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9. ABSTRACT

Entries, from the 4th, 5th, and 6th International Spring Wheat Nursery growing at Bhubaneswar, Orissa State, India, in 1970, 1971, and 1972 were severely parasitized with Helminthosporium blight (Helminthosporium sorokinianum). The leaves, culms, and spikes were discolored. Infected wheat plants ripened prematurely, grain formation was reduced, and grains that developed were often shriveled. Seventy-five varieties were classified for infection on a scale of 1 (resistant) to 5 (susceptible). No varieties were rated in class 1 and 15 in class 2 (moderately resistant). The latter included varieties from the spring wheat area of the United States and Canada (Chris, Manitou, Selkirk, Thatcher, and Justin). All strains from the CIMMYT program in Mexico were moderately to highly susceptible. This is the first report of Helminthosporium blight as a serious disease of wheat in Orissa.

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INCIDENCE OF HELMINTHOSPORIUM BLIGHT
ON WHEAT IN ORISSA STATE, INDIA

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ABSTRACT

Entries from the 4th, 5th, and 6th International Spring Wheat Nursery growing at Bhubaneswar, Orissa State, India, in 1970, 1971, and 1972 were severely parasitized with *Helminthosporium* blight (*Helminthosporium sorokinianum*). The leaves, culms, and spikes were discolored. Infected wheat plants ripened prematurely, grain formation was reduced, and grains that developed were often shriveled. Seventy-five varieties were classified for infection on a scale of 1 (resistant) to 5 (susceptible). No varieties were rated in class 1 and 15 in class 2 (moderately resistant). The latter included varieties from the spring wheat area of the United States and Canada (Chris, Manitou, Selkirk, Thatcher, and Justin). All strains from the CIMMYT program in Mexico were moderately to highly susceptible. This is the first report of *Helminthosporium* blight as a serious disease of wheat in Orissa.

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Wheat has been a minor crop in Orissa State, India in the past, but with the availability of the new high yielding varieties acreage is increasing. A major disease affecting the wheat crop in Orissa is *Helminthosporium* blight caused by *Helminthosporium sorokinianum* Sacc. ex Sorokin. This note reports results of screening varieties for resistance during 1970 at the Orissa University of Agriculture and Technology, Bhubaneswar, Orissa, and the relative presence of the disease during the 1970 through 1972 seasons.

DISEASE AND PREVALENCE

Helminthosporium blight has not been reported before as a serious disease of wheat in Orissa, but serious occurrence has been reported in the states of Uttar Pradesh, Bihar, and West Bengal (3). Most of the published reports on varietal reaction have utilized seedling tests (2, 4, 5), although Anderson (1) and Statler and Darlington (5) reported on reaction of adult plants. According to our observations in Orissa, the leaves, culms, and spikes of adult plants are severely parasitized. The earliest symptoms appear on the older leaves prior to or about the time of heading. Later, there is a blackening of the nodes and internodal areas, the glumes turn grayish-brown in color as the sporulation increases, and ultimately most of the spike becomes affected. Infected wheat plants ripen prematurely, grain formation is reduced, and developed grains are often shriveled. Black disease lesions may be observed on the threshed grains. These are similar to the wheat head blight symptoms described by Anderson (1).

MATERIALS AND METHODS

Material for the study was comprised of entries from the 4th, 5th, and 6th International Spring Wheat Nurseries. During 1970 and 1971, one crop was raised each season, but in 1972 two plantings were made with a 2-week interval between. All plantings were made in December and disease readings were taken in late February or early March.

The pathogen, *Helminthosporium sorokinianum*, was isolated in pure culture on potato-dextrose agar from diseased leaves and glumes of naturally infected wheat plants in each of the three crop years. Following standard techniques, we established virulence and identified the

causal organism. Degree of infection on the leaves, culms, and spikes was scored on a scale of 1 to 5 as follows: 1 = trace (resistant), 2 = light (moderately resistant), 3 = moderate (moderately susceptible), 4 = heavy (susceptible), and 5 = very heavy (highly susceptible).

An attempt was made to determine how favorable the environment was for disease expression in each of the crop seasons. The environment was indexed by taking the average infection score for all lines in common for the four plantings.

RESULTS AND DISCUSSION

On the basis of the index values, the environments of the four plantings could be differentiated as follows: 1970 season, environmental index = 3.10; 1971 season, environmental index = 2.28; 1972 season (first planting), environmental index = 2.15; 1972 season (second planting), environmental index = 1.46. From these environmental indexes, it is apparent that conditions were most favorable for the disease in 1970 and least favorable in the second planting of 1972. Thus, the disease reactions could be evaluated best in the most favorable season, that is, 1970.

The adult plant disease rating of 75 commercial varieties and experimental strains for reaction to *Helminthosporium* blight in Orissa in 1970 are reported in Table 1. All varieties and strains were affected and none was rated in class 1 as resistant. Fifteen strains were rated in class 2 as slightly resistant. The remaining 60 strains were classed as moderately to highly susceptible. All of the strains originating from the CIMMYT program in Mexico were moderately to highly susceptible. Inasmuch as the high yielding varieties being introduced into Orissa, such as Sonora 64, Lerma Rojo 64A, and Sonalika, originated from the CIMMYT program and are susceptible, the need for finding resistant germplasm which may be utilized in a breeding program is apparent. The strains that originated in the spring wheat areas of the United States and Canada (Chris, Manitou, Selkirk, Thatcher, and Justin) were in the moderately resistant class. This suggests that in their development they were subjected to more exposure to *Helminthosporium* blight than were the wheats from the CIMMYT program and that more resistance genes were concentrated into their background as a result of this selection pressure. Greaney, et al. (2) reported Thatcher to be more resistant to *Fusarium-Helminthosporium* root rot than other spring wheat varieties being tested. Stetler and Darlington (5) reported lower adult plant ratings for the varieties Thatcher and Chris after inoculation with *H. sorokinianum* than for one other hard red spring and three durum varieties. The other varieties in the moderately resistant class came from Argentina (Buck Mananital, Klein Rendidor, Klein Petiso x Rafaela), Australia (Gabo, Mengavi), Kenya (Kenya Leopard, 4265-HD3 (MD x K-Y) x (Wis-Sup), Brazil (Carazinho), Germany (Kloka WM 1353), and Italy (Victor I).

Table 1. Comparative ratings (scale 1-5) of adult plants of spring wheat varieties for *Helminthosporium* blight infection in Orissa State, India, in 1970.

Infection Rating	Varieties
1 (resistant)	None
2 (moderately resistant)	Buck Mananital, Carazinho, Chris, Gabo, Kenya Leopard, Klein Rendidor, Kloka WM 1353, Manitou, Selkirk, Thatcher, Victor I, 4265-HD3 (MD x K-Y) x (Wis-Sup), Justin, Mengavi, Klein Petiso x Rafaela.
3 (moderately susceptible)	Pictic 62, Lerma Rojo 64A, Son 64 x C-271, Zipa 68, (LR 64 x N 10B) x An ³ E, Giza 155, Crim, Triple Dirk, Gaboto, Crespo 63, Tobari 66, Son 64 x TzPP-Nai 60, 36896-Cj 54 ² x Yt-54A, Red River, Piamontes, Bonza, Timgalen, TR-236, Pal #1, Pato Argentino, Narino 59, Xelaju, Nainari 60, C271 x Wt-Son 64, Turpin No. 7, NP832, Centrifon, Norteno 67, NP881, Son 64 x SKE-LR 64A, C-591, Taichung 31, NP880, L1418-3463L1231 x 23L1274-111, LR 64 x Son 64, Giza 144, Tacuari.
4 (susceptible)	Noroeste 66, Inia 66, Penjamo 62, Zambezi, Sonora 64, NP852, Son 64 x Klein Rendidor, Siete Cerros, (TzPP-Son 64) (LR 64A-TzPPxAn ³ E), LR x P4160 ³ , Lundi, C-306, Bonza 63, Ciano 67, C-273, Bonza 55, Yaqui 50.
5 (highly susceptible)	Huelquen, Napo 63, Ciano 'S', Sonalika, NAR(sib) x Pj(sib), V878.

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