Effect of foliar spraying with two types of nutrients on some growth and yield traits of wheat (*Triticum eastivum* L.).

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Abstract

The field experiment was conducted during the winter season 2019 in Al-Azzawiya region in Babylon province, in order to study the effect of foliar spraying with the nutrient fertocrine foliar and the amino acid Siapton 10L on the growth and yield of wheat and the amino acid Siapton 10 L at a concentration of 2, 2.5, 3 ml.L^{-1} water in addition to the control treatment (sprayed with water only) on the Barcelona cultivar of wheat. A factorial experiment was applied according to the randomized complete block design (RCBD) with three replications. The results of growth traits (plant height, flag leaf area, number of tillers . m-2) and yield traits (number of grains.spike $^{-1}$, spike length and weight of 100 grains) showed a significant superiority for the treatment of spraying Siapton 10 L at a concentration of 2.5 ml. L^{-1} and it gave 120.00 cm , 53.00 cm^2, 451.70 m^2 and 3.481 cm, 96.70 grains, 6.90 g respectively. It was followed by fertocrine foliar treatment at a concentration of 2 ml. L^{-1} and it gave 116.00 cm, 46.33 cm 2, 417.70 m ^{2} and 11.73 cm, 083.3 grains, 6.27 g, respectively, compared to the control treatment.

Keywords: wheat, fertocrine , Siapton , yield, growth.

تأثير الرش الورقي بنوعين من المغذيات في بعض صفات نمو وحاصل الحنطة ( ) ***Triticum eastivum* L.**

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المستخلص

نفذت تجربة حقلية خلال الموسم الشتوي 2019 في منطقة العزاوية بمحافظة بابل بهدف دراسة تأثير الرش الورقي بالمغذي فرتكراين فوليار والحامض الاميني سيابتون 10 ل في نمو وحاصل الحنطة .تضمنت التجربة سبع معاملات هي رش المغذي الورقي فرتكراين فوليار بتركيز 1، 1.5، 2مل .لتر$^{-1}$ ماء والحامض الاميني سيابتون 10 ل بتركيز2، 2.5، 3مل . لتر $^{-1}$ماء اضافة الى معاملة المقارنة (رش بالماء فقط) على نبات الحنطة صنف برشلونة . وطبقت تجربة عاملية وفقا لتصميم القطاعات العشوائية الكاملة (RCBD) بثلاثة مكررات. أظهرت نتائج صفات النمو (ارتفاع النبات ومساحة ورقة العلم وعدد الاشطاء.م$^{-2}$) وصفات الحاصل (عدد الحبوب .سنبلة $^{-1}$ وطول السنبلة ووزن 100 حبة) تفوقاً معنوياً لمعاملة رش سيابتون 10 ل بتركيز2.5 مل .لتر$^{-1}$ وأعطت 120.00 سم ، 53.00سم^2 ، 451.70 م^2 و 3.481 سم ، 96.70حبة ،6.90غم على التوالي وتليها معاملة فرتكراين فوليار بتركيز 2 مل .لتر$^{-1}$ وأعطت 116.00 سم ،46.33 سم^2 ، 417.70 م^2 و11.73سم ، 083.3 حبة ،6.27 غم على التوالي قياساً لمعاملة المقارنة . ونستنتج من هذه الدراسة ان افضل المعاملات هي معاملة الرش بالسيابتون 10 ل عند تركيز 2.5مل .لتر$^{-1}$ في صفات النمو ومكونات الحاصل تليها معاملة الرش بالفرتكراين فوليار عند تركيز 2 مل .لتر^1 في اثناء موسم الزراعة.

Introduction

Triticum eastivum L. is one of the main grain crops in the world and the most important. The importance of wheat is due to the fact that it contains gluten, a type of protein essential for the production of high quality bread, which grains of other crops lack. The crop tops the strategic crops in Iraq for being a major source of food and its role in economic development and social (2).In addition to containing quantities of fats, vitamins B1, B2, and some mineral salts (7). The wheat crop is one of the old crops that were planted thousands of years ago and is cultivated almost in all regions of Iraq. The cultivated area for 2019 amounted to 6,331 thousand dunams, and the production amounted to 4,343,000 tons, with a yield rate of 686.1 kg. dunams (20)and (17) showed that foliar nutrition is one of the preferred means because it is easy, economical and quick, and there are no problems for the soil with it, as well as being positive with micro and macro nutrients due to the many problems of some of these elements when added to the soil, which causes a decrease in its availability for plants adding fertilizers by spraying on the vegetative system of plants is one of the modern methods, using diluted solutions for several times, and it is one of the important and successful methods to treat nutrient deficiencies, especially the small ones (13). Amino acids are one of the modern methods in agriculture, which can become one of the main directions in scientific research and its practical and theoretical purposes, as it leads to increased productivity and improved quality. Increasing the proportion of protein and improving its quality (35). and (39)showed that amino acids are the initiator of the formation of hormones and growth regulators. The amino acids affect directly or indirectly the physiological activities coundected by plants, including the plant's resistance to inappropriate natural factors such as high and low temperatures, temperature and humidity, increasing plants' immunity, vitality and resistance to changes in the critical environment, as well as the high level of salinity in the soil or irrigation water, so the plant can restore its condition natural (22).The results of a number of researchers indicated that spraying with amino acids led to an increase in grain yield and improvement of the qualitative traits of bread wheat (28) and (36). (12) indicated that the amino acids were sprayed at a concentration of (400,500,600) $ml.L^{-1}$ on three cultivars of rye wheat (tritical) on two dates at the Tillering stage and the other when spike formation stage. Farah cultivar was at 600 $ml.L^{-1}$ concentration excelled in the number of days of cultivation. Even spike formation 75% of the spikes and the number of $spikes.m^2$, and the same cultivar at the concentration of 500 $ml.L^{-1}$ was significantly excelled on the number of grains. spike and weight of 1000 grains,The cultivar Aml 7 at the concentration of 500 $ml.L^{-1}$ gave a significantly excelled in the leaf area of the flag leaf and (33) stated that spraying amino acids increases the content of calcium and potassium in the vegetative and root system of wheat.(14) indicated in a study he conducted that spraying Algaren foliar fertilizer at a concentration of 1 and 2 $ml.L^{-1}$ and Borogreen foliar fertilizer at a concentration of 2 and 4 $ml.L^{-1}$ on wheat plants, only gave the treatment of Borogreen foliar fertilizer at a concentration of 4 $ml.L^{-1}$ significant increase in the average number of grains per spike and grain yield.It was found (18) that spraying a nutrient solution of macro and micro elements with different concentrations (0, 100, 150, 020) ppm on the cultivar IPA 95, where the spray treatment with a concentration of 200 ppm was significantly excelled and gave the highest average in the traits of the number of spikes 239.83 $spikes.m^2$. The number of grains is 69.17 $grains.\ spike^{-1}$, the weight of 1000 grains is 17.10.gm, and the grain yield is 2.95 $tons.ha^{-1}$.(16) mentioned that the use of four concentrations of foliar fertilization (a mixture of micro and macro elements) is 6.4.2.0 L. ha^{-1}, the concentration 4 $L.ha^{-1}$excelled in the trait, the number of spikes is 575.75 $spikes.m^2$ and the number of grains in

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the spike is 77.22 grains. spike^{-1}, and the weight of 1000 grains is 41.38 g and it was shown (37) that spraying wheat with a mixture of nutrients nitrogen, phosphorous, potassium, zinc, copper, boron, magnesium and molybdenum (in six spraying stages),Whereas, spraying plants with nutrients at the stages of growth (tilleing, booting and Milk Ripe stage) gave the highest average number of grains, weight of 1000 grains, biological yield and grain yield. (3) when studying the effect of foliar spraying with a group of small elements (Fe, Zn, Cu, B) mixed with each other and at a concentration of 150, 100 and 50.0 mg. L^{-1} in the growth of three cultivars of wheat (Abu Ghraib, IPA 99 and Sham 6), to a concentration 100 mg. L^{-1} excelled by giving it the highest average of plant height, spike length and number of grains.spike^{-1}, while the concentration 150 mg.L^{-1} excelled in the traits of the flag leaf area , the number of spikes.m2, the weight of 1000 grains, and the total grain yield.(11) showed that spraying iron at a concentration of 0.50,100,150 mg.L^{-1} on the wheat crop of Rashid cultivar, the concentration of 150 mg.L^{-1} significantly excelled in the leaf area trait, and the concentration 100 mg.L^{-1} gave the highest average in the trait. plant height. Based on what was mentioned above, the study was conducted with the aim of knowing the effect of foliar spraying with the nutritious fertocrine foliar and amino acid Siapton 10 L on the growth and yield of Barcelona cultivar wheat.

Materials and methods

The field experiment was conducted in the 2019 agricultural season in one of the fields in Al-Azawiya area, north of the center of Babylon province. The experiment included seven treatments: spraying the foliar nutrient fertocrine foliar with three concentrations of 1, 1.5, 2 ml.L^{-1} of water produced by the Jordanian company Agrimanco and the amino acid Siapton 10 l from the production of The Italian company Isagro with three concentrations of 2, 2.5, 3 ml.L^{-1} in addition to the control treatment (spraying with water only) on the Barcelona cultivar wheat, spraying was conducted in two stages at the beginning of flowering and the second spray two weeks after the first spray, and the third spray took place two weeks after the second, and the experiment was applied according to the The Randomized Complete Block Design (RCBD) and with three replications.

Table (1): components of the fertocrine foliar nutrient

Mo %	Co %	B %	Cu %	Zn %	Mn %	Fe %	N %	free amino acids of vegetable origin %	organic matter of vegetable origin %	pH
0.02	0.01	0.1	0.1	0.75	0.5	0.1	5	8	40	4.3

components for amino acid siaptone 10 L :

siaptone 10L contains:

- Amino acids (Proline - Hydroxyproline and Clacin) 55%

- free amino acids 10%

Random samples of field soil at a depth of (0-30 cm) were taken from several sites and analyzed (Table 2).

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Table (2) Physical and chemical properties of field soil.

soil texture .	Traits								
	Silt	Sand	Clay	K (mg.kg^{-1})	P (mg.kg^{-1})	N (mg.kg^{-1})	organic matter %	Ece / ds.m^{-1}	pH
	%								
Sandy loam	24.5	60	15.5	192.0	5.6	13.4	1.13	4.5	8.0

The experimental land was tillage by two orthogonal plows using the Moldboard plows, then smoothed and leveled, then divided into three replicates, and each replicate was divided into boards.The field soil was fertilized with triple superphosphate (P2O5 45%) with an average of 100 kg. ha^{-1} and urea fertilizer (%N 46) with an average of 200 kg. ha^{-1} Triple super phosphate fertilizer was added once and nitrogen fertilizer in two batches, the first at the beginning of the tilleing stage and the second at the end booting stage (10). After completing the cultivation of the experimental land on 11/14/2019, the irrigation was done in a calm manner to ensure germination and after germination and during the growth phase, the service operations continued for the crop and the wheat plants were harvested when they reached the stage of full maturity on 5/8/2020.

The following traits were studied:

First, vegetative growth traits :

plant height (cm)

Ten main stems were taken randomly from each experimental unit, and the plant height was measured from the level of the soil surface to the top of the spike, the main branch without awn . Colored rings were used at the beginning of the tilleing stage (42).

2-Number of tillers .m^{-2}

The number of tillers was calculated for each experimental unit for an area of 1 m^2.

3- the flag area (cm^2)

The ten flag leaves for the main stems and for each experimental unit were randomly taken according to the following equation: leaf length x leaf width from the middle x 0.95 (40).

Second: The trait of the yield and its components

4-spike length (cm)

It was calculated as an average length of ten spikes per experimental unit and was measured from the base of the spike to the end of the terminal spikelet's without the awn during the harvesting phase.

5 -number of grain. spike^{-1}

The average number of grains is 25 spikes taken randomly from each experimental unit.

6 -weight of 100 grains (gm)

100 grains of the grain yield of the experimental unit were randomly counted and then the grains were weighed.

The results were analyzed according to the followed design, and L.S.D was used to compare the means at the probability level of 0.05 (4). GenStat (41) was used.

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Results and discussion

1- Traits of vegetative growth:

The results in Table 3 indicate that the treatment of spraying with 10 L at a concentration of 2.5 ml. L^{-1} was significantly excelled in the average of plant height, number of tillers and the flag leaf area , as it gave the highest average in the above traits as it reached 120.00 cm, 53.00 cm^2, 451.70 m^2 followed by the spraying treatment fertocrine foliar at a concentration of 2 ml. L^{-1}, which gave 116.00 cm, 46.33 cm^2, 417.70 m^2 respectively mentioned traits compared to the control treatment.The reason for the excelled treatment Siapton 10 L at a concentration of 2.5 ml.L^{-1} is that the spraying of amino acids in the stage of vegetative growth and tilleing led to an increase in the root and vegetative total of their role as vital stimulants that stimulate the growth of leaves and roots and affect vital processes and accelerate and increase the resistance of the plant to inappropriate conditions (26).Reducing the effect of drought and its effect on the photosynthesis process, reducing competition between plants and increasing productivity (23) These results are consistent with ((31 and 29)). It may also be due to the role of some of the elements present in the fertocrine in increasing cell division and elongation and that the appropriate time for fertilization is more important From the amount of fertilizer added (24).This result is consistent with what was found by ((38, (34) and 30)) who indicated that the presence of micro-nutrients leads to an increase in the concentration of chlorophyll pigment and thus an increase in plant efficiency and an increase in plant height as well as a result of the role of some elements in the solution nutrient in encouraging tissues the meristemia in the crown generating area of the branches and these results agree with what was found (9).The reason for the increase in the area of the flag leaf is due to the increase in the level of spraying with nutrients that contain a group of micro-elements and the fact that these elements perform many functions within the plant through their participation in the process of oxidation, reduction, respiration and the formation of chlorophyll.It plays an important role in the electronic transport system in the photosynthesis process, as well as the presence of nitrogen, which has a significant impact and a positive role. All this leads to an increase in manufactured substances that contribute to the process of cell division and elongation, as well as the role of other nutrients such as phosphorous and potassium (1), (6) and (21) and (25) These results are in agreement with (27).

2-The yield traits

The results in Table 4 indicate that the siaptone spraying treatment 10 L at a concentration of 2.5 ml. L^{-1} was significantly excelled in the average length of the spike, the number of grains, the $spike^{-1}$ and the weight of 100 grains, where it gave the siaptone spraying 10 L at a concentration of 2.5 ml. L^{-1} the highest average. In the above traits 13.48 cm, 96.70 grains, 6.90 g.Followed by the spraying treatment with fertocrine foliar at a concentration of 2 ml.L^{-1}, which gave 11.73 cm, 83.30 grain, 6.27 g. The reason for the excelled of the treatment siaptone 10 L at a concentration of 2.5 ml. L^{-1} is due to the role of amino acids in improving vegetative growth and thus reflected on the trait of the crop and its components (15th). These results are in agreement with what was mentioned (5) and (35).Also, the reason may be due to the plant's need for high concentrations of plant growth, especially in the early stages of spike formation (the emergence and development of the spike). Also, the presence of some elements such as K encourages the transfer of carbohydrates and nutrients in the tissues of the plant, and its deficiency leads to a reduction in the components of the yield. Also, K works, which reduces the state of abortion in the inflorescences. These results are consistent with what was reached (9), (8) and (19).The reason

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may also be due to the role of nutrients and amino acids in increasing the efficiency of the photosynthesis process and the process of transferring the products of the metabolism process from the site of their manufacture in the leaves to the storage sites in the grains, as well as increasing energy production and the formation of ATP and the construction of sugars, starch and proteins and the construction of lipids and the formation of nucleic acids that are stored in grains, which It leads to weight gain (32).

Table (3) Effect of spraying with fertocrine foliar and siaptone 10 L on some traits of vegetative growth of wheat

Treatments	number of tillers (m^2)	flag area (cm^2)	plant height (cm)
control (without spraying)	290.00	36.17	78.67
fertocrine foliar 1 ml. L^{-1}	304.00	38.67	88.00
fertocrine foliar 1.5 ml. L^{-1}	344.00	43.00	95.67
fertocrine foliar 2 ml. L^{-1}	417.70	46.33	116.00
Siapton 10 for 2 ml. L^{-1}	403.70	45.33	111.67
Siapton 10 for 2.5 ml. L^{-1}	451.70	53.00	120.00
Siapton 10 liters 3 ml. L^{-1}	375.00	44.67	107.67
L.S.D 0.05	28.66	3.32	3.63

Table (4) Effect of spraying with fertocrine foliar and siaptone 10 L on some traits of the components of wheat yield

Treatments	weight of 100 grains (g)	number of grain. $spike^{-1}$	spike length (cm)
control (without spraying)	3.90	56.30	7.33
fertocrine foliar 1 ml. L^{-1}	4.68	61.00	8.33
fertocrine foliar 1.5 ml. L^{-1}	4.93	63.00	9.77
fertocrine foliar 2 ml. L^{-1}	6.27	83.30	11.73
Siapton 10 for 2 ml. L^{-1}	5.90	82.00	11.00
Siapton 10 for 2.5 ml. L^{-1}	6.90	96.70	13.48
Siapton 10 L 3 ml. L^{-1}	5.18	71.00	10.66
L.S.D 0.05	0.23	9.08	0.74

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