.55 and 39.14 %) from cultivar DBW-316 and minimum DI (24.94 and 25.58 %) from PBW-833 recorded, respectively. At hard dough stage, the maximum DI recorded (79.50 and 81.16%) from cultivar DBW-316 and minimum DI (62.07 and 62.79 %) from PBW-833 recorded, respectively in (table 1). The present findings are in congruent with the findings of Hobbs *et al.*, (1996) emphasized the crucial role of adjusting sowing dates for effective leaf blight management in rice-wheat rotations. Chaurasia and Duveiller (2006); Biswas and Srivastava (2010) supported these findings concerning wheat spot blotch. Duveiller *et al.*, (2005) observed heightened spot blotch severity and increased yield losses with delayed sowing, even in resistant genotypes. Kumari *et al.* (2020) also reported crops sown on November 11th, exhibited minimal disease incidence compared to those sown later on December 16th. During the timely sown treatment at the flowering stage (November, 11th), no disease was recorded. At the hard dough stage, genotype HD 3271 showed the minimum disease incidence (40.08%), followed by DBW 39 (41.36%) and HD 2733 (41.70%).

For both the years (2021-22 and 2022-23), at dough stage, the maximum PDI (16.11 and 18.52%) was recorded from cultivar PBW -179 and minimum PDI (2.96 and 3.15 %) with PBW-833 recorded, respectively. At hard dough stage, the maximum PDI recorded (34.44 and 35.67%) from PBW-179 and minimum PDI (5.74 and 6.52%), respectively at (D_1) timely sown condition. For D_2 (10th Dec. 2021-22 and 2022-23) date of sowing, the maximum PDI recorded (18.70 and 24.70%) from cultivar DBW-316 and minimum PDI (2.78 and 4.26%) from PBW-833 recorded, respectively. At dough stage, the maximum PDI recorded (38.89 and 41.11%) from cultivar DBW-316 and minimum PDI (21.67 and 24.44 %) from PBW-833 recorded, whereas at hard dough stage, the maximum PDI recorded (76.11 and 82.22 %) from cultivar DBW-316 and minimum PDI (36.30 and 37.04 %) from PBW-833 which was statistically at par with DBW-187 (39.26 and 37.41 %) recorded respectively in (table 2).The present finding aligns with finding of Singh *et al.*, (1998) cautioned against severe wheat blights post 30th November. Wegulo *et al.*, (2009); Singh *et al.* (2014) reported spot blotch severity from flowering to watery milk stage, with increased severity under late sowing conditions (Rosyara *et al.*, 2008; Gurung *et al.*, 2012; Duveiller *et al.*, 2005). Kumari *et al.* (2020) was also reported lowest percent disease index (PDI) on 11thNovember, emphasizing that delayed sowing exposes even resistant varieties to spot blotch. At the hard dough stage, HD 3271 had the minimum PDI (2.22%), followed by DBW 39 (6.66%) and HD 2733 (8.89%).

Area Under Progressive Curve (AUDPC) was minimum for (D_1) timely sown treatment (5th Nov., 2021-22 and 2022-23) as compared to (D_2) late sown (10th Dec., 2021-22 and 2022-23) in (Table 3). The maximum AUDPC (233.31 and 249.55) was recorded from cultivar PBW -179 and minimum AUDPC (40.81 and 44.87) recorded from PBW-833, respectively at timely sown cultivars. For (D_2), the maximum AUDPC (604.07 and 659.79) was recorded from cultivar PBW-835 and minimum AUDPC (288.47 and 315.65) recorded from the cultivar PBW-833, respectively. The present study aligns with previous finding of Chaurasia and Duveiller (2006) conducted a study over three seasons (*Rabi* 2000-2003) and found that sowing wheat during the third week of Number resulted in a lower value of AUDPC (Area Under Disease Progress Curve) compared to sowing in December. Aryal and Shrestha (2013) selected two different date of sowing 25th November and 15th December for the assessment of spot blotch disease and crop yield and found AUPDC was high in plant sown on 15th December as compared to 25th November both in flag leaf and flag-1 leaf (penultimate leaf) that was 339.2, 780.4 and 449.9, 965.1, respectively.

The minimum grain yield (35.00 and 34.67 q/ha) was recorded from cultivar PBW- 179 and maximum grain yield (41.83 – 41.13 q/ha) recorded from PBW-833 followed by DBW-187 (38.21 and 36.87 q/ha), respectively at timely (D_1) sown condition, whereas, the minimum grain yield (24.19 and 23.87 q/ha) was recorded from cultivar DBW-316 and maximum grain yield (32.58 – 32.37 q/ha) recorded from PBW-833 followed by PBW-179 (29.38 and 29.30 q/ha), respectively at late sown condition in (table 3). The present finding supported by finding of Gurung *et al.*, (2012) higher disease severity and a reduction in grain yield of 20.5%, 27.2%, and 37.3% for crops sown on 26th November, 11th December and 26th December, respectively. Wherein rice and wheat are predominantly grown. This region has the potential to support high wheat yields if proper crop production practices are put into place (Dubey *et al.*, 2020). There is a substantial yield gap in wheat mainly due to delayed sowing in wheat after optimum time results in yield reduction by almost 1% per day (Dhillon and Fischer1994). Kumari *et al.* (2020) conducted a study with nine wheat genotypes sown on three different dates, showing that timely sowing (11th Nov.) resulted in better germination and 1000 grain weight compared to late (16th Dec.). The four types of wheat exhibited notable distinctions in terms of disease severity, grain yield, and thousand kernel weight (TKW). Another comprehensive finding of Ajay *et al.* (2023). Overall, the comparison of grain yields revealed that the yields of the long duration variety (LDVs) were higher than the short duration variety (SDVs). The yield difference between them was around 1 t/ha The mean grain yield of LDVs in the top 10% cases was 5.95t/ha whereas this value for the SDVs was 4.45t/ha. A similar comparison for the biomass yield of LDVs and SDVs highlighted a difference of slightly more than 2t/ha in favor of the LDVs. In the top 10% cases of LDVs and SDVs, the mean biomass yields were 14.16- and 10.81t/ha, respectively. These numbers very clearly indicate that LDVs have substantially higher potential.

Table 1: Effect of cultivars and date of sowing on disease incidence at different growth stage against *Bipolaris sorokiniana* during 2021-22 and 2022-23.

Date of planting	Genotypes	Disease Incidence (%) *					
		Flowering stage		Dough stage		Hard dough stage	
		2021-22	2022-23	2021-22	2022-23	2021-22	2022-23
D_1 (5th Nov., 2021-22&2022-23)	DBW-316	0.00 (0.00)	0.00 (0.00)	19.44 (26.16)	21.42 (27.57)	53.33 (46.91)	54.67 (47.68)
	PBW-833	0.00 (0.00)	0.00 (0.00)	13.54 (21.59)	14.85 (22.67)	34.61 (36.04)	35.40 (36.51)
	DBW-187	0.00 (0.00)	0.00 (0.00)	14.46 (22.35)	16.22 (23.75)	39.11 (38.71)	40.03 (39.25)
	HD-3118	0.00 (0.00)	0.00 (0.00)	19.48 (26.19)	22.90 (28.59)	55.19 (47.98)	56.26 (48.60)
	HI 1563	0.00 (0.00)	0.00 (0.00)	19.26 (26.03)	20.27 (26.76)	51.93 (46.11)	52.91 (46.67)
	PBW-723	0.00 (0.00)	0.00 (0.00)	16.74 (24.15)	16.95 (24.31)	42.30 (40.57)	43.40 (41.21)
	PBW- 179	0.00 (0.00)	0.00 (0.00)	24.49 (29.66)	25.56 (30.37)	58.52 (49.91)	60.66 (51.15)
D_2 (10th Dec., 2021-22& 2022-23)	DBW-316	33.08 (35.11)	34.11 (35.74)	38.55 (38.38)	39.14 (38.73)	79.50 (63.08)	81.16 (64.28)
	PBW-833	19.65 (26.31)	20.77 (27.11)	24.94 (29.96)	25.58 (30.38)	62.07 (51.98)	62.79 (52.41)
	DBW-187	21.91 (27.91)	22.55 (28.35)	25.85 (30.56)	27.05 (31.34)	65.42 (53.98)	65.85 (54.24)
	HD-3118	27.50 (31.63)	28.89 (32.51)	30.61 (33.59)	31.36 (34.06)	67.49 (55.24)	70.89 (57.35)
	HI 1563	27.59 (31.69)	29.25 (32.74)	34.00 (35.67)	34.34 (35.87)	69.31 (56.36)	72.56 (58.41)
	PBW-723	23.90 (29.27)	24.38 (29.59)	28.33 (32.16)	28.87 (32.50)	66.27 (54.49)	67.76 (55.40)
	PBW- 179	20.55 (29.96)	21.87 (27.88)	27.39 (31.56)	28.79 (32.45)	63.13 (52.61)	64.32 (55.32)
C.D at 5 %		a= 4.92 b=3.76 a×b=11.38	a= 3.33 b=1.62 a×b=3.32	a= 4.65 b=5.79 a×b=16.57	a= 3.15 b=3.17 a×b=6.13	a= 3.33 b=1.62 a×b=3.32	a= 5.0 b=5.48 a×b=16.85
S.Em (±)		a= 0.81 b=1.29 a×b=3.92	a= 0.55 b=0.56 a×b=1.14	a= 0.78 b=1.98 a×b=5.68	a= 0.52 b=1.09 a×b=2.12	a= 0.55 b=0.56 a×b=1.14	a= 0.82 b=1.88 a×b=5.77

Factor a- Date of sowing, Factor b= Genotype, Factor (a× b) Date of sowing × Genotype *-Mean data of three replications, Under parenthesis angular transformed values.

Table 2: Effect of cultivars and date of sowing on per cent of disease index at different growth stage against *Bipolaris sorokiniana* during 2021-22 and 2022-23.

Date of planting	Genotypes	Per cent disease index*					
		Flowering		Dough		Hard Dough	
		2021-22	2022-23	2021-22	2022-23	2021-22	2022-23
D1 (5th Nov., 2021-22 & 2022-23)	DBW-316	0.00 (0.00)	0.00 (0.00)	12.59 (20.78)	15.19 (22.94)	29.63 (32.98)	31.67 (34.25)
	PBW-833	0.00 (0.00)	0.00 (0.00)	2.96 (9.91)	3.15 (10.22)	5.74 (13.86)	6.52 (14.79)
	DBW-187	0.00 (0.00)	0.00 (0.00)	4.44 (12.16)	5.19 (13.17)	7.22 (15.59)	7.22 (15.59)
	HD-3118	0.00 (0.00)	0.00 (0.00)	14.26 (22.19)	15.19 (22.94)	31.30 (34.02)	32.22 (34.58)
	HI 1563	0.00 (0.00)	0.00 (0.00)	9.07 (17.53)	9.63 (18.08)	24.44 (29.63)	25.74 (30.49)
	PBW-723	0.00 (0.00)	0.00 (0.00)	5.00 (12.92)	5.74 (13.86)	19.26 (26.03)	23.52 (29.01)
	PBW- 179	0.00 (0.00)	0.00 (0.00)	16.11 (23.66)	18.52 (25.49)	34.44 (35.93)	34.26 (35.83)
D2 (10th Dec., 2021-22 & 2022-23)	DBW-316	18.70 (25.62)	24.07 (29.38)	38.89 (38.56)	41.11 (39.88)	76.11 (60.74)	82.22 (65.06)
	PBW-833	2.78 (9.60)	4.26 (11.91)	21.67 (27.74)	24.44 (29.63)	36.30 (37.05)	37.04 (37.49)
	DBW-187	4.44 (12.16)	6.48 (14.75)	27.22 (31.45)	29.44 (32.86)	47.78 (43.73)	54.44 (47.55)
	HD-3118	12.96 (21.10)	15.00 (22.79)	32.78 (34.93)	35.00 (36.27)	62.04 (51.97)	65.74 (54.17)
	HI 1563	16.11 (32.66)	19.07 (25.89)	35.00 (36.27)	37.22 (37.60)	65.19 (53.84)	68.33 (55.75)
	PBW-723	6.30 (14.54)	6.85 (15.17)	30.19 (33.33)	32.22 (34.58)	56.48 (48.72)	59.81 (50.66)
	PBW- 179	3.89 (11.38)	5.19 (13.17)	24.63 (29.75)	26.85 (31.21)	39.26 (38.80)	37.41 (37.71)
C.D. at 5%		a= 1.16 b=0.43 a×b=0.31	a= 1.89 b=0.66 a×b=0.77	a= 3.81 b=0.77 a×b=1.81	a= 0.68 b=0.10 a×b=0.04	a= 3.49 b=2.92 a×b=6.27	a= 1.71 b=1.31 a×b=1.37
S. Em (±)		a= 0.19 b=0.15 a×b=0.10	a= 0.31 b=0.22 a×b=0.26	a= 0.63 b=0.26 a×b=0.62	a= 0.11 b=0.03 a×b=0.01	a= 0.57 b=1.00 a×b=2.35	a= 0.28 b=0.45 a×b=0.47

Factor a- Date of sowing, Factor b= Genotype, Factor (a× b) Date of sowing × Genotype, *-Mean data of three replications, Under parenthesis angular transformed values.

Table 3: Effect cultivars and of date of sowing on yield and AUDPC at different growth stage against *Bipolaris sorokiniana* during 2021-22 and 2022-23.

Date of planting	Genotypes	Yield (q/ha) *		AUDPC	
		2021-22	2022-23	2021-22	2022-23
D_1 (5th Nov., 2021-22 & 2022-23)	DBW-316	35.95	34.73	191.85	217.13
	PBW-833	41.83	41.13	40.81	44.87
	DBW-187	38.21	36.87	56.39	61.57
	HD-3118	35.44	33.20	209.35	219.07
	HI 1563	36.15	33.37	149.07	157.50
	PBW-723	36.69	34.47	102.41	122.50
	PBW- 179	35.00	34.67	233.33	249.54
D_2 (10th Dec., 2021-22 & 2022-23)	DBW-316	24.19	23.87	604.07	659.81
	PBW-833	32.58	32.37	288.43	315.65
	DBW-187	27.90	27.70	373.33	419.35
	HD-3118	25.85	25.53	491.94	527.59
	HI 1563	24.38	23.97	529.54	566.48
	PBW-723	27.26	27.07	431.02	458.89
	PBW- 179	29.38	29.30	323.43	337.04
C.D at 5 %		a= 5.55 b=3.53 a×b=12.06	a= 2.45 b=3.13 a×b=4.72	-	-
S.Em (±)		a= 0.91 b=1.21 a×b=4.13	a= 0.40 b=1.07 a×b=1.62	-	-

Factor a- Date of sowing, Factor b= Genotype, Factor (a× b) Date of sowing × Genotype, *-Mean data of three replications, AUDPC- Area Under Disease Progressive Curve.

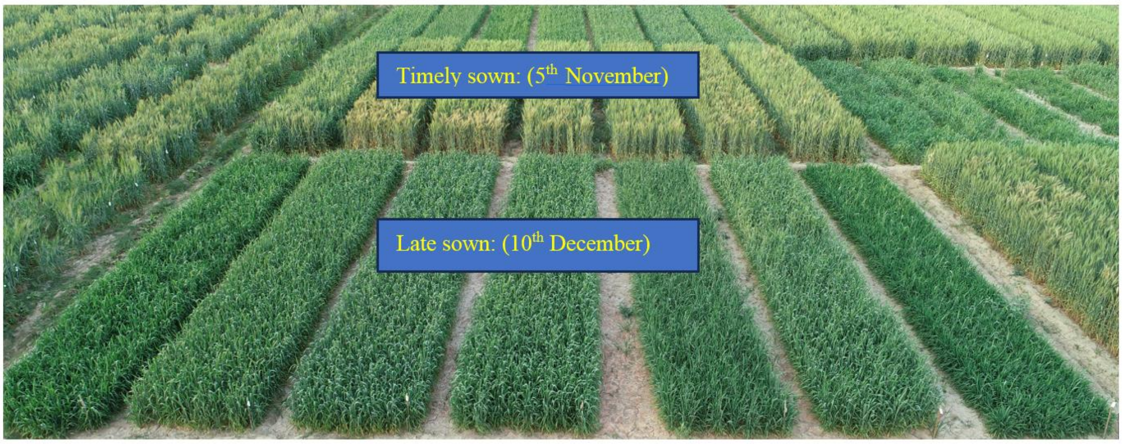

Plate 1. An aerial view experiment of evaluation cultivars and date of sowing on yield response against Spot blotch disease of wheat.

CONCLUSIONS

Timely-sown genotypes consistently exhibited lower disease incidence and percent disease index compared to late-sown ones across both years 2021-22 and 2022-23. At flowering stage, all genotypes were disease-free. PBW-833 showed the minimum disease indices at different growth stages, resulting in higher grain yields and lower AUDPC. In contrast, DBW-316 exhibited higher disease indices and lower yields, especially in late-sown conditions. These findings underscore the importance of timely sowing in disease management and crop productivity, with PBW-833 emerging as a promising genotype.

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