

Health Status Evaluation and Morphology Study of Prevalent Seed Borne Fungi of Wheat Seed

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Abstract: In this experiment common seed borne diseases of wheat plant was studied. Seeds were “farmers’ saved wheat seed” and previously untreated seed. Collected samples were sorted out from contamination then the samples were mixed together. Two hundred seeds were taken randomly from the mixture for this experiment. Seeds were allowed to germinate in petri dish using blotter paper method under controlled light and temperature. After seven days of germination six predominant pathogenic fungal genus were identified. The common fungal genus was *Bipolaris* (51.5%) followed by *Aspergillus* (31.5%), *Rhizopus* (29.5%), *Alternaria* (23%), *Fusarium* (18.5%) and *Curvularia* (13%).

Key words: Seed borne, Farmers saved, Blotter paper, Pathogenic fungi.

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I. Introduction

Wheat (*Triticum aestivum* L.) is a cereal grain belongs to the family poaceae. It is a major source of staple food to the mankind and commonly grown all over the world. In the market year 2017 the average wheat production was 1115000 metric tons in Bangladesh¹, which is very low in comparison to the leading wheat producing countries. Many factors responsible for this circumstance among them seed borne diseases get first position. In Bangladesh total 12 seed borne diseases are recorded². In Bangladesh, only 10% seeds are delivered from authentic source of the total wheat seed requirement which are good in quality, rest 90% traditionally produced by farmers. These farmer-saved seeds are often infected by seed borne pathogens.

Infected wheat seeds are the carrier of pathogens propagules for long-distance dissemination. Diseased seeds resulting not only poor yield but also deteriorate marketable quality of grains³. Seed borne diseases of wheat like Black point of wheat (*Bipolaris* sp.), *Rhizopus* ear rot (*Rhizopus* sp.), Black mould (*Aspergillus* sp.), head blight or scab (*Fusarium* spp), *Alternaria* leaf blight of wheat (*Alternaria* sp) and *Curvularia* leaf spot of wheat (*Curvularia* sp.) are considered as the main restriction of wheat cultivation, that reduced yield and deteriorated crop quality^{4,5}. Beside this, infected grains also have harmful effects on human health and animals.

The present experiment has been undertaken to recognize the pathogenic seed borne fungi by observing their morphology and to evaluate the health condition of farmers’ saved wheat seed.

II. Materials And Methods

The experiment was done in the Molecular Plant Pathology Laboratory of Department of Plant Pathology, Sher-e-Bangla Agricultural University.

Collection of seed sample:

The wheat seeds were collected from farmers known as ‘farmers’ saved wheat seed’. Collected seeds were previously untreated.

Preservation of the seed:

Apparently clean seeds were sorted out from contaminants and abnormal seeds. Seeds were placed in a gunny bag and kept in room temperature for short time.

Plating of Seeds:

Total eight petri dish of nine cm in diameter were sterilized then placed on a clean and disinfected working table. A set of two blotter papers were dipped in distilled water and placed in the lower dish. The seeds were poured into a tray and samples for plating taken at random. Twenty five seeds per dish were plated using a pair of forceps. Two hundreds (200) seeds were examined. The date of inspection and plate number were written on the cover of each petri dish [Figure 1.].



Figure 1. Plating of wheat seeds

Incubation of Seeds:

All the petri dishes were gently collected on one tray and transferred to the incubation room. The plated seeds were incubated at a temperature of 22 °C for 7 days in alternating cycles of 12 hours darkness and 12 hours light. The source of light used in the incubation room was near ultraviolet (NUV).

Examination of Incubated Seeds and Recording of Infections:

After incubation for 7 days, the dishes were removed and arranged serially. Moving from one Petri dish to the other, each seed was examined under a stereomicroscope. Habit characters of each fungus were observed and used to identify the fungus that grew on seeds. Their identities were confirmed by consulting mycological literature and experienced seed health analysts. The abbreviation for the identified fungus was written on the wet blotter beside the seed with green blotter pencil. Different fungi in each petri dish were counted by crossing the abbreviations. Count of each fungus from each dish was entered in working recording sheets immediately after examination of the dish.

III. Result And Discussion

Morphology of the pathogenic fungus:

In this experiment six pathogenic fungal genus were studied as they were predominant and established pathogen of wheat seed. Presented fungal genus are *Bipolaris*, *Aspergillus*, *Rhizopus*, *Alternaria*, *Fusarium* and *Curvularia*.

The fungus genus were confirmed following the key explanations of [6,7,8,9,10,11].

1. *Bipolaris*:

Infected seeds are recognized by the presence of brown to black color pigmentation in the seed coat, at advanced stage the kernels become shriveled. Colony on the seed is brown to black. Conidiophore are simple or branched. Conidia usually produced on the tip of conidiophore were slightly curved shaped, light brown in color number of conidial septation ranged from 2 to 5 [Figure 2 (A)].

2. *Aspergillus*:

Severely infected wheat seeds turn discolored and shriveled. Two species of this genus were found on wheat seeds. In one species, colony on seed is usually yellow green to olive brown in color and spreading on seed surface. Conidiophores bear compact, spherical or swollen spore head in some shade of colony color. In another species, colony on seed are typically carbon black in color. Conidiophores bear columnar spore heads in some shade of greenish black to carbon black [figure 2. (B) & (C)].

3. *Rhizopus*:

Various size dark spots first appears on seed. The fungus colony spreads rapidly on seed with abundant threadlike grey mycelium. Small, Dark, pinheads size sporangia can be observed at the head of sporangiophores [Figure 2 (D)].

4. *Alternaria*:

Small chlorotic lesion appear on wheat leaf and seed. Colony on seed is usually dark grey in color, but may also be brown to almost black in appearance. Dark to olive brown conidiophores are straight, simple or occasionally branched. Brownish color conidia develop in chains with a short tapering at the tip [Figure 2. (E)].

5. *Fusarium*:

Infected wheat seeds become brown in color. Colony on seed grows abundantly with fine, white loose mycelium usually yellow then red. Powder like substance on mycelium can be seen due to the presence of conidial chains [Figure 2. (F)].

6. *Culvularia*:

Infected Kernel become smudge of wheat. Colony color on seed surface is brown to black, hairy, cushionshape, and loosely attached. Conidiophores usually grow singly or in groups. Conidia are borne at the apex or sides of the conidiophore. Conidia are dark slightly curved, usually broad in the middle cell [Figure 2. (G)]

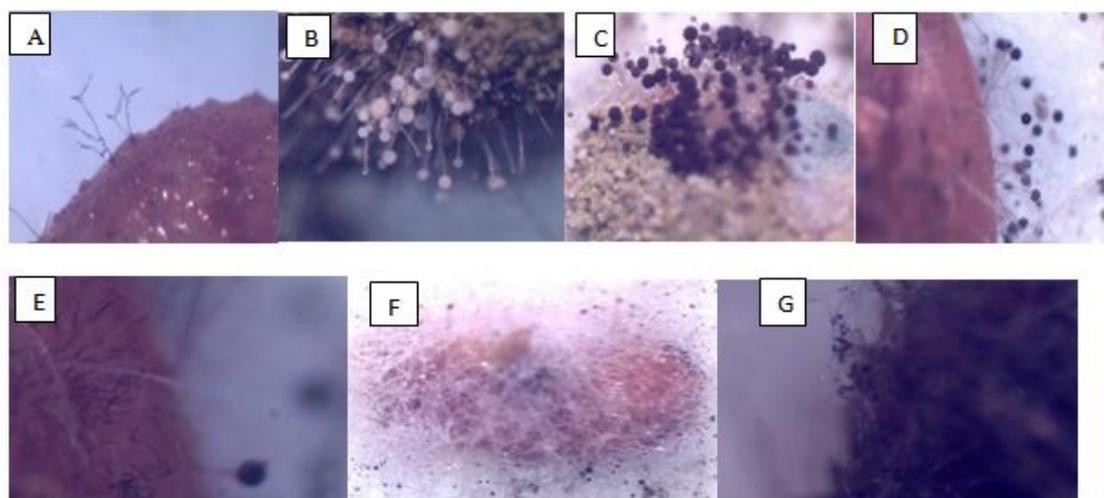


Figure 2. Morphology of the fungus that grows on wheat seed. (A) *Bipolaris* (B) & (C) *Aspergillus* (D) *Rhizopus* (E) *Alternaria* (F) *Fusarium* (G) *Curvularia*.

Occurrence of six pathogenic fungal genus:

In this experiment six pathogenicfungi were studied viz,*Bipolaris*, *Aspergillus*, *Rhizopus*, *Alternaria*, *Fusarium* and *Curvularia*. They were predominante and established pathogen of wheat seed. Among the pathogen studied *Bipolaris* were most frequent in terms of percent of infection (51.5%) followed by *Aspergillus* (31.5%) and *Rhizopus* (29.5%). The incidence of infection was minimum in case of *curvularia* (13%) [Table 1].

Table no 1:Occurrenceof six target pathogenic fungal genus in farmers saved wheat seed

Fungi	Dish Number								% of infection
	1	2	3	4	5	6	7	8	
<i>Bipolaris</i>	12	14	17	13	15	11	10	11	51.5
<i>Aspergillus</i>	6	8	5	10	7	9	10	8	31.5
<i>Rhizopus</i>	8	6	9	7	10	5	8	6	29.5
<i>Alternaria</i>	7	4	8	5	7	4	6	5	23
<i>Fusarium</i>	4	3	5	6	3	7	4	5	18.5
<i>Curvularia</i>	3	2	4	3	4	5	2	3	13

IV. Conclusion

Morphology of six pathogenic fungi and health status of farmers saved wheat seed were evaluated in this experiment.The frequency of infection was high in case of *Bipolaris* followed by *Aspergillus*, *Rhizopus*, *Alternaria*, *Fusarium*, *Curvularia*. From the above discussion it can be concluded that, health status of farmers saved wheat seed in Bangladesh is unpleasant. As quality seeds are the main source of high yielding crops,it should be improved. Seed treatment can be done using fungicides or hot water before sowing. Manually seed cleaning might increase the quality of seeds.

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