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Research Article

Studies on Impact of Foliar Application of Nutrients on Growth and Yield of Wheat (*Triticum aestivum* L.)

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Abstract : The field experiment was conducted during Rabi season of 2019-2020, to investigate "Studies on impact of foliar application of nutrients on growth and yield wheat (Triticum aestivum L.)" Crop at Student Instructional Farm (S.I.F.) of C.S. Azad University of Agriculture and Technology, Kanpur. The eight treatments were tested in Randomized Block Design with four replication, T1-RDF (120:60:40 NPK), T2-RDF +FYM (@0.96q/h), T3-RDF + Urea (@2.0%), T4-RDF +ZnSO4 (@0.5%), T5-RDF + Borex (@0.2%), T6-RDF + Urea (@2.0%) + ZnSO4 (@0.5%), T7-RDF + ZnSO4 (@0.5%) + Borex (@0.2%), T8-RDF + Urea (@2.0%) + ZnSO4 (@0.5%) + Borex (@0.2%). The soil of field was sandy loam. The pH of soil was 7.8. The wheat variety K-9423 (Unnat Halna) was sown on 2 December, 2019 at row spacing of 20 cm with seed rate of 100 kg/ha. Full dose of phosphorous and potash was applied as basal dose at the time of sowing and the nitrogen was applied as per treatment. The source of nitrogen, phosphorous and potash was organic and inorganic respectively. Result showed that the treatment T8-RDF + Urea (@2.0%) + ZnSO4 (@0.5%) + Borex (@0.2%) found superior in terms of maximum root and shoot growth, yield attributes and yield. The maximum grain yield (42.210 q/h) and straw yield (129.380 q/h) recorded under RDF + Urea (@2.0%) + ZnSO4 (@0.5%) + Borex (@0.2%) treatment in present field experiment. The increment in the grain yield evaluated 21.31% under T8-RDF + Urea (@2.0%) + ZnSO4 (@0.5%) + Borex (@0.2%) treatment compare to RDF control treatment.

Key word: Foliar application, Urea, ZnSO4, Borex and wheat crop.

Introduction

Wheat is a grass widely cultivated for its seed, a cereal grain which is worldwide staple food. The many species of wheat together makeup genus Triticum; the most widely grown is common wheat (T. aestivum). Botanically, the wheat kernel is a type of fruit called a caryopsis. Wheat is the most important staple food of about two billion people (36% of the world population). Wheat provides nearly 55% of the carbohydrates and 20% of the food calories consumed globally (Breiman and Graur, 2008). It is known as common bread wheat and valued for bread making. Although most of wheat is grown for human food and about 10 per cent is retained for seed and industry (for production of starch, paste, malt, dextrose and gluten). Wheat grain contains all essential nutrients and about 12% water, 60-80% carbohydrates, proteins (8-15%), contain adequate amount of all essential amino acid (except lysine, tryptophan and methionine), fat (1.5-2%), minerals (1.5-2%), vitamins such as B complex, vitamin E and 2.2% crude fiber keeping this view enhancing foliar applied nutrients on growth and yield of wheat (Triticum aestivum L.) in central Uttar Pradesh.

Matarials and Methods

The present investigation was conducted in Students Instructional Farm (SIF) at C.S. Azad University of Agriculture and Technology, Kanpur (U.P.) during Rabi season of 2019-20. The experimental farm falls under the Indo-genetic alluvial tract of Central Uttar Pradesh. Geographically, Kanpur is situated in the central part of U.P. and subtropical tract of North India between latitude ranging from 250 56' to 280 58' North and longitude 790

31' to 800 34' East and located on an elevation of about 125.9 meter above mean sea level in Gangetic plain. The seasonal rainfall of about 816 mm received mostly from IInd Fortnight of June or first Fortnight of July to mid October with a few showers in winter season. The maximum and minimum temperature in the Rabi season usually occurs 350 C and 150 C, respectively. The soil of experimental field was well leveled, sandy loam in texture with pH of 7.8 and E.C. of 0.22 mm/ha/cm at 25oC. It contains 0.24% organic carbon, 170 kg available N/ha, 16 kg/ha available phosphorous and 180 kg/ha available potassium. Crop was fertilized uniformly at a rate of 120 kg N+60 kg P2O5+40 kg K2O. The experiment was laid out in a "Randomized Block Design" with four replications. The eight treatments were tested viz. T1-RDF (120:60:40 NPK), T2-RDF +FYM (@0.96q/h), T3-RDF + Urea (@2.0%), T4-RDF +ZnSO4 (@0.5%), T5-RDF + Borex (@0.2%), T6-RDF + Urea (@2.0%) + ZnSO4 (@0.5%), T7-RDF + ZnSO4 (@0.5%) + Borex (@0.2%), T8-RDF + Urea (@2.0%) + ZnSO4 (@0.5%) + Borex (@0.2%). The trial was conducted in 2 December and the variety was K-9423 (Unnat Halna). Sowing was done by hand behind the country plough with uniform seed rate of 100 kg/ha. Seed of wheat variety was sown at row spacing of 20 cm. The crop was harvested at field maturity at 120 DAS on 3, April 2020. The observations were recorded on growth characters, yield attributes and yields of crop.

Result And Discussion

Growth Attributes

The data indicated in Table-1 that plant population/m2 was significantly higher in treatment of T2 RDF + FYM (@0.96 q/h). The highest plant height was recorded in treatment T8 RDF+ Urea (@2.0%) + ZnSO4 (@0.5%) + Borex (@0.2%). The maximum fresh weight and dry weight was recorded under T8 RDF+ Urea (@2.0%) + ZnSO4 (@0.5%) + Borex (@0.2%) and the lowest fresh weight and dry weight was recorded under T1 RDF control treatment. The root length was recorded maximum till the time of harvesting in T8 RDF+ Urea (@2.0%) + ZnSO4 (@0.5%) + Borex (@0.2%) treatment. The number of tillers per plant was recorded maximum in T8 RDF+ Urea (@2.0%) + ZnSO4 (@0.5%) + Borex (@0.2%) treatment and minimum in T1 RDF control treatment. The leaf area index shows significantly maximum increment in treatment T8 RDF+ Urea (@2.0%) + ZnSO4 (@0.5%) + Borex (@0.2%) and minimum at T1 RDF control. The maximum plant height, shoot fresh weight and dry weight, root length, number of tillers per plant and LAI was recorded under treatment T8 RDF+ Urea (@2.0%) + ZnSO4 (@0.5%) + Borex (@0.2%). It was also reported by Allah Wasaya et al. (2017) that foliar application of zinc and boron in combination helps in improving growth attributing characters.

Yield Attributes

The data showed in Table-2 that number of ears per plant was significantly higher in treatment T8 RDF+ Urea (@2.0%) + ZnSO4 (@0.5%) + Borex (@0.2%). The number of grain per ear recorded at the time of harvesting stage was maximum under treatment T8 RDF+ Urea (@2.0%) + ZnSO4 (@0.5%) + Borex (@0.2%). The ear length was recorded maximum in treatment T8 RDF+ Urea (@2.0%) + ZnSO4 (@0.5%) + Borex (@0.2%) at the time of harvesting. The number of spikelets per ear recorded highest at the time of maturity in treatment T8 RDF+ Urea (@2.0%) + ZnSO4 (@0.5%) + Borex (@0.2%). The maximum test weight was recorded higher under treatment T8 RDF+ Urea (@2.0%) + ZnSO4 (@0.5%) + Borex (@0.2%). The similar findings were shown by Mohd. Arif, et al. (2019) that foliar application of nutrient will increase yield attributing characters.

Yields

It is clear from Table-3 that biological yield was highest in treatment T8 RDF+ Urea (@2.0%) + ZnSO4 (@0.5%) + Borex (@0.2%) is 168.330 q/ha, it is recorded maximum 14.59% when compared to lowest treatment i.e. RDF control treatment. The significantly highest grain yield was recorded under T8 RDF+ Urea (@2.0%) + ZnSO4 (@0.5%) + Borex (@0.2%) is 41.210 q/ha and recorded maximum 21.31% when compared to control treatment. The maximum harvesting index 24.48% is recorded under treatment T8 RDF+ Urea (@2.0%) + ZnSO4 (@0.5%) + Borex (@0.2%). Similar findings were reported Moghadam, M. J. et al. (2012), Amiya Biswas et al. (2018) that foliar spray of zinc and boron help in increasing the grain yield.

Table: 1. Effect of different treatments on growth attributes of wheat crop

Treatment	Plant population	Plant height (cm)	Fresh weight/plant (g)	Dry weight/plant (g)	Root length (cm)	No. of tiller/ plant	Leaf area index (cm^2)
Control (RDF)	123.00	64.150	18.750	17.350	8.470	4.190	3.510
RDF+FYM (0.96q)	124.00	73.180	21.390	19.790	9.650	4.790	4.000
RDF+Urea (2.0%)	121.00	67.600	19.760	18.280	8.930	4.420	3.700
RDF+$ZnSO_4$ (0.5%)	119.00	74.160	21.680	20.060	9.780	4.850	4.090
RDF+Borex (0.2%)	121.00	75.670	22.110	20.460	10.010	4.950	4.160
RDF+Urea (2.0%) + $ZnSO_4$(0.5%)	123.00	76.950	22.480	20.800	10.170	5.100	4.320
RDF+$ZnSO_4$ (0.5%) + Borex(0.2%)	120.00	81.100	23.690	21.920	10.720	5.350	4.560
RDF+Urea (2.0%)+$ZnSO_4$ (0.5%)+Borex(0.2%)	123.00	84.550	24.700	22.860	11.180	5.430	4.600
S.E. (d)	**1.8368**	**1.9388**	**0.6123**	**0.4795**	**0.4533**	**0.2898**	**0.1225**
C.D.	**N.S.**	**4.0335**	**1.2738**	**0.9976**	**0.9426**	**0.6029**	**0.2548**

Table: 2. Effect of different treatments on yield attributes of wheat crop

Treatment	No. of ear/plant	No. of grain/ear	Ear length (cm)	No. of spikelet/ear	Test weight (g)
Control (RDF)	3.980	37.450	8.650	17.750	41.67
RDF+FYM(0.96q/h)	4.550	42.640	9.850	20.210	41.73
RDF+Urea(2.0%)	4.200	39.480	9.120	18.710	41.90
RDF+ZnSO4(0.5%)	4.620	42.870	9.900	20.320	42.11
RDF+Borex(0.2%)	4.730	43.200	9.970	20.460	42.45
RDF+Urea(2.0%)+ZnSO4(0.5%)	4.870	44.850	10.350	21.240	42.60
RDF+ZnSO4(0.5%)+Borex(0.2%)	5.150	46.250	10.650	21.850	42.72
54366RDF+Urea(2.0%)+ZnSO4(0.5%) + Borex(0.2%)	5.220	47.450	10.710	21.980	42.86
S.E. (d)	**0.2655**	**1.2244**	**0.1830**	**0.3570**	**0.264**
C.D.	**0.5520**	**2.5473**	**0.3821**	**0.7424**	**0.729**

Table: 3. Effect of different treatments on yield of wheat crop

Treatment	Biological yield (q/ha)	Grain yield (q/ha)	Straw yield (q/ha)	Harvesting Index (%)
Control (RDF)	146.890	33.970	111.590	23.12
RDF+FYM(0.96q)	156.700	34.720	112.970	22.15
RDF+Urea(2.0%)	156.818	35.170	118.960	22.42
RDF+ZnSO4(0.5%)	158.820	35.380	123.340	22.27
RDF+Borex(0.2%)	160.320	37.140	125.600	23.16
RDF+Urea(2.0%)+ZnSO4(0.5%)	163.340	37.740	127.110	23.10
RDF+ZnSO4(0.5%)+Borex(0.2%)	164.850	40.000	127.720	24.26
RDF+Urea(2.0%)+ZnSO4(0.5%)+ Borex(0.2%)	168.330	41.210	129.380	24.48
S.E. (d)	**5.1114**	**1.0434**	**4.0507**	**0.708**
C.D.	**10.6339**	**2.1707**	**8.4272**	**1.482**

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