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EFFECT OF FOLIAR APPLICATION OF BORON AND ZINC MIXTURE ON YIELD OF SOME WHEAT CULTIVARS (*TRITICUM AESTIVUM* L.)

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ABSTRACT

The present investigation entitled Effect of foliar application of boron and zinc mixture on yield of some wheat cultivars (*Triticum aestivum* L.). The experiment was carried out in agriculture college of Kerbala University, during winter season of 2013-2014. The experiment was laid out in split plot design with three replications and 12 treatments. The experiment consisted of Z and B mixture @ (0, 25 and 50) mg.L^{-1} and four cultivars Adnania, Fatih, Abu Garib3 and Tahadi, The highest number of spike/m^2 (381), Thousand grain Weight (45.68 g), Number of grain in spike (42.40) and Grain yield (**6.332** megagram.ha^{-1}) were recorded in 50 mg.L^{-1} with Tahadi cultivar , 50 mg/L with faith cultivar, 25 mg.L^{-1} with Abu Garib3 and 50 mg.L^{-1} with Tahadi cultivar respectively.

Keywords **:** Wheat (*Triticum aestivum* L.) number of spike, Thousand grain Weight, Number of grain in spike, Grain yield, boron and zinc.

Introduction

Wheat (*Triticum aestivum* L.) ranks first among the cereal crops of the world both in area and production. About one-third population of the world live on wheat grain for their existence (Hanson *et al.,* 1982; Almosawy *et al.*, 2014; Almosawy *et al.*, 2018a).Wheat is popular among the farmers due to its nutritive value and lower cost of production. The grains of wheat have high nutritive value containing 8-15% protein, 60-68% starch fat, minerals, cellulose, vitamins, etc. (Singh, 2000; Alamery, 2014; Alafeea *et al.*, 2019). The reasons for lower yield of wheat in our country are due to the factors like lack of good quality seeds, untimely seeding and poor knowledge about management practices such as spacing, seed rate, irrigation, fertilizer application and other cultural operations(Alamery *et al.*, 2018; Lateef *et al.*, 2019; Alamery *et al.*, 2019). Practically, factors such as good cultivars and adequate cultural practices like balanced fertilizer application are very important for higher production of crops like wheat. Grain sterility is one of the serious problems in obtaining higher yield of wheat. Among micronutrients, Zinc (Zn) and Boron (B) play a key role in pollination and seed set processes. Zn is involved in many enzymatic activities, component of some proteins, compound needed for the production of growth hormones (auxins) such as IAA, Zn also is involved in chlorophyll synthesis and cell membrane integrity. B is in cell wall structure integrity, regulation of H^+ transport, B is essential to transport of photosynthetic sugars, adequate B increases flower production and retention and seed development (John *et al.*, 2011; Almosawy *et al.*, 2019). B application has been found more effective in yield improvement (Johnson, 2005). The micronutrients play an important role in increasing crop yield in wheat (Asad and Rafique, 2000). (Korzemowska, 2008; Habib, 2009 and Wroble, 2009; Almosawy *et al.*, 2018b) reported that wheat yield has significantly with spraying B and Zn. Moghadam *et al*., 2012 found an increase in the wheat yield with foliar application of Zn, B and Cu. Mekkei and Haggan Eman, 2014 reported that yield of wheat increase with Cu, Fe, Mn and Zn Foliar Application. El-Ghamry *et al*. (2009) found that foliar micronutrients (Boron, Molybdenum and zinc) gave the maximum mean values of all investigated yield parameters.

Materials and Methods

The present investigation "Effect of foliar application of boron and zinc mixture on yield of some wheat cultivars (*Triticum aestivum* L.)" was carried out during Winter season 2013-2014 at agriculture college of Karbala University. The experiment was laid out in split plot design with three replication, the treatments consisted of three concentrations of Z and B mixture @ (0, 25 and 50) mg.L^{-1} and four cultivars (Adnania, Fatih, AbuGarib3 and Tahadi). Entire quantity of P and K 100 kg. ha^{-1} were applied as a basal dose before sowing and well mixed with the soil and adding 200 kg.ha^{-1} N, half of the dose of N was applied at seedling stage, remaining dose of N was applied at 30 days after first time. Z and B mixture was spray at seedling growth stage and at the booting stage. The fertilizer N P K were given in the form of urea, tripel supper phosphate and potassium sulfate respectively.

Results and Discussion

Number of spikes per m^2

The data presented in (Table 1) clearly showed that the (Z+B) spray played significant role in affecting number of spikes per m^2. The maximum number of spikes per m^2 was recorded statistically signifigant in (Z+B) @ 50 Mg. L^{-1} application which was recorded (363.4), superior over control which was recorded (333.9). Result showed that the cultivar played significant role in affecting number of spikes per m^2. The maximum number of spikes per m^2 was recorded statistically signifigant in Tahadi and Fatih cultivar which was recorded (353.5 and 349.3). The minimum number of spikes per m^2 was noticed with Abu Garib3 cultivar (335). (Z+B) application interaction with cultivars played significant role in affecting number of spikes per m^2, where superior interaction (Tahadi + 50 Mg. L^{-1}) on other interaction which was recorded (381), followed by @ (fatih + 50 Mg. L^{-1}) (367.5). The minimum number of spikes per m^2 was noticed with AbuGarib3 only (327.5).

Thousand grain Weight (g)

Result showed that (Z+B) significantly affected on Thousand grain Weight (Table 2), where (Z+B) @ 50 Mg. L^{-1} gave highest of Thousand grain weight (41.31 g) superior over control which was recorded (35.05 g). Result showed that the No significant role among cultivars in affecting thousand grain weight. (Z + B) interaction with cultivars had significant influence on Thousand grain weight, where superior interaction (Fatih + 50 Mg. L^{-1}) on other interaction which was recorded (45.68g), followed by @ (Adnania + 50 Mg. L^{-1}) which was recorded (42.20 g). The minimum Thousand grain Weight was noticed with Adnania only (34.26 g).

Number of grains per spike

According to analysis of variance (Table 3), (Z+B) spray had significant influence on Number of grains per spike. The maximum Number of grains per spike was recorded statistically signifigant in (Z+B) @ 25 Mg. L^{-1} and 50 Mg. L^{-1} application which was recorded (38.46 and 37.56) respectively superior over control which was recorded (33.82). The response of cultivar to Number of grains per spike was significant. The maximum Number of grains per spike was recorded statistically signifigant in Abu Garib3 cultivar which was recorded (37.53). The minimum Number of grain in spike was noticed with Adnania cultivar (35.09). (Z + B) application interaction with cultivars played significant role in affecting Number of grains per spike, where superior interaction (AbuGarib3 + 25 Mg. L^{-1}) on other interaction which was recorded (42.40), followed by @ (fatih + 50 Mg. L^{-1}) (40.27). The minimum Number of grain in spike was noticed with fatih only (32).

Grain yield megagram.ha^{-1}

Result in the (Table 4) indicated that the (Z+B) spray played significant role in affecting Grain yield. The maximum Grain yield recorded statistically significant in (Z+B) @ 25 Mg. L^{-1} and 50 Mg. L^{-1} application which was recorded (5.840 and 5.765) megagram.ha^{-1} respectively superior over control which was recorded (5.249) megagram.ha^{-1}. Result showed that the cultivar played significant role in affecting Grain yield. The maximum Grain yield was recorded statistically signifigant in Tahadi cultivar which was recorded (5.818) megagram.ha^{-1} superior over other cultivars. The minimum Grain yield was noticed with Abu Garib3 cultivar (5.460) megagram.ha^{-1}. (Z + B) interaction with cultivars played significant role in affecting Grain yield, where superior interaction (Tahadi + 50 Mg. L^{-1}) on other interaction which was recorded (6.332) megagram.ha^{-1}. The minimum Grain yield was noticed with Abu Garib3only (5.159) megagram.ha^{-1}.

Table 1 : Effect of foliar application of boron and zinc mixture on number of spikes per m^2 of some Wheat cultivars (*Triticum aestivum* L).

Treatments	**Number of spikes per m^2**	**Cultivars**	**Number of spikes per m^2**	
Main plot (Z+B) mg.L^{-1}		Sub plot (V)		
T0	333.9	Adnania	343	
T1	338.2	Fatih	349.3	
T2	363.4	AbuGarib3	335	
F-Test	S	Tahadi	353.5	
CD at 5%	4.8	F-Test	S	
		CD at 5%	7.62	
Treatments	**Adnania**	**Fatih**	**AbuGarib3**	**Tahadi**
T0	333	336	327.5	339
T1	335	344.5	333.5	340
T2	361	367.5	344	381
F-Test		S		
CD at 5%		9.55		

Table 2 : Effect of foliar application of boron and zinc mixture on thousand grain weight of some wheat cultivars (*Triticum aestivum* L.)

Treatments	**Thousand grain Weight (g)**	**cultivars**	**Thousand grain Weight (g)**	
Main plot (Z+B) $mg.L^{-1}$		Sub plot (V)		
T0	35.05	Adnania	37.02	
T1	37.76	Fatih	38.75	
T2	41.31	AbuGarib3	37.81	
F-Test	S	Tahadi	38.58	
CD at 5%	1.021	F-Test	n.s	
		CD at 5%	3.758	
Treatments	**Adnania**	**Fatih**	**AbuGarib3**	**Tahadi**
T0	34.26	34.67	34.80	36.47
T1	34.58	35.90	41.47	39.08
T2	42.20	45.68	37.16	40.18
F-Test		s		
CD at 5%		5.260		

Table 3 : Effect of foliar application of boron and zinc mixture on Number of grains per spike of some wheat cultivars (*Triticum aestivum* L.)

Treatments	**Number of grains per spike**	**cultivars**	**Number of grains per spike**	
Main plot (Z+B) $mg.L^{-1}$		Sub plot (V)		
T0	33.82	Adnania	35.09	
T1	38.46	Fatih	36.76	
T2	37.56	AbuGarib3	37.53	
F-Test	S	Tahadi	37.09	
CD at 5%		F-Test	s	
	2.953	CD at 5%	1.739	
Treatments	**Adnania**	**Fatih**	**AbuGarib3**	**Tahadi**
T0	34.50	32	34.20	34.60
T1	34.77	38	42.40	38.67
T2	36	40.27	36	38
F-Test		S		
CD at 5%		3.225		

Table 4 : Effect of foliar application of boron and zinc mixture on Grain yield (megagram.ha^{-1}) of some wheat cultivars (*Triticum aestivum* L.)

Treatments	**Grain yield (megagram.ha^{-1})**	**Cultivars**	**Grain yield (megagram.ha^{-1})**	
Main plot (Z+B) $mg.L^{-1}$		Sub plot (V)		
T0	5.249	Adnania	5.579	
T1	5.840	Fatih	5.615	
T2	5.765	AbuGarib3	5.460	
F-Test	S	Tahadi	5.818	
CD at 5%	0.188	F-Test	s	
		CD at 5%	0.158	
Treatments	**Adnania**	**Fatih**	**AbuGarib3**	**Tahadi**
T0	5.291	5.210	5.159	5.336
T1	5.895	5.979	5.703	5.786
T2	5.551	5.658	5.520	6.332
F-Test		S		
CD at 5%		0.308		

The integration of Z+B mixture in combination with cultivar was found significant in increasing yield than control. Application of Zinc (Zn) and Boron (B) play a key role in pollination and seed set processes. Zn is involved in

many enzymatic activities, compound needed for the production of growth hormones (auxins) such as IAA, Zn also involved in chlorophyll synthesis and cell membrance integrity. Adequate B increases flower production and retention, and seed development (John *et al*., 2011) beside good varaity which lead to increase number of spike per m^2, Thousand grain Weight and grains per spike that lead to increase total yield.

Conclusion

Based on the results of experiment it was aimed to identify suitable treatment for wheat with respect to yield of wheat during winter season 2013-2014. It may be concluded that the treatment (50 $mg.L^{-1}$ (Z and B mixture+Tahadi cultivar) was recorded the best among treatments combinations on yield, it was obtained highest total yield (6.332) $megagram.ha^{-1}$

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