

# Research Article EFFECT OF SEED ENHANCEMENT TREATMENTS ON SEED VIGOUR POTENTIAL OF WHEAT SEED PRODUCED UNDER ZERO TILLAGE CONDITION

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Abstract: Wheat (*Triticum aestivum* L.) is a widely adapted crop. It is grown from temperate, irrigated to dry and high-rain-fall areas and from warm, humid to dry, cold environments. Seed produced under zero tillage condition leads to moisture stress in the field condition which might affect the vigour potential of seed. Generally, stress (moisture) has deleterious effect on germination and vigour of crop. In the present investigation, the single lot of wheat variety DBW 14 was sown under two different tillage conditions after treatments with different seed enhancement agents with the objective to assess their effect on seed vigour potential. Seed vigour potential of seed lot produced under zero tillage was comparatively inferior to that of normal tillage. Treatment with KNO3 (2%) significantly improved followed by combined treatment of KNO<sub>3</sub> (2%) and Bavistin, (2g/kg of seed) of all the seed vigour potential parameters viz., 100 seed weight, standard germination, seedling dry weight, seedling length, vigour index-I and vigour index-II, mean emergence time and field emergence index show lower value in zero tillage condition in comparison to normal tillage.

### Keywords: Wheat, Seed, Enhancement, Tillage, Vigour

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### Introduction

Wheat is a one of the most important cereal crops in India. India ranks second position for production 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 [1]. Seed is a basic and vital input for sustained growth in agricultural productivity and production since ninety percent of the food crops are grown from seed [19]. Good quality seed can increase yields by 5-20 percent. The extent of this increase is directly proportional to the quality of seed that is being sown. In South Asia, where rice-wheat cropping system being followed, yield of wheat is generally low which is due to late sowing, delayed harvesting of paddy, short duration of winter season and poor facilities of irrigation. Further availability of good guality water to be utilized in wheat production is decreasing day by day 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 [18]. 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. 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 [13]. 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 [21]. Pre-sowing seed enhancement treatment has been commonly used to reduce the time between

seed sowing and seedling emergence and to synchronize emergence [16]. 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<sub>3</sub> (T1, 2.0%, 18h), Hydration-Dehydration (T2, H-D, 8h), CaCl<sub>2</sub> (T3, 2.0%, 12h), seed dressing with Bavistin (T4, 2 gram per kg of seed), hydration with KNO3 (2.0%) followed by Bavistin (T5, 2 gram per kg of seed), hydration with distilled water followed by Bavistin (T6, 2 gram per kg of seed), hydration with CaCl<sub>2</sub>(2%) followed by Bavistin (T7, 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 plots. 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 100 seed weight (g), germination (%), seedling dry weight (mg), seedling length (cm), [seedling vigour index-I (Germination × seedling length), seedling vigour index-II (Germination × Seedling dry weight) [2], mean emergence time, MET [8] and field emergence index, FEI [15].

# **Results and Discussion**

The seed enhancement treatments have already been proven to improve germination and vigor potential of seed lot in several crops that contributes to the better crop establishment in field. The seed enhancement treatments had enhanced all seed quality parameters under both the tillage condition in present study.

### Effect of Seed Enhancement Treatments on Seed Vigour Potential of Wheat Seed Produced under Zero Tillage Condition

Table-T Mean values for unreferit laboratory parameters under normal unade conditio	Table-1	Mean values	for different	laboratorv	parameters	under norma	tillage (	condition
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	100 Seed weight (g)	Standard Germination (%)	Seedling Length (cm)	Seed Dry Weight (mg)	Vigour Index- I	Vigour Index-II	Mean Emergence Time	Field Emergence Index
Normal Tillage (B1)	3.42	95.54	19.30	41.41	1844.72	3939.27	5.34	82.09
Zero Tillage (B2)	3.36	94.21	17.90	39.53	1687.23	3725.98	5.55	80.28
CD (0.01)	0.049	1.200	0.295	0.571	39.215	72.938	0.275	1.284

#### Table-2 Mean values for seed vigour parameters under different tillage conditions

Treatments	100 Seed weight (g)	Standard Germination (%)	Seedling Length (cm)	Seed Dry Weight (mg)	Vigour Index- I	Vigour Index- II	Mean Emergence Time	Field Emergence Index
Normal Tillage (B1)								
B <sub>1</sub> T <sub>0</sub>	3.18	92.67	18.10	41.4	1677.40	3718.77	6.18	77.03
B <sub>1</sub> T <sub>1</sub>	3.56	98.00	20.73	42.4	2032.00	4272.20	4.36	88.14
B <sub>1</sub> T <sub>2</sub>	3.42	94.33	18.45	41.6	1740.64	3847.93	5.42	86.15
$B_1T_3$	3.43	94.33	19.67	39.6	1854.20	3741.87	5.52	77.37
B <sub>1</sub> T <sub>4</sub>	3.34	96.67	19.19	39.2	1855.56	3847.83	5.24	82.07
B₁T₅	3.57	96.50	19.57	43.6	1888.35	4200.07	5.21	82.73
B <sub>1</sub> T <sub>6</sub>	3.42	95.83	19.09	41.4	1829.61	3943.13	5.63	78.61
B <sub>1</sub> T <sub>7</sub>	3.46	96.00	19.58	40.4	1880.02	3942.33	5.16	84.62
Zero Tillage (B <sub>2</sub> )								
B <sub>2</sub> T <sub>0</sub>	3.15	90.35	16.92	37.67	1528.85	3402.60	6.34	76.03
B <sub>2</sub> T <sub>1</sub>	3.43	97.00	18.63	41.47	1806.86	4022.60	5.35	86.44
B <sub>2</sub> T <sub>2</sub>	3.33	93.67	17.81	39.93	1668.04	3739.73	5.61	79.22
$B_2T_3$	3.38	93.33	17.89	38.80	1669.92	3621.87	5.39	77.73
$B_2T_4$	3.36	93.50	17.61	39.30	1647.30	3675.40	5.82	82.03
B <sub>2</sub> T <sub>5</sub>	3.45	96.00	18.40	40.20	1765.78	3860.60	5.55	76.07
B <sub>2</sub> T <sub>6</sub>	3.36	95.50	17.82	39.87	1702.75	3805.77	5.37	79.18
B <sub>2</sub> T <sub>7</sub>	3.39	94.33	18.11	39.00	1708.31	3679.30	5.49	85.55
CD (0.01)	0.077	NS	0.661	1.404	112.991	224.824	0.777	3.632

### Effect of tillage condition

The 100 seed weight, germination (%), seeding length, seedling dry weight, vigour index-I, vigour index-II, mean emergence time and field emergence index was recorded significantly higher in seed lot harvested from normal tillage (3.42, 95.54, 19.30, 41.41, 1844.72, 3939.27, 5.34, 82.09 respectively) than in zero tillage (3.36, 94.21, 17.90, 39.53, 1687.23, 3725.98, 5.55, 80.28 respectively). The percent increment over and above zero tillage condition for 100 seed weight, germination (%), seeding length, seedling dry weight, vigour index-I, vigour index-II, mean emergence time and field emergence index was 1.78, 1.41, 7.25, 4.75, 9.33, 5.72, 3.78, 2.25 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 100 seed weight, seed germination, seedling length, seedling dry weight, seed vigour index-I, seed vigour index-II, mean emergence time and field emergence index of wheat when was raised under normal tillage condition [Table-2]. The similar results were also reported in sunflower [14], paddy [9], wheat [1, 4, 20] and maize [12] by several researchers. Treatment with KNO3 results in highest percent improvement over control for 100 seed weight, germination, seedling length, seedling dry weight, seed vigour index-l, seed vigour index-II, field emergence index and mean emergence time showed percent improvement 11.95, 5.76, 14.55, 8.65, 21.14, 14.88, 14.42 and reduction of 29.45 with values of 3.56g, 98.00 percent, 18.10cm, 43.60mg, 2030.00, 4272.20, 88.14 and 4.36days, respectively. Similar results were also reported in soybean [5], wheat [11, 20] and maize [6] by several researchers. Next best treatment was KNO<sub>3</sub> (2.0%) followed by seed dressing with bavistin which showed significantly better performance & at par to KNO<sub>3</sub> for improving the 100 seed weight, germination, seedling length, seedling dry weight, seed vigour index-l, seed vigour index-II, field emergence index and mean emergence time showed percent improvement of 12.26, 4.14, 19.57, 8.47, 12.58, 6.03, 15.70 and reduction of 7.40 with values of 3.57g, 96.50 percent, 19.57cm, 43.53g, 1888.35, 4200.07, 82.73 and 5.21 days respectively over untreated seeds. Similar findings were also reported in wheat [10, 11, 22], lentil [23], green pepper [3], brinjal & tomato [17].

## 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 100 seed weight, seed germination, seedling length, seedling dry weight, seed vigour index-I, seed vigour index-II, mean emergence time and field emergence index [Table-2].

Poor crop establishment is a major problem in wheat production under zero tillage condition. Seed treatments with KNO<sub>3</sub> significantly improved the all the seed quality parameters with percentage increment of 8.89, 7.36, 10.09, 10.09, 18.18, 18.22, 13.69 and reduction of 12.62 in 100-seed weight, seed germination, seedling length, seedling dry weight, seed vigour index-I, seed vigour index- II, field emergence index and mean emergence time, respectively over control with values of 3.43 g, 97 percent, 18.63 cm, 41.47 mg, 1806.86, 4022.60, 5.35 days and 86.44 respectively. Next to KNO<sub>3</sub>,treatment with KNO<sub>3</sub> (2.0%) followed by seed dressing with bavistin given better result which exhibited statistically at par to KNO<sub>3</sub> for 100-seed weight, seed germination, seedling length, seedling dry weight, seed vigour index-I, seed vigour index-I, field emergence time with percentage increment of 9.52, 6.25, 8.73, 6.72, 15.50, 13.46, 0.05 and reduction of 12.46 over untreated seeds with value of 3.45 g, 96.00 percent, 17.82 cm, 39.87 mg, 1702.75, 3805.77, 79.18 and 5.37 days, respectively.

It was very much clear from the findings of experiment that untreated seeds exhibited significantly inferior performance. Seed treated with KNO<sub>3</sub>(2.0%) exhibited better quality which is followed by CaCl<sub>2</sub> (2%), CaCl<sub>2</sub> (2%) followed by seed dressing with bavistin, distilled water, seed dressing with bavistin, distilled water, followed by seed dressing with bavistin, CaCl<sub>2</sub> (2%) followed by seed dressing with bavistin that scored nearly similar values and were at par to control that exhibited germination (%), seedling length (cm), seedling dry weight (g), seed vigour index-I, seed vigour index-II, mean emergence time and field emergence index respectively.

### Conclusion

It was concluded from the present study that seed vigour potential of seed lot produced under zero tillage was comparatively inferior to that of normal tillage. Further seed enhancement treatment improved the seed vigour potential in both the tillage condition. Almost all the treatment has improved vigour potential significantly over control. Among all the treatments, KNO<sub>3</sub> (2%) was found to be best which was also at par with KNO<sub>3</sub> (2%) followed by seed dressing with Bavistin in both the conditions tillage condition.

Application of research: If we go seed production of wheat under zero tillage condition, then we could use  $KNO_3$  (2 %) to improve the seed vigour potential. This results in good stand establishment, which leads to higher yield.

## Research Category: Seed Technology

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## Conflict of Interest: None declared

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