

Seed quality of wheat under conservation agriculture based technology

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Abstract

The experiment was carried out at the research field and laboratory of Seed Technology Division BARI, Joydebpur, Gazipur during rabi season of 2013-14 to find out the suitable conservation agriculture based technology for wheat seed production and to know the varietal performance of wheat under resource conservation agriculture based technology for quality seed production. The experiment was laid out in split plot design with three replications where variety was used in main plot. The treatment comprises of two wheat variety, V₁= BARI Gom-27 and V₂= BARI Gom-28 and four conservation agriculture based technology viz. CA₀= Conventional tillage, CA₁=Strip tillage, CA₂=Power tillage operated seeder and CA₃= Raised bed system. Plant height, Spike length, No. of florate per spike, No. of grain per spike, 1000 seed weight and Yield were significant with variety and different conservation tillage practices. The maximum plant height and spike length was observed from CA₃ (Raised bed system). Higher florate no, grain per spike, thousand seed weight and finally the highest seed yield were found from CA₃ (Raise bed system). After harvesting significantly the highest seed germination (97%) root length, shoot length, seedling dry weight and vigour index were recorded from the seeds of raised bed plot. Wheat variety BARI Gom -28 produced better quality seed under raised bed system compared to BARI Gom-27.

Keywords: wheat, raised bed, conservation agriculture and yield

Introduction

Wheat is the second most important cereal crop in Bangladesh. Due to the development of modern varieties of wheat, farmers are interested to grow this crop. BARI Gom- 27 and BARI Gom-28 are the popular variety of wheat at farmers level. That is why demand of high yielding variety (HYV) wheat seed is increasing day by day. Intensive tillage systems resulted in increased soil compaction and decreased soil organic matter (Gangwar et. al., 2005) and biodiversity (Biamal et. al., 2000). Reduced or conservation tillage is gaining more attention in recent years with increasing concerns about natural resource degradation. Research results revealed that, if bed planting system is applied for cultivation of wheat, than grain yields can be even greater than those from a conventional planting system (Sayre, 2004), in addition to the improvement and conservation of soils. Farmers are showing interest on adapting of resource conserving technology. Resource conservation agriculture is becoming popular in the farmers field at Rajshahi, Natore, Pabna and Chapai Nawabgonj district of the country. There is not enough information about seed quality of wheat

where conservation agriculture technologies are used. It is essential to know the performance of newly developed wheat varieties under conservation agriculture. Hence, the present study was undertaken to know the seed quality of wheat under conservation agriculture.

Materials and Methods

The field experiment was conducted at the research field of Seed Technology Division, BARI, Joydebpur, Gazipur during rabi season of 2013-14. The experiment was laid out in split -plot design with three replications. Unit plot size was 10m × 5m, Two varieties were V₁=BARI Gom-27, V₂=BARI Gom-28 and four conservation tillage were CA₀=Conventional tillage, CA₁=Strip tillage, CA₂= Power tillage operated seeder and CA₃= Raised bed System. In case of conventional treatments 120 kg of wheat seeds were used and the conservation treatments were done by different types of power tiller operated seeder machine. Before sowing the treatments plots were fertilized with Urea, TSP, MOP, Gypsum and Boron @N₁₀₀P₃₀K₅₀S₂₀B₁. Seeds were sown on 5 December, 2013 in 20cm row spacing in all the treatments except raised bed system. Irrigation

and other intercultural operations were done as per crops requirement. The crop was harvested at harvest maturity stage. Data on yield, yield components and seed quality parameters were recorded. The recorded data were analyzed statistically and treatments were compared by LSD test.

Results and discussion

The yield contributing characters of wheat were influenced by different conservation agriculture practices. Significantly the highest plant height was observed from CA₃ (raise bed) treatment and lowest was from CA₁ (strip tillage) (Table-1). Treatment CA₀ gave statistically identical result with CA₁ and CA₂.

Spike length in an important yield contributing character which was influenced by different conservation technique. Statistically the highest spike length (9.63cm) was recorded from CA₃ (raised bed) treatment. The lowest spike length (8.61cm) was observed from CA₁ (strip tillage operation) treatment. Statistically identical result was founded from CA₀ and CA₂ treatment.

Number of floret per spike was varied under different conservation agriculture practiced in this study. The highest floret number (17.96) was observed from CA₃ (raised bed system) treatment which was statistically similar with CA₀ (conventional tillage) and CA₂ (PTOs). In case of CA₁ treatment (strip tillage) practices the lowest floret no. (16.68) was recorded from the study.

Number of grain per spike was influenced by different seeding method. Mathematically the highest (52.12) grain per spike was recorded from CA₃ (raise bed system) treatment and lowest (47.30) was found from CA₁ (strip tillage) treatment.

Thousand seed weight is an important yield influencing parameter which was varied in different conservation agriculture based technology. Statistically the highest (41.64 g) thousand seed weight was found from CA₃ (raise bed) treatment plot and the lowest thousand seed weight (37.53 g) was recorded from CA₁ (strip tillage) treatment. Statistically similar result was found from CA₀ (38.21 g) treatment and CA₂ (39.35 g) treatment.

Seed yield is the economic part of wheat. Ultimate goal of the wheat producer is to obtain maximum seed yield from the crop. Seed yield is the function of different yield contributing parameter. As spike length, floret no, grain per spike, thousand seed weight was the highest from raised bed system, statistically the highest seed yield (4.09 t/ha) was recorded from CA₃ (raised bed system). The lowest grain yield (3.27 t/ha) was recorded from CA₁ (strip tillage) treatment. Conventional agriculture practices (CA₀) and power tiller operated seed (CA₂) technique of sowing gave the statistically identical seed yield of wheat.

Variety of wheat and different conservation agriculture based technology influenced significantly among the treatments (Table 2). The highest spike length, floret no, grain per spike thousand seed weight and ultimately seed yield was found from V₂ × CA₃ treatment. Raised bed enhanced the better shoot development, better nutrient use efficiency and sunlight which ultimately influenced the yield contributing character and producing larger spike, more and bold grain per spike and finally better yield of raise bed plot in V₂ × CA₃ treatment combination.

Table 1. Effect of Conservation Agriculture based technology on yield and yield components of wheat

Treatment	Plant height (cm)	spike length (cm)	Floret no.	Grain/spike	TSW (g)	Yield (t/ha)
CA ₀ (Conventional tillage)	80.26	9.21	17.36	47.74	38.21	3.71
CA ₁ (Strip tillage)	77.38	8.61	16.68	47.30	37.53	3.27
CA ₂ (PTOs)	79.24	9.20	17.43	48.10	39.35	3.41
CA ₃ (Raise Bed system)	84.90	9.63	17.96	52.12	41.64	4.09
LSD (0.05)	3.43	0.39	0.86	4.57	1.29	0.31
CV (%)	8.40	6.43	4.86	5.24	3.86	6.94

Note: V₁=BARI Gom-27, V₂=BARI Gom-28 and CA₀=Conventional tillage, CA₁=Strip tillage, CA₂= Power tillage operated seeder and CA₃= Raised bed System

Interaction effect of variety and conservation agriculture based technology on yield and yield components of wheat

Table 2. Interaction effect of variety and conservation agriculture based technology for wheat seed production

Treatment	Plant height (cm)	spike length(cm)	Floret no.	Grain/spike	TSW (g)	Yield (ton/ha)
V ₁ ×CA ₀	82.09	8.96	16.67	44.82	34.22	3.78
V ₁ ×CA ₁	75.99	8.78	16.17	45.23	34.56	2.93
V ₁ ×CA ₂	79.21	9.16	16.92	46.12	35.29	3.44
V ₁ ×CA ₃	84.93	9.46	17.47	50.43	37.50	3.96
V ₂ ×CA ₀	78.43	9.45	18.05	50.65	42.20	3.64
V ₂ ×CA ₁	78.76	8.44	17.18	49.36	40.50	3.12
V ₂ ×CA ₂	79.23	9.24	17.95	50.67	43.40	3.38
V ₂ ×CA ₃	84.82	9.81	18.44	53.80	45.77	4.23
LSD _(0.05)	3.43	0.39	0.86	4.57	1.29	0.31
CV(%)	8.40	6.43	4.86	5.24	3.86	6.94

Note: V₁=BARI Gom-27, V₂=BARI Gom-28 and CA₀=Conventional tillage, CA₁=Strip tillage, CA₂= Power tillage operated seeder and CA₃= Raised bed System

Table 3. Effects of Conservation agriculture based technology on seed quality of wheat

Treatments		Germination (%)	Shoot length (cm)	Root length (cm)	Seedling dry weight (mg)	Vigor index
Variety-1 (V ₁)	CA ₀	91.67	9.25	8.35	23.32	2140
	CA ₁	90.00	9.15	7.11	25.26	2271
	CA ₂	92.67	7.41	6.28	23.70	2197
	CA ₃	96.33	9.64	9.6	27.91	2689
Variety-2 (V ₂)	CA ₀	93.33	8.05	5.92	32.01	2986
	CA ₁	92.67	6.11	4.26	27.22	2524
	CA ₂	94.33	7.607	5.71	30.66	2891
	CA ₃	97.33	8.193	6.11	32.84	3195
LSD _(0.05)	-	2.85	2.37	2.07	3.88	368.9
CV(%)	-	1.71	16.31	17.50	7.07	7.94

Note: V₁=BARI Gom-27, V₂=BARI Gom-28 and CA₀=Conventional tillage, CA₁=Strip tillage, CA₂= Power tillage operated seeder and CA₃= Raised bed System

It was observed that seed quality of wheat is greatly influenced by conservation agriculture. The highest germination rate (97.33%) of wheat was recorded from V₂×CA₃ treatment combination which was at par with V₁×CA₃ treatment combination. Good quality seed of raise bed plot in both cases gave better germination rate compared to other treatment combination. Shoot length of the harvested seed was found the highest from V₁×CA₃ treatment and the lowest was recorded from V₂×CA₁ treatment. Due to the varietal effect, variety BARI gom-27 gave the higher shoot length but it was observed from the study that in case of both varieties the raise bed gave the better result than other treatment combination. Root length of wheat seedling was measured the highest from

V₁×CA₃ treatment combination and the lowest root length was recorded from V₂×CA₁ treatment combination. Seedling dry weight was recorded maximum from V₂×CA₃ treatment combination and minimum was found from V₁×CA₀ treatment combination. The maximum vigour index (3195) was calculated from V₂×CA₃ treatment combination and the lowest (2140) was recorded from V₁×CA₀ treatment combination. The bold seed of V₂×CA₃ treatment have more reserve material within the seed which acts favour on higher root length, shoot length seedling dry weight and ultimately highest vigour index of the seed. From the study, it was found that raise bed system of planting in both variety performed better than other treatment combination although, BARI Gom-28 (V₂) gave

superior result compared to BARI Gom-27(V₁) with different treatment combination.

Conclusion

From the study it can be concluded that raised bed system of sowing under conservation agriculture based technology could be practiced for obtaining higher seed yield and seed quality of wheat. Wheat variety BARI Gom -28 performed better for quality seed production under raised bed system compared to BARI Gom-27.

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