



## **Influence of amino acids foliar applications on the quality of bread in several wheat cultivars *Triticum aestivum* L.**

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### **Abstract:**

A field experiment was carried out during winter season 2019-2020 at a private farm located in Al-Daghara, Al-Diwaniyah Governorate, with the aim of studying the effect of foliar spraying with amino acids on the quality of several varieties of wheat. A randomized complete block design (RCBD) was used in the experiment with three replicates. The treatments included two factors. The main plots included four cultivars: Ibaa 99, Boohth 22, Latifiya, and Tammuz 2. The subplots were 0 and 1.5 liters of water amino acids. The results showed that there were significant varietal differences, Ibaa 99 was produced gluten content about 26.66%, Specific gravity of 81.48 kg/hL, flour extraction 69.78% , gluten strength 86.91%, and the lowest fall number was 389.6, and the variety was superior to Boohth 22 in the protein percentage of 11.86%, the results also showed that there were significant differences between the amino acid treatments in some of character studied as the 1.5 L treatment increased the Grain content of gluten, 26.75%, the percentage of gluten strength, 88.75%, and the protein content 11.97, Therefore, the addition of amino acids affected the quality of the varieties.

**Key words:** wheat , foliar spraying , amino acids.



## Introduction

Wheat (*Triticum aestivum* L.) is a winter crop widely grown in the world, it represents food. The percentage of gluten, its quality, the strength of the dough and its tolerance when exposed to the resulting gases are considered [13]. Iraq is one of the first places for the emergence of this crop, it still suffers from Low productivity in quantity and quality [6]. This decline may be due to not following correct crop management methods during production processes and not using modern methods to increase and improve production in quantity and quality, such as varieties and adding some useful nutrients and improvers. The Food and Agriculture Organization [5], also announced that global wheat production for 2019 amounted to 2,685 million tons, and the expected increase in production was 5.6% in 2019 over the level of 2018, meaning approximately 771 million tons [1]. It is expected to reach Total wheat use reached 758 million tons 1.5% higher than in 2018-2019. The amount of bread that one person eats daily in developing countries such as Iraq ranged between 137 and 411 grams[12]. Therefore, Iraq needs 4,200 million tons of wheat annually to reach self-sufficiency, according to a study that was recently announced. Iraq still needs to import a million tons of wheat and mix it with the local product to improve the quality of flour and bread, because when preparing Iraqi bread, it needs a high percentage of gluten, which the local varieties of Iraqi wheat do not

provide it [8]. There are essential amino acids in wheat, including ten acids that are amino acids, tryptophan glutamic acid. Protein is also one of the important components of the wheat grain and is determined Its suitability to different nutritional qualities [7]. in the study varieties of wheat significantly differed in content of the grain dry gluten, as the variety Tammuz 2 recorded the highest of dry gluten, 16.69 and 16.30% for the two seasons, respectively[11]. So the aim of studying the effect of foliar spraying with amino acids on the quality of several varieties of wheat.

## Materials and Methods

The samples were taken randomly from the field soil before planting at a depth of (0-30) cm before planting, mixed well, a single composite sample was taken from it, and the physical and chemical characteristics of the soil were estimated, as shown in Table (1).

The field has been plowed, then smoothing, leveling, and dividing it into panels. The area of each panel was 2\*2 m<sup>2</sup> according to the design used. Then, it was planned with a distance of 20 cm between one line and another and planted with seeds of the varieties used, based on the seed quantity of 120 kg/ha [8], and the seeds were tested. Before planting, the germination rate was 93-95% and the number of plates in one



replicate was 16, thus the number of experimental units was 48 units. Potassium was added in an amount of 120 kg/ha in the form of potassium sulphate (42% K) and phosphorus in the form of monomeric superphosphate (21% P) in the amount of 120 kg/ha , when preparing the soil for cultivation and before loosening in one batch. As for nitrogen, it was added in the form of urea (46% N) at a rate of 200 kg per hectare in three batches (when three complete leaves appeared on the plant zadoks13 and when the node appeared The second on the stem (zadoks32 and on the bush (zadoks40)) was planted on 11/18/2019, Crop service operations were carried out from preparing the land for planting until harvest and included irrigation and weeding as needed.

Spraying treatment with amino acids: A general solution of DRIN (bio stimulant) brown in color was used as a source of amino acids, produced by the company (GREEN HAS ITALIA) and of Italian origin. The percentage of total amino acids in it is 46.8%, organic carbon (C) is 22.8%, and organic nitrogen is 7.56. %, provided that it is diluted with water at a rate of 15 ml / 1.5 liters of water, provided that the foliar spraying is carried out with amino acids. The first appointment is in the elongation stage. The second appointment is in the post-flowering stage (100% completion of flowering). The spraying treatment included distilled water (control) and the second treatment included spraying with amino acids.

**Table (1) Some chemical and physical qualities of field soil before planting**

<b>Physical qualities</b>	<b>Sand</b>	<b>%</b>	<b>18.2</b>
	<b>clay</b>	<b>%</b>	<b>36.8</b>
	<b>silt</b>	<b>%</b>	<b>45.0</b>
	<b>PH</b>	<b>7.3</b>	
<b>Chemical qualities</b>	<b>Ec</b>	<b>ds.m<sup>-1</sup></b>	<b>5.00</b>
	<b>Available nitrogen</b>	<b>ppm</b>	<b>0.1</b>
	<b>Available phosphorus</b>	<b>ppm</b>	<b>2.6</b>
	<b>Available potassium</b>	<b>ppm</b>	<b>172.8</b>

\*The analyzes were conducted in Al-Qadisiyah university Agriculture college.



the experiment carried out using a design Split Plot Design with three replications , the four varieties of wheat occupied the main plots (Ibaa 99 variety, the Boohth 22 variety, the Latifiya variety, the Tammuz 2 variety).

The subplots were Control without amino acids and 1.5 L H<sup>-1</sup> amino acids.

Qualitative characteristics:

- Estimation of specific gravity
- Flour extraction %
- Estimating the percentage of wet gluten (total)
- Gluten strength percentage (%)
- Determination of protein and ash
- the Fall number: Extraction method as stated in[13]

After collecting, reducing and tabulating the data, it was statistically analyzed using the Genstat12 program according to the data analysis tool, and the averages of the coefficients were compared using the Least Significant Difference (L.S.D) test at the probability level of 0.05.

## Results and discussion

### 1-Specific gravity (kg/hL)

The results indicated a significant effect of the varieties factor, while it did not indicate any significant differences for amino acids or the interaction between acids and varieties.

The results of Table (2) show that there are significant differences between the varieties in the specific gravity characteristic, as the Ibaa 99 variety excelled, with a non-significant difference with Boohth 22, and gave the highest specific weight (81.48) kg/hectol, while the Latifiya variety gave the lowest specific weight (80.23) kg/hectol. The superiority of the Ibaa 99 and Boohth 22 cultivar is attributed to the variation of the varieties in the specific gravity to the difference in the proportions of the chemical composition of the grains. It has been pointed out that the high protein content in the grains leads to a decrease in the value of the specific gravity, and these results agreed with [9].

**Table No. (2) the effect of amino acids and varieties on specific gravity (kg/hL)**

amino acids ml / L	varieties				average
	Ibaa 99	Boohth 22	Latifiya	Tammuz 2	
control	80.67	81.2	80.17	80.5	80.635
1.5 liters	82.3	81.22	80.3	80.63	81.1125



average	81.48	81.21	80.23	80.57	80.8725
L.S.D 0.05	P	V			p*v
	ns	0.72			ns

## 2-Flour extraction percentage (%):

The results indicated a significant effect of the experimental factors of amino acid and varieties on the flour extraction percentage (%), and there were no significant differences in the interaction between the varieties and amino acids in flour extraction percentage.

The amino acid treatments, according to the results of Table 3, indicated that there were significant differences between the amino acid treatments, as treatment 1.5 L gave 71.12%, superior to treatment control, which gave 65.47%. The reason may be attributed to the

plant's optimal use of amino acid spraying and the formation of proteins, including gluten protein [2]. The results of Table (3) also show that there are significant differences between the varieties in the percentage of flour extraction (%), as the Ibaa 99 variety was superior gave 69.78%, with a non-significant difference with the Boohth 22 variety while the Latifiya variety gave a lower rate of 67.09%. The superiority of the Boohth 22 and Ibaa 99 variety may be attributed to The variation in varieties may be due to the type of gluten proteins and the type of amino acids that structure them, in agreement with [4].

**Table No. (3) the effect of amino acids and varieties on flour extraction%**

amino acids ml / L	varieties				average
	Ibaa 99	Boohth 22	Latifiya	Tammuz 2	
control	66.47	65.2	64.57	65.66	65.47
1.5 liters	73.09	71.71	69.61	70.05	71.12
average	69.78	68.46	67.09	67.85	
L.S.D 0.05	P	V			p*v
	0.911	1.288			ns

**3- Gluten percentage** according to the AACC standard and based on the humidity of 14%:

The results indicated a significant effect of the experimental factors varieties and amino acids on the gluten percentage, and there were no significant differences

in the interaction between the amino acid varieties.

The results of Table (4) showed that there were significant differences between the amino acid treatments, and treatment 1.5 L gave 26.76%, superior to treatment control, which gave 25.05%.



The reason may be attributed to the plant's optimal use of amino acid spraying and the formation of proteins, including gluten protein [2].

The results of Table (4) show that there are significant differences between the varieties in the grain content of gluten, as the Boohth 22 variety was superior, with a non-significant difference, the Ibaa 99 variety, giving 26.66%, while the Latifiya variety gave 24.96%. The

superiority of the Boohth 22 and Ibaa 99 variety may be attributed to the variation of the varieties in The quality of gluten proteins and the quality of the amino acids that make up them. [4], stated that the percentage of wet gluten in the dough is a reflection of the protein percentage and is one of the good indicators of the quality of the variety. These results agreed with what was indicated by [11] .

**Table No. (4) the effect of amino acids, and varieties on the percentage of gluten %**

amino acids ml / L	varieties				average
	Ibaa 99	Boohth 22	Latifiya	Tammuz 2	
control	25.58	25.54	24.41	24.6	25.05
1.5 liters	27.64	27.8	25.5	26.08	26.76
Average	26.61	26.66	24.96	25.34	
L.S.D 0.05	P		V		p*v
	0.527		0.745		ns

#### 5 -Gluten strength percentage (%):

The results in Table (5) indicated a significant effect of the experimental factors varieties , amino acids and the interaction between them on the character of the percentage of gluten strength.

The amino acid treatments, according to the results of Table (5), indicated that there were significant differences between the amino acid treatments, as treatment 1.5 L gave 88.75%, superior to treatment control, which gave 78.60%. The reason may be attributed to the plant's optimal benefit from spraying amino acids and forming proteins,

including gluten protein [2]. The results of Table (5) also show that there are significant differences between the varieties in the percentage of gluten strength, as the Ibaa 99 variety was superior to the Boohth 22 variety, with a non-significant difference, as it gave 86.91%, while the Latifiya variety gave a lower percentage of 79.82%. The superiority of the Boohth 22 and Ibaa 99 variety may be attributed to the fact that it may be due to Varieties vary according to the type of gluten proteins and the type of amino acids that structure them, as mentioned by [4]. The interaction between amino acids and varieties also showed significant differences in Table (5), and the treatment of the combination



1.5 L \*Ibaa 99 gave the highest percentage, 95.05%.

**Table No. (5) the effect of amino acids and varieties on the percentage of gluten strength**

amino acids ml / L	varieties				average
	Ibaa 99	Boohth 22	Latifiya	Tammuz 2	
control	78.77	80.57	76.83	78.25	78.605
1.5 liters	95.05	92.12	82.8	85.03	88.75
Average	86.91	86.34	79.82	81.64	
L.S.D 0.05	P		V		p*v
	1.66		2.34		3.32

#### 6- Protein (%):

The results in Table (6) indicated a significant effect of the experimental factors varieties , amino acids and the interaction between them on the percentage of protein.

The results of Table (6) also showed that there were significant differences between the amino acid treatments on the percentage of protein, and the 1.5 L treatment gave 11.975%, superior to the control, which gave 11.194%. This may be attributed to the free amino acids that, when added, are an essential nitrogen source in building proteins and enzymes and preparing energy for biological processes, and this result agreed with the results of Other Boohth [10].

The results of Table (6) show that there are significant differences between the varieties in the percentage of gluten, as

the variety Boohth 22 excelled and gave 11.869%, while the variety Latifiya gave the lowest percentage of 11.18%. The variation in the percentage of protein between the varieties depends mainly on the nature of the variety and its genetic structure It was found that the varieties differ in the efficiency of their roots to absorb nitrogen from the soil and their ability to reduce nitrates during the period of grain filling. These results agreed with the findings of Al-Salem (2018), as everyone found significant differences between the varieties and genotypes in their experiments on the percentage of protein in grains. The interaction between the amino acids and the varieties also showed the presence of significant differences in Table (6), and the interaction treatment gave 1.5 L \* Ibaa 99 The highest percentage is 12,158%.

**Table No. (6) the effect of amino acids and types on protein character (%)**

amino acids ml / L	varieties				average
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	Ibaa 99	Boohth 22	Latifiya	Tammuz 2	
control	11.183	11.537	10.847	11.207	11.194
1.5 liters	12.158	12.202	11.525	12.013	11.975
Average	11.671	11.869	11.186	11.61	
L.S.D 0.05	P		V		p*v
	0.114		0.162		3.32

## 7-The fall number

The results in Table (7) indicated a significant effect of the experimental factors varieties , amino acids and the interaction between them on the fall number. The results of Table (7) also showed the presence of significant differences between the amino acid treatments, as the treatment control gave the highest value of the fall number, 448.5 N/s, while the treatment 1.5 L gave the lowest value, 421.3 N/s. the presence of significant differences

between the varieties, as the Latifiya variety excelled and gave 469.2 N/s. While the variety Ibaa 99 gave the lowest reading of 389.6 N/s.

The interaction between the amino acids and the varieties also showed the presence of significant differences in Table (7), and the combination treatment gave control\* Latifiya The highest fall number 477.2 N/s.

**Table No. (7) the effect of amino acids and varieties on the fall number**

amino acids ml / L	varieties				average
	Ibaa 99	Boohth 22	Latifiya	Tammuz 2	
control	420.5	438.5	477.2	458	448.55
1.5 liters	358.7	428.5	461.2	437	421.35
Average	389.6	433.5	469.2	447.5	
L.S.D 0.05	P		V		p*v
	15.88		22.46		31.77

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