Comparison of Foliar Verses Soil Application of Micronutrients on the Production of Wheat (*Triticum aestivum*. L) Crop.

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Abstract: The present work was laid out to compare the effect of foliar verses soil application of micronutrients on the production of wheat crop at experimental side of southern wheat station Agriculture Research Institute Tandojam, during Rabi season 2016. There were ten fertilizer treatments viz T1= K2%, T2= 1% Zn, T3= B 0.2%, T4= Cu 2%, T5= Mg 1% as foliar application while T6= 6Kg Zn ha^{-1}, T7= 3.5Kg B ha^{-1} (Borax) T8= 5Kg Cu ha^{-1} (CuSo4), untreated T9 tried with an standard dose of 230-115 Kg and NP ha^{-1} was (T10). The experiment was laid out in three replicated Randomized Complete Block Design. It was observed that plant height, tillers $plant^{-1}$, spike length, grains $spike^{-1}$, 1000 grain weight and grain yield ha^{-1} differed significant between all the treatments. Soil application of 6 Kg ha^{-1} Zn gave maximum grain yield of 5113.33 Kg ha^{-1}, this increscent in yield was associated with significant increase in tillers $plant^{-1}$ of 20.81.Spike length of 13.84 cm, grain $spike^{-1}$ of 71.95 and 1000 seed weight was 68.66 respectively. It is concluded that soil application of micronutrients were relatively more effective than foliar application in local soil condition. Among the micronutrients Zn applied at 6 Kg ha^{-1}, followed by 3 Kg Mg ha^{-1} and 3.5 Kg B ha^{-1} gave higher grain yield due to increased values in all yield related parameters.

Keywords: Micronutrients, Wheat, Foliar, Soil, Fertilizer and Nitrogen.

INTRODUCTION

Wheat *Triticum aestivum* L., is a major cash crop of Pakistan. it is extremely grown, produced and consumed in the country. It is mostly preferred as human food than any other cereal grain. The straw and by product of flour milling and industries are important sources of feed for livestock. Among all cereals wheat is the most preferred food of our people. Wheat kernel contains approximately 60-80 percent starch, 8-15 % protein, 2-2.5% glucose, 1.5-2% fat, 2-3% sugar and 1.5-2% minerals. Moreover, this figure may change from variety to variety locality to locality. Soil application of fertilizer is a common practice in the forming community although, it may cause some problems of fixation and leaching. However the other fertilizers are easily absorbed and spread rapidly to the all parts of the plant, spraying fertilizer solution directly on the foliage of a crop which has the advantages to solve the problems of fixation loss of availability and losses by leaching which occur when fertilizer are applied to the soil. Micronutrient significantly decreased in the soil with crop age in the wheat [1], investigated the effect of foliar application of boron, manganese and zinc in winter durum wheat, caused by Drechsleratritici-repintis (Died) shoem. Micronutrients were applied when plants were at the first node stage. In both years, in the sprayed plots the flag leaf had significantly fever lesions than the untreated ones, at booting through milk stages. The treatment with B significantly reduced the number of lesions per leaf compared to the other treatment to the booting stage in both years [2], evaluate the wheat performance by foliar application of micronutrients [3], suggested that during crop growth supplementary foliar fertilization increase plants mineral status and improve crop yields [4], studied effect of fertilizer application on soil heavy metal concentration

MATERIALS AND METHODS

A field experiment was conducted during the year (2016) for determination of foliar and soil application effects of micronutrients in wheat at the experimental area of southern wheat station Agriculture Research Institute Tandojam. For this purpose land was given a dry ploughing by using gobal plough to eradicate the weeds and uniform distribution of irrigation water. A four acre inches of irrigation water soaking dose was applied when came in condition, cultivator was practiced followed by leveling and rotavatar. A homogenous seed of TD –1 wheat variety was sown by singe coulter hand driven drill in the plots measuring in

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area of 24*7. 5= 180 m^2. The experiment was laid out in three replicated randomized complete block design.

Detail of Treatments

1	T1	130	65	K 2%
2	T2	130	65	Zn 1%
3	T3	130	65	B 0.2%
4	T4	130	65	Cu 2%
5	T5	130	65	Mg 1%
6	T6	130	65	Zn 6%
7	T7	130	65	B 3.5 kg borax
8	T8	130	65	Co 5 kg CuSO4
9	T9	130	65	Mg 3 kg magnesium sulphate
10	T10	130	65	0 control
11		130	65	

RESULTS

The study was carried out to examine the effect of foliar application v/s soil application of micronutrients on the growth and grain yield of wheat variety TD-1 during the year 2016 the results recorded on various growths and yield components are presented in Tables **1-6**.

Plant Height (cm)

The results pertaining to mean plant height of variety TD-1 as effected by foliar v/s soil application of various micronutrients is reported in Table **1**. The results (Table **1**) showed that plant height was significantly maximum (92.28 cm) under control followed by T5 (Mg 1 %) T4 (Cu 2% foliar) with average plant height of (91.89 cm) and (90.57 cm) respectively.

Table 1: Mean Value for Plant Height (cm) of Wheat Variety TD-1 as Effected by Foliar V/S Soil Application of Micronutrients

T1	1130- 65- k 2%	83.27
T2	130- 65- Zn 1%	82.22
T3	1340- 65- B02%	90.10
T4	130- 65- Cu 2%	90.57
T5	4130- 65- Mg 1 %	91.89
T6	1530- 65- Zn 6 kg	81.58
T7	130- 65- B 3.5 kg borax	83.14
T8	130- 65- Cu 5 kg $CuSO_4$	85.47
T9	130- 65- 3 kg Magnesium Sulphate	83.38
T10	130- 65- 0 Control	92.28

The crop received foliar application of boron at 0.2 % resulted plant height of (90.10 cm) while, minimum plant height of (81.58 cm) cm was recorded when NP was added with soil application of 6 kg Zn (33).

Tillers Plants^{-1}

The wheat variety TD-1 as influenced by foliar v/s soil application of micronutrients is reported in Table **2**. The results indicated that number of tillers plant^{-1} was significantly highest (20.18) under 33% soil applied zinc at the rate of 6 kg ha^{-1} followed by 18.60 and 17.82 average number of tiller plant^{-1} recorded under soil applied borax at 3.5 kg and 3 kg Mg sulfate, respectively. The lowest tiller plants (14.04) were recorded in plots receiving no micronutrients in any form (control).

Table 2: Mean Value for Number of Tiller Plants^{-1} of Wheat Variety TD-1 as Affected by Foliar v/s Soil Application of Micronutrients

T1	130- 65- k 2%	16.67 bc
T2	130- 65- Zn 1%	15.19 cd
T3	130- 65- B0.2%	15.37 cd
T4	130- 65- Cu 2%	15.25 cd
T5	130- 65- Mg 1 %	15.36 cd
T6	130- 65- Zn 6 kg	20.18 a
T7	130- 65- B 3.5 kg borax	18.60 b
T8	130- 65- Cu 5 kg $CuSO_4$	16.97 bc
T9	130- 65- 3 kg Magnesium Sulphate	17.82 b
T10	130- 65- 0 Control	14.40 e

Spike Length (cm)

The result regarding the spike length of wheat variety TD-1 as influenced by foliar v/s application of micronutrients is reported in Table **3**. The results indicated that application of 6 Kg ZN ha $^{-1}$ as soil dressing recorded longer spikes (13.84 cm) followed by 3.5 kg B ha^{-1} (13.02 cm) and 3kg Mg ha^{-1} (12.61 cm) respectively, while, no application of micronutrients resulted in minimum spike length (8.88 cm).

Grains Spike^{-1}

The results regarding the grain spike^{-1}of wheat variety TD-1 as influenced by foliar v/s soil application of micronutrients is reported in Table **4**. The wheat crop treated with soil dressing of 6 kg Zn ha^{-1} recorded greater grains (71.95 spike^{-1}), followed by 3,5 kg B ha^{-1} (65.05 spike^{-1}) and 3 kg Mg ha^{-1}(64.92 spike^{-1}) was recorded in plots where no micronutrients were applied.

Table 3: Mean Value for Spike Length (cm) of Wheat Variety TD-1 as Affected by Foliar v/s Soil Application of Micronutrients

T1	130- 65- k 2%	11.90 c
T2	130- 65- Zn 1%	11.03 d
T3	130- 65- B0.2%	11.09 d
T4	130- 65- Cu 2%	10.80 d
T5	130- 65- Mg 1 %	10.75 d
T6	130- 65- Zn 6 kg	13.84 a
T7	130- 65- B 3.5 kg borax	13.02 b
T8	130- 65- Cu 5 kg $CuSO_4$	12.52 b
T9	130- 65- 3 kg Magnesium Sulphate	12.61 b
T10	130- 65- 0 Control	8.88 e

Table 4: Mean Value for Grains Spike (g) of Wheat Variety TD-1 as Affected by Foliar v/s Soil Application of Micronutrients

T1	130- 65- k	64.34 d
T2	130- 65- Zn 1%	62.27 bc
T3	130- 65- B0.2%	59.34 cd
T4	130- 65- Cu 2%	59.95 e
T5	130- 65- Mg 1 %	57.34 d
T6	130- 65- Zn 6 kg	71.95 a
T7	130- 65- B 3.5 kg borax	65.08 b
T8	130- 65- Cu 5 kg $CuSO_4$	60.60 c
T9	130- 65- 3 kg Magnesium Sulphate	64.92 b
T10	130- 65- 0 Control	46.62

1000 Grains Weight (Seed Index) (g)

The results regarding 1000 grain (g) of wheat variety TD-1 as influenced by foliar v/s soil application of micronutrients is reported in Table **5**. It was observed that the wheat crop received 6 kg Zn ha^{-1} by soil dressing which gave greater seed index value (68.66 g), followed by 3.5 kg B ha^{-1} (63.12 g) followed by 3.5 kg Mg ha^{-1} (63.08 g) however, untreated (control) displayed minimum seed index value (50.68 g).

Grain Yield (kg ha^{-1})

The results regarding mean grain yield kg ha^{-1} of wheat variety TD-1 as influenced by foliar v/s soil application of micronutrients is reported in Table **6**. The results indicated that the grain yield (kg ha^{-1}) was significantly highest under 6 kg Zn ha^{-1} applied through soil which gave maximum grains kg Mg ha^{-1} yield (5113.33 kg ha^{-1}), followed by 3 kg Mg ha^{-1}, (4944.33 kg ha^{-1}), while, no application of micronutrients resulted in a lowest grain yield (4124.67 kg ha^{-1}). Same results were suggested by [3-5], they observed that boll mean weight is an important component for increasing of yield $plant^{-1}$ and the number of bolls were more by the foliar application of zinc.

Table 5: Mean Value for Seed Index (g) of Wheat Variety TD-1 as Affected by Foliar v/s Soil Application of Micronutrients

T1	130- 65- k	59.26cd
T2	130- 65- Zn 1%	58.22 cd
T3	130- 65- B0.2%	61.90 bc
T4	130- 65- Cu 2%	67.16 de
T5	130- 65- Mg 1 %	54.69 e
T6	130- 65- Zn 6 kg	68.66 a
T7	130- 65- B 3.5 kg borax	73.12 b
T8	130- 65- Cu 5 kg $CuSO_4$	60.49bc
T9	130- 65- 3 kg Magnesium Sulphate	63.08 b
T10	130- 65- 0 Control	50.68g

Table 6: Mean value for Grain Yield kg $ha^{-1}$of Wheat Variety TD-1 as Affected by Foliar v/s Soil Application of Micronutrients

T1	130- 65- k 2%	4699.33 cd
T2	130- 65- Zn 1%	4584.00 e
T3	130- 65- B0.2%	4650.67
T4	130- 65- Cu 2%	4472.33 f
T5	130- 65- Mg 1 %	4333.33 g
T6	130- 65- Zn 6 kg	5113.33 a
T7	130- 65- B 3.5 kg borax	4928.00 b
T8	130- 65- Cu 5 kg $CuSO_4$	4793.33 c
T9	130- 65- 3 kg Magnesium Sulphate	4944.33 b
T10	130- 65- 0 Control	4124.67 h

Soil application of zinc at 6 kg ha^{-1} with dressing of 230-115 kg NP ha^{-1} produced greater grain yield (5113.33 kg ha^{-1}), this enhancement in grain yield was associated with the increase in tillering capacity (20.81 plant), spike length (13.84 cm), grain $spike^{-1}$ (71.95) and 1000 grain weight (68.66 g) respectively, followed by 3 kg Mg ha^{-1} (4943.33 kg ha^{-1} grain yield) and 3.5 kg B ha^{-1} (4928.00 kg ha^{-1} grain yield) respectively however, no application of micronutrients in the

presence of basal dose of 230-115 NP kg produced taller plants (92.28 cm), or foliar application of Mg (1%), Cu (2%) and B (2%) also increased plant height as compared to soil dressing. These results demonstrate that soil application of micronutrients proved more effective than the foliar application among the micronutrients, wheat responded significantly more to Zn, followed by Mg and B, while other micronutrients were less effective. These results were supported by the findings of [5-8] they that wheat utilize Zn more efficiently in calcareous soils. They further found that available P and pH were the major controlling factors for DTPA-Zn, however, it is reported that addition of Fe+Zn+Mn and foliar spray nutrients significantly increased 1000 grain weight and grain yield Plant^{-1}.

CONCLUSIONS

On the basis of present study, it may be concluded that soil application of micronutrients were relatively more effective than foliar application in the local soils condition. Among the micronutrients Zn applied at 6kg ha-1 followed by 3 kg Mg ha-1 and 3.5 B ha-1 gave higher grain yield due increase values in all yield related parameters.

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