Effect of humic application on qualitative traits of bread wheat cultivars (*Triticum aestivum* L.)

Bassem Shakour Al-Bayati [1]
Basem76na@tu.edu.iq

[1] Field Crop Department, College of Agriculture, Tikrit University, Salah Alden, Iraq.

● Date of research received 03/04/2023 and accepted 12/06/2023**.**

Abstract

A field experiment was carried out at the research station of the Department of Field Crops in the College of Agriculture at the University of Tikrit during the winter agricultural season 2020-2021 AD in gypsum soil. The aim of study was the effect of three stages of ground addition of humic with an amount of 32 kg.ha, which is the stage of four leaves and flowering in addition to (control treatment) in the chemical traits of soft wheat varieties, which are Al-Rasheed, Tammuz 2 and Ibaa 99). The results were as follows. Significant differences were observed between the studied varieties. The cultivar Tammuz 2 excelled in the traits of protein percentages (13.23) %, gluten (26.66) %, and dry gluten (9.60%), while the rational cultivar recorded the highest average of the two labels, the gluten coefficient (60.14) and the sedimentation coefficient (26.22). The date of addition in the branching stage excelled in the traits of humidity, protein and wet gluten, and the addition stage in the flowering stage excelled in the trait of the gluten coefficient. Sedimentation coefficient, while the overlapping treatment of cultivar Tammuz 2 with the date of addition in the branching stage was superior in the proportions of protein and wet gluten, and the treatment of overlap Tammuz 2 with the date of addition in the flowering stage was superior in the percentage of dry gluten.

Key words: soft wheat, cultivars, humic acid, qualitative traits
Citation: Nadhim, B. (2023). Effect of humic application on qualitative traits of bread wheat cultivars (Triticum aestivum L.). *Kirkuk University Journal For Agricultural Sciences*,14 (2), 215-222. doi: 10.58928/ku23.14220
Correspondence Author: Bassem Shakour Al-Bayati-Basem76na@tu.edu.iq

Introduction

Wheat (*Triticum asetivum* L.) is one of the important and basic grain crops in most countries of the world [1].It contains 75% starch, 1.5% fat, vitamins, especially (B1, B2), and mineral salts that are useful in nutrition, such as calcium, magnesium, phosphorus, and iron, in addition to the amino acids that humans need [2] The amount of protein in the wheat crop is one of the most important standards adopted in determining the quality of its relationship to the final product. [3].Attention and focus began globally on high-productivity and good-quality wheat varieties, especially the new varieties, taking into account the application of crop service operations in a scientific and sound manner, and adopting the means to ensure an integrated and studied system in adding and using organic fertilizers in order to obtain the best results in increasing production, improving quality, reducing costs, and maintaining environment [4], and among these methods is the use of safe organic compounds such as humic, which is a good improver for the physical and chemical properties of the soil, and increasing the availability of plant nutrients. In recent years, organic fertilizers such as humic have been resorted to in balanced levels in order to improve soil properties and nourish plant and accelerate the processes of vegetative growth and thus increase production [5]. Humic contributes to maintaining a clean environment by reducing the harmful effects of agricultural pesticides as well as increasing the growth and elongation of roots by increasing the amounts of nutrients absorbed into the soil by the roots [6]. Mentioned that the addition of humic stimulates the activity of plant hormones, especially the auxin hormone, which causes elongation of cells, which is reflected in the increase of the vegetative system, and thus is reflected in the fruiting system of the plant.

Due to the increase in the high consumption of wheat as a source of energy and protein and its special importance from a nutritional point of view in Iraq, the idea of this study came to be, which aims to evaluate varieties of wheat in the different stages of adding to your humic and the extent of its impact on the qualitative traits of wheat

Materials and methods

Experiment included two factors, namely: the first: three varieties of bread wheat, which are (Al-Rashid, Dates 2, Ibaa 99), and the second: three stages of humic as ground addition and with a second quantity (32 kg.H1), which is (without addition and addition in four stages). Leaves and addition in the flowering stage), a field experiment was carried out at the research station of the Department of Field Crop Sciences in the College of Agriculture at the University of Tikrit during the winter agricultural season 2020--2021 AD. The certified ranks and the yield of the agricultural season 2019-2020 AD , The experimental land was plowed with two orthogonal plows using the flip-flop plow, the soil was smoothed and then leveled and divided into experimental units. kg. hectares, and the experimental land was fertilized with nitrogen fertilizer in the form of urea (46% N) at a rate of 200 kg h. It was added in two batches, the first at planting and the second after 60 days of planting, and a triple superphosphate fertilizer was used for a source of phosphorus (P2O5 46%). At a rate of 100 P2O5 kg h. It was added in one batch when preparing the soil [7]. The specification of the organic fertilizer (humic) used was the BioHealth type in the form of water-soluble granules manufactured in Germany. Its contents are as follows: humic acid (75%). Trichoder maherzianum and Bacillus subtilis %(10), marine algae 5%, organic matter (10%). The studied characteristics The flour models were prepared: the amount of water needed to be added to each type of wheat was calculated after knowing its initial moisture, and then a calculated amount of water was added to bring the moisture to 14% in the three varieties and left for 24 hours for hydration. Then the seeds of each variety were ground separately. One degree of bran flour was obtained, and the extraction rate ranged from (79-80) %. Then, they were placed in bags in a refrigerator until the tests were carried out.

1- Moisture content:

The moisture content of the flour was measured by a moisture tester - PFEUFFR (HE-50) approved by the General Company for Grain Processing.

2-Protein (%):

The percentage of protein was estimated according to the method [8] using the Inframatic device equipped by Perten located in the General Company for Grain Processing, which is the reflection of infrared radiation (NIR) [9].

3-Wet gluten (%):

The percentage of wet gluten was estimated for flour of wheat varieties using the method [8] using the device (Perten 2200) in the quality control laboratory of the General Company for Grain Processing.

4- Dry gluten (%)

After calculating the percentage of wet gluten, the sample was dried in an oven at a temperature of (105°C) for four minutes on the Glutork 2020 device, then the sample was weighed in a sensitive scale, and the result was recorded and converte to percentage.[10]

$$\text{Dry gluten}(\%) = \frac{\text{Dry gluten weight}}{\text{Weight of the flour sample}} \times 100$$

5-Gluten coefficient (%):

It expresses the strength of gluten regardless of its quantity, and the low coefficient of gluten is an indicator of damage to the protein. The value of the coefficient is calculated after the wet and weak gluten are extracted. and is calculated.

The gluten coefficient is from the following equation:

$$\text{Gluten coefficient} = \frac{\text{Wet weight \_ Weak weight}}{\text{wet weight}} \times 100$$

6- Sedimentation volume (ml):

The sedimentation volume was estimated according to the [11]. procedure as a method for estimating the strength of wheat, using the Inframatic apparatus, which was prepared by the Swiss company Perten. The data were analyzed statistically using the computer and based on the (SAS) program, and the arithmetic means of the studied characteristics were compared according to the multi-range test.

Results

1- Moisture content.

The results of Table (1) showed that the plants treated with humic acid in the four-leaf stage were significantly superior, with the highest average for the trait reaching (8.96%) compared to no addition, which gave the lowest average for the trait (8.72%), and the reason for the increase may be attributed to In moisture at the added level of humic acid, it has provided the plant with the nutrients it needs, as well as improving the chemical and physical properties of the soil, which helped to increase the penetration of roots into the soil and thus increase water absorption.As for the overlap between cultivars and stages of addition, Al-Rasheed cultivar excelled at the stage of four leaves. And he gave the highest value for the trait amounted to (9.13)%, while the co-treatment of the Tammuz 2 variety with no addition gave the lowest value for the trait amounted to (8.53%).

Table (1) Varieties averages and stages of adding humic acid in terms of moisture content.

Variety	Humic acid application			
	without addition (comparison transaction)	The addition is in the branching stage	Addition at the beginning of flowering stage	variety average rate
Rashid class	8.60 bc	9.13 a	8.66 bc	8.75 a
Tammuz class 2	8.53 c	8.83 abc	8.86 abc	8.78 a
Class APA 99	8.90 abc	8.93 ab	8.86 abc	8.90 a
Application average rate	8.72 b	8.96 a	8.75 b	

2-Protein (%).

The results of Table (2) showed that the cultivar Tammuz 2 excelled with the highest average for the trait amounting to (13.23) % compared to the rational cultivar, which gave the lowest average for the trait amounting to (12.64%). The reason for these differences between the varieties is attributed to their genetic nature and the extent of their response to the physiological processes that affect the formation of the products of photosynthesis. Significant differences are observed between the stages of the addition, as the addition excelled in the stage of four leaves and gave the highest average of the trait amounted to (13.22)%, and the reason is due to the effect of humic in preparing the nutrients needed by the plant for its growth as well as improving the chemical and physical properties of the soil, which helps to increase the dry matter, which was reflected Positively increasing the percentage of protein, while the comparison treatment gave the lowest average for the trait amounted to (12.63)%. Al-Rasheed with the comparison treatment, which gave the lowest mean for the trait amounted to (12.10%)

Table (2) Varieties averages and stages of adding humic acid in protein (%) .

Variety	Humic acid application			variety average rate
	without addition (comparison transaction)	The addition is in the branching stage	Addition at the beginning of flowering stage	
Rashid class	12.10 d	13.10 b	12.73 c	12.46 c
Tammuz class 2	13.10 b	13.50 a	13.13 b	13.23 a
Class APA 99	12.70 c	13.07 b	12.76 c	12.84 b
Application average rate	12.63 c	13.22 a	12.87 b	

3- Wet gluten (%).

The results of Table (3) indicate that the Tammuz 2 cultivar recorded the highest average for the trait amounted to (26.66)%, while the Abaa 99 cultivar gave the lowest average for the trait amounted to (25.00)% and did not differ significantly from the Tammuz 2 cultivar. In this characteristic, it may be due to its difference in the percentage of protein in which the Tammuz 2 variety excelled, and these results were consistent with the results of [12]and [13]. The treatment of humic added at the four-leaf stage was significantly superior with the highest mean for the trait amounting to (27.44%) compared to no addition, which gave the lowest mean for the trait (23.44%). This trait, in turn, increased the percentage of gluten.As for the interaction between the cultivars and the stages of addition, the addition treatment excelled at four leaves and the Tammuz 2 variety, recording the highest value for the trait amounted to (29.00%), while the treatment of the interaction between the rational variety with no addition gave the lowest value for the trait amounted to (22.33%).

Table (3) Varieties averages and stages of humic addition in wet gluten (%)

Variety	Humic acid application			variety average rate
	without addition (comparison transaction)	The addition is in the branching stage	Addition at the beginning of flowering stage	
Rashid class	22.33 d	27.33 ab	25.66 bc	25.11 b
Tammuz class 2	24.33 b	29.00 a	26.66 b	26.66 a
Class APA 99	23.66 cd	26.00 b	25.33 bc	25.00 b
Application average rate	23.44 c	27.44 a	25.88 b	

4-dry gluten (%).

It is clear from the results of Table (4) that the cultivar Tammuz 2 had a significant superiority with the highest average for the trait amounting to (9.60)%, compared to cultivar IPA99 which gave the lowest average for the trait amounting to (21.8)%. The superiority of the Tammuz 2 cultivar in this characteristic may be attributed to its superiority in the proportion of wet gluten, on which dry gluten depends (Table 3). This result was in line with the results of [12] and [13]. The treatment of humic added at the four-leaf stage was significantly superior, with the highest mean for the trait amounting to (9.10%) compared to no addition, which gave the lowest mean for the trait (7.62%). As for the interaction between cultivars and stages of addition, the cultivar Tammuz 2 excelled at the flowering stage and gave the highest value for the trait amounted to (9.96)%, while the Ibaa 99 variety with no addition gave the lowest value for the trait amounted to (7.54%).

Table (4) Varieties averages and stages of humic addition in dry gluten (%).

Variety	Humic acid application			variety average rate
	without addition (comparison transaction)	The addition is in the branching stage	Addition at the beginning of flowering stage	
Rashid class	7.06 de	9.23 ab	8.36 bc	8.38 b
Tammuz class 2	8.96 b	9.96 a	9.76 ab	9.60 a
Class APA 99	7.03 e	8.10 cd	7.30 d	8.21 b
Application average rate	7.62 c	9.10 a	8.47 b	

5-Gluten coefficient.

The results of Table (5) indicate that Al-Rasheed cultivar recorded the highest mean for the trait amounted to (60.14), and did not differ significantly from the cultivar Tammuz 2 (58.04), while the cultivar Abaa 99 gave the lowest mean for the trait amounted to (54.19). To the quality of gluten due to the dependence of the gluten treatment on the percentage of strong gluten that does not pass through the holes of the centrifuge sieve. Therefore, the Tammuz 2 cultivar was superior in the percentage of gluten, which led to its superiority in this trait, as evidenced by the results. (59.16) compared to no addition, which gave the lowest mean for the trait (54.88), and it did not differ significantly from the stage of adding four leaves. The reason for the superiority of this addition of humic acid may be attributed to its superiority in protein (Table 2) and the content of wet (Table 3) and dry gluten (Table 4) Which in turn affected this trait.As for the overlap between cultivars and stages of addition, Al-Rasheed cultivar excelled at the branching stage and gave the highest value for the trait amounted to (62.68), while the cultivar IPA99 with no addition gave the lowest value for the trait amountedto (51.77).

Table (5) Varieties averages and stages of humic acid in the gluten coefficien

Variety	Humic acid application			variety average rate
	without addition (comparison transaction)	The addition is in the branching stage	Addition at the beginning of flowering stage	
Rashid class	57.47abc	62.68 a	60.28 ab	60.14 a
Tammuz class 2	55.40 bc	57.85 abc	60.87 ab	58.04 a
Class APA 99	51.77 c	54.46 bc	56.34 abc	54.19 b
Application average rate	54.88 b	58.33 a	59.16 a	

6-Sedimentation coefficient.

The results of Table (6) showed that the rational cultivar had a significant superiority with the highest mean for the trait amounting to (22.26), and it differed significantly from the cultivar Tammuz 2, which gave the lowest value for the trait amounting to (22.25). Non-glutinous proteins, and this result agreed with what was reached by [13], as evidenced by the results. The stage of adding four leaves was significantly superior to the highest mean for the trait amounted to (27.55) compared to non-adding, which gave the lowest average for the trait (23.88). The reason is due to The role of humic led to an increase in the availability of nutrients, which in turn leads to an improvement in the qualitative characteristics of the grain.As for the interaction between cultivars and the stages of addition, the Al-Rasheed variety excelled at the branching stage and gave the highest value for the trait amounted to (28.66), while the Tammuz 2 variety with no addition gave the lowest value for the trait. It reached (23.33).

Table (6) Varieties averages and stages of adding humic to the sedimentation coefficient

variety	Humic acid application			variety average rate
	without addition (comparison transaction)	The addition is in the branching stage	Addition at the beginning of flowering stage	
Rashid class	24.00 ef	66.28 a	66.26 bc	22.26 a
Tammuz class 2	23.33 f	33.26 bcd	33.25 cde	22.25 b
Class APA 99	33.24 ef	66.27 ab	66.24 def	55.25 ab
Application average rate	88.23 c	55.27 a	55.25 b	

References

[1] Zahid pervaiz , K. H ., Hussain; S. S.H. Gill and A.A. Sheikh (2003). Iron requirement of barani wheat. Int. J. Agri. Biol. 5(4): 608-610.

[2] Al-Alusi, Youssef Ahmed Mahmoud (2003). IntegratedDiagnosis and Recommendation Dris in Nutritional Balance of Wheat Crop, Iraqi Journal of Soil Sciences, 3(1): 119-120.

[3] Groeger ,S,: Loes chenberger , F, and Hetzendorfer , H. (1997) . Breeding For bread making quality in wheat at probstdorfer saatzzucht , Annual wheat news Letter . V . 44

[4] Rollin G. S. 2014. Agronomy Wheat Production Handbook. Kansas State Research and Exlention, Manhattan, Kansas., P: 2-7.

[5]Zidan, Riad and Samir Dayoub. 2005. The effect of some humic substances and amino acids on the growth and production of normal potatoes, Salanumtuberosun L.. Journal of Scientific Studies and Research Publishing. 14 (37): 117-136.

[6] Olaetxea,M.,Mora,V., Garia,A. C.,Santos, L.A.,Baigorri .R,Fuentes, M.etal.2016. Root-Shoot signaling crosstalk involved in the shoot growth promoting action of rhizospherichumic acids plant signal Behav.Plant Signal Behav.J.4(11):1-4.

[7] Jadoua, Khudair Abbas. (1995). Wheat facts and guidelines. Publications of the Ministry of Agriculture. General Authority for Agricultural Extension and Cooperation.

[8] A.A.C.C. (1998). Approved methods of the American Association of Cereal Chem. St.

[9] Gomez,B, H, F ; A . Abugalieva; A. Morgounov and I. Cakmak (2010). Phenotypic correlations, G X E interactions and broad sense heritability analysis of grain and flour quality characteristics in high latitude spring bread wheats from Kazakhstan and Siberia. J. Euphytica. 171 (1): 23-38.

[10] Al-Abdullah, Bayan Yassin and Ali Falih Al-Sarraj. 2016. Practical lessons of grain technology. Ministry of Higher Education and Scientific Research. faculty of Agriculture. TikritUniversity,Iraq.

[11] Zelleny, L. 1947. A simple sedimentation test for estimating the bread-baking and gluten qualities of wheat flour. Cereal Chem. 24, 465-475.

[12] Abu Al-Nadr, Enas Ismail Mohamed. 2019. Response of Varieties of Bread Wheat. aestivum. L) Triticum) levels of nitrogen fertilizer and irrigation under gypsum soil conditions. PhD thesis, Department of Field Crops College of Agriculture, TikritUniversity, Iraq.

[13] Al-Nimrawi. Saad Khalaf Hammad Hussein. 2021. The response of several cultivars of bread wheat to spraying with glutamic acid and the effect of seasons, locations and storage methods on growth characteristics, yield and quality of flour, PhD thesis. Field Crops Department, College of Agriculture, University of Tikrit, Iraq.

تأثير مراحل أضافه حامض الهيومك في الصفات النوعية لثلاث أصناف من حنطة الخبز (*Triticum aestivum* L)

باسم شكور البياتي [1]

Basem76na@tu.edu.iq

[1]قسم المحاصيل الحقلية، كلية الزراعة، جامعة تكريت، صلاح الدين، العراق.

- تاريخ استلام البحث 03/04/2023 وتاريخ قبوله 12/06/2023

المستخلص

نفذت تجربة حقلية في محطة بحوث قسم المحاصيل الحقلية في كلية الزراعة في جامعة تكريت خلال الموسم الزراعة الشتوي 2020-2021 م في تربة جبسيه ، بهدف دراسة تأثير مستويات من حامض الهيومك في بعض صفات الكيميائية لاصناف وهي (الرشيد و تموز 2 و إباء99) وكانت النتائج كما يأتي ولوحظ هناك فروق معنوية بين الأصناف المدروسة .

اذ تفوق صنف تموز 2 في صفات (نسبة البروتين 13.23، نسبة الكلوتين 26.66، نسبة الكلوتين الجاف 9.60)، بينما سجل صنف الرشيد اعلى متوسط الصفتين معامل الكلوتين (60.14)، معامل الترسيب(26.22) . تفوق الموعد الاضافة الثاني في مرحلة التفرعات في صفات (نسبة الرطوبة و نسبة البروتين و نسبة الكلوتين الرطب) ، كما تفوقت مرحلة الإضافة في مرحلة التزهير في صفة معامل الكلوتين ، تفوق المعاملة المشتركة بين صنف الرشيد معنوياً مع الموعد الاضافة الثاني في أعطاء أعلى متوسطات عند مرحلة التفرعات في صفات نسبة الرطوبة و معامل الكلوتين ، معامل الترسيب بينما تفوق صنف تموز2 مع الموعد الثاني عند التفرعات ، اما صفة نسبة البروتين و نسبة الكلوتين الرطب و تفوقت معاملة التداخل تموز2 مع الموعد الثالث عند التزهير في صفة نسبة الكلوتين الجاف .

الكلمات المفتاحية: الحنطة، اصناف، حامض هيومك، الصفات النوعية