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Original Research Article

Effect of Seed Enhancement Treatments on Field Parameters of Wheat Seed Produced under Zero Tillage Condition

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Keywords

Wheat, Seed, Enhancement, Tillage, Field parameters

A B S T R A C T

Wheat (*Triticum aestivum* L.) is a widely adapted crop and is grown from temperate, irrigated to dry and high-rain-fall areas and warm, humid to dry, cold environments. Seed produced under zero tillage condition leads to moisture stress in the field condition which might affect the yield and its component trait. A single lot of wheat variety DBW 14 was sown under two different tillage conditions after treatments with seed enhancement agents. Seed yield and its component traits of seed lot produced under zero tillage was comparatively inferior to that of normal tillage. Treatment with $CaCl_2$ (2%) followed by Bavistin (T_7, 2 gram per kg of seed) significantly improved followed by combined treatment of hydration with distilled water followed by Bavistin (T_6, 2 gram per kg of seed) of all the seed yield component parameters *viz.*, plant height, seed yield per plant, seed yield per square meter, number of spike per square meter, number of seeds per spike and harvest index per plant which was lower value in zero tillage condition than in normal tillage.

Introduction

Wheat is a one of the most important cereal crop of India and is the second largest producer of wheat in the world after China. The area, production and productivity of wheat in India is about 30.27 Mha, 93.50 MT and 0.309 MT/ha respectively (GOI 2015-16). (Anonymous, 2015-16). Seed is a basic and vital input for sustained growth in agricultural productivity and production since ninety per cent of the food crops are grown from seed (Schwinn 1994). Good quality seed can increase yields by 5-20 per cent. The extent of this increase is directly proportional to the quality of seed that is being sown. Wheat yields in the South Asia where rice-wheat cropping system being followed are suffering due to delayed sowing, late harvesting of rice, short period of winter seasons, less developed facilities of irrigation and poor crop stands due to lack of optimal moisture. The availability of good quality water is decreasing with time due to higher population pressure, urbanization and industrialization. Another reason of water scarcity is becoming an increasingly critical issue in India is because of the need to feed

an exploding population. India's groundwater is being depleted, rainwater is getting wasted, and surface water is being polluted (Prakash 2014). In this context we have adopted the resource conservation agriculture both for grain as well as seed production. Zero tillage is one of the agro techniques under resource conservation agriculture where seed is sown without doing any tillage practice.

There is not much study available whose directly reflect the status of seed quality being grown under zero tillage and its improvement through seed enhancement treatment. Several workers have already reported that seed enhancement treatment with certain agent is improving the seed quality parameters. Harris (1996) demonstrated that simply soaking seeds in plain water before sowing could increase the speed and uniformity of germination and emergence, leading to better crop stands, and stimulated seedlings to grow much more vigorously. In pre sowing seed enhancement treatment, seeds are soaked in different solutions with high osmotic potential due to prevent the seeds from absorbing enough water for radical protrusion, which is suspending the seeds in lag phase (Taylor *et al.,* 1998). Pre sowing seed enhancement treatment has been commonly used to reduce the time between seed sowing and seedling emergence and to synchronize emergence (Parera and Canliffe, 1994).

Materials and Methods

The study entitled was carried out at Bihar Agricultural University, Sabour, Bhagalpur (Bihar) in rabi 2016-17. Single seed lot of DBW 14 was treated with different seed enhancement treatment *viz*., KNO_3 (T_1, 2.0 %, 18h), Hydration-Dehydration (T_2, H-D, 8h), $CaCl_2$ (T_3, 2.0%, 12h), seed dressing with Bavistin (T_4, 2 gram per kg of seed), hydration with KNO_3 (2.0%) followed by Bavistin (T_5, 2 gram per kg of seed), hydration with distilled water followed by Bavistin (T_6, 2 gram per kg of seed), hydration with $CaCl_2$ (2%) followed by Bavistin (T_7, 2 gram per kg of seed). Seed enhancement treatment was done by soaking of required quantity of seeds in tap water with different chemicals for different hours in ratio of 1:2 (Kg of seeds/volume of solution) by using wet gunny bag. Then the treated or primed seeds were dried in shade to maintain the seed moisture content approximately 12 or 13 %. Treated seeds were sown in the plot size area of 7x4 square meters with a spacing of 20x10 cm. Seed lots were adjusted in six number of plot. Treated seeds along with control (untreated) were sown in two separate experiments for normal and zero tillage conditions and crop was raised with recommended package and practices. Processed seeds were examined for the quality parameters and data were recorded on plant height (cm), seed yield per plant (SYP, g), seed yield per square meter (SYM, g),) number of spike per square meter (NSP), number of seeds per spike (NSS) and harvest index per plant (HIP).

Results and Discussion

The seed yield is a complex character and dependant on many attributes. The high vigorous seed gives better plant growth which lead to higher seed yield per unit area. Thus, to know the effect of seed enhancement treatment and tillage condition on seed yield and component characters such as The plant height (cm), seed yield per plant (SYP, g), seed yield per square meter (SYM, g), number of spike per square meter (NSP), number of seeds per spike (NSS) and harvest index per plant (HIP) the experiment were conducted and mean values are given in the table 2.

A clear difference was observed in all the parameters studied during normal and zero tillage condition. The seed enhancement

treatment had improved significantly over control of all the parameters studied in both the tillage condition.

Effect of tillage condition

The plant height (cm), seed yield per plant, seed yield per square meter, number of spike per square meter, number of seeds per spike and harvest index per plant was recorded significantly higher from normal tillage (74.64, 1.58, 583.96, 369.13, 46.75, 39.43 respectively) than in zero tillage (71.33, 1.51, 544.46, 360.58, 44.24, 36.85 respectively).

Table.1 Mean values for different laboratory parameters under normal tillage conditions

Tillage Conditions	PH	SYP	SYM	NSP	NSS	HIP
Normal Tillage (B1)	74.64	1.58	583.96	369.13	46.75	39.43
Zero Tillage (B2)	71.33	1.51	544.46	360.58	44.24	36.85
CD (0.01)	**NS**	**0.072**	**27.667**	**10.807**	**2.267**	**1.835**

PH: Plant height: SYP: seed yield per plant; SYM: seed yield per square meter; NSP: number of spike per square meter; NSS: number of seeds per spike; HIP: and harvest index per plant

Table.2 Mean values for field parameters under different tillage conditions

Treatments	PH	SYP	SYM	NSP	NSS	HIP
Normal Tillage (**B_1**)						
B_1T_0	74.29	1.45	500.43	344.33	43.93	35.80
B_1T_1	75.45	1.61	638.70	395.67	47.13	40.39
B_1T_2	74.34	1.52	603.79	396.33	44.63	37.21
B_1T_3	74.40	1.54	535.13	348.67	45.17	38.40
B_1T_4	73.20	1.53	566.12	369.67	46.50	38.36
B_1T_5	74.43	1.54	572.51	372.33	44.77	38.65
B_1T_6	75.40	1.66	572.23	345.17	49.33	41.59
B_1T_7	75.62	1.79	682.75	380.83	52.53	45.03
Zero Tillage (**B_2**)						
B_2T_0	70.62	1.41	483.60	342.17	39.93	34.08
B_2T_1	70.29	1.49	577.75	389.00	43.60	35.98
B_2T_2	71.21	1.44	511.74	356.50	42.50	34.96
B_2T_3	71.04	1.57	540.85	343.50	46.50	38.18
B_2T_4	71.67	1.46	527.73	369.17	40.80	35.92
B_2T_5	70.77	1.53	524.33	342.33	44.87	37.60
B_2T_6	72.98	1.59	565.72	356.33	47.80	38.35
B_2T_7	72.10	1.62	623.92	385.67	47.93	39.75
CD (0.01)	**NS**	**0.102**	**39.127**	**15.284**	**3.207**	**2.596**

The per cent increment over and above for zero tillage condition plant height, seed yield per plant, seed yield per square meter, number of spike per square meter, number of seeds per spike and harvest index per plant was 4.43, 4.43, 6.76, 2.31, 5.36 and 7.22 respectively (Table 1).

Effect of seed enhancement treatments: Normal tillage

All the pre-sowing seed enhancement treatment were found significantly improve the seed quality in terms of the plant height, seed yield per plant, seed yield per square meter, number of spike per square meter, number of seeds per spike and harvest index per plant when was the wheat seed raised under normal tillage condition (table 2). Similar findings were also reported by Ahmadvand *et al.,* (2012, sunflower), Farooq *et al.,* (2006, rice), Monel *et al.,* (2011, sorghum), Patel *et al.,* (2017, maize) and Singh *et al.,* (2017, wheat).

Treatment with $CaCl_2$ (2%) followed by bavistin results in highest percent improvement over control for plant height, seed yield per plant, seed yield per square meter, number of spike per square meter, number of seeds per spike and harvest index per plant showed per cent improvement 1.79, 23.45, 36.43, 10.60, 19.58 and 25.78 with values of 75.62 cm, 1.79 g, 682.75 g, 380.83, 52.53 and 45.03 per cent respectively. Similar results were also found by Ajirloo *et al.,* (2013, maize), Farooq *et al.,* (2006, rice), Jafar *et al.,* (2012, wheat), Pawar *et al.,* (2003, sunflower), Shehzad *et al.,* (2012, sorghum).

Next best treatment was hydration with distilled water followed by bavistin which showed significantly better performance & at par to $CaCl_2$ (2%) followed by bavistin for improving the plant height, seed yield per plant, seed yield per square meter, number of spike per square meter, number of seeds per spike and harvest index per plant showed per cent improvement of 1.49, 14.48, 14.35, 0.24, 12.29, and 16.17 with values of 75.40 cm, 1.66 g, 572.23 g, 345.17, 49.33, and 41.59 per cent respectively over untreated seeds. These findings were strongly supported by Ajirloo *et al.,* (2013, maize), Meena *et al.,* (2013, wheat), Toklu *et al.,* (2015, wheat), Patel *et al.,* (2017, brinjal and tomato), Yucel *et al.,* (2012, lentil).

Zero tillage

In the present study when wheat crop sown under zero tillage after treatment of seed with different pre-sowing seed enhancement treatments, it results in improvement of seed quality in terms of plant height, seed yield per plant, seed yield per square meter, number of spike per square meter, number of seeds per spike and harvest index per plant (table 2). Poor crop establishment is a major problem in wheat production under zero tillage condition.

Seed treatments with $CaCl_2$ (2%) followed by bavistin significantly improved the all the seed quality parameters with percentage increment of 2.10, 14.89, 29.02, 12.71, 20.04 and 16.64 in plant height, seed yield per plant, seed yield per square meter, number of spike per square meter, number of seeds per spike and harvest index per plant respectively over control with values of 72.10 cm, 1.62 g, 623.92 g, 385.67, 47.93 and 39.75 per cent respectively.

Next to $CaCl_2$ (2%) followed by bavistin, hydration with distilled water followed by bavistin given better result which exhibited statistically at par to $CaCl_2$ (2%) followed by bavistin for plant height, seed yield per plant, seed yield per square meter, number

of spike per square meter, number of seeds per spike and harvest index per plant with percentage increment of 3.34, 12.77, 16.98, 4.14, 19.71 and 12.53 over untreated seeds with value of 72.98 cm, 1.59 g, 565.72 g, 356.33, 47.80 and 38.35 per cent respectively.

It was very much clear from the findings of experiment that untreated seeds exhibited significantly inferior performance. Seed treated with $CaCl_2$ (2%) followed by bavistin gives better quality next to hydration with distilled water followed by bavistin, KNO_3 (2%), KNO_3 (2%) followed by bavistin, $CaCl_2$ (2%), distilled water, seed dressing with bavistin, that scored nearly similar values and were at par to control that plant height, seed yield per plant, seed yield per square meter, number of spike per square meter, number of seeds per spike and harvest index per plant respectively.

It was concluded from the present study that seed yield and its component traits of wheat variety DBW 14 produced under zero tillage was comparatively inferior to that of normal tillage. Further seed enhancement treatment improved the seed yield component traits in both the tillage condition. Almost all the treatment has improved seed yield parameters significantly over control. Among all the treatments, $CaCl_2$ (2%) followed by bavistin was found to be best which was also at par with hydration with distilled water followed by bavistin in both the tillage condition.

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