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# Effect offoliar application stages and concentrations ofleaf fertilizer on growth and yield of oat and it components

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***Abstract:*** *Afield experiment was conducted at the experimental field of the department of field crops, Agri.of college ,Univ.of Baghdad-Abu Graib during 2013-2014 and 2014-2015season,to study the effect of foliar application stages and concentrationsof leaf fertilizer on growth and grain yield of oat and it components .Factorial experiment in randomized complete block design with three replication was conducted .The first treatment was foliar application stages at the beginning the vegetative growth and beginning the flowering ,while the second treatment the concentrations of leaf fertilizer which consist (N,P,K,S,Fe,Cu,B,Mg,Mn,Zn) with concentrations (1000,2000,3000)mg$L^{-1}$in addition control treatment (foliar with water ). The results showed that the treatment at the beginning the vegetative growth gave the highest plant height 112.80 cm and 114.80 cm and tillers numbers 287.15 and 320.07 tiller $m^{-2}$ while the treatment at the beginning the flowering gave high of weight 1000 grain 43.73 gm and 45.92 gm ,high number of panicle in plant was 446.1 and 462,40 panicle in plant and high number of grain was 60.50 a number of tillers, number of panicle, number of grain and gran yield .We conclude from this studythatthe concentration of 3000 mg $L^{-1}$ at the beginning of flowering gave the best results for oat crop .*

***Keywords****: oat, foliar application, vegetative growth ,flowering ,activated leaf fertilizer .*

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## I. Introduction

Oats is herbal plant uses grain as food for humans and animals because it is rich in fiber and nutrients .Oats are usually eaten with milk or as meal for breakfast as it supplies the body with energy through the day and is useful for diabetics as it reduces blood sugar and maintains levels of insulin .Oats work to strengthen the immune system in humans as it contains the antioxidants to protect the body and cells from cancer and plant leaves are soft and of high nutritional value and are palatable to animals (Dong et al,2003) .The importance of the provision of nutrients ( macro and micro) for any crop and with amounts which needed by the plant is necessary for the highest yield ,this elements are found with relatively large mounts but this elements not available to absorption because it not soluble in soil solution such as potassium which is fix in soil clays and phosphorous which is precipitation in soil limy ( Haynes ,1980 and AL-Zubaide,2000) .

Studies have confirmed that the lack of any one or more of these nutrients ,whether macro or micro nutrients of any crop becomes the determining factor for the growth and productivity of this crop (Matula,2005) . It is therefore necessary to provide these elements by spraying it in the form of dilute solution and several times ,which is an important and successful methods to address the lack of these nutrients and more better within the plant .In addition ,the importance of leaf nutrition permeability allows the possibility of mixing fertilizers with pesticides and growth regulators and provides an opportunity to reduce the energy consumption required for the transfer of element ions within the plant ( Werner and Hayland(2000) and Martin (2000)).

The addition of chemical fertilizer to soil requires great effort especially in large areas as well as the problems of pollution and salinity of the soil and prefer to spray with nutrition solution which are quick absorption by the epidermis and stomata on the surface of the leaves which leads to faster utilization and there for reflected on the biological and physiological processes within the plant which affects the quantity and quality .Research has indicated that there is a shortage of micro elements in Iraqi soil and that this shortage is one of the main factors that negatively affect the productivity of crops (AL-Mohamady,2005)

AL-Maamory (1997) is found that corn crop is sprayed with 10 Ml $L^{-1}$ of AL-Nahrein fluid ( a nutrient liquid ) containing several nutrients such as K,Fe,Mn,Zn,Cu,N,P with concentrations 10,8,6,0.3,0.2,0.3,and 0.1% sequentially and boron with concentration 1ppm has been given a significant increase in the leaf area and plant height and the length of the ear whether spraying nutrition liquid alone or with boron .

Saleh (2010) pointed out that spraying the nutrition solution consisting of Zn 0.015% Cu 0.01% and Fu 0.05% in the form of sulphat salts for these elements on the wheat crop leads to an increase in the grain yield compared to the comparison treatment while Farhan (2011) pointed to the clear response to the wheat .IPA99

cultivar for leave nutrition (Fe,Cu and Zn) he added that it is desirable to spray the nutrients on several batches with irrigation water instead of giving it at once .Khosa et al (2011) they pointed out when NPK were sprayed with micro nutrients with concentrations of 5000,200,4000 and 4000,200,5000 mg $L^{-1}$ respectively ,the high concentrations of the combination had a significant effect on plant height which was 46.55 cm compared to the comparison where the plant height was 13.55 cm .AL-Zubaidi found that spraying of NPK in three concentrations included NPK1 (200 +1000 + 2500 ) mg $L^{-1}$ NPK2 (3500 + 1500 + 300 )mg $L^{-1}$ , NPK3 (4500 + 2000 + 400 ) mg $L^{-1}$ in addition to the comparison treatment sprayed with water by giving it the highest green yield of barley and oats 26.78 Mg $ha^{-1}$ and 26.56 Mg $ha^{-1}$ .while the treatment of NPK1 gave the highest grain yield of barley 3.53 Mg $ha^{-1}$ and the treatment NPK2 highest grain of oats 4.61Mg $ha^{-1}$ .

## II. Materials and Methods

A field experiment was conducted at the experimental farm ,Dept. of field Crop ,College of Agriculture,Univ. of Baghdad during 2013 -2014 and 2014 -2015 to study the effect of the stages and concentrations of spraying activated leaves fertilizer which contains nutrients ( N,P,K,S,Fe,Cu,B,Mg,Mn,Zn) on growth and yield of oats . a factorial experiment was used according to Randomized Complete Block design (RCBD) by three replications involved two factors ,the first factor was the spraying stages ( start of vegetative growth and the beginning of flowering ) .the second factor was the activated leaf fertilizer concentrations ( 3000,2000,1000) $mgL^{-1}$ in addition of comparison treatment ( spraying with water only ) , The soil was prepared for agriculture by plowing well with the tilled plow and settling it after trespassing and then taking six random samples from different sites of the soil of the field and at a depth of ( 0-30 ) cm to study the physical and chemical soil properties , they were analyzed in the graduate laboratories of the college of Agri.the soil of the experiment was divided in the form of plates with a distance of 2 3 meters ,the seeds of oats were planted on rows so that each plate contained 10 rows of distance between row 15 cm and the quantity of seed 40 Kgm $ha^{-1}$ obtained from the field crops Dep.college of Agri.Univ.of Baghdad . The experimental soil was planted at 27/10/2013 and 29/10/2014 ,fertilizer was added at a rate of 57Kgm $ha^{-1}$ for each nitrogen element in the form of urea (46%N) and phosphorus in the form of tri sulfate phosphate and potassium as potassium sulfate (52%K) add half the amount of nitrogen at planting and the other half in the flowering stage ,while phosphorus and potassium added during the cultivation at once and for all treatments including treatment of comparison .(Ganei ,2011) .Irrigation and weeding were carried out according to the need ofplant. The ground of the experiment was covered with nets after the first irrigation ,in order to avoid the birds damage to the grain and raised the nets after two weeks of germination ,spray the leaf fertilizer early in the morning to avoid high temperatures where the solubility of the concentrations with distilled water used dorsal spray and added the material published ( tween) ( Abu-Dahi et al ,2001) .five plants were randomly removed from the midline in the booting stage of each experimental unit to study the following growth traits :

1- Plant height (cm): plant height was measured from the base of plant up to panicle base of main steam average of five plants.
2- Number of leaves in plant :Was calculated as the average number of leaves of the five plant taken .
3- Number of tiller :Was calculated of the harvested area $1m^2$ for each experimental unit.
4- Number ofpanicle : Was calculated of the harvested area $1m^2$ for each experimental unit.
5- Number of grains in panicle :Was calculated from 5 panicle taken randomly after hand-off .
6- Weight of 1000 grains :Were taken randomly after discarding the panicle from the harvested area and each experimental unit was weighed by the sensitive balance.
7- Biological yield : Was calculated for all the plants in the harvested area of each experimental unit ,the whole plant was weighed ( straw and grains) and then turned to Mg $ha^{-1}$.
8- Grain yield : After hand –off of the sample plants harvested from each experimental unit and after the removal of straw from the weight of the grain after adding the grain used to estimate the weight of 1000 grain for the same treatment and then turned to Mg $ha^{-2}$.

**Table 1:** some chemical and physical properties of soil field experience for 2013-2014 and 2014-2015 seasons

| | 2013-2014 | 2014-2015 | |
|---|---|---|---|
| Trait | Value | Value | unit |
| PH | 7.76 | 7.60 | |
| EC | 3.4 | 3.6 | d c $m^{-1}$ |
| CEC | 26.7 | 27.8 | c mol $k^{-1}$ |
| O.M | 12.5 | 11.4 | gm k $soil^{-1}$ |
| Carbonate minerals | 223 | 295 | gm k $soil^{-1}$ |
| Valuable N | 35 | 34 | mg k $soil^{-1}$ |
| Valuable P | 11.5 | 10.3 | mg k $soil^{-1}$ |
| Valuable K | 223 | 245 | mg k $soil^{-1}$ |
| $SO4^{-2}$ | 4.10 | 4.50 | U mol $L^{-1}$ |
| $CL^{-1}$ | 6.42 | 6.10 | U mol $L^{-1}$ |

| | | | |
|---|---|---|---|
| $Na^{+1}$ | 6.41 | 5.95 | U mol $L^{-1}$ |
| $Mg^{+2}$ | 2.20 | 2.22 | U mol $L^{-1}$ |
| $Ca^{+2}$ | 6.32 | 6.17 | U mol $L^{-1}$ |
| B (Extract with hot water) | 0.53 | 0.55 | mg k $soil^{-1}$ |
| Sand | 135 | 135 | gm k $soil^{-1}$ |
| Greenway | 555 | 554 | gm k $soil^{-1}$ |
| Clay | 310 | 311 | gm k $soil^{-1}$ |
| Texture | | Mixed clay Greenway | |

## III. Results and discussion

Plant height (cm)

The results of table 2 indicate that there is a significant effect on the stage and concentration of activated leaf fertilizer spraying and interaction between the two factor in the average height of oats plant for both seasons ,the spraying treatment was superior at the beginning of the vegetative growth and gave the highest average height of the plant at 112.8 cm and 114.80 cm in relation to spraying at the beginning of flowering 93.70cm and 97.10 cm and the proportion of increase of 20.27% and 18.22% for two seasons respectively .this may be due to the fact that the a availability of nutrients at the beginning of growth will encourage the formation of a strong and solid root system, which increases nutrient uptake of the soil and reach the food balance in the plant and then increase the division and elongation of cells and plant height ( AL-Mandlawi ,2002) .The same table shows increase the average height of the plant by increasing the concentration of activated fertilizer ,the plants sprayed at a concentration of 3000 mg $L^{-1}$ given highest average of 114.2 cm and 116.5 cm and increased by 31.00% and 22.37% for two seasons compared to the comparison ( without spraying ) ,this may be due to the plant response to increase the concentration of activated fertilizer because it contains the necessary elements division and elongation of cells .(Mahler ,2004) it is noted from the table that the spraying of plants at the beginning of vegetative growth at a concentration of 3000 mg $L^{-1}$ gave the highest average plant height of 127cm and 129.6 cm with an increase of 31.87% and 20.21%in comparison with the comparison treatment which gave 96.30 cm and 96.9 cm and both seasons sequentially .

**Table 2:** Effect of activated leaf fertilizer concentrations and foliar stages on plant high (cm)

| Foliar Stage | 2013-2014 activated leaf fertilizer concentrations $mgL^{-1}$ | | | | Mean | 2014-2015 activated leaf fertilizer concentrations $mgL^{-1}$ | | | | Mean |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1000 | 2000 | 3000 | | 0 | 1000 | 2000 | 3000 | |
| beginning of vegetative growth | 87.30 | 114.60 | 113.30 | 127.0 | 110.55 | 96.90 | 117.0 | 115.60 | 129.60 | 114.80 |
| beginning of flowering | 87.70 | 91.80 | 93.80 | 101.40 | 93.70 | 93.40 | 95.80 | 95.70 | 103.40 | 97.10 |
| **LSD 0.05** | 11.82 | | | | | 12.02 | | | | 6.01 |
| **Mean** | 87.50 | 103.20 | 103.60 | 114.20 | | 95.2 | 106.4 | 105.7 | 116.5 | |
| **LSD 0.05** | 8.35 | | | | | 8.50 | | | | |

Number of leaves

Table 3 shows no significant effect of the spraying stages, while there was a significant effect of the concentration of activated leaf fertilizer and the interaction between them in the average number of leaves in the plant for both seasons ,as 3000 mg $L^{-1}$ treatment was superior by giving the highest average number of leaves plant 6.91 leaf and 7.05 leaf and an increase of 26.55% ,26.57% compared to the comparison treatment ,which gave 5.46% leaf for both seasons sequentially .This may be due to the importance of nutrients in increasing the susceptibility of plant to the division and specialization of cells and stimulate initiates leaves (saleh,1991) .The same table shows an increase in the average number of leaves at spraying treatment at the beginning of vegetative growth at concentration of 3000mg $L^{-1}$ to the highest average number of leaves of 7.30 and 7.44 leaf in plant compared with comparison which gave the lowest number of leaves in two spraying stage which reached 5.46 and 5.57 leaf in plant for both seasons respectively .

**Table 3**: Effect of activated leaf fertilizer concentrations and foliar stages on number of leaves $plant^{-1}$

| Foliar Stage | 2013-2014 activated leaf fertilizer concentrations $mgL^{-1}$ | | | | Mean | 2014-2015 activated leaf fertilizer concentrations $mgL^{-1}$ | | | | Mean |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1000 | 2000 | 3000 | | 0 | 1000 | 2000 | 3000 | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| beginning of vegetative growth | 5.46 | 5.66 | 6.10 | 7.30 | 6.31 | 5.57 | 5.77 | 6.22 | 7.44 | 6.25 |
| beginning of flowering | 5.46 | 6.00 | 6.33 | 6.53 | 5.55 | 5.57 | 6.11 | 6.46 | 6.66 | 6.20 |
| **LSD 0.05** | 0.75 | | | | N.S | 0.76 | | | | N.S |
| **Mean** | 5.46 | 5.83 | 6.21 | 6.91 | | 5.57 | 5.94 | 6.34 | 7.05 | |
| **LSD 0.05** | | | 0.53 | | | | | 0.54 | | |

Number of tillers

The results of table 4 showed a significant effect to the stage and concentration of activated leaf fertilizer and their interaction in the average number of tillers for both seasons . the spraying treatment ,the spraying at the beginning of the vegetative growth treatment was superior with the highest number of tillers at 287.15 and 320.07 tiller $m^{-2}$ with an increase of 8.52% ,4.90% in compared with spraying at the beginning of flowering for both seasons respectively. The same table shows an increase in the number of tillers at the highest concentration ,which reached 344.20 and 396.10 tiller $m^{-2}$ with an increase of 53,38%,68.80% compared to the comparison treatment which gave 244.40 and 234.65 tiller $m^{-2}$ for both seasons sequentially .The increase in the number of tillers with high concentration may be due to the lack of plant efficiency of low concentration to meet the need for metabolic processes .From the same table ,we observe the relative response between the spraying treatment at the beginning of vegetative growth and the concentration of leaf fertilizer ,the more of the concentration of fertilizer at the beginning of vegetative growth the number of tillers increased, the spraying treatment at the beginning of vegetative growth at the concentration of 3000 mg $L^{-1}$ was given the highest number of tillers 386.30 and 398.20 tiller $m^{-2}$ for both seasons in respectively ,it may be due to the increase in the number of tillers when spraying the plant in the early stages of growth and high concentration of leaf fertilizer that the addition of nitrogen in the early stages of plant growth works to increase vegetative growth and then increase the interference of the radiation of the sun which is reflected on the increase of produced and supply primers of these substances for the continuity of growth and prolongation of the production of tillers also increases the activity of basal static in the life of the plant and then cause to growth and appearance (Whingwiriand Kemp,1980)phosphorus stimulates the division of cells that affect the increase in the number of tillers as well as the role of potassium in increasing vegetative growth and its role as transfer of processed food from source (leaves) to growth regions (Abu-Dahi.and.AL-Younis (1988) and Havlin) (2005)and the role of zinc ,iron and copper in the composition of amino acids ,carbohydrates and energy compound and increase the process of photosynthesis and then increase , the growth of vegetative and then increases the growth of vegetative and reflected positively on the growth of tillers ( ا Abu-Dahi.and.AL-Younis (1988)) .

**Table 4:** Effect of activated leaf fertilizer concentrations and foliar stages on number of tillers $m^{-2}$

| **Foliar Stage** | **2013-2014** activated leaf fertilizer concentrations $mgL^{-1}$ | | | | **Mean** | **2014-2015** activated leaf fertilizer concentrations $mgL^{-1}$ | | | | **Mean** |
|---|---|---|---|---|---|---|---|---|---|---|
| | **0** | **1000** | **2000** | **3000** | | **0** | **1000** | **2000** | **3000** | |
| beginning of vegetative growth | 222.0 | 277.30 | 316.00 | 386.30 | 287.15 | 231.50 | 278.20 | 372.40 | 398.20 | 320.07 |
| beginning of flowering | 226.80 | 262.80 | 266.90 | 302.00 | 264.60 | 237.80 | 283.00 | 305.4 | 394.20 | 305.10 |
| **LSD 0.05** | 56.87 | | | | 12.44 | 66.69 | | | | 33.34 |
| **Mean** | 224.40 | 270.10 | 291.50 | 344.20 | | 234,65 | 280.60 | 338.9 | 396.10 | |
| **LSD 0.05** | | | 30.22 | | | | | 47.16 | | |

Number of panicle

The results of table 5 indicate that there was a significant effect on the stage and concentration of activated leaf fertilizer and their interaction in the average number of panicle in plant for both seasons ,spraying treatment at the beginning of flowering was superior in this trait which gave the highest average of 446.1 and 462.40 panicle $plant^{-1}$ for both seasons respectively .From the same table we see that the 3000 $mgL^{-1}$ concentration was given higher number of panicle 538.7 and 555.30 panicle $plant^{-1}$ compared with the comparison treatment which gave 339.5 and 348.40 panicle $plant^{-1}$ for both seasons respectively . may be due to The increased number of tillers ( table 4 ) cause to increased number of panicle with an increase of spraying concentration to 3000$mgL^{-1}$.The spray treatment at the beginning of flowering and the concentration treatment

of 3000 $mgL^{-1}$ gave the highest average number of panicle 568.70 with increase 59.61% and 59.55% compared with the comparison treatment which gave 339.50 and 367.4 panicle $plant^{-1}$ for both seasons respectively .

**Table 5:** Effect of activated leaf fertilizer concentrations and foliar stages on number of panicle $plant^{-1}$

| Foliar Stage | 2013–2014 activated leaf fertilizer concentrations $mgL^{-1}$ | | | | Mean | 2014–2015 activated leaf fertilizer concentrations $mgL^{-1}$ | | | | Mean |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1000 | 2000 | 3000 | | 0 | 1000 | 2000 | 3000 | |
| beginning of vegetative growth | 322.70 | 359.70 | 468.30 | 508.70 | 414.80 | 329.40 | 370.80 | 482.80 | 524.40 | 426.90 |
| beginning of flowering | 356.30 | 409.70 | 449.70 | 568.70 | 446.10 | 367.40 | 422.30 | 473.90 | 586.30 | 462.40 |
| **LSD 0.05** | 78.47 | | | | 39.24 | 80.45 | | | | 40.23 |
| **Mean** | 339.50 | 384.70 | 459.0 | 538.70 | | 348.40 | 396.60 | 478.30 | 555.30 | |
| **LSD 0.05** | 55.49 | | | | | 56.89 | | | | |

Number of grains

The data in table 6 show a significant effect on the stage and concentration of activated leaf fertilizer and their interaction in the mean number of grains $panicle^{-1}$ ,as the treatment of spraying at the beginning of the flowering stage ,the highest average of this trait amounted to 60.50 and 62.12 grain panicle with a 27.66% and 27.29 percentage increase in spraying at the beginning of vegetative growth ,which gave 47.39 and 48.80%grain $panicle^{-1}$ for both seasons respectively .The treatment of 3000$mgL^{-1}$ was also given the highest mean number of grains at 61.01 and 63.50 grain $panicle^{-1}$ and the increase of 38.34% and 19.55% compared to the comparison treatment ,which amounted to 44.10 53.1 grain $panicle^{-1}$ .The treatment of spraying at the beginning of the flowering ,with a concentration of 3000 mg $L^{-1}$ gave the highest number of grain to 70 72.9 grain $panicle^{-1}$ and for the two seasons respectively .The increase in the number of grains at the beginning of flowering and the high concentration of leaf fertilizer may be due to the increase in the number of tillers at this treatment (table 4) which increased the vegetative area exposed to sunlight and thus increased photosynthesis and the presence of potassium the carrier of nutrients from the source to the sink and the role of nitrogen as one of the components of proteins enzymes and chlorophyll ,it enters into all the processes of protoplasm ,enzymatic reactions and photosynthesis so it plays an important role in increasing the grain yield .

**Table 6**: Effect of activated leaf fertilizer concentrations and foliar stages on number of grain $panicle^{-1}$

| Foliar Stage | 2013–2014 activated leaf fertilizer concentrations $mgL^{-1}$ | | | | Mean | 2014–2015 activated leaf fertilizer concentrations $mgL^{-1}$ | | | | Mean |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1000 | 2000 | 3000 | | 0 | 1000 | 2000 | 3000 | |
| beginning of vegetative growth | 43.11 | 49.95 | 44.50 | 52.02 | 47.39 | 42.80 | 52.00 | 46.30 | 54.20 | 48.80 |
| beginning of flowering | 45.09 | 64,67 | 62.24 | 70.00 | 60.50 | 43.40 | 67.40 | 64.80 | 72.9 | 62.12 |
| **LSD 0.05** | 8.31 | | | | 4.15 | 8.66 | | | | 4.33 |
| **Mean** | 44.10 | 57.31 | 53.37 | 61.01 | | 43.10 | 59.7 | 55.60 | 63.50 | |
| **LSD 0.05** | 5.87 | | | | | 6.13 | | | | |

Weight of 1000 grain

The results of table 7 showed significant differences between the study factors and the interaction between them in the weight of 1000 grain ,the spraying treatment at the beginning of the flowering gave the highest mean of this trait of 43.73 gm and 45.92 gm with ratio of increase of 7.94% and 9.04% compared with treatment at the beginning of vegetative growth ,which gave 40.51 gm ,42.11 gm for two seasons respectively ,spray with 1000 $mgL^{-1}$ concentration was superior by giving the highest weight of 45.27 gm ,47.91 gm compared to the comparison treatment ,which gave 39.44 gm ,40.98 gm for two seasons respectively .We can see from the same table the superiority of the treatment of spraying at the beginning of the flowering and the

concentration of 1000 mg $L^{-1}$ by giving the highest weight of 46.45 ND 48,46 gm for two seasons ,maybe due to low rate of weight of 1000 grain at treatment of 3000 mg $L^{-1}$ to increase the number of grains panicle ,which cause to the distribution of produced in one panicle on a large number of grains .

**Table 7:** Effect of activated leaf fertilizer concentrations and foliar stages on weight of 1000 grain

| Foliar Stage | 2013–2014 | | | | Mean | 2014–2015 | | | | Mean |
|---|---|---|---|---|---|---|---|---|---|---|
| | activated leaf fertilizer concentrations $mgL^{-1}$ | | | | | activated leaf fertilizer concentrations $mgL^{-1}$ | | | | |
| | 0 | 1000 | 2000 | 3000 | | 0 | 1000 | 2000 | 3000 | |
| beginning of vegetative growth | 38.57 | 45.00 | 40.90 | 37.57 | 40.51 | 38.49 | 47.36 | 43.05 | 39.54 | 42.11 |
| beginning of flowering | 41.31 | 46.45 | 44.81 | 42.33 | 43.73 | 43.48 | 48.46 | 47.17 | 44.56 | 45.92 |
| **LSD 0.05** | 4.76 | | | | 2.10 | 4.93 | | | | 2.46 |
| **Mean** | 39.94 | 45.72 | 42.86 | 39.95 | | 40.98 | 47.91 | 45.11 | 42.05 | |
| **LSD 0.05** | 3.37 | | | | | 3.49 | | | | |

Biological yield

The results in table 8 indicate that there is no significant effect on stage and concentration of sprayed activated fertilizer and their interaction between them in the biological yield for two seasons respectively .

**Table 8:** Effect of activated leaf fertilizer concentrations and foliar stages on Biological yield Mg $h^{-1}$

| Foliar Stage | 2013–2014 | | | | Mean | 2014–2015 | | | | Mean |
|---|---|---|---|---|---|---|---|---|---|---|
| | activated leaf fertilizer concentrations $mgL^{-1}$ | | | | | activated leaf fertilizer concentrations $mgL^{-1}$ | | | | |
| | 0 | 1000 | 2000 | 3000 | | 0 | 1000 | 2000 | 3000 | |
| beginning of vegetative growth | 14.04 | 15.25 | 14.77 | 14.85 | 14.73 | 14.93 | 16.22 | 15.71 | 15.79 | 15.66 |
| beginning of flowering | 13.87 | 15.17 | 15.73 | 16.53 | 15.33 | 14.75 | 16.26 | 16.73 | 17.22 | 16.24 |
| **LSD 0.05** | N.S | | | | N.S | N.S | | | | N.S |
| **Mean** | 13.96 | 15.21 | 15.25 | 15.69 | | 14.84 | 16.24 | 16.22 | 16.50 | |
| **LSD 0.05** | N.S | | | | | N.S | | | | |

Grain yield

The results of table 9 indicate that there was no significant of the spraying stages while there was a significant effect on the concentration of activated leaf fertilizer spraying and there interaction in the grain yield of oats for two seasons .The 3000 mg $L^{-1}$ concentration was superior by giving the highest grain yield of 5.27 and 5.66 Mg $h^{-1}$ ,while the comparison treatment gave less grain yield of 4.36,4.68 Mg $h^{-1}$ for two seasons respectively .from the same table we note the superiority of the treatment of spraying at the beginning of the flowering and when spray concentration 3000 mg $L^{-1}$ gave the highest grain yield of 5.53 ,5.94Mg $h^{-1}$ for two seasons respectively .The reason may be due to the increase in the number of grains (table 7) and thus positively reflected on the yield .

We conclude from this study that the use of activated leaf fertilizer has improved the performance of oats when sprinkled with the stage and appropriate concentration and the concentration of 3000 mg $L^{-1}$ at the beginning of flowering gave the best results .

**Table 9**: Effect of activated leaf fertilizer concentrations and foliar stages on grain yield Mg $h^{-1}$

| Foliar Stage | 2013–2014 | | Mean | 2014–2015 | Mean |
|---|---|---|---|---|---|
| | activated leaf fertilizer concentrations $mgL^{-1}$ | | | activated leaf fertilizer concentrations $mgL^{-1}$ | |

| | 0 | 1000 | 2000 | 3000 | | 0 | 1000 | 2000 | 3000 | |
|---|---|---|---|---|---|---|---|---|---|---|
| beginning of vegetative growth | 4.39 | 4.07 | 5.49 | 5.02 | 4.74 | 4.71 | 4.37 | 5.90 | 5.39 | 5.09 |
| beginning of flowering | 4.34 | 4.37 | 5.16 | 5.53 | 4.95 | 4.66 | 5.12 | 5.50 | 5.94 | 5.32 |
| **LSD 0.05** | 0.67 | | | | N.S | 0.72 | | | | N.S |
| **Mean** | 4.36 | 4.42 | 5.33 | 5.27 | | 4.68 | 4.75 | 5.72 | 5.66 | |
| **LSD 0.05** | 0.47 | | | | | 0.50 | | | | |

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