IMPACT OF FOLIAR APPLICATION OF MICRO-NUTRIENTS FERTILIZERS (SUPER DAWN) ON THE GROWTH AND YIELD OF TWO WHEAT (*Triticum aestivum* L.) VARIETIES

Muharam Ali Hisbani*[1], Ahmed Naqi Shah[1], Maqsood Ahmed Chandio[2], Masroor Hassan Solangi[1], Muhammad Azeem Malik[1]
[*1]Department of Agronomy, Sindh Agriculture University Tandojam, Sindh, Pakistan
[2]Department of Entomology Sindh Agriculture University Tandojam, Sindh, Pakistan
Corresponding Email: muharramhisbani@gmail.com

ABSTRACT:- *The experiment was conducted at the Soil Chemistry Section, Agriculture Research Institute, Tandojam, during Rabi season, 2015-16. Experiment was laid out in three replicated randomized complete block design (factorial). The results for wheat varieties showed that maximum (85.2%) m^2 germination, (83.1cm) plant height, tillers $plant^{-1}$ (6.1), grains $spike^{-1}$ (59.9), spikelet's $spike^{-1}$ (21.8), seed index (1000-grain weight, g) (49.2g) and grain yield (5452.4 kg ha^{-1}) were observed in TJ-83 as compared to variety Imdad-2005 which produced minimum (84.3%) germination, (66.7cm) plant height, tillers $plant^{-1}$ (5.9), grains $spike^{-1}$ (55.0), spikelet's $spike^{-1}$ (22.8), seed index (1000-grain weight, g) (42.4g) and grain yield (5044.6 kg ha^{-1}). The micronutrients fertilizer (super down) levels had statistically significant effects on all the plant traits. The results revealed that the maximum germination (87.3%) m^2 was observed plant 4 sprayed after 30, 45, 60 and 75 days of sowing as compared to (85.4%) germination where plant 4 sprayed after 30, 45 and 60 days of sowing. Whereas, the minimum (81.1%) m^2 germination was observed under control plot where no any spray was applied. The maximum plant height (84.15cm) was observed plant 4 sprayed after 30, 45, 60 and 75 days of sowing as compared to (81.8cm) plant height where plant 3 sprayed after 30, 45 and 60 days of sowing. Whereas, the minimum (55.75cm) plant height was observed under control plot where no any spray was applied. The maximum tillers $plant^{-1}$ (6.9) was observed plant 4 sprayed after 30, 45, 60 and 75 days of sowing as compared to (6.3) tillers $plant^{-1}$ where plant 4 sprayed after 30, 45 and 60 days of sowing. Whereas, the minimum (4.9) tillers $plant^{-1}$ was observed under control plot where no any spray was applied. However the results observed that the maximum grains $spike^{-1}$ (63.5) was observed plant 4 sprayed after 30, 45, 60 and 75 days of sowing as compared to (61.5) grains $spike^{-1}$ where plant 3 sprayed after 30, 45 and 60 days of sowing. Whereas, the minimum (47.1) grains $spike^{-1}$ was observed under control plot where no any spray was applied. The results revealed that the maximum spikelet's $spike^{-1}$ (25.6) was observed plant 4 sprayed after 30, 45, 60 and 75 days of sowing as compared to (22.8) spikelet's spike-1 where plant sprayed after 30, 45 and 60 days of sowing. Whereas, the minimum (15.3) spikelet's spike-1 was observed under control plot where no any spray was applied. The maximum seed index (57.9g) was observed plant 4 sprayed after 30, 45, 60 and 75 days of sowing as compared to (50.6g) seed index where plant 3 sprayed after 30, 45 and 60 days of sowing. Whereas, the minimum (28.3g) seed index was observed under control plot where no any spray was applied. The maximum grain yield (6146.0 kg ha-1) was observed plant 4 sprayed after 30, 45, 60 and 75 days of sowing as compared to (5828.0 kg ha-1) grain yield where plant 4 sprayed after 30, 45 and 60 days of sowing. Whereas, the minimum (3298.5 kg ha-1) grain yield was observed under control plot where no any spray was applied.*

Keywords: Foliar application, micro-nutrients, growth, yield, wheat

INTRODUCTION

Among the cereals, wheat (*Triticum aestivum* L.) ranks first in area and production in the world. It has played a very vital role in stabilizing the food grains production over the past few years. In Pakistan the crop is being grown throughout the country on an area of about 8.5 million hectares and 20.9 million tons production was achieved [1]. Wheat production of 23.864 million tons for the year 2010 as against the set target of 25 million tons reflects a shortfall of 4.5 percent. Pakistan is likely to miss wheat production target of 25 million tons set for the current fiscal year 2011-12. It is likely to produce 24.03 million tons. The wheat was cultivated 9210.1 hectares and country is likely to produce 24.03 m tons of the wheat crop against the given target of 25 twenty five million tons and the wheat also cultivated 6621 hectares in the province of Punjab in our country and to produce 18.34 m tons against the set target of 19.2 m tons. However, in the Sindh Province of Pakistan wheat was cultivated on an area of 1482.2 hectares and is probable to supply 3.733 m. tons towards the set target of three.5 million tons and the crop changed into cultivated on 757.9 hectares inside the Khyber Pakhtunkhwa and is in all likelihood to provide 1.211 m tons in opposition to the set target of 1.5 m tons. While, the wheat changed into also cultivated on 394.0 thousand hectares in the province of Balochistan and is in all likelihood to produce 0.744m tons against the set goal of zero eight million tons [2]. The essential motives for low wheat manufacturing i.e. low quality seed, salinity, water logging, insufficient use of fertilizers, and lack of irrigation water, high enter expenses, low farmers' training and no need of micronutrients and natural fertilizers [3]. The nutrition is the crucial for flowers and yield, therefore, mineral fertilization is a common agronomic exercise that leads to enhance production. Mineral fertilization includes several factors, while the Nitrogen and Phosphorus or many of the macro elements and micronutrient that used in fertilization [4;5;6]. It is know that foliar application by all micronutrients gave significant effect on yield traits and protein content. They are needed in trace amounts, but their adequate supply improves nutrients availability and positively affects the cell physiological that is reflected in yield as well [7]. The use of micronutrient is important because of increasing economic and environmental concerns [8]. Others [9] Reported that Cu, Fe, Mn and Zn contents of grain of wheat increased by application of mineral fertilizers. More to the point, application methods for macro and trace elements also affect the yield. For instance, some[10] reported that foliar application with combination of micronutrients (Cu+Fe+Mn+Zn) produced the highest values of plant height (85.03 and 87.17 cm), tillers number m^{-2}, spikes number m^{-2}, spike length, number of spikelet $spike^{-1}$,

number of grains spike^{-1}, 1000-grain weight, grain yield, straw yield, biological yield and harvest index, respectively, in both seasons followed by Zn foliar application followed by Mn foliar application followed by Fe foliar application then Cu foliar application. Further, [11] recommended foliar sprays of nutrient solution at tilling, jointing and boot stage in conjunction with half of the endorsed dose of N and P to growth yield and yield additives of wheat. [12] reported that boom of 31.6% in wheat grain yield over manipulate via the addition of five kg Zn ha^{-1} further, the yield parameters like wide variety of spike plant^{-1}, spike duration, plant height, biological yield and 1000- grain weight has been increased over control. additionally, grain yield, straw yield, 1000- grain weight and wide variety of grains/spike, Fe, Mn and Zn attention in flag leaves and grains as well as, protein content in grain have been extensively accelerated through application of those elements [13]. Moreover, the extent of Zn content material became raised from 15.2 to 37.4 mg kg^{-1} by utility of 10.0 kg Zn ha^{-1} for that reason, substantial improvement in wheat productiveness may be harvested with simultaneous increased concentration of Zn nutrient in grain for relief of syndrome precipitated because of Zn deficiency across rural and peri-urban communities [14].

The use of iron at 12 kg ha^{-1}, additionally, confirmed encouraging outcomes comparable, more or less, to boron. Among various application strategies, facet dressing at four weeks after sowing showed the best effects as compared to soil utility and foliar spray. For instance, higher leaf place index and crop growth fee had been obtained with the application of zinc at 10 kg ha^{-1} also special micronutrients had good sized interplay with utility methods for grain yield side dressing satisfactory interacted with boron for producing better numbers of tillers, grains consistent with spike and grain yield. This method showed a better combination with iron for higher wide variety of tillers and grain yield [15]. The foliar application of macronutrients caused a vast and/or exceptionally vast effect on some of increase parameters and yield components at some stage in the 2 developing seasons. In addition, a few nutrienst of wheat grains content material i.e. k, Zn, Mn and Cu were massive and or exceedingly enormous improved due to foliar applications of macronutrients. There have been vast variations between the 2 varieties for maximum studied traits [16]. Among numerous application methods, soil utility of micronutrients (at sowing) showed the excellent effects compared to side dressing and foliar utility both at four weeks after sowing was also, special micronutrients drastically interacted with the application techniques for grain yield. Soil application quality interacted with boron for producing higher wide variety of tillers, grains spike^{-1}, grain yield and almost all the physiological developments. This aggregate also resulted in the exceptional internet returns with a better gain value ratio [17].

Materials and Methods

The experiment was conducted at the Soil chemistry Section, Agriculture Research Institute, Tandojam, during Rabi season, 2015-16. The experiment was laid out in three replicated randomized complete block design (factorial). The micronutrients fertilizer super dawn was applied as 1000 ml in100 liter of water per hectare and the recommended NPK 150-80-0 all P with 1/3 N was applied sowing time remaining Nitrogen was applied into two splits with first and second irrigation. The DAP and urea were used for soil applied. The experimental details are given below:

Experimental design: Randomized complete block design (RCBD) factorial

Replications: 3

Net plot size: 5 m x 5 m= (25 m^2)

Treatments: Two factors (A and B)

Factor (A): Fertilizer levels = 5 (1000 ml/100 L ha^{-1}).

T_1 = control (untreated plot)

T_2 = 1 spray (1st spray 30 DAS)

T_3 = 2 sprays (30-45 DAS)

T_4 = 3 sprays (30-45-60 DAS)

T_5 = 4 sprays (30-45-60-75 DAS)

Factor (B): Varieties = 2

V_1 = Imdad, V_2 = TJ-83

Treatment combinations:

$T_1 = F_1V_1$, $T_2 = F_2V_1$, $T_3 = F_3V_1$, $T_4 = F_4V_1$, $T_5 = F_5V_1$, $T_6 = F_1V_2$, $T_7 = F_2V_2$, $T_8 = F_3V_2$, $T_9 = F_4V_2$, $T_{10} = F_5V_2$

Observation to be recorded:

1. Germination (%) m^2
2. Plant height (cm).
3. Number of tillers plant^{-1}
4. Number of spike lets spike^{-1}
5. Number of grains spike^{-1}
6. Seed index (1000 seed weight, g)
7. Grain yield (kg ha^{-1})

Methodology for recording observations

Seed germination (%) m^2

Seed germination (%) m^2 was recorded at maturity stage and calculated according to the stander formula.

$$\text{Seed germination} = \frac{\text{No. of plants germinate}}{\text{No. of seed sown}} \times 100$$

Plant height (cm)

Plant height was recorded at maturity of crop using measurement tape from bottom to tip of the randomly selected plants in each plot and was averaged in centimeters.

Tillers plant^{-1}

Tillers in each randomly selected plant were counted and accordingly average plant^{-1} was worked out in each treatment.

Spikelet's spike^{-1}

Number of spikelet's spike^{-1} were counted visually at maturity and divided by number of spikes.

Grains spike^{-1}

The total grains in five randomly selected plants were counted in each plot and total number of grains was divided with a total number of spikes.

Seed index (1000 grain weight, g)

Weight of grains from randomly selected plants was obtained after threshing and the average weight of grains plant^{-1} was recorded in grams.

Grain yield kgha^{-1}

At maturity, the wheat crop in each plot was harvested and threshed, and yield ha^{-1} was calculated by the following formula:

$$\text{Grain yield (kg ha}^{-1}\text{)} \quad \frac{\text{Grain yield plot}^{-1}\text{ (kg)}}{\text{Plot size (m)}} \times 1000$$

Statistical analysis:

The collected data was subjected to statistical analysis using MSTAT-C (Russel and Eisensmith, 1983). The LSD test was applied to compare treatments superiority, where necessary.

LAYOUT PLAN OF THE EXPERIMENT

Experimental design: Randomized complete block design (RCBD) factorial

Replications: 3

Net plot size: 5 m x 5 m = (25 m^2)

Treatments: Two factors (A and B)

Factor (A): Fertilizer levels = 5 (1000 ml/100 L ha^{-1}).

T_1 = Control (No spray)

T_2 = 1 spray (1st spray 30 DAS)

T_3 = 2 sprays (30-45 DAS)

T_4 = 3 sprays (30-45-60 DAS)

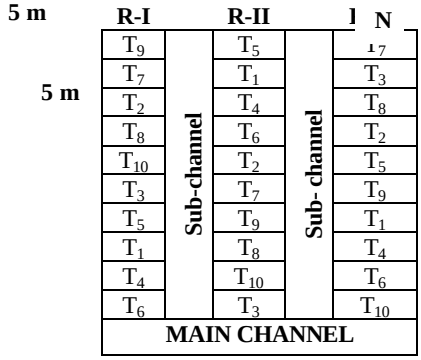
T_5 = 4 sprays (30-45-60-75 DAS)

Factor (B): **Varieties = 2**

V_1 = Imdad V_2 = TJ-83

Treatment combinations:

$T_1 = F_1V_1$, $T_2 = F_2V_1$, $T_3 = F_3V_1$, $T_4 = F_4V_1$, $T_5 = F_5V_1$, $T_6 = F_1V_2$, $T_7 = F_2V_2$, $T_8 = F_3V_2$, $T_9 = F_4V_2$, $T_{10} = F_5V_2$



RESULTS

The experiment was conducted to investigate the impact of foliar application of micronutrients fertilizer (super dawn) on the growth and yield of wheat varieties. Two wheat varieties viz., Imdad-2005 and TJ-83 and five fertilizer levels viz., control (untreated plot), 1 spray (1st spray 30 DAS), 2 spray (30- 45 DAS), 3 sprays (30- 45 - 60 DAS) and 4 sprays (30- 45 - 75 DAS) were used. The experiment was laid out in randomized complete block design having three replications. The plot size kept was 5m x 5m (25m^2). The results are described are as under:

Germination (%) m^2

The results regarding germination (%) m^2 of two varieties of wheat planted under five different fertilizer levels are presented in (Table-1). The results indicated that varieties and fertilizer levels had non-significant effect on germination (%) m^2. The results revealed that wheat varieties TJ-83 produced maximum (85.2%) germination than wheat variety Imdad-2005 with germination of (84.3%) m^2. The micronutrients fertilizer (super dawn) levels had statistically significant effects on germination (%) m^2. The results revealed that the maximum germination (87.3%) m^2 was observed plant sprayed after 30, 45, 60 and 75 days of sowing as compared to (87.1%) m^2 germination where plant sprayed after 30, 45 and 60 days of sowing. Whereas the plant sprayed after 30 and 40 days of sowing was recorded (84.4%) germination. On other hand the plant treated after 30 days was observed (83.9%) m^2 germination. Whereas, the minimum (81.1%) m^2 germination was observed under control plot where no any spray was applied. It is clear from the results that variety TJ-83 had more germination (%) m^2 under 4 sprays whereas plot was sprayed after 30, 45, 60 and 75 days of sowing.

Table 1. Germination (%) m^2 of wheat varieties as affected by foliar application of micronutrients fertilizer (super dawn)

Micronutrients fertilizer (Super down) levels	Varieties		Mean
	Imdad-2005	TJ-83	
Control (No spray)	81.5	85.7	81.1
1 spray (30 DAS)	86.2	81.6	83.9
2 sprays (30 and 45 DAS)	85.7	83.1	84.4
3 sprays (30, 45 and 60 DAS)	85.4	89.3	87.1
4 sprays (30, 45, 60 and 75 DAS)	82.9	91.7	87.3
Mean	84.3	85.2	

	Fertilizer (F)	Varieties (V)	F X V
SE	=0.9487	0.6000	1.3416
LSD@5%=	-----	------	--------

Plant height (cm)

The results regarding plant height (cm) two varieties of wheat planted under five different fertilizer levels are presented in (Table-2). The results indicated that varieties and fertilizer levels had significant effect on plant (cm). The results revealed that wheat variety TJ-83 produced maximum 83.1cm) plant height as compared to variety Imdad-2005 which produced (66.7cm) plant height. The micronutrients fertilizer (super dawn) levels had statistically significant effects on plant height (cm). The results revealed that the maximum plant height (84.15cm) was observed plant sprayed after 30, 45, 60 and 75 days of sowing as compared to (81.8cm) plant height where plant sprayed after 30, 45 and 60 days of sowing. Whereas the plant sprayed after 30 and 40 days of sowing was recorded (78.3cm) plant height. On the other hand the plant treated after 30 days was observed (74.7cm) plant height. Whereas, the minimum (55.75cm) plant height was observed under control plot where no any spray was applied. It is clear from the results that variety TJ-83 had maximum plant height (cm) under 4 sprays whereas plot was sprayed after 30, 45, 60 and 75 days of sowing.

Table 2. Plant height (cm) of wheat varieties as affected by foliar application of micronutrients fertilizer (Super dawn)

Micronutrients fertilizer (Super down) levels	Varieties		Mean
	Imdad-2005	TJ-83	
Control (No spray)	53.1	58.4	55.7 E
1 spray (30 DAS)	67.3	82.1	74.7 D
2 sprays (30 and 45 DAS)	70.7	85.8	78.3 C
3 sprays (30, 45 and 60 DAS)	70.9	92.7	81.8 B
4 sprays (30, 45, 60 and 75 DAS)	71.7	96.6	84.1 A
Mean	66.7 B	83.1 A	

	Fertilizer (F)	Varieties (V)	F X V
SE=	2.0598	1.3027	2.9130
LSD@5%=4.3274		2.7329	6.1199

Tillers $plant^{-1}$

The results regarding tillers $plant^{-1}$ two varieties of wheat planted under five different fertilizer levels are presented in (Table-3). The results indicated that varieties and fertilizer levels had significant effect on tillers $plant^{-1}$. The results revealed that wheat variety TJ-83 gave maximum (6.1)

tillers plant^{-1} as compared to variety Imdad-2005 which recorded (5.9) tillers plant^{-1}. The micronutrients fertilizer (super dawn) levels had statistically significant effects on tillers plant^{-1}. The results revealed that the maximum tillers plant^{-1} (6.9) was observed plant sprayed after 30, 45, 60 and 75 days of sowing as compared to (6.3) tillers plant^{-1} where plant sprayed after 30, 45 and 60 days of sowing. Whereas the plant sprayed after 30 and 45 days of sowing was recorded (6.0) tillers plant^{-1}. On the other hand the plant treated over 30 days was observed (5.9) tillers plant^{-1}. Whereas, the minimum (4.9) tillers plant^{-1} was observed under control plot where no any spray was applied. It is clear from the results that variety TJ-83 had a maximum tillers plant^{-1} under 4 sprays whereas plot was sprayed after 30, 45, 60 and 75 days of sowing.

Table 3. Tillers plant^{-1} of wheat varieties as affected by foliar application of micronutrients fertilizer (Super dawn)

Micronutrients fertilizer (Super down) levels	Varieties		Mean
	Imdad-2005	TJ-83	
Control (No spray)	4.5	5.3	4.9 E
1 spray (30 DAS)	5.8	6.0	5.9 D
2 sprays (30 and 45 DAS)	6.0	6.1	6.0 C
3 sprays (30, 45 and 60 DAS)	6.4	6.3	6.3 B
4 sprays (30, 45, 60 and 75 DAS)	7.1	6.8	6.9 A
Mean	5.9 B	6.1 A	

	Fertilizer (F)	Varieties (V)	F X V
SE	=0.4118	0.2604	0.5824
LSD@5%=0.8651	0.	5472	1.2235

Spikelet's spike^{-1}

The results regarding spikelet's spike^{-1} two varieties of wheat planted under five different fertilizer levels are presented in (Table-4). The results indicated that varieties and fertilizer levels had significant effect on spikelet's spike^{-1}. The results revealed that wheat variety TJ-83 observed maximum (21.8) spikelet's spike^{-1} as compared to variety Imdad-2005 which noted (22.8) spikelet's spike^{-1}. The micronutrients fertilizer (super dawn) levels had statistically significant effects on spikelet's spike^{-1}. The results revealed that the maximum spikelet's spike^{-1} (25.6) was observed plant sprayed after 30, 45, 60 and 75 days of sowing as compared to (22.8) spikelet's spike^{-1} where plant sprayed after 30, 45 and 60 days of sowing. Whereas the plant sprayed after 30 and 45 days of sowing was recorded (21.1) spikelet's spike^{-1}. On the other hand the plant treated after 30 days was observed (19.5) spikelet's spike^{-1}. Whereas, the minimum (15.3) spikelet's spike^{-1} was observed under control plot where no any spray was applied. It is clear from the results that variety TJ-83 had maximum spikelet's spike^{-1} under 4 sprays whereas plot was sprayed after 30, 45, 60 and 75 days of sowing.

Table 4. Spikelet's spike^{-1} of wheat varieties as affected by foliar application of micronutrients fertilizer (Super dawn)

Micronutrients fertilizer (Super down) levels	Varieties		Mean
	Imdad-2005	TJ-83	
Control (No spray)	15.8	14.5	15.3 c
1 spray (30 DAS)	18.2	20.1	19.5 BC
2 sprays (30 and 45 DAS)	19.9	22.3	21.1 AB
3 sprays (30, 45 and 60 DAS)	20.7	25.0	22.8 AB
4 sprays (30, 45, 60 and 75 DAS)	23.5	27.2	25.6 A
Mean	19.6 B	21.8 A	

	Fertilizer (F)	Varieties (V)	F X V
SE	=0.6254	0.3956	0.8845
LSD@5%=1.3140		0.8310	1.8582

Grains spike^{-1}

The results regarding grains spike^{-1} two varieties of wheat planted under five different fertilizer levels are presented in (Table-5). The results indicated that varieties and fertilizer levels had a significant effect on grains spike^{-1}. The results revealed that wheat variety TJ-83 produced more (59.9) grains spike^{-1} as compared to variety Imdad-2005 which noted (55.0) grains spike^{-1}. The micronutrients fertilizer (super dawn) levels had statistically significant effects on grains spike^{-1}. The results revealed that the maximum grains spike^{-1} (63.5) was observed plant sprayed after 30, 45, 60 and 75 days of sowing as compared to (61.5) grains spike^{-1} where plant sprayed after 30, 45 and 60 days of sowing. Whereas the plant sprayed after 30 and 45 days of sowing was recorded (58.3) grains spike^{-1}. On other hand the plant treated over 30 days was observed (55.5) grains spike^{-1} whereas, the minimum (47.1) grains spike^{-1} was observed under control plot where no any spray was applied. It is clear from the results that variety TJ-83 had maximum grains spike^{-1} under 4 sprays whereas plot was sprayed after 30, 45, 60 and 75 days of sowing.

Table 5. Grains spike^{-1} of wheat varieties as affected by foliar application of micronutrients fertilizer (Super dawn)

Micronutrients fertilizer (Super down) levels	Varieties		Mean
	Imdad-2005	TJ-83	
Control (No spray)	48.6	45.7	47.1 D
1 spray (30 DAS)	50.7	60.3	55.5 CD
2 sprays (30 and 45 DAS)	55.0	61.6	58.3 BC
3 sprays (30, 45 and 60 DAS)	58.6	64.4	61.5 AB
4 sprays (30, 45, 60 and 75 DAS)	61.7	65.4	63.5 A
Mean	55.0 B	59.9 A	

	Fertilizer (F)	Varieties (V)	F X V
SE	=0.8010	1.2664	1.7910
LSD@5%=1.6828		2.6607	3.7628

Seed index (1000-grain weight, g)

The results regarding seed index two varieties of wheat planted under five different fertilizer levels are presented in (Table-6). The results indicated that varieties and fertilizer levels had a significant effect on seed index. The results revealed that wheat variety TJ-83 observed maximum (49.2g) seed index as compared to variety Imdad-2005 which noted (42.4) seed index. The micronutrients fertilizer (super dawn) levels had statistically significant effects on seed index. The results revealed that the maximum seed index (57.9g) was observed plant sprayed after 30, 45, 60 and 75 days of sowing as compared to (50.6g) seed index where plant sprayed after 30, 45 and 60 days of sowing. Whereas the plant sprayed after 30 and 45 days of sowing was recorded (47.2g) seed index. On other hand the plant treated after 30 days was observed (45.5g) seed index. Whereas, the minimum (28.3g) seed index was observed under control plot where no any spray was applied. It is clear from the results that variety TJ-83 had maximum seed index under 4 sprays whereas plot was sprayed after 30, 45, 60 and 75 days of sowing.

Table 6. Seed index (1000 grain weight, g) of wheat varieties as affected by foliar application of micronutrients fertilizer (Super dawn)

Micronutrients fertilizer (Super down) levels	Varieties		Mean
	Imdad-2005	TJ-83	
Control (No spray)	25.4	31.3	28.3 E
1 spray (30 DAS)	41.4	49.7	45.5 D
2 sprays (30 and 45 DAS)	43.3	51.2	47.2 C
3 sprays (30, 45 and 60 DAS)	48.1	53.1	50.6 B
4 sprays (30, 45, 60 and 75 DAS)	54.0	61.8	57.9 A
Mean	42.4 B	49.2 A	

	Fertilizer (F)	Varieties (V)	F X V
SE	=0.9235	0.5841	1.3060
LSD@5%=1.9402		1.2271	2.7439

Grain yield (kg ha^{-1})

The results regarding grain yield (kg ha^{-1}) two varieties of wheat planted under five different fertilizer levels are presented in (Table-7). The results indicated that varieties and fertilizer levels had a significant effect on grain yield (kg ha^{-1}). The results revealed that wheat variety TJ-83 produced maximum (5452.4 kg ha^{-1}) grain yield as compared to variety Imdad-2005 which noted (5044.6 kg ha^{-1}) grain yield. The micronutrients fertilizer (super dawn) levels had statistically significant effects on grain yield. The results revealed that the maximum grain yield (6146.0 kg ha^{-1}) was observed when plant sprayed after 30, 45, 60 and 75 days of sowing as compared to (5828.0 kg ha^{-1}) grain yield where plant sprayed after 30, 45 and 60 days of sowing. Whereas the plant sprayed after 30 and 45 days of sowing was recorded (5557.5 kg ha^{-1}) grain yield. On other hand the plant treated after 30 days was observed (5412.5 kg ha^{-1}) grain yield. Whereas, the minimum (3298.5 kg ha^{-1}) grain yield was observed under control plot where no any spray was applied. It is clear from the results that variety TJ-83 had maximum grain yield under 4 sprays whereas plot was sprayed after 30, 45, 60 and 75 days of sowing.

Table 7. Grain yield (kg ha^{-1}) of wheat varieties as affected by foliar application of micronutrients fertilizer (Super dawn)

Micronutrients fertilizer (Super down) levels	Varieties		Mean
	Imdad-2005	TJ-83	
Control (No spray)	3515	3082	3298.5 E
1 spray (30 DAS)	5062	5763	5412.5 D
2 sprays (30 and 45 DAS)	5230	5885	5557.5 C
3 sprays (30, 45 and 60 DAS)	5570	6086	5828.0 B
4 sprays (30, 45, 60 and 75 DAS)	5846	6446	6146.0 A
Mean	5044.6 B	5452.4 A	

	Fertilizer (F)	Varieties (V)	F X V
SE	=178.07	112.62	251.84
LSD@5%=374.12 2		36.61	529.09

DISCUSSION

Low first-rate seed, salinity, water logging, inadequate use of fertilizers, the loss of irrigation water, excessive enter costs, low farmers education and no need of micronutrients and natural fertilizers are the major reasons for low wheat production [3]. Vitamins are critical for plant life and yield, therefore, mineral fertilization is a common place agronomic exercise that leads to improve manufacturing. Mineral fertilization consists of several elements, however, nitrogen and potassium or among the macro-elements and micronutrient that used in fertilization [4;5;6].

The results revealed that wheat varieties TJ-83 produced maximum (85.2%) germination than wheat variety Imdad-2005 with germination (84.3%). The micronutrients fertilizer (super dawn) levels had statistically significant effects on germination (%). The results revealed that the maximum germination (87.3%) was observed plant sprayed after 30, 45, 60 and 75 days of sowing as compared to (87.1%) germination where plant sprayed after 30, 45 and 60 days of sowing. Whereas the plant sprayed after 30 and 40 days of sowing was recorded (84.4%) germination. On te other hand the plant treated over 30 days was observed (83.9%) germination. Whereas, the minimum (81.1%) germination was observed under control plot where no any spray was applied. It is clear from the results that variety TJ-83 had more germination (%) under 4 sprays whereas plot was sprayed after 30, 45, 60 and 75 days of sowing. It is known that foliar application by all micronutrients give significant effect on yield traits and protein content. They are needed in trace amounts, but their adequate supply improves nutrients availability and positively affects the cell physiological that is reflected in yield as well [7]. The results revealed that wheat varieties TJ-83 produced maximum (83.1cm) plant height as compared to variety Imdad-2005 which produced (66.7cm) plant height. The micronutrients fertilizer (super dawn) levels had statistically significant effects on plant height (cm). The results revealed that the maximum plant height (84.15cm) was observed plant sprayed after 30, 45, 60 and 75 days of sowing as compared to (81.8cm) plant height where plant sprayed after 30, 45 and 60 days of sowing. Whereas the plant sprayed after 30 and 40 days of sowing was recorded (78.3cm) plant height. On other hand the plant treated after 30 days was observed (74.7cm) plant height. Whereas, the minimum (55.75cm) plant height was observed under control plot where no any spray was applied. It is clear from the results that variety TJ-83 had maximum plant height (cm) under 4 sprays whereas plot was sprayed after 30, 45, 60 and 75 days of sowing. The results revealed that wheat varieties TJ-83 observed maximum (6.1) tillers plant^{-1} as compared to variety Imdad-2005 which recorded (5.9) tillers plant^{-1}. The micronutrients fertilizer (super dawn) levels had statistically significant effects on tillers plant^{-1}. The results revealed that the maximum tillers plant^{-1} (6.9) was observed plant sprayed after 30, 45, 60 and 75 days of sowing as compared to (6.3) tillers plant^{-1} where plant sprayed after 30, 45 and 60 days of sowing. Whereas the plant sprayed after 30 and 45 days of sowing was recorded (6.0) tillers plant^{-1}. On the other hand the plant treated after 30 days was observed (5.9) tillers plant^{-1}. Whereas, the minimum (4.9) tillers plant^{-1} was observed under control plot where no any spray was applied. It is clear from the results that variety TJ-83 had a maximum tillers plant^{-1} under 4 sprays whereas plot was sprayed after 30, 45, 60 and 75 days of sowing. Further, [11] advocated foliar sprays of nutrient solution at tilling, jointing and boot stages along with half of the recommended dose of N and P to increase yield and yield components of wheat. [12] Found an increase of 31.6% in wheat grain yield over control by the addition of 5 kg Zn ha^{-1}. Similarly, the yield parameters like number of spike plant^{-1}, spike length, plant

height, biological yield and 1000- grain weight were increased over control. Additionally, grain yield, straw yield, 1000- grain weight and number of grains spike^{-1}, Fe, Mn and Zn concentration in flag leaves and grains as well as, protein content in grain were significantly increased by application of these elements [13]. Furthermore, the level of Zn content was raised from 15.2 to 37.4 mg kg^{-1} by application of 10.0 kg Zn ha^{-1}. Thus, substantial improvement in wheat productivity could be harvested with simultaneous increased concentration of Zn nutrient in grain for alleviation of syndrome caused due to Zn deficiency across rural and peri-urban communities [14]. The results revealed that wheat varieties TJ-83 observed maximum (59.9) grains spike^{-1} as compared to variety Imdad-2005 which noted (55.0) grains spike^{-1}. The micronutrients fertilizer (super dawn) levels had statistically significant effects on grains spike^{-1}. The results revealed that the maximum grains spike^{-1} (63.5) was observed plant sprayed after 30, 45, 60 and 75 days of sowing as compared to (61.5) grains spike^{-1} where plant sprayed after 30, 45 and 60 days of sowing. Whereas the plant sprayed after 30 and 45 days of sowing was recorded (58.3) grains spike^{-1}. On other hand the plant treated after 30 days was observed (55.5) grains spike^{-1} whereas, the minimum (47.1) grains spike^{-1} was observed under control plot where no any spray was applied. It is clear from the results that variety TJ-83 had amaximum grains spike^{-1} under 4 sprays whereas plot was sprayed after 30, 45, 60 and 75 days of sowing. [10] Reported that foliar application with a combination of micronutrients (Cu+Fe+Mn+Zn) produced the highest values of plant height (85.03 and 87.17 cm), tillers m^{-2}, spikes m^{-2}, spike length, spike^{-1}, grains spike^{-1}, 1000-grain weight, grain yield, straw yield, biological yield and harvest index, respectively, in both seasons followed by Zn foliar application followed by Mn foliar application followed by Fe foliar application then Cu foliar application. The results revealed that wheat varieties TJ-83 observed maximum (21.8) spikelet's spike^{-1} as compared to variety Imdad-2005 which noted (22.8) spikelet's spike^{-1}. The micronutrients fertilizer (super down) levels had statistically significant effects on spikelet's spike^{-1}. The results revealed that the maximum spikelet's spike^{-1} (25.6) was observed plant sprayed after 30, 45, 60 and 75 days of sowing as compared to (22.8) spikelet's spike^{-1} where plant sprayed after 30, 45 and 60 days of sowing. Whereas the plant sprayed after 30 and 45 days of sowing was recorded (21.1) spikelet's spike^{-1}. On other hand the plant treated after 30 days was observed (19.5) spikelet's spike^{-1}. Whereas, the minimum (15.3) spikelet's spike^{-1} was observed under control plot where no any spray was applied. It is clear from the results that variety TJ-83 had maximum spikelet's spike^{-1} under 4 sprays whereas plot was sprayed after 30, 45, 60 and 75 days of sowing. The results revealed that wheat varieties TJ-83 observed maximum (49.2g) seed index as compared to variety Imdad-2005 which noted (42.4) seed index. The micronutrients fertilizer (super down) levels had statistically significant effects on seed index. The results revealed that the maximum seed index (57.9g) was observed plant sprayed after 30, 45, 60 and 75 days of sowing as compared to (50.6g) seed index where plant sprayed after 30, 45 and 60 days of sowing. Whereas the plant sprayed after 30 and 45 days of sowing was recorded (47.2g) seed index. On other hand the plant treated after 30 days was observed (45.5g) seed index. Whereas, the minimum (28.3g) seed index was observed under control plot where no any spray was applied. It is clear from the results that variety TJ-83 had maximum seed index under 4 sprays whereas plot was sprayed after 30, 45, 60 and 75 days of sowing. The results revealed that wheat varieties TJ-83 observed maximum (5452.4 kg ha^{-1}) grain yield as compared to variety Imdad-2005 which noted (5044.6 kg ha^{-1}) grain yield. The micronutrients fertilizer (super down) levels had statistically significant effects on grain yield. The results revealed that the maximum grain yield (6146.0 kg ha^{-1}) was observed plant sprayed after 30, 45, 60 and 75 days of sowing as compared to (5828.0 kg ha^{-1}) grain yield where plant sprayed after 30, 45 and 60 days of sowing. Whereas the plant sprayed after 30 and 45 days of sowing was recorded (5557.5 kg ha^{-1}) grain yield. On other hand the plant treated after 30 days was observed (5412.5 kg ha^{-1}) grain yield. Whereas, the minimum (3298.5 kg ha^{-1}) grain yield was observed under control plot where no any spray was applied. It is clear from the results that variety TJ-83 had maximum grain yield under 4 sprays whereas plot was sprayed after 30, 45, 60 and 75 days of sowing. The foliar application of macronutrients induced a full-size and/or quite a giant impact on a number of increase parameters and yield additives during the 2 developing seasons. Similarly, some nutrient of wheat grains content material i.e. ok, Zn, Mn and Cu had been giant and pretty giant extended due to foliar application of macronutrients. There had been good sized variations among the 2 varieties for most studied characteristics [16]. Using iron at 12 kg ha^{-1} also showed encouraging results comparable, more or less, to boron. Among diverse utility techniques, facet dressing at four weeks after sowing showed the pleasant outcomes in comparison to soil application and foliar spray. As an example, higher leaf region index and crop boom charge had been obtained with the applications of zinc at 10 kg ha^{-1}. Additionally, one-of-a kind micronutrients had vast interplay with application strategies for grain yield. Facet dressing best interacted with boron for producing better wide variety of tillers, grains according to spike and grain yield. This approach confirmed better mixture with iron for better number of tillers and grain yield [15].

CONCLUSIONS

From the present study it is concluded that

All the yield traits, varieties, micronutrient and their interaction varieties x micronutrients fertilizer (Super dawn) were significant. The results for varieties showed that the wheat variety TJ-83 gave maximum, yield and yield contributing characters than other wheat varieties, germination (%) m^2 plant height (cm), number of tillers plant^{-1}, spikelet's, grains spike^{-1}, seed index (1000 grain weight g), grain yield (kg ha^{-1}). However, the results further showed that the variety Imdad-2005 recorded minimum yield and yield contributing characters, germination (%) m^2 plant height (cm), number of tillers plant^{-1}, spikelet's, number of grains spike^{-1}, grains spike^{-1}, seed index (1000 grain weight g), grain yield (kg ha^{-1}). Micronutrients (super dawn) sprayed after 30, 45, 60 and 75 days of sowing gave higher germination (%) m^2 plant height (cm), number of tillers plant^{-1}, spikelet's, number grains spike^{-1}, grains spike^{-1}, seed index (1000 grain weight g), grain yield (kg ha^{-1}).

REFERENCE

[1]GoP.,"Medium-term Development Imperatives and Strategy for Pakistan". *Planning Commission, Government of Pakistan, Islamabad*. p.61 (2010).

[2]GoP.,"Wheat area, production and yield. Agricultural Statistics of Pakistan, 2011-12". *Statistics Division, Federal Bureau of Statistics, Government of Pakistan, Islamabad*. p.3 (2011-12).

[3]Khan, Z.A, M.A. Khan and Baloch, M.S.,"Effect of different manures on the yield of wheat". *Scientific Khyber*, **12**(1): 41-46 (1999).

[4]El- Shaarawy, G.A.M.,"Evaluation of some new wheat cultivars under some agricultural treatments". *Ph. D. Thesis Fac. Agric. Al- Azharuniv., Egypt*. (2003).

[5]Saleh, M.E.,"Response of Egyptian and Mexican wheat cultivar to different nitrogen fertilization levels under U. A. E. conditions". *Zagazig J. Agric. Res*., **30**(4): 1203-1221(2003).

[6]Hussain, N.A, A.M. Khan and Javeed, M.A.,"Effect of foliar application of plant micronutrient mixture on growth and yield of wheat (*Triticum aestivum*, L.)". *Paskitan, J. Biol Sci*., **8**(8): 1096-1099 (2005).

[7]Toaima, S.E.A, Amal, A. El-Hofi and Ashoush, H.,"Yield and technological characteristics of some wheat varieties as affected by N fertilizer and seed rates". *Agric. Sci. Mansoura Univ*., **25**(5): 2449-2467 (2000).

[8]Soleimani, R.,"The effect of integrated application of micronutrient on wheat in low organic carbon conditions of alkaline soils of Western Lran, 18th world cong. of soil Sci., July 9-15" *philadelphia USA*. (2006).

[9]Khan, M.Z, S. Muhammed, M. Naeem, A.E.A. Khtar and Khalid, M.,"Response of some wheat (*Truticum aestivum*, L.) varieties to foliar application under rainfed conditions". *Pak. J. Bot*., **38**(4): 1027- 1034 (2006).

[10]Mekkei, M.E.R. and El Haggan, A.M.A.,"Effect of Cu, Fe, Mn, Zn foliar application on productivity and quality of Some wheat cultivars (*Triticum aestivum*, L.)". *J. Agri-Food & Appl. Sci*., **2**(9): 283-291 (2014).

[11]Arif, M, M.A. Khan, H. Akbar and Ali, S.,"Respects of wheat as a dual purpose crop and its impact on weeds". *Pak. J. Weed Sci. Res*., **12**(1-2): 13-17 (2006).

[12]Khan, R, A.R. Gurmani, M.S. Khan and Gurmani, A.H.,"Residual, direct and cumulative effect of zinc application on wheat and rice yield under rice wheat system". *Soil Environ*., 28: 24-28 (2009).

[13]Zeidan, M.S, Manal, F. Mohamed and Hamouda, H.A.,"Effect of foliar fertilization of Fe, Mn and Zn on wheat yield and quality in low sandy soils fertility". *World J. Agric. Sci*., **6**(6): 696-699 (2010).

[14]Ali, M.A, N.H. Tariq, N. Ahmed, M. Abid and Rahim, A.,"Response of wheat (*Triticum aestivum*, L.) To soil applied boron and zinc fertilizers under irrigated conditions". *Pak. J. Agri., Agril. Engg., Vet. Sci*., **29**(2): 114-125 (2013).

[15]Nadim, M.A, I.U. Awan, M.S. Baloch, E.A. Khan, K. Naveed and Khan, M.A.,"Response of wheat (*Triticum aestivum*, L.) to different micronutrients and their application methods". *The J. of Animal & Plant Sci*. **22**(1): 113-119 (2012).

[16]Abd El-Ghany, H.M, A. Ebtsam. El-Housini and Afifi, M.H.M.,"Effect of certain macronutrients foliar application on growth, yield and nutrients content of grains for two bread wheat varieties in sandy soil". *J. Appl. Sci. Res*., **9**(2): 1110-1115 (2013).

[17]Nadim, M.A, I.U. Awan, M.S. Baloch, N. Khan and Naveed, K.,"Micronutrient use efficiency in wheat as affected by different application methods", *Pak. J. Bot*., **45**(3): 887-892 (2013).