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RESPONSE OF YIELD AND YIELD COMPONENTS OF WHEAT TOWARDS FOLIAR SPRAY OF NITROGEN, POTASSIUM AND ZINC

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ABSTRACT

An experimental trail was designed to quantify the response of yield and yield component of wheat toward foliar spray of nitrogen, potassium and zinc. The experiment was conducted at Agricultural Research Farm of Khyber Pakhtunkhwa Agricultural University, Peshawar during 2002-2003. Yield and yield component of wheat showed significant response towards foliar spray of Nitrogen, Potassium and Zinc. Maximum biological yield (8999 kg ha^{-1}), number of grains (52) $spike^{-1}$ and straw yield (6074 kg ha^{-1}) were produced in plots under the effect of foliar spray of 0.5% N + 0.5% K + 0.5% Zn solution (once), while control (no spray) plots produced minimum biological yield (5447 kg ha^{-1}), number of grains (29) $spike^{-1}$ and straw yield (3997 kg ha^{-1}). Similarly maximum thousand grain weight (46 g) and grain yield (2950 kg ha^{-1}) were recorded in plots sprayed with 0.5% N + 0.5% K + 0.5% Zn solution (twice), followed by lowest values (36 g) and (1450 kg ha^{-1}) in plots having no spray (control). Among the treatment of 0.5% N + 0.5% K + 0.5% Zn solution applied either one or two times, gave best response towards yield and yield components of wheat in irrigated area of Peshawar valley.

Keywords: wheat, yield, foliar spray, nitrogen, potassium, zinc.

INTRODUCTION

Wheat, the so called "king of cereals" is locally known as "Ghandum". It is the leading world food crop. The acceptance of wheat as a basic food stuff led to its wide spread dissemination as food aid to developing countries. The current problem of wheat contributing in low yield is the use of old technology like unawareness about the efficient method and time of application of fertilizer etc. Foliar applications of micro and macro-nutrients are more effective in term of getting maximum yield and reduce losses.

Nitrogen plays a vital role in increasing the yield of crop. Application of proper amount of nitrogen is considered key to obtain bumper crop of wheat. Foliar application of nitrogen has more effect on yield and yield components of wheat because it is more effective and minimum losses involved in foliar spray. (Sud *et al*., 1990)

Potassium is a "work horse" plant nutrient. Perhaps this is why it is not bound into any specific plant compound. Therefore, potassium is free to travel and to wheel and deal with in the plant almost at well. It should not be surprising that a shortage of potassium can result in loss of crop yield, quality and profitability. Foliar spray of potassium in combination with nitrogen and some micro-nutrients like zinc had significant effect on grain yield of wheat (Emen and Moqied, 1998).

Zinc is essential for the synthesis of plant growth regulator also called auxin (IAA); such compound regulates the growth and development of plants. Zinc uptake is promoted by liberal use of foliar spray of nitrogen and potassium. That is the reason due to which fertilizer, enriched with zinc is preferable for intensive farming system. The present experiment was designed to determine the yield and yield components of wheat under the effect of foliar spray of nitrogen, potassium and zinc.

MATERIALS AND METHODS

The experiment titled "Yield and Yield components of wheat as effected by foliar application of Nitrogen, Potassium and Zinc" was conducted at Agricultural Research Farm of the Khyber Pakhtunkhwa Agricultural University, Peshawar in the year 2002-03. The soil of the experimental site was silty clay loam with a clay type montmorillonite, low in nitrogen (0.03 - 0.04%), low in organic matter (0.8- 0.9%) and alkaline in reaction with a pH of 8.0-9.2. The experiment was laid out using Randomized Complete Block Design (RCBD) with four replications. Plot size 2.2m x 5m having 30cm row spacing were used for the project. Different foliar spray treatments were control, water spray, 0.5% N solution (once), 0.5% K solution (once), 0.5% N solution (twice), 0.5% K solution (twice), 0.5% Zn solution (once), 0.5% N + 0.5% K spray (once), 0.5% N + 0.5% Zn spray (once), 0.5% K + 0.5% Zn spray (once), 0.5% N + 0.5% K + 0.5% Zn spray (once) and 0.5% N + 0.5% K + 0.5% Zn spray (twice). These treatments were applied at tillering and boot stage. Data regarding biological yield, number of grains $spike^{-1}$, thousand grain weight, grain yield and straw yield were recorded in each plot. Biological yield were recorded by harvesting three central rows in each plot, make bundles and weighted to record the data and converted it into average. Number of grains $spike^{-1}$ were calculated from randomly counting gains in five spikes and converted into average by dividing total number of grains over number of spikes. Data on thousand grains weight was also recorded by weighing 1000 grains from each treatment through electric balance. Grain yield data were

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recorded by threshing three central rows already harvested for the purpose of biological yield thoroughly cleaned and weighted and converted the data into kg ha^{-1}. Date on straw yield (kg ha^{-1}) was measured by subtracting grain yield (kg ha^{-1}) from biological yield (kg ha^{-1}). The data recorded on yield and yield components were analyzed statistically using method appropriate for RCBD. Least Significant Test was used to test the significance of differences among means of different treatments.

RESULTS AND DISCUSSIONS

Biological yield (kg ha^{-1})

Biological Yield (kg ha^{-1}) is given in Table-1. The analysis of variance shows that foliar application of N, K and Zn had significant effect on the biological yield. Mean valves for the foliar application treatments indicate that maximum biological yield (8999 kg ha^{-1}) was recorded in plots sprayed with 0.5% N +0.5%K+0.5%Zn solution applied once, while minimum valves (5447 kg ha^{-1}) was obtained in control (no spray) plots. This might be due to more number of tillers m^{-2} each of which bear more spikes. The results are in agreement with result of Rajput *et al*., (1995) who reported that biological was increased with foliar spray of nitrogen. Dafan *et al*., (1999) also observed the same results. They reported that foliar application of potassium increased the biological yield.

Number of grains $spike^{-1}$

Table-1 shows that data on number of grains $spike^{-1}$ was significantly affected by foliar application of N, K and Zn. Highest number of grain(52) $spike^{-1}$ was recorded in plots sprayed with 0.5% N +0.5%K+0.5%Zn solution applied once, while lowest number of grain(29) $spike^{-1}$ was noticed in control (no spray) plots. Our results are in conformity with Dafen *et al*., (1999) who observed that foliar application of nitrogen increased number of grains $spike^{-1}$ and grain weight. Similar results were reported by Rogalski (1994).

Thousand grain weight (g)

Data regarding thousand grain weight of wheat as affected by foliar application of N, K and Zn are given in Table-1. Statistical analysis of the data showed that there is significant effect of foliar application of nitrogen, potassium and zinc on thousand grain weight. The mean valves of foliar treatments showed that maximum 1000 grain weight (46 g) was recorded in plot sprayed with 0.5% N + 0.5% K + 0.5% Zn solution two times, while minimum grain weight (36 g) was obtained in plots sprayed with water only. The possible reason might be due to more accumulation of dry matter in grains with increase application of foliar spray. These results are also in line with those of Fillipove and Mangova (1992) as they reported that grain weight increased with foliar application with nitrogen and potassium spray but the contrasting results were given by Sud *et al*., (1990) who did not observed any change in 1000 grain weight with increasing nitrogen rate.

Grain yield (kg ha^{-1})

Data regarding grain yield (kg ha^{-1}) are shown in Table-1. Statistical analysis of the data revealed that significant difference were found among the treatment of foliar application of N, K and Zn for grain yield. Highest grain yield (295 kg ha^{-1}) was observed in plot sprayed with 0.5% N + 0.5% K + 0.5% Zn solution two times, followed by lowest value (1450 kg ha^{-1}) in control (no spray) plots. The possible arguments may be due to split application of foliar spray at anthesis and boot stage increase the grain development and as a result higher grain yield is produced. Our results are in agreement with the result of Eman and Moqied (1989) as they noticed that foliar application of urea increase the grain yield. The results reported by Narang *et al*., (1997) were also showed that foliar application spray of potassium increase grain yield. These results can also be matched with Zafar and Fayyaz (2007).They reported that foliar as well as soil applied treatments of nitrogen increased yield of wheat. The matching results were also given by Zameer *et al*., *(*2006).

Straw yield (kg ha^{-1})

Data presented in Table-I indicate that straw yield had significantly effect by foliar application of N, K and Zn. Maximum straw yield (6074 kg ha^{-1}) was recorded in plots sprayed with 0.5% N + 0.5% K + 0.5% Zn solution (once), followed by minimum value (3997 kg ha^{-1}) in control (no spray) plots. The increase of straw yield was attributed to increased number of tiller. The similar results were given by Khalid *et al*., (2004). They reported that straw yield increase with increase rate of nitrogen fertilizer.

CONCLUSIONS AND RECOMMENDATIONS

On the basis of experimental results, it was concluded that yield and yield components of wheat responded positively to foliar spray of 0.5% N + 0.5% K + 0.5% Zn solution applied either one (tillering or boot stage) or two times (tillering + boot) stage. Therefore, foliar application 0.5% N + 0.5% K + 0.5% Zn solution sprayed either one or two times is recommended for getting maximum yield in wheat crop under the irrigated areas of Peshawar.

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Table-1. Response of various plants growth characters towards foliar application of Nitrogen, Potassium and Zinc.

Treatment	**Bio yield kg ha^{-1}**	**Number of grain spike^{-1}**	**Thousand grain weight** (g)	**Grain Yield** (kg ha^{-1})	**Straw yield** (kg ha^{-1})
Control (No.)	5447 c	29 f	36 g	1450 b	3997 c
Water	8528 ab	33 ef	45 gb	2933 a	5594 ab
0.5% N solution (once)	8194 ab	37 de	38 fg	2700 a	5494 ab
0.5% K solution (once)	8916 ab	38 cde	40 ef	3112 a	5804 ab
0.5%N solution (twice)	8055 ab	37 de	41 def	2737 a	5368 ab
0.5% K solution (twice)	8638 ab	37 de	41 def	2875 a	5763 ab
0.5% Zn solution (once)	7466 b	41 bcde	40 def	2378 a	5086 b
0.5% N + 0.5% K spray (once)	7888 ab	45 abc	39 efg	2525 a	5363 ab
0.5% N + 0.5% Zn spray (once)	7833 ab	43 bcd	43 bcd	2625 a	5208 ab
0.5% K + 0.5% Zn spray (once)	8583 ab	48 ab	44 abc	2925 a	5658 ab
0.5% N + 0.5% K +0.5% spray (once)	8999 a	52 a	43 bcd	2925 a	6074 a
0.5% N + 0.5% K +0.5% spray (twice)	8499 ab	44 bcd	46 a	2950 a	5549 ab
LSD	1477	7.99	2.97	827.7	949

Means followed by one letter (s) are not significantly different statistically at $P \leq 0.05$.
N = Nitrogen
K = Potassium
Zn = Zinc

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