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Impact of Types of Seed bed and Zincon Yield attributes and Yield of Wheat (*Triticum aestivum*L.)

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ABSTRACT

A field experiment was conducted during the rabi season 2015-16 at the Crop Research farm of Agronomy, Allahabad School of Agriculture, SHIATS, Allahabad (U.P.) to conclude the effect of types of seedbed and levels of zinc on growth and yield of wheat (Triticum aestivum L.). The experiment consisted of two types of seedbed i.e.furrow irrigated raised bed (FIRB) and conventional bed system, and five level of zinc viz. 0, 10, 20, 30 and 40 kg ha^{-1} was laid out inrandomized block design (FRBD) with three replications. The result revealed that seedbed (FIRB) and zinc level (40 kg ha^{-1}) produced the significant and plant height (98.33 and 97.07 cm), highest number of tillers hill^{-1} (11.87 and 11.20), Effective tillers meter^{-2}(451.33 and 420.83 m^{-2}) grain yield (4.27 and 4.30 t ha^{-1}) straw yield (4.94 and 5.22 kg ha^{-1})and harvest index (46.53 and 46.59%) respectively. However, the highest benefit cost ratio (3.28) was obtained in treatment (FIRB + 10 kg ha^{-1}).

Key words: Levels of zinc, types of seedbed, wheat, Furrow irrigated raised bed (FIRB) and conventional bed system.

I. INTRODUCTION

In India wheat is cultivated in an area of 31.19 million hectares with an average productivity of 3075 kg ha^{-1} and production of 95.91 million tons (GOI, 2014).Wheat is also a staple food of Afghanistan and accounting for over half of the population calorific intake (Chabot and Dorosh, 2007). Although Afghanistan imports wheat from a number of neighboring countries, during 2008-2010, the area under wheat cultivation was 2.3 million hectare, production of 3.3 million tonnes but the productivity was only 1.42 t ha^{-1}. According to a report from the Economic Research Service of USDA (2011) growing of wheat under rain fed condition coupled with underutilization of water harvesting and potential irrigation facilities are the major regions for abysmal productivity in Afghanistan.

Zinc is one of the essential and important micronutrients reported to be deficient in the soils of NEPZ (Singh, 2010) and plays an important role as a metal component in various enzymes or as a functional, structural or regulator cofactor of large number of enzymes. The depletion of soil Zn leads to low productivity and low concentration in edible grains, which causes Zn deficiency in humans, particularly in semiarid tropics (Shiva y*et al.,* 2008), perhaps including Afghanistan's arid and semi-arid regions having sandy and sandy loam soil, which are low in organic carbon. Losses of yield of 40% or more in many Zn-deficient soils have a major economic impact on the farmers due to the reduced income, as a result of lower yield.). These constraints need to be addressed for improving wheat production. Better soil and water management technologies are a prerequisite to improve water and fertilizer use efficiency. (FIRB) planting method of crop grown on raised beds, usually 70 to 90 cm

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wide, with 2-3 rows on top of each bed, the furrows between the beds are used for irrigation water application. With this system, the emerging wheat plants form a solid stand in the space between the irrigation furrows. This system does allow the use of furrow for irrigation, which provides better water management and reduce seed rate than the conventional flatbed planting (Jat, *et al.,* 2005). This system has suitably been modified for better adaptability in locales.

II. MATERIALS AND METHODS

The experiment was carried out during rabi season of 2015 at Crop Research Farm, Department of Agronomy, Allahabad School of Agriculture, SHIATS, Allahabad (UP), which is located at 250 24' 42" N latitude, 810 50' 56" E longitude and 98 m altitude above the mean sea level.The soil was sandy loam in texture having pH (7.80), low in soluble salt (0.13dSm^{-1}),organic carbon (0.33%), available P_2O_5 (8.0kg ha^{-1}) and K_2O (228.0 kg ha^{-1}), respectively.

The experiments were laid out in randomized block design (RBD) with three replications on a plot size of 5.0×3.0 m. In the first factor, two types of seedbed *i.e.* Furrow irrigated raised bed (FIRB) and conventional bed were used in study. In second factor, there were 5 levels of Zn (0, 10, 20, 30, 40 kg Zn ha^{-1}) assigned. Nutrient management through Urea, DAP, MoP and Zinc sulphate to supply the required NPK and Zn. Full dose of P_2O_5, K_2O each of 50 kg ha^{-1} and half amount of RDN (60 kg ha^{-1}) were applied as basal dressing rest of 50% N through urea was applied at 30 DAS as top dressing,wheat was sown with 5 levels of Zn, *i.e.* 0, 10, 20, 30 and 40 kg Zn ha^{-1}. To record the various yield observations on wheat, a sample consisting of five plants were selected at random. Plant height (cm), number of tillers hill^{-1}, dry weight (g hill^{-1}), number of grains spike^{-1} werecalculated from individual plots. At harvest, grain and straw yield of both the crops were recorded manually with help of electronic compact scale. Economics and system productivity were calculated the basis of prevailing market prices. The data subjected to statistical analysis.

III. RESULTS AND DISCUSSIONS

Yield attributes andyield: The data presented in Table-1 revealed that yield and yield attributes of wheat as plant height (cm), effective tillers (m^2), test weight (g), grain yield (t ha^{-1}) and straw yield (t ha^{-1}) were influenced by various treatments of cropping system. In effect of seedbed, the highest plant height (65.52 and 97.07 cm)at 60 and 90 DAS was observed in S_1 (FIRB) whereas, in effect of Zn the highest plant height (98.33 cm) was observed in Z_5 (40 kg ha^{-1}) at 105 DAS. In addition, Zn plays essential role in improving plant growth, through the biosynthesis of endogenous hormones, which are responsible for promotion of plant height (Hansch and Mendel, 2009).Although, the maximum number of effective tillers (412.60 m^2) was observed in S_1 (FIRB) while, the maximum effective tillers observed in level of Zn it was observed (420.83 m^2) in Z_3 (20 kg ha^{-1}). The increase of effective tillers may be due to the involvement of zinc in biosynthesis of Idole-3 acetic acid (Shivay and Prasad, 2013).Further, seedbed S_1 (FIRB) registered maximum value (36.27 g) of test weight whereas, Zn level had significant influence on test weight of wheat and the highest value (40.50 g) was observed in treatmentZ_5 (40 kg ha^{-1}). It is presumed those enzymic reactions, growth process, hormone production and also the translocation of photosynthates to reproductive parts, thereby leading to vigorous or bold seeds of the crop (Chaudhary*et al.,* 2014). The highest grain yield (3.95 t ha^{-1}) was registered in seedbed S_1 (FIRB), Zn levels recorded the highest grain yield (4.27 t ha^{-1}) in Z_3 (30 kg ha^{-1}) as well. These finding corroborated with the result of (Indani and Kumar, 2012). Straw yield of wheat was recorded (4.84 t ha^{-1}) in S_1 (FIRB) whereas, in levels of Zn recorded significantly higher value of 4.94 t ha^{-1} in Z_5 (40 kg ha^{-1}). Further, the increase in biological yield may be due to higher plant height and dry matter accumulation. This result is in accordance with Indani and Kumar 2012. In harvest index, the maximum value (46.53%) was registered in seedbed S_2 (Conventional) whereas, in Zn levels the highest HI (46.59%) was observed in treatment Z_3 (20 kg ha^{-1}) as compared to other treatments.

The non-significant results were obtained on yield and yield attributes of wheat due to interaction and different levels of Zn with each other.

IV. CONCLUSION

The findings of the present studies elucidates that application of 40 kg ha^{-1} zinc can be enhanced the yield (4.31 t ha^{-1}) of crops by increasing efficient use of zinc at different level and different seedbed methods. Zinc and different types of seedbed *i.e.* FIRB and conventional which is new crops establishment technique are required to harvest optimum crop yield. This also helps in improving grain quality (protein content), economic growth of wheat which need kind attention of extension agencies for their dissemination and acceleration of adaption at farm level. Since the findings are based on the research done in one season, it may be repeated for confirmation.

Table 1.Impact of Types of Seedbed and Zinc on Yield Attributes and Yield of Wheat

Treatments	Plant height (cm)	No. of effective tillers (m^2)	No. of grains $spike^{-1}$	Test Weight (g)	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})	Harvest index (%)
S_1: FIRB*	97.07	412.60	62.33	36.27	3.95	4.84	44.71
S_2: Conventional	97.00	358.53	62.85	35.87	3.81	4.36	46.53
SEd (±)	0.22	3.52	0.66	0.91	0.24	0.23	1.27
CD (P= 0.05)	NS	7.40	NS	NS	NS	0.48	NS
CV (%)	7.29	7.25	11.30	19.61	1.84	5.23	1.19
Z_1(0 kg ha^{-1})	95.00	321.83	56.90	28.67	3.13	3.93	44.46
Z_2(10 kg ha^{-1})	96.83	383.67	63.97	34.83	3.63	4.38	45.33
Z_3(20 kg ha^{-1})	97.38	393.17	63.00	37.00	4.27	4.88	46.59
Z_4(30 kg ha^{-1})	97.67	408.33	64.00	39.33	4.15	4.88	45.94
Z_5(40 kg ha^{-1})	98.33	420.83	65.10	40.50	4.21	4.94	45.79
SEd (±)	0.35	5.57	1.05	1.44	0.38	0.36	2.01
CD (P= 0.05)	0.75	11.71	2.21	3.03	0.79	0.76	NS
CV (%)	7.38	9.09	12.22	22.78	11.31	7.29	2.80

*Furrow irrigated raised bed

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