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Research Article

Effect of Different Varieties and Levels of Zinc on Growth and Yield of Wheat (*Triticum aestivum* L.)

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Abstract: A field experiment was conducted during rabi season of 2019-20 at Student's Instructional Farm of Chandra Sekhar Azad University of Agriculture and Technology, Kanpur (UP) India to examin the effects of varying varieties and different levels of zinc on growth and yield of wheat. The treatment consisted four wheat varieties viz, K 607, K 307, HD 2967, and K 1006 and three levels of zinc viz, 0 kg ha-1, 5 kg ha-1, 7.5 kg ha-1, laid out in Factorial Randomized Block Design replicated three times. The all inputs given timely at recommended rates. The results exhibited that the performance of HD 2967 and K 1006 was found significantly superior over the rest of varieties in terms of growth, yield attributes and yield. The variety HD 2967 recorded maximum grain yield (42.57q ha-1), harvest index (40.40%), followed by K 1006 recorded grain yield (41.15 q ha-1), harvest index 40.31%). Application of 7.5 kg ha-1 zinc produced maximum grain yield (40.84 q ha-1), harvest index (40.37), followed by application of 5 kg ha-1 zinc produced grain yield (39.81 q ha-), harvest index (40.14%), significantly superior over no application of zinc. Therefore, the variety HD 2967 better performance in terms of growth attributes, yield attributes and grain yield with zinc application of 7.5 kg ha-1 in present field experimentation.

Keyword: Different varieties, zinc level?

Introduction

Wheat (Triticum aestivum L.) belonging to family Poaceae (Graminae) is the single most important annual cereal crop, that has been considered as integral component of the food security system of several nations. It is important food crop of whole world. It is consumed mostly in the form of breads as "chapati". wheat straw is used for feeding the cattle. Wheat contains more protein than other cereals and has relatively high content of Niacin and Thiamine. It is basically concerned in providing the characteristics substance "Glutien" which is very essential for bakery. It is a majaor diet component because of the wheat plants, agronomic adaptability with with the ability to grow from near arctic regions to equator, from sea level to plains of tibet, approximately 4000 m above sea level. Wheat is the most important winter crop grown in india during rabi season (November to April). Wheat is a staple food of world, especially of developing nation, which lacks mechanism of zinc absorption, compared to pulses, more intention is therefore necessary to be given for the same. Micronutrient, zinc deficiency affects one third population of world. Although it is not integral part like nitrogen, phosphorus and potash but recent arose deficiencies in soil, plants and of course in human beings ranged a bell of danger.

Zinc fertilization has great relevance to India, because about half of its soils are deficient in available Zn. Notably 50% of the cultivated soils used for cereal production are reported to be zinc deficient which affects growth and development of plants.

Material and Methods

The field experiment was conducted during Rabi season of 2019-20 at Student's Instructional Farm of Chandra Sekhar Azad University of Agriculture and Technology, Kanpur (UP) India, situated at 125.9meter altitude, latitude of 25° 56' to 26° 58' N and longitude 79° 31' to 80° 34' E. Treatments involved four wheat varieties

viz, K 607, K 307, HD 2967 and K 1006 and three levels of zinc viz, 7.5 kg ha-1, 5 kg ha-1 and 0 kg ha-1. The treatments were laidout in Factorial Randomized Block Design replicated three times. The soil of experimental field was sandy loam with 52.38% sand, 27.86% silt and 19.76% clay with pH of 7.8. It was moderately fertile being low in organic matter (26%), available N (145 kg ha-1), phosphorus (18 kg ha -1), potash (182.0 kg ha-1) and zinc (0.41 ppm). The recommended dose of N, P, and K is 120:60:40. Zinc sulphate (ZnSO4) used as a sourse of zinc. The sowing was done on 26/11/2019. The meteorogical observations recorded during the study period revealed that at the time of germination (November - December 2019) the temperature ranges 8.8°C to 25.8°C. The temperature during growth growth period i.e., December 2019, January 2020, February 2020 was ranged 5.3°C to 14.3°C (minimum temperature) and 13.9°C to 25.3°C (maximum temperature). During maturity in the month of March and April 2020, the maximum temperature ranges 26.6°C to 36.8°C and minimum temperature ranges from 13.9°C to 23.8°C. The relative humidity varies between 48.2% to 82.65% and cumulative rainfall 30.2 mm. Data collected included plant population, plant height, tiller population, fresh weight, dry weight, test weight, spike length, grain yield, biological yield, and harvest index. The crop was harvested on 26/04/2020.

Results and Discussion

Growth Variables

The data presented in Table- 1 revealed that plant height was significantly influenced by varieties and different levels of zinc and maximum plant height (92.98 cm) was recorded at maturity stage under variety HD 2967 followed by K 1006 variety. The total tillers plant -1 (7.02) recorded under HD 2967 which statistically at par with K 1006 significantly over rest of varieties and minimum total tillers plant-1 (3.77) was recorded under K 607. The production of maximum fresh weight (24.57 gm) at harvest stage is recorded under HD 2967 followed by K 1006 and other varieties. The maximum dry weight (22.36 gm) was recoded under HD 2967 varieties followed by K 1006 and minimum fresh weight (18.63 gm) under K 607.

The maximum plant height (91.18 cm) is recorded at maturity stage with the application of 7.5 kg ha-1 which is statistically at with 5 kg ha kg ha-1 and minimum plant height (88.66 cm) was recorded with no application of zinc. Similar results were obtained by Chaudhary et al, (2018), Jan et al, (2013) and Saifullah et al, (2016). The maximum total tillers plant-1 (6.08) was recorded with the application of 7.5 kg ha-1 zinc which is statistically at par with 5 kg ha-1 zinc and significantly superior with no application of zinc. The maximum fresh weight (23.45 gm) with the application of 7.5 kg ha-1 zinc which is significantly suprior over rest of zinc levels. And under zinc application, maximum dry weight (21.41 gm) was recorded with application of 7.5 kg ha-1 of zinc which is significantly superior over application. And under zinc application, maximum dry weight (21.41 gm) was recorded with application of 7.5 kg ha-1 of zinc which is significantly superior over application of 5 kg ha-1 of zinc and minimum dry weight (19.26) was recorded with no application of zinc.

Table: - 1 Effect of varieties and different levels of zinc on growth attributes

Treatment	Plant height at harvest (cm)	Total tillers plant ^{1}	Fresh weight at harvest (g)	Dry weight at harvest (g)
(A) Varieties				
K 607	87.68	3.77	20.07	18.63
K 307	88.38	5.31	21.73	19.75
HD 2967	92.98	7.02	24.57	22.36
K 1006	90.78	6.87	22.89	20.62
SE(d)±	0.83	0.16	0.29	0.29
CD (P=0.05)	1.73	0.33	0.60	0.61
(B) Levels of zinc				
0 kg ha-1	88.66	5.23	21.16	19.26
5 kg ha-1	90.02	5.91	22.34	20.35
7.5 kg ha-1	91.18	6.08	23.45	21.41
SE(d)±	0.72	0.14	0.25	0.25
CD (P=0.05)	1.50	0.29	0.52	0.53

Yield Variables

The data related to yield variables is presented in Table: -2 and reveals that all the varieties and zinc levels exhibited significant difference in terms of yield attributes. The variety HD 2967 recorded maximum spikes (416.76 m-2) which is statistically at par with K 1006 significantly superior over other varieties. The longest spike (9.26 cm) was recorded under HD 2967 followed by K 1006 significantly superior over other varieties. Similar results were found by Ghasal et al. (2017). The variety HD 2967 recorded significantly maximum number of grains spikes-1 (55.98) and test weight (43.36 g) followed by K 1006 which recorded 52.48 grains spike-1 and 40.25g test weight.

The highest spikes (422.96 m-2) recorded with application of 7.5 kg ha-1 zinc which is statistically at par

with 5 kg ha-1 zinc and significantly superior over with no appliaction of zinc. Similar results were found by Chaudhary et al. (2018). The zinc application recorded longest spikes (9.08 cm) was recorded with 7.5 kg ha-1 which is statistically at par with 5 kg ha-1 significant over no application of zinc. Similar results were found by Chaudhary et al. (2018), Singh et al. (2014), and Nautiyal et al. (2011). The zinc application recorded highest number of grains spike-1(52.52) and highest test weight (40.06 g) recorded with 7.5 kg ha-1 zinc which is statistically at par with 5 kg ha-1 and significant over no application of zinc. Similar results were obtained by Chaudhary et al. (2018) and Nautiyal et al. (2011).

Yield

The critical appraisal of the data presented in Table: - revealed that maximum grain yield (42.55 q ha-1) under HD 2967 which is significantly followed by K 1006 recorded 41.15 q ha-1 and minimum grain yield (37.25 q ha-1) was recorded under K 607 variety. The highest straw yield (62.56 q ha-1) was recorded under HD 2967 which is statistically at par with K 1006 (60.19 q ha-1) and minimum straw yield (55.62 q ha-1) was recorded under K 607. The maximum harvest index (40.40%) recorded under HD 2967 which significantly followed by K 1006 (40.31%) and minimum (40.1%) under K 607.

The maximum grain yield (40.84 q ha-1) recorded with application of 7.5 kg ha-1 of zinc which is statistically at par with 5 kg ha-1 of zinc superior over no application of zinc. Similar results were obtained by Chaudhary et al. (2018), Tao et al. (2018) and Zou et al. (2012). The zinc application recorded highest straw yield (60.28 q ha-1) recorded with 7.5 kg ha-1 of zinc which is statistically at par with 5 kg ha-1 of zinc and significanly superior over no application of zinc. Similar results were obtained by Jan et al. (2013) and Shaheen et al. (2007). The zinc application recorded maximum harvet index (40.37%) was recorded with 7.5 kg ha-1 of zinc which is significantly followed by 5 kg ha-1 (40.14%). Similar results were found by Jan et al. (2013).

Table: - 2 Effect of varieties and different levels of zinc on yield attributes

Treatment	No. of spikes m-2	No. of grains spike-1	Spike length (cm)	Test weight (g)
(A) Varieties				
K 607	407.71	48.48	7.79	36.86
K 307	396.43	49.28	7.91	37.43
HD 2967	416.76	55.98	9.26	43.36
K 1006	416.11	52.48	9.00	40.25
SE(d)±	2.72	0.82	0.23	0.34
CD (P=0.05)	5.66	1.70	0.47	0.71
(B) Levels of zinc				
0 kg ha-1	386.23	50.41	7.59	38.65
5 kg ha-1	418.57	51.73	8.80	39.71
7.5 kg ha-1	422.96	52.52	9.08	40.06
SE(d)±	2.36	0.71	0.20	0.29
CD (P=0.05)	4.90	1.47	0.41	0.61

Table: - 3 Effect of varieties and different varieties on yield.

Treatment	Grain yield (q ha-1)	Straw yield (q ha-1)	Harvest Index (%)
	(A) Varieties		
K 607	37.25	55.62	40.10
K 307	38.16	56.85	40.16
HD 2967	42.55	62.56	40.40
K 1006	41.15	60.91	40.31
SE(d)±	0.58	1.09	0.04
CD (P=0.05)	1.21	2.27	0.08
Levels of zinc			
0 kg ha-1	38.68	57.46	40.14
5 kg ha-1	39.81	59.22	40.22
7.5 kg ha-1	40.84	60.28	40.37
SE(d)±	0.50	0.95	0.03
CD (P=0.05)	1.05	1.97	0.07

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