



Impact of Seed Transmission of *Bipolaris sorokiniana* on the Planting Value of Wheat Seeds

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Abstract

An experiment was conducted in vitro to determine the planting value of wheat seeds as affected by *Bipolaris sorokiniana*. The wheat seed samples were tested in blotter method and impairment caused by *B. sorokiniana* was recorded after sprouting of the seeds. During the germination of wheat seeds the pathogen transmitted from seed to plant and caused germination failure, coleoptile infection and root infection. Significantly, the highest transmission of the pathogen caused germination failure in the sample S₂ (64.3%). The coleoptile infection was recorded in the sample S₃ (9.5%) followed by S₂ (5.4%) and S₁ (2.4%) respectively. The pathogen was recorded to be transmitted from seed to the coleorhizae giving rise to significantly the highest infection in S₃ (2.6%) followed by S₂ (2.3%) and S₁ (2.1%) respectively in blotter. Regression between prevalence of the pathogen and germination failure along with the coleoptiles and coleorhizae infection indicated the increasing trend of deteriorating planting value of the seed with the increasing rate of transmission of the pathogen from seed to germinating seed and seedlings.

Key words: Aggressive pathogen, Germination failure, Impairment, Prevalence

Introduction

Bipolaris sorokiniana (Sacc. in sorok.) Shoemaker, syn. *Drechslera sorokiniana* (Sacc.) has been reported to be the most important and serious concern to both wheat growers and researchers in the world (CIMMYT, 1991). It is world widely very aggressive pathogen of wheat in the warmer areas including Bangladesh (Dubin and Ginkel, 1991). The pathogen is ubiquitous in nature but highly seed borne and seed transmitted in wheat (Bazlur Rashid and Neergaard, 1996, Fakir *et al.*, 1997). The importance and distribution of seedborne *B. sorokiniana* in wheat have been reported in Bangladesh (Bazlur Rashid *et al.*, 1992). While carrying and disseminating the pathogen the seed itself may be victimized resulting the blackpointed and shriveled. Thus the pathogen lowers the market value as well as planting value of the seeds which ultimately affects the cultivation of wheat in the country (Bazlur Rashid *et al.*, 2003). With the increased and intensified cultivation of the crop in Bangladesh the pathogen has become a serious concern to the producers, dealers, growers and researchers in the recent years. Therefore the present work was designed to determine the planting value of the seeds in terms of the transmitting pathogenic effects on the growth determining parameters such as germination failure, coleoptiles infection and coleorhizae infection.

Materials and Methods

Three seed samples of widely cultivated wheat variety “Shatabdi” collected from Bangladesh Agricultural Development Corporation (BADCO) were tested in the Seed Pathology Centre, Bangladesh Agricultural University during 2010-11. The seed

health test was done by standard blotter method (ISTA, 1976). The pathogen was confirmed by observing under compound stereobinocular microscope. Prevalence of the pathogen and their aggressiveness resulting impairment during seed to plant was recorded in detail.

Results and Discussion

After a week of incubation the germinating seeds and seedlings in moist blotter yielded various kinds of infection with the manifestation of the pathogenic growth and infection in coleoptiles and coleorhizae (Plate 1). Prevalence of the *B. sorokiniana* associated with the blotted seeds is presented in Fig. 1.

The conditions required for seed germination and sprouting of the seeds under moist blotter are equally applicable for the dormant pathogen for growing. It is revealed from Fig.1 that the highest prevalence of *B. sorokiniana* (64.3%) was recorded in the sample S₂ followed by S₁ (53.8 %) and S₃ (54.4%). With the progress of the aggressive growth of the pathogen deteriorate the whole germinating seeds (Fig. 2).

The relationship between seed borne infection and percent seed germination showed gradual reduction in seed germination with the increase in infection level. This finding is in agreement with that of Bazlur Rashid (1996) where a trend of decrease in seed germination and rotting with the increase of seed borne infection was reported in wheat var. Kanchan and Sonalika while Fakir (1988) reported that the pathogenic nature of *B. sorokiniana* was found to cause seed rot to the emerged seedling.

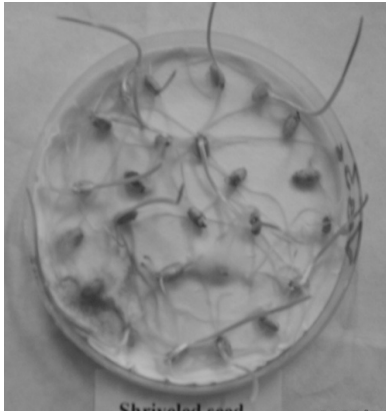


Plate 1. Seed rot, coleoptile and coleorhiza infection in germinating seeds and seedlings caused by *B. sorokiniana* in blotter

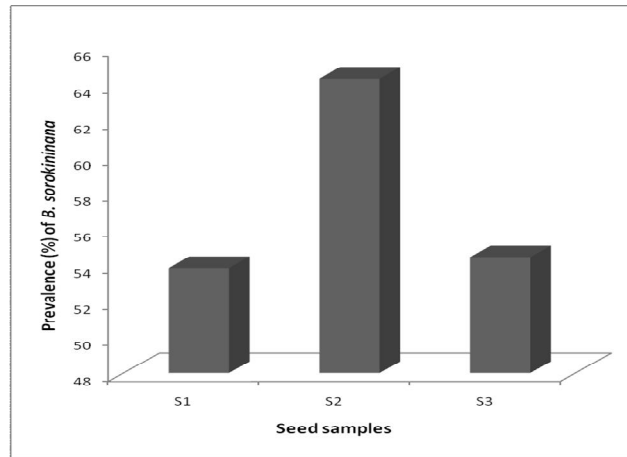


Fig. 1. Prevalence of *B. sorokiniana* in different seed samples in blotter (based on 400 seeds in each sample)

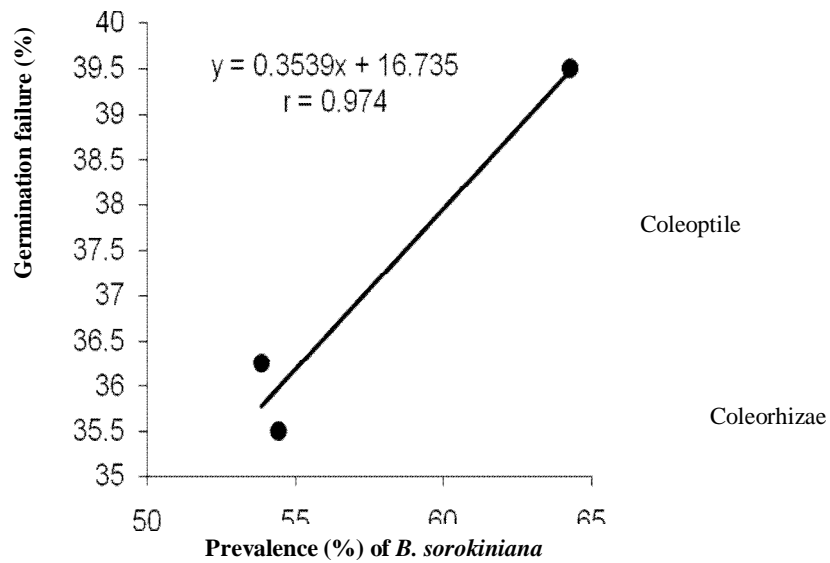


Fig. 2. Regression between prevalence of *B. sorokiniana* and germination failure of wheat seeds.

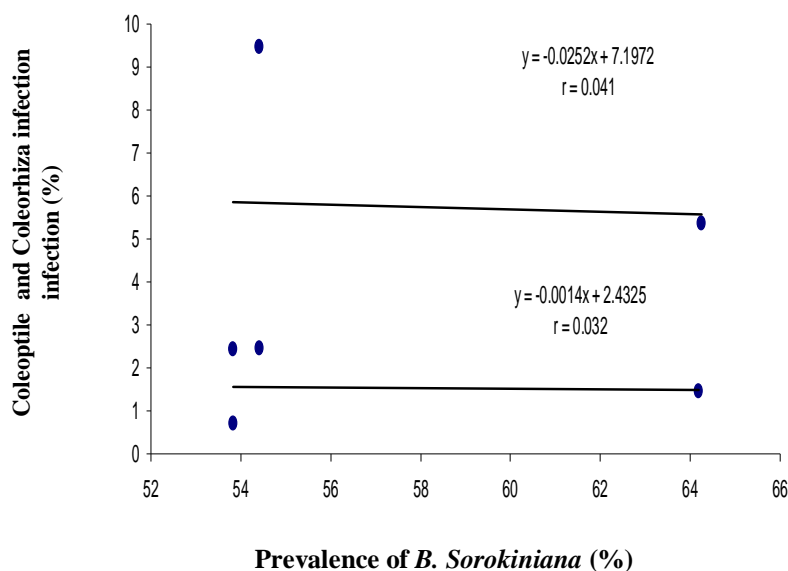


Fig. 3. Relationship between the coleoptiles and coleorhizae along with the prevalence of *B. sorokiniana* during seed to plant transmission in wheat

Coleoptile and coleorhiza infection

Coleoptile enclosing leaf primordia and coleorhizae enclosing radicle are the most prominent plant growth quality determining factors leading to measure the planting value of the seeds. Therefore, the coleoptiles and the coleorhizae of the germinating seeds were also observed and recorded for infection. The results are presented in Fig. 3 and Fig. 4.

The pathogen has been recorded to be transmitted and caused coleoptile infection in the sample S₃ (9.5%) followed by S₂ (5.4%) and S₁ (2.4%), and the coleorhiza infection in the sample S₃ (2.6%) followed by S₂ (2.3%) and S₁ (2.1%), respectively. As soon as the seed germinate in favorable environmental condition the symptoms appeared as dark brown lesions on the outer coleoptile tissue that may coalesce into long areas of necrotic brown tissue. In severe cases, the entire seedling was recorded to be died. However, the seedlings survived but the growth of the sprout become stunted and / or with less vigor. During germination of the seed along with the fungal growth a competition between the sprouting seed and growth of the pathogen occurs. According to Mehta (1997) spot blotch of wheat caused by *B. sorokiniana* adversely affect germination, development of the root system or kill the seedling within a few days and capable of causing up to 100% yield losses which

corroborate with the findings of Hossain and Azad (1994). The pathogen *B. sorokiniana* has been found to reduce 88.7% grain/ear and produced 87.5% discolored and blackpointed grains (Hossain *et al.*, 1998).

From the present findings it is observed that *B. sorokiniana* is the most aggressive type of pathogen that causes coleoptiles infection, root infection and seed rot during transmission from seed to plant in wheat. This aggressiveness of the pathogen varied in different seed samples which cause impairment immediate after sowing in the field. The infected seeds reduce the market value as well as the planting value of seeds.

Conclusions

In recent years, with the increased and intensified cultivation of wheat, the seed borne *B. sorokiniana* has become a serious concern to both growers and researchers in the country. Seed health test should therefore be adopted before sowing and suitable seed treatment measure may also be adopted where necessary for maintaining the desired plant population against the pathogen.

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