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USE OF DIFFERENT TREATMENTS TO INCREASE THE EFFICIENCY OF FLAG LEAF AND THE PARTS OF THE SPIKE ON THE DRY MATTER PRODUCTION OF WHEAT CROP *TRITICUM AESTIVUM* L.

Ahmed L.J. Al-Toby and Faisal M. M. Al-Taher
Department of Crop Field, Agriculture College, University of Al-Muthanna, Iraq.

Abstract

A field experiment was carried out in the research station of Agriculture college\AL-Muthanna University, Um Alakaf region which located in the northeast of Al-Muthanna city (9 Km from the center of Samawah city) at winter season (2017-2018) to knowing the using of different treatments to increasing the efficiency of flag leaf and the parts of the spike on the dry matter production of Wheat crop *Triticum aestivum* L. the experiment including the study the effect of different treatments as control treatment, Nitrogen treatment, Potassium sulfate K_2SO_4 treatment, Humic treatment and the Chelating Iron on the growth and yield of three varieties from wheat (Ebba 99, Nwewya, Coa), the experiment was applied by Spilt–Plot design by using Randomized Complete Block Design (R.C.B.D) and with three replicates as the varieties were put in the main plots and the treatments in the sub pilots . the result explained that the nitrogen treatment gave the best response of the growth attributes and the yield components as the nitrogen treatment significantly exceeded by recorded the highest mean of the plant height attained (78.89) cm, the chlorophyll content in the leaves (56.39 SPAD), the flag leaf area (35.18) cm^2, the number of grains in the spike (54.89) grain $spike^{-1}$ and the weight of 1000 grain (37.58) gm.

***Keywords*:**Wheat crop, Ebba 99,Nwewya , Coa, Humic, K_2SO_4, chelating iron.

Introduction

Wheat crop *Triticum aestivum* L. is from an important crops from the nutritional side and it ranked first between the crops in the world and Iraq from an important and the planting area and it is the one of the most widespread crops (shafashq and Aldbaby,2008) as the grain formed from 63-71% starch, 8-17 protein, 8-17 water, 2-2.5% cellulose, 1.5-2% fats, 23% sugar and 1.5-2% minerals, the planting area from its globally attained 736.5 thousand hectares and its productivity expected to be about 739.9 million tan (FAO, 2017), In Iraq the planting area of land has reached 3697 thousand per hectar with a productivity 2885 thousand tan (Directorate of agricultural statistic, 2016), and it is an essential source of human and animal feeding because it contains proteins, carbohydrates, essential amino acids, minerals, vitamins and fiber (Shewry, 2009). which made wheat ranked first place in the list of consumer food commodities as wheat grain provides the adult with more than 25% from the need of protein and more than 50% of energy needing (Saudi, 2013). However, the wheat crop in Iraq suffers from low productivity especially in Al-Muthanna city with an average production of 89309 tons per year. this productivity is low as compared with the other cities which impede the achievement of self-sufficiency because of the failure to follow the proper crop management styles (Directorate of agricultural statistic, 2010). among the factors that increase the crop productivity are those with high potential to invest available resources to increase the production as well as soil factors in terms of composition, tissue, the degree of reaction, salinity and abundance of nutrients on it (Latif, 2006). The entering the new, high productivity, and adapted varieties with the local conditions is the basis of the expansion of the agricultural area of the crop and raise it productivity in order to support the national economy as well as the attention to other service factors, the maximum productivity of grain crops, especially wheat and barley, depends on many factors, including the activity of leaf photosynthesis, for its importance in the dry matter production during the growth and maturity phases of the grain (Kathim, 2015). The importance of the flag leaf due to the role which played in determining the value of grains as they remain green and effective during the stage of full grain, as well as near the flower cluster as compared with the other leaves (Chowdhry *et al.*, 1999).

Materials and Methods

The Experiment Site

A field experiment was conducted in the research station of Agriculture college\AL-Muthanna University in Um aleakf region which located in the northeast of Al-Muthanna city (9 Km from the center of Samawah city) at winter season (2017-2018) in the soil with characteristic showed in the table (1), the samples of soil were taken randomly at depth (0-30) cm and from different places then the samples were mixed together to be homogenized, softened and passed from sieve with holes 2 mm diameter then a combination samples were taken to make some physical and chemical analysis as showed in table (1).

Table 1 : Some physical and chemical characteristics of the experiment field soil

The characteristic	The value	Unit
Electrical conductivity Ec	4.9	ds/m^{-1}
PH	8.1	———
Available nitrogen	7.7	Mg Kg^{-1}
Available phosphor	3.3	Mg Kg^{-1}
Available potassium	240	Mg Kg^{-1}
Soil separators		
Clay	42.5	%
Sand	12.5	
Silt	45	
Soil texture		Silty clay loam

***** Thischaracteristic were analyzed at water and soil department laboratory in Agriculture college \ AL-Muthanna university.

The Plant Height (cm)

It was calculated at the flowering stage as a mean of 10 plants randomly taken from each experimental unit based on the height of stem from the soil surface until the peak of the spike on the main stem (without Awn).

The chlorophyll content in the leaves (spad)

It was calculated as a mean of 10 plants randomly taken from each experimental unit at 50% flowering as a mean of 10 recorders to each experimental unit in the field by using Chlorophyll software Content mater– 502.

The Flag leaf area (cm^2)

It was calculated as a mean of 10 flag leaves of the main stem to each experimental unit according to the following equation :

The Flag leaf area = the length of the flag leaf * the depth at the widest area * 0.95 (Thomas, 1975).

The number of grain $spike^{-1}$

The mean of 10 grains was calculated for10 spikes to each experimental unit after the spike manually emptied and cleaned from the grains according to the number of grains to each spike.

The Weight of 1000 grain (gm)

1000 grain were randomly taken from each experimental unit then each sample was weighted by using the sensitive scale.

Results and Discussion

Growth Attributes

The plant height (cm)

The results of the statistical analysis showed a significant effect of the treatments and their interaction with the varieties in the plant height (cm), while the varieties did not show a significant effect of this attribute(Table 2),the results of table 2 also explained that the nitrogen treatment was significantly exceeded and gave the highest mean attained 78.52 cm with no significant difference between the potassium sulfate and cheating iron treatments which recorded means attained 77.72 and 76.98 cm respectively, While the humic treatment was recorded the least mean attained 70.47 cm. this may be due to the role of nitrogen in the promotion of root and vegetable growth as well as the role of iron in the chlorophyll molecule build, which led to improving the height of the plant, and this result agreed with (Hussein and others 2013) who found increases the plant height with Nitrogen increase of wheat yield. while the humic treatment gave the least mean to this attribute attained 70.47 cm, this may be due to the role of nitrogen on the promotion of root and vegetable growth as well as the role of iron on the chlorophyll molecule build which led to improving the plant height, and this result agreed with what found by (Hussein *et al*., 2013) which explained increases of the plant height with Nitrogen increase of wheat yield, whereas the interaction, the results showed a significant differences of the interaction between the varieties and treatments in the plant height as the combination (potassium sulfate treatment × Coa varieties) gave the highest mean attained 84.45 cm without any significant differences between the two combinations (control treatment ×Nwewya variety) and (N treatment × Ebba 99 variety), while the combination (Humic treatment ×Nwewya variety) gave the least mean of plant height attribute attained 60.20 cm (Table 2).

The chlorophyll content in the leaves (SPAD)

The result in the table (3) showed significant differences of the varieties and the treatments and the interaction between them on the chlorophyll content in the leaves and from the same results we showed also the wheat varieties significantly differ between them as Ebba 99 significantly exceeding and did not differ from Nwewya which were given means attained 53.74 and 52.35 SPAD, whilst Coa variety gave the least mean of the chlorophyll content in leaves attained 48.33 SPAD, the reason maybe due to differences of varieties in their genotype. as for the treatments the results in the table (3)showed the treatments significantly differ between them in the chlorophyll content in the leaves SPAD, as nitrogen treatment was significantly exceeding and gave

the highest mean attained 56.39 SPAD followed by the control and potassium sulfate and Hiumc treatments which showed no significant difference between them and recorded means attained 51.05 , 49.62 and 50.88 SPAD respectively ,while the chelating iron treatment gave the least mean attained 49.44 SPAD, this may be due to the effect of nitrogen on the synthesis of the chlorophyll molecule, As for the interaction the results in the table (3) also showed a significant effect of the interaction between the varieties and treatments on the chlorophyll content in the leaves as the combination (Nitrogen treatment* Nwewya variety) gave the highest mean attained 60.52 SPAD whereas no significant differences between the combinations (Nitrogen treatment* Coa variety), (Humic treatment* Ebba99 variety) and (control treatment* Ebba99 variety) which gave means attained 56.63, 55.94 and 54.49 SPAD respectively, whereas the combination (potassium sulfate* Coa variety) gave the least mean of the chlorophyll content in the leaves attained 41.42 SPAD.

The Flag leaf area (cm^2)

The results of the table (4) showed a significant differences of the treatments on the flag leaf area (cm^2), while the varieties and their interaction with the treatments did not show any significant effect of this attribute, the same results showed too the Nitrogen treatment was significantly exceeding and given the highest mean of the flag leaf area and recorded a value attained 35.18 cm^2, while the control treatment gave the least mean of this attributes attained 30.78 cm^2, the reason may be due to the effect of the basic nitrogen in the activation of vegetative growth which affected in the cells division and elongation and it works to increase the concentration of chlorophyll pigment in the leaves which led to an increase the photosynthesis process and that positively reflected on the plant flag leaf area , these results were agreed with what Hashim(2006) found who explained the increase of the flag leaf area by increasing Nitrogen of the wheat crop.

The number of grains in the spike (Grain $spike^{-1}$)

The results in the table (5) showed a significant effect of the treatments and their interaction with the varieties in the number of grains, as noted from the same table the nitrogen treatment was significantly exceeding on all other treatments which it gave the highest mean attained 54.89 grain $spike^{-1}$ followed by potassium sulphate, humic acid and chelating iron respectively with no significant difference between them and recorded means attained 51.16, 49.21 and 48.92 grain $spike^{-1}$ respectively, while the control treatment gave a mean attained 45.61, this may be due to the availability of nitrogen in the growth stages of the crop and it emergence contributed on the enhancement of photosynthesis and increase it products as well as increased chlorophyll content in the leaves and that's led to increased the number of the spikes starters which the grains consisting from its and to find a suitable opportunity to reduce the abortion in the flowers by reducing the competition between them on the produced nutrients then increase the number of grains per one spike which associated with increasing the length of spike. as for the interaction the results in the (table 5) showed a significant effect of the interaction between the varieties and treatments in the number of the grains in the spike and there were no significant differences between the combinations (potassium sulfate* Coa variety), (Nitrogen treatment* Ebba99 variety) and (potassium sulfate* Ebba99 variety) which recorded means attained 56.95, 56.90 and 54.90 grain $spike^{-1}$ respectively, whilst the combination (potassium sulfate* Nwewya variety) gave the least mean attained 41.63 grain $spike^{-1}$.

The weight of 1000 grain (gm)

The results in the table (6) indicated to a significant differences of the varieties and the treatments on the weight of 1000 grains which did not appear their interactions with treatments any significant effect of this attribute ,the results also showed a significant difference between the wheat varieties in the weight of 1000 grains as Nwewya variety significantly exceeding on the two other varieties Coa and Ebba 99 which did not differ significantly between them and recorded means attained 37.53, 33.51 and 33.32 gm respectively, this may be due to the difference in the genotype, as for the treatments the results in the table (6) also showed the two treatments was significant differ between them in weight of 1000 grains, as the nitrogen treatment was significantly exceeded on all other treatments and gave the highest mean attained 37.58 gm without any significant difference from Humic treatment which gave mean attained 36.13 gm, while the control treatment recorded the least mean of 1000 grains attained 31.44 gm, the increase may be due to the role of nitrogen that absorbed through the vegetative system in increasing the efficiency of the awn on the starch production which converts into sugars, as well as increase the dissolved proteins that are transferred to grains and which depend on the leaf area and thus reflected on the grain weight increasing, this results agreed with what found by Al-arkawizi (2010) which noted the increase in the weight of 1000 grains with an increase of Nitrogen of wheat crop.

Table 2 : Effect of varieties and the treatments and the interaction between them on the plant height (cm)

Varieties	Treatments					
	control	Nitrogen	Potassium sulphate	Humic	Chelating iron	Mean
Coa	71.05	79.40	84.45	72.25	75.45	76.52
Nwewya	82.80	76.67	70.70	60.20	78.67	73.81
Ebb99	68.00	79.50	78.00	78.97	76.83	76.26
Mean	73.95	78.52	77.72	70.47	76.98	
L.S.D 0.05	varieties	treatments	Interaction			
	N.S	3.54	7.81			

Table 3 : Effect of varieties and the treatments and the interaction between them on the chlorophyll content in the leaves (SPAD)

Varieties	Treatments					
	control	Nitrogen	Potassium sulphate	Humic	Chelating iron	Mean
Coa	49.06	56.63	41.42	46.09	48.46	48.33
Nwewya	49.59	60.52	54.75	50.61	46.29	52.35
Ebb99	54.49	52.03	52.69	55.94	53.57	53.74
Mean	51.05	56.39	49.62	50.88	49.44	
L.S.D0.05	varieties	treatments	Interaction			
	3.12	3.50	5.86			

Table 4 : Effect of varieties and the treatments and the interaction between them on the flag leaf area (cm^2)

Varieties	Treatments					
	control	Nitrogen	Potassium sulphate	Humic	Chelating iron	Mean
Coa	31.64	36.18	32.25	31.57	31.33	32.59
Nwewya	31.81	32.93	28.18	31.05	33.00	31.39
Ebb99	28.90	36.44	34.95	31.97	34.32	33.32
Mean	30.78	35.18	31.79	31.53	32.88	
L.S.D 0.05	varieties	treatments	Interaction			
	N.S	2.60	N.S			

Table 5 : Effect of varieties and the treatments and the interaction between them on the number of grains in the spike (grain $spike^{-1}$)

Varieties	Treatments					
	control	Nitrogen	Potassium sulphate	Humic	Chelating iron	Mean
Coa	45.10	54.70	56.95	47.80	45.50	50.01
Nwewya	47.97	53.07	41.63	51.17	46.97	48.16
Ebb99	43.77	56.90	54.90	48.67	54.30	51.71
Mean	45.61	54.89	51.16	49.21	48.92	
L.S.D 0.05	varieties	treatments	Interaction			
	N.S	4.09	6.87			

Table 6 : Effect of varieties and the treatments and the interaction between them on the weight of 1000 grains (gm)

Varieties	Treatments					
	control	Nitrogen	Potassium sulphate	Humic	Chelating iron	Mean
Coa	32.67	35.60	33.00	34.50	31.80	33.51
Nwewya	32.57	40.73	38.47	38.30	37.60	37.53
Ebb99	29.10	36.40	31.03	35.60	34.47	33.32
Mean	31.44	37.58	34.17	36.13	34.62	
L.S.D0.05	varieties	treatments	Interaction			
	2.65	1.91	N.S			

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