Wheat seed quality – A study on farmers' seed

Salina P. Banu[1], J.M. Duxbury[2], J.G. Lauren[3], Craig Meisner[4] and Rafiqul Islam[5]

[1] Wheat Research Centre, Bangladesh Agricultural Research Institute, Gazipur-1701,Bangladesh
[2, 3]2917 Bradfield Hall, Cornell University, Ithaca, New York 14853 USA
[4]CIMMYT, P.O.Box no. 6057, Gulshan, Dhaka-1212, Bangladesh
[5]Economics Division, Bangladesh Rice Research Institute, Bangladesh

Abstract

High quality seed is the key to successful agriculture. Survey results have shown that 64% of Bangladeshi farmers use their own wheat seed year after year, or 26% purchase from other farmers in local markets. Only 10% of the seed is purchased from governments' seed suppliers. As a result, poor seed quality is a significant factor affecting wheat productivity at the farm level in Bangladesh. To quantify farmers' seed quality, wheat seeds were collected from the same 44 farms in the Chuadanga region of southwestern Bangladesh during sowing and after harvest. Seed germination was compared between the standard blotter test and a soil assay on farmers' representative soil at Wheat Research Center, Bangladesh Agricultural Research Institute, Gazipur. Results indicated that the soil assay is an easy and accurate way for farmers to evaluate seed quality under their conditions. Good to best quality seed (>81% germination) during sowing in first week of December was 68% by the soil assay and 93% by the blotter test. After harvest in May, seeds from all farms germinated by blotter test, but only 9% of farmer seeds had >81% germination by soil assay. Infection of *Bipolaris sorokiniana* was found on harvested seed from 80% of the farms after storage in October. This and other seed-borne fungus demand for seed treatment to increase wheat production in Bangladesh.

Media summary

Farmers' seed quality is a factor to stabilize wheat production and the assessment of farmer's seed quality in farmer's representative soil assay will be more practical.

Key words

Seed germination, post harvest dormancy, seedling emergence, seed-borne disease, realistic guide and farmers' training.

Introduction

Stands of wheat outside the high producing areas, such as the Indian Punjab, are often poor despite high seeding rates. In heavy-textured soils, poor seedbed preparation and poor seed-soil contact is a major problem, which has led to the identification and development of no-tillage planting methods that are more successful than other methods. Survey results have shown that 64% of Bangladeshi farmers use their own wheat seed year after year, or 26% purchase from other farmers in local markets. Only 10% of the seed is purchased from governments' seed suppliers. So, planting of poor seed quality results in poor crop stands and become a significant factor affecting wheat productivity at the farm level. Seed-borne disease is one of the causes of low seed viability (Bewley and Black 1994), which can be determined by standard germination test (Elias et. al. 2004). However, since the standard germination test is conducted under ideal conditions, it does not necessarily reflect the germination potential of seed lot under field conditions (Munn 1926; Copeland and McDonald 2001). Most farmers produce their own seed, which is generally surface broadcast then worked into the soil by a subsequent tillage or planking operation, which leaves seed at variable depths. Since some seed is planted too deep to germinate, the relative contributions of seed quality and planting technique to poor stand establishment are uncertain. Thus, we attempted to assess the farmer's seed quality by a simple test of seed germination and emergence on farmers' representative soil along with the standard blotter test to provide the more realistic guide of seed viability and actual field performance.

Methods

Collection of farmer's seed and farmer's representative soil

Seeds of popular Kanchan variety were collected from same 44 farmers of different villages of Chuadanga during sowing in December and after harvest in April. Soil was also collected from the representative villages of Chuadanga.

Blotter test for germination percentage and for infection of seed-borne pathogen

Twenty-five seeds were placed on 2 pieces of moistened blotter paper in a Petri dish as 5 replicates/farmers and incubated at room temperature for 7 days on a laboratory bench. Normal seedlings were counted after 7 days for % germination. Blotter was moistened when necessary during the incubation period. Individual seeds and seedlings were examined under a microscope for seed-borne pathogen infection and results were expressed as percentage by number of seeds affected.

Soil assay for germination percentage and seedling infection

Twenty-five seeds were sown in farmer's soil (moisture at field capacity) placed in a small earthen pot and covered with a thin layer of dry soil as 5 replicates/farmers in an open room. Seedlings emerged from soil were counted after 7 days for % germination. A light spray irrigation was given after germination. Seedlings were washed under running tap water and counted for infected seedlings as discolored root with infected stem base.

Seed preservation and subsequent germination tests

Clean and dry seeds collected from farmers after harvest (@1kg seed/farmer) was placed in cotton bags and kept in a sealed drum at room temperature at the Wheat Research Center in Gazipur. Germination tests and pathogen inspections were performed on these stored seeds by blotter test in April, May, June, August and October and by soil assay in May, August and October.

Results

At sowing in December, wheat seed germination was greater than 81% (good-best category) in 93% of farmers (41 farmers) conducting the blotter test, whereas only 68% (30 farmers) conducting the soil assay test had >81% (good-best category) germination (Table 1). So, there was an increase of germination with blotter test in 25% farms indicating interaction between environmental condition and soil-borne pathogen pressures affecting the emergence and plant stands in soil assay, despite the viable seed (Lisker and Klein 1997; Anon 2000). In May, six-weeks after harvest, wheat seeds from all 44 farms showed 91-100% germination with the blotter test, but only 9% of farmers (4 farms) had >81% germination with the soil assay test. However, by October, 91-100% germination was attained by 89% of farmers (39 out of 44 farms) with soil assay test. These results indicate that the germination conditions influence the level of post harvest dormancy in wheat seeds which have very short dormancy period by internal control of seed (Bewley and Black 1994; Krenzer *et. al*. 2002).

Bipolaris sorokiniana infection was found on 64% seedlings (28 farmers) germinated with blotter test just after harvest in April (Figure 1) and increased to 80% (35 farmers) after storage in October. This indicates the seed-borne nature of this polycyclic pathogen and its infection along with other seed-borne pathogens with mite demands seed treatment (Scheel 1997). In October, seedling infection of <70% (good rating) was found in 80% of farmers' (35 farms) with blotter test, but it reduced in 48% of farmers' (21 farms) with soil assay (Table 2). This difference for good rating in 32% of farmers' (14 farms) indicates the realistic guide of seed viability under soil conditions than blotter test, infection by soil-borne pathogens combined with seed-borne pathogens and also demands for the seed treatment.

Seeds tested in December were from farmer storage, while seeds tested in October were stored at the Wheat Research Center. Seed germination under good-best category was found in 93% of farmers (41 farms) in October than 68% of farmers (30 farms) in December from the soil assay (Table 1). This increase of 25% germination in October indicates the need of farmer seed storage facility (Copeland and McDonald 2001) through proper training.

Table 1: Farmers' seed germination rate at sowing and after harvest

Grading of seed	At sowing		After harvest					
	December		May		August		October	
	B	S	B	S	B	S	B	S
Best (91-100% G)	34	14	44	1	40	31	40	39
Good (81-90% G)	7	16	0	3	2	8	2	2
Moderate (70-80% G)	3	9	0	10	1	2	2	2
Poor (<70% G)	0	5	0	30	1	3	0	1
Total farmer	44	44	44	44	44	44	44	44

G-germination, B-blotter test, S-soil assay

Table 2: Seedling infection rate in farmer's seed in germination test

Grading of seedling	August		October	
	Blotter	Soil	Blotter	Soil
Very bad (91-100% infected)	9	0	0	6
Bad (81-90% infected)	14	4	6	10
Moderate (70-80% infected)	7	3	3	7
Good (<70% infected)	14	37	35	21
Total farmer	44	44	44	44

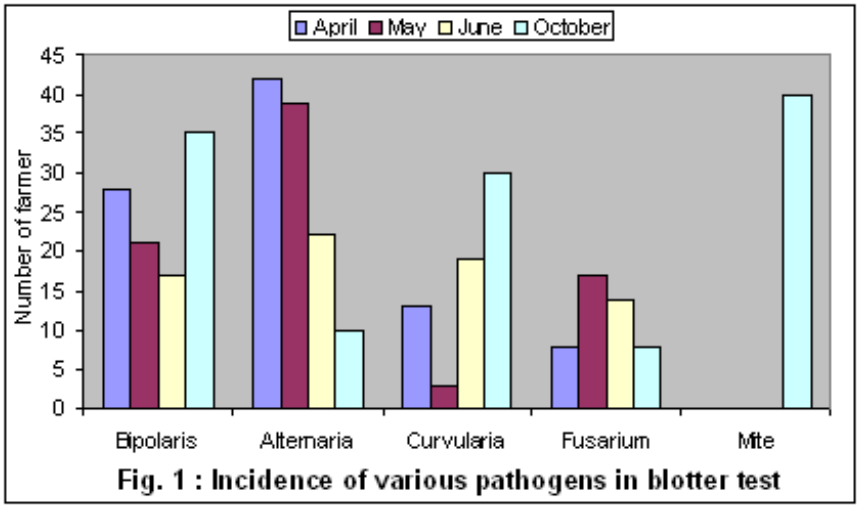

Fig. 1 : Incidence of various pathogens in blotter test

Conclusion

A simple test of seed germination and emergence from soil can provide farmers a more realistic guide of seed viability under farmer's soil conditions than the blotter test. This is inexpensive, rapid, uncomplicated, and close to actual field performance. The soil assay can provide farmers a guide for seeding rate indicating when fungicidal treatments should be applied, or when a new seed source should be sought according to the condition of his own land and saved seed. Farmers only need a simple training.

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