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Assessment of different levels of N P K and Zn on different growth parameters and yield of wheat (*Triticum aestivum* L)

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Abstract
An experiment was conducted Rabi season of 2013-14. It was observed that the best yield attributes characters was in treatment T_8-(@NPK_{100} +@ Zinc $Sulphate_{100}$) in respect to different days intervals i.e. 30, 60, 90 and 120 days after sowing (DAS). Number of leaves per plant were 14.06, 19.10 and 20.10 and no. of branches per plant were 6.30, 11.40 and 12.20 found to be significant at 30 DAS, 60 DAS and 90 DAS but, Plant height was 29.10 cm, 99.53 cm and 107.16 cm found significant at 30 DAS and 60 DAS and interaction effect of NPK and Zinc Sulphate found non-significant at 90 DAS. In the same yield (q ha^{-1}) was 24.82 found to be significant. In the same treatment T_8, Interaction between the Zinc Sulphate and N P K on an average test weight, fresh weight, dry weight and oil content (%) as 4.10 g, 81.06 g, 70.76 g and 45.44 % respectively showed a non-significant effect. Effect of NPK and Zinc Sulphate on fresh weight, dry weight and oil content (%) was significant and effect of NPK on test weight was significant and effect of Zinc Sulphate found non-significant. Adequate plant nutrient supply holds the key for improving the food seed production food security.

Keywords: Yield, Mustard, Nitrogen, Phosphorous, Sulphur

Introduction
India has witnessed a significant increase in total food grain production 259.29 Mt with a major contribution of wheat with 94.88 Mt during 2013-14 and is expected to touch 109 Mt in 2020. Wheat (*Triticum spp*.) is the second most important winter cereal in India after rice. Bread wheat contributes approximately 95% to total production while another 4% comes from durum wheat and dicoccum share in wheat production remains only 1%. Wheat crop contributes substantially to the national food security by providing more than 50% of the calories to the people who mainly depend on it. Top 10 wheat producers (2009) Exporting Quantity (tons) China 114.5, India 80.6, USA 59.4, Russia 56.5, France 39.4, Pakistan 24.0, Germany 25.1, Australia 23.0, Canada 22.5, Ukraine 20.0, Turkey 17.8, Global (Singh, 2010) [11]. To wheat the demand of increasing population, India food grain production wheat go up to about 325Mt by 2025.To achieve this largest, Production has to increase at the rate of 7.0 MT per year over the next 10-12 years, without never increase in irrigated crop land. (Singh, 2011) [11]. According to latest official data, wheat has been sown in a record 31.18 million hectare 2013-14 rabi season, as against 29.12 million hectare in the year-ago. So far, wheat acreage remains higher in Uttar Pradesh at 9.94 million hectares, Madhya Pradesh at 5.78 million hectares and Rajasthan at 3 million hectares. Wheat acreage remains lower so far in Punjab, Karnataka, Uttarakhand, Assam, West Bengal and Chhattisgarh. It also involves creation of a system where everyone in the supply chain is properly incentivized to maximize production and efficiency," Fertilizer is the most importance and indispensable input in crop production and response to chemical fertilizer is related to certain properties in individual nutrient source soil crop characteristics and this very true in case of Nitrogen, Phosphorus and Potash and Zinc an which play a key role among the nutrient essential for plant growth. About 40 Mt fertilizer nutrients will have to be used to produce 380-400 Mt of food grain to feed and estimated population of 1.5 billion by 2050 A.D. The Stagnation in crop Productivity has lower demand to be due to deficiency of some micro and secondary nutrients (Dhane, 2011) [6] interrogated nutrients in wheat on yield of and nutrient uptake (116, 204 and 125 kg ha^{-1}) with the application of 100% N P k + 10 t FYM ha^{-1} as compared to the grain yield of 4.41t ha^{-1} and total N P K uptake (95.7, 18.1 and 111kg ha^{-1} respectively) with the 100% N P K alone. The yield of and nutrient uptake by wheat were significantly lower with the suboptimal doses of N P K.

Materials and Methods

The experiment was conducted during *Rabi* season 2013-14 on crop research farm of department of Soil Science at Sam Higginbottom Institute of Agriculture, Technology and Sciences, Deemed-to-be-University Allahabad, the area is situated on the south of Allahabad on the right side of the river Yamuna on the south of rewa road at a distance of about 6 km. from Allahabad city. It is situated at 25^0 27' N latitude, 81^0 51' E longitudes and at the *altitude* of 98 meter above the mean sea level (MSL). The soil was neutral in reaction, soil texture sandy loam, and low in available N, medium in available P_2O_5 and high in available K_2O content. The experiment was laid out in randomized block design with three replications the data recorded during the course of investigation was subjected to statistical analysis by "Analysis of variance technique" Fisher (1960) [7]. The treatment consisted of nine combination of inorganic source of fertilizers T_0 (@NPK_0 + @Zn_0 kg ha^{-1}) Control, T_1-(@NPK_{75} + @Zn_0 kg ha^{-1}), T_2-(@NPK_{100} kg ha^{-1}+ @Zn_0 kg ha^{-1}),T_3-(@NPK_0 Kg ha^{-1} + @Zn_{15} kg ha^{-1}), T_4 -(@NPK_{75} Kg ha^{-1} + @Zn_{15} kg ha^{-1}), T_5 -(@NPK_{100} kg ha^{-1}+ @Zn_{15} kg ha^{-1}),T_6 -(@NPK_0 kg ha^{-1} +@ Zn_{30} kg ha^{-1}), T_7-(@NPK_{75} kg ha^{-1}+ @Zn_{30} kg ha^{-1}), T_8- (@NPK_{100} kg ha^{-1}+@ Zn_{30} kg ha^{-1}). The plot size having 2 x 2 m for crop seed rate is 100 kg ha^{-1} (*Triticum aestivum* L.*)* Cv. Ankur Kedar. The source of nitrogen, phosphorus, potassium, and Zn as Urea, SSP, MOP and Zinc Sulphate respectively. Basal dose of fertilizer was applied in respective plots according to treatment allocation in furrows opened by about 5 cm. All the agronomic practices were carried out uniformly to raise the crop. Soil sample were collected from the soil 0-15 cm depth, plant data were taken at 30, 60, 90 and 120 days after sowing (DAS).

Table 1: Mechanical, Physical and Chemical analysis of pre - harvest soil

Particulars	Results	Method employed
Bulk density(g cm^{-3})	1.71	Graduated measuring cylinder (Black 1965) [3]
Pore space (%)	37.94	Graduated measuring cylinder (Black 1965) [3]
Soil pH (1:2) soil water suspension (w/v)	7.42	Digital pH meter
Soil EC. (dSm^{-1}) at 25^0C of 1:2 soil water suspension	0.18	Digital Conductivity meter (Wilcox 1950) [23]
Organic carbon (%)	0.22	Rapid titration method (Walkely and Black 1947) [22]
Available Nitrogen (kg ha^{-1})	260.00	Alkaline permagnate method (Subbiah and Asija 1956) [13]
Available Phosphorus (kg ha^{-1})	26.00	Colorimetric method (Olsen *et al*. 1954) [10]
Available Potassium (kg ha^{-1})	189.00	Flame photometric method (Toth and Prince, 1949) [20]
Available Zn (ppm)	0.56	Shaw and Dean method, (1952) [14]

Results and Discussion

Growth parameter

The results given as dip aced in Table 2. The interactive effects of different levels inorganic fertilizers generally influenced the important parameter of wheat crop. N P K and Zn Fertilizer in conjunction on plant height (cm), No. of tiller per plant, at 120 DAS were found to be significant, the maximum parameter at T_8 (@ 100% (NPK_{100} kg ha^{-1} +@ Zn_{30}Kg ha^{-1}) were recorded at (105.66, 11. 66) respectively. Increase in plant height due to increasing of N P K and Zn fertilizer, may be due to adequate or nutrients which is turns help in vigorous vegetative growth of plants and subsequently increase the plant parameter through cell elongation cell division photosynthesis and turbidity of plant cell.

Table 2: Assessment of Different Levels of N P K and Zn their Interaction on Growth Parameters of Wheat (*Tritium aestivum* L.) Ankur Kedar at 120 DAS

Treatments	Plant height (cm)				No. of tiller per Plant			
	30DAS	60DAS	90DAS	120DAS	30DAS	60DAS	90DAS	120DAS
T_0 =L_0 R_0	25.00	52.00	82.71	92.66	1.66	5.66	9.00	9.00
T_1 = L_0 R_1	32.66	58.33	83.43	102.66	2.00	5.33	9.66	9.66
T_2 = L_0 R_2	25.66	59.66	85.00	103.33	2.33	6.00	9.66	9.66
T_3 = L_1 R_0	27.66	58.66	88.75	102.33	3.33	6.33	10.00	10.00
T_4 = L_1 R_1	28.33	58.66	87.95	102.00	3.66	6.33	10.33	10.33
T_5 = L_1R_2	28.00	58.33	89.61	103.33	4.00	7.00	10.66	10.66
T_6 = L_2 R_0	27.66	58.33	88.66	101.66	4.33	7.33	11.00	11.00
T_7 = L_2 R_1	31.33	58.00	91.22	101.66	5.00	7.66	11.33	11.33
T_8 = L_2 R_2	33.66	60.66	93.12	105.66	5.66	8.66	11.66	11.66
Mean	28.66	58.07	87.82	101.69	3.55	6.70	10.36	10.36
F- test	NS	S	S	S	NS	NS	NS	NS
S. Em (±)	1.75	0.93	0.47	1.26	0.38	0.46	0.39	0.39
C.D. at 5%	-	2.79	1.01	3.79	-	-	-	-

As decapitate in Table-3 the higher yield Application of Zn along with N P K significantly increased the grain yield of wheat over N P K alone, emphasizing on the essentiality of balanced fertilization to obtain higher productivity. The reduction of Olsen-P and available K due to exclusion of P and k from the fertilizer schedule might have led to the improper root development, bronzing yellowing of leaf tips and susceptibility to lodging, pests diseases, frost etc. leading to deleterious effects on growth and yield of wheat (Tandon and Sekhon 1988, Verma *et al*. 2005) [18, 21]. Grain yield of wheat increased significantly with graded doses of N P K and Zn Grain Yield = 49 qha^{-1} Straw Yield = 133 qha^{-1} = 49/100×133= 66.6 % Straw Yield high than grain yield.

Table 3: Assessments of different levels of N P K and Zn and their interaction on yield of wheat (*Triticum aestivum* L.) Ankur Kedar at 120 DAS

Treatments	Grain Yield (q ha^{-1})	Straw Yield (q ha^{-1})	C:B Ratio
T_0=L_0R_0	29.00	62.50	1:1.26
T_1=L_0R_1	33.33	78.16	1:1.29
T_2=L_0R_2	34.83	92.50	1:1.30
T_3=L_1R_0	36.50	93.33	1:1.44
T_4=L_1R_1	39.16	99.16	1:1.48
T_5=L_1R_2	41.00	104.83	1:1.49
T_6=L_2R_0	41.33	111.66	1:1.69
T_7=L_2R_1	46.66	116.33	1:1.71
T_8=L_2R_2	49.00	132.50	1:1.74
Mean	38.17	98.99	
F- test	**S**	**S**	
S. Em (±)	1.04	10.87	
C.D. at 5%	-	-	

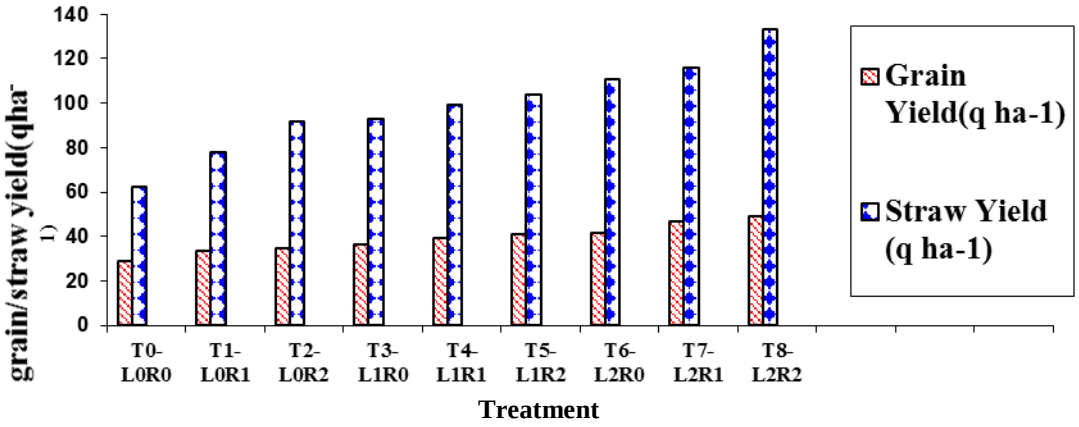

Fig 1: Response of N P K and Zn on grain and straw yield of wheat (*Triticum aestivum* L.)

Conclusion

It is concluded that post harvest soil properties such as Organic carbon (%) available nitrogen (kg ha^{-1}) available Zn, were found to be significant with the increarse application of N P K and Zn fertilizers. The level treatment combination was found to be T_8-(@N P K_{100} kg ha^{-1} + @Zn_{30} kg ha^{-1}) in terms of grain/straw yield 49.00 and 133.00 q ha^{-1} respectively of wheat Var. Ankur Kedar and highest net profit was (`29285.00 ha^{-1}).

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