Efficiency of Sulfur and Zinc on Growth and Yields of Wheat (Triticumaestivum L.)

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Abstract

A field experiment was conducted to investigate the effect of application of Sulfur and Zinc fertilization on growth and yield components of wheat (Triticumaestivum L.) grown on sandy loam soil of A.S. College, Lakhaoti, Research farm, Bulandshahar, during 2016 and 2017 the pooled data revealed that the growth parameters. Yieldand yield attributesincreased significantly with the application of recommended does(120kg N, 60kg p_2o_5 and 40kg k_2o/ha) of fertilizers, with application of 40kg S+ 10kg Zn/ha

Key words: *Wheat sulfur zinc.*

I. INTRODUCTION

Sulfur and Zinc are important element in wheat Nutrition without educate sulfur., crops can not reads their full potential in terms of yields, quality or protein content, nor can they make efficient use of applied nitrogen [13], at high nitrogen fertilization levels significant response to sulfur fertilization were found which emphasized the needs for precision application of sulfur in intensive wheat production systems. Continued use of nitrogen without supplemental sulfur on low sulfur soil will reduced flour quality of wheat [5].Reproductive Phase of wheat appears to be more sensitive to sulfur deficiency than vegetative growth phages with decreased grain size under sulfur limiting conditions. In addition to effects on yield, the sulfur status of wheat grain is an important parameters for the quality of wheat produce [7].Sulfur deficiency in crops plant has been recognized as a limiting factors not only for crop growth and seed yield but also for poor quality of products, because sulfur is a constituent of several essential compounds such as cysteine, methionine, co-enzyme, Thioredoxin and sulfolipids. It was shown that sulfur application altered the amino acid composition with a greater proportion of sulfur containing cysteine and methionine [14].Zinc is an important essential element present in plant enzymatic systems,[16]. Reported that zinc has best numbers of functions in plant growth andmetabolism.Zinc deficiency has a multitude of effect of plant growth.Zinc deficiency is a wide spread Indian soils constraint it effected to crop productivity [14].Zinc has been found useful in improving yield and yield components of wheat.[10] andadequately applied zinc has been shown to improve the water use efficiency of wheat plants [1].In general zinc application appears to improve the overall field performance of wheat plants.

Table-2 Effect of sulfur and zinc on growth and yield attributes character on wheat

TREATMENT	Plant Height	No. Of Tillers/Hill	Spike Length	No. Of Grain/Spik	Grain Yields q/ha	straw Yields q/ha	Amino Acid in grain,g/kg	
							Cystine	Methionin
Control	81.1	4.14	6.13	36.42	27.12	49.92	2.34	1.86
RDF(Recommended fertilizer dose)	93.23	6.56	6.86	38.12	41.31	62.32	2.38	1.88
RDF + 40kg S/ha	95.64	7.21	7.67	41.39	47.2	80.74	2.52	2.05
RDF +10 kg Zn/ha	94.32	6.49	7.32	39.19	46.14	77.38	2.41	1.93
RDF + 40kg S +10 kg Zn/ha	97.64	8.4	7.91	44.17	52.1	86.53	2.6	2.19
SEm±	1.08	0.304	0.201	0.72	0.042	0.121	0.03	0.02
C D at 5%	2.2	0.612	0.414	1.44	0.088	0.248	0.07	0.04

II. MATERIALS AND METHODS

The investigationswas carried out during the winter (Rabi) season of 2016 and 2017 at Research farm of A.S. College.,Lakhaoti. (Bulandshahar), Utter Pradesh. The soils of experimentalfields was slightly Alkaline (pH 7.70). Low in organic carbon (0.38%) and available nitrogen (187 kg/ha) and medium in available phosphorus (18.51 kg/ha). Zn (0.56ppm),Sulfur (6.52 kg/ha)and potassium(248kg/ha).The experiment was laid out in Randomized block Design(RBD) with 4 replications. The 4 treatments consisted of five fertility levels. Controls,RDF (120kg N/ha,60kg P_2O_5/haand 40kg

K_2O/ha),RDF+40kg sulfur/ha, R.D.F+10Kg Zinc/ha and RDF+40kg sulfur and 10kg zinc/ha. The total number of plots is 20.A wheat Variety H.D 2967 was sown on 16/12/2016 and 17/12/2017 during the first and second year,Respectively using a seed rate of 110 kg/ha.,full does of P_2O_5, K_2O, sulfur,Zn and half does of Nitrogen applied as basal and half does applied nitrogen during flowering stage in the form of urea, DAP,MOP,Gypsum,and Zinc Sulfates,crop was harvested.on 14/04/2017 and 16/04/2018 respectively during 2017 and 2018.

III. RESULTS AND DISCUSSION

A. Height of Plant (cm)

The height of plant was significantly influenced by combined application of sulfur and zinc (Table-2).The maximum height (97.64 cm)of wheat plant was observed in application of 40kg S+ 10Kg Zn/ha followed by application of 40kg S/ha (95.64cm).due to fertilization of sulfur and zinc help luxuriant vegetative growth and increase the height of plant to trap the sunlight for photosynthesis.plant height reduction in wheat when 0 kg sulfur and 0 kg Zn application has also been reported by [9] and [12].

B. NumbersOf Tiller/ Hill

A significantly difference with respect of No. of Tillers / Hill was observed due to differ in fertility level of S, Zn and N,P,K, (Table-2).The average height of tillers/hill (8.40) was observed in the combined application of 40kg S +10KgZn /ha. In crop followed by recommended does of N,P,K,and 40kg S/ha.(7.21)and RDF + 10kg Zn/ha (6.49).However,the No. of Tillers/Hill of wheat significantly differ with increasing in fertility level of Zn and S. Similar results has also been observed by [3] and [8]**.**

C. Spike length (cm)

There was a difference in spike length (cm) was observed in sulfur and zinc fertilized plot unfertilized plot (Table-2). The length of spike (7.91 cm) was observed in application of 40kg S + 10kg Zn/ha followed by 40kg s/ha (7.6cm) did not differ significantly. Similar results were reported by [2].

D. NumbersOf Grain/spike

The data directed that application of sulfur and zinc in combined form had significant impact on No. of grain/spike.The application of 40kg S + 10kg Zn/ha.showed that maximum grain/spike (44.17) however,it was significantly differ in plots supplied with 40kg S/ha.(41.39), the lowest No. of grains observed in control plots(36.42).These results are in conformity with these of [11]**.**

E. Grain Yield (q/ha.)

Data concerning grain yields are shown in (Table-2) grain yield was significantly influenced by sulfur and Zinc application. The maximum grain yields (52.10 q/ha)was achieved in the plots applied 40kg S +10kgZn/ha followed by 40kg S / ha (47.20 q/ha) and the lowest yields was recorded in the control plot (27.12 q/ha) less competition for resources and better scope of intercultural operations at early growth stages were the favorable points, which might have fragged the process of partitioning photosynthesis from source to sink resulting in the higher grain yield [4]**.**Reported that application of 20kg S/ha. increases the photosynthesis activity,nutrient uptake , protein synthesis, and also increase the Cysteine (2.60 g/ha) and Methionine (2.15 g/ha) in grain.

Table 1-Physical and chemical properties of the soil

Parameter	Soil	
Sand %	66.5	66.7
Silt %	12.4	12.3
Clay %	20	20.4
Textral Soil	sandy	Loam
pH(1:2:5 soil Water suspention	7.7	7.5
EC (1:2:5 Soil Water Suspention)ds/m at 25˚C	0.61	0.63
Organic Carbon %	0.38	0.39
Total N_2 %	0.05	0.049
Available P_2O_5(Kg/ha)	18.8	18.82
Available K_2O (Kg/ha)	147.3	148.23
DTPA- Extractable Zn (ppm)	0.46	0.48
Extractable SO_4/S (Mg/kg)	16.5	16.58
Available Nitrogen %	179.1	181.3

F. Straw Yield(q/ha.)

A significantly difference with respect to straw yields of wheat crop was observed due to supply of single and combined application of nutrients (Tabel-2).The maximum straw yields (86.53 q/ha)was observed in application of 40kg S/ha (80.74 q/ha) and the lowest straw yields was recorded with control .The luxuriant vegetative growth and spread the canopy of the plants it may be help to observed more sunlight for photosynthesis, enzyme activation, protein synthesis and oxidation of fatty acids.

G. Amino acid content in grain

The effects S and Zn treatment was significantly affected by content of essential amino acids cysteine and methionine in wheat grain. The highest cysteine content (2.60 g/kg grain) and methionine (2.19 g/kg grain) was obtained by the application of 40kg S + 10kg Zn/ha. followed by 40kg S/ ha. Cysteine (2.52 g/kg grain) and methionine (2.05 g/kg grain) the similar study was also reported by Gomez Becerra et al (2010) indicated that application of sulfur and zinc increases size, weight of

grain and concentration of methionine and cysteine in seed.

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