

Effect of Amino Acids and Nano Fertilizers on Qualitative Characters of Two Varieties of Rye Wheat

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ARTICLE INFO	ABSTRACT
Received: December 22, 2023 Accepted: January 20, 2024 Volume: 4 Issue: 1	This study was applied in field for season 2021-2022 in Telkaif district, north of Mosul city, in order to find out the response of two varieties of rye wheat (Sara and Rizan) and seven treatments of soaking of the seed with polyamine amino acids and N20P20K20 nano fertilizer in concentrations (0, 2000, 4000 ppm amino acids, 1500, 3000 ppm nano- Fertilizer, 2000 ppm amino acids + 1500 ppm nano- Fertilizer, 4000 ppm amino acids + 3000 ppm nano- Fertilizer) for Qualitative traits. Where is significant superior in content of each (moisture, protein, ash, fat and wet gluten) which amounted to (10.41, 13.54, 2.15, 2.09 and 31.97)% respectively. As for the soaking treatment ,the control treatment were superior in content of both moisture and carbohydrates, and the fourth treatment in content of both fat and grain hardness, and the sixth treatments in content of each protein , ash and wet gluten . Effect of interaction between varieties and soaking treatments on all traits.
KEYWORDS Amino acids, Nano fertilizers, Hardness	

1. Introduction

Rye wheat (Triticale) is the first cereal crop produced by man that combines the characteristics of wheat (Triticum) and rye (Secale), which has the characteristics of a new compound that may outperform the current cereal crops, as it combines the high yield and high protein content of wheat with the ability to withstand conditions the harsh environment and high content of lysine for rye as well as its use in ruminant and poultry diets (El-Matually, et.al, 2012). The qualitative traits of grains such as content each of (moisture, protein, Ash, fat, carbohydrate) in grains play an effective and important role in determining price policy and raising manufacturing efficiency and product qualitative (Roberts, et.al, 2022) . Therefore, it is necessary to choose good quality varieties, as well as pay attention to using techniques that improve the qualitative characteristics of the plant one of these techniques is soaking seeds with water or chemical solutions before planting them for a specific period of time without allowing them to germinate and re-drying them to their original moisture and then replanting them after that, It may improve the vital activity of the seeds, especially the relatively degraded seed, It also reduces the time between sowing seeds and the emergence of seedlings, accelerating and homogenizing the germination and thus obtaining the optimum plant density and reducing the competition of the weeds and its reflection on the growth, yield and quantitative traits of the plant (Iqbal, et al., 2015).

The use of nanotechnology is one of the most important modern technologies and is considered an effective alternative to traditional fertilizers due to the small size of its particles, which are (1-100) nanometers, and thus nano-fertilizers increase the absorption of nutrients easily, as both the surfaces of the leaves and the root of the plant are the gateway to enter the main nutrients for plants, which facilitates Their penetration with nanomaterials, and thus nanofertilizers facilitate the complex absorption process using molecular carriers or through internal cellular channels (Mastronardi, et al., 2015). These

nanomaterials also increase the plant's ability to resist diseases, unfavorable conditions and an increase in the efficiency of fertilizer use as a result of its easy penetration into plant cells, which is reflected in the characteristics of agricultural production and qualitative traits (Ghorbani et al., 2011).

The importance of amino acids comes through increasing the plant's ability to withstand unfavorable environmental stress conditions such as temperatures, low humidity, increased salinity, and others, as well as being one of the main cellular components of the plant that contribute to the formation of chlorophyll, thus increasing the rate of photosynthesis and regulating the number of branches in the plant and its reflection in growth and components of the yield and the qualitative of grains (Mohamad, et al., 2016).

The agricultural field faces many challenges, the most important of which is climate change and reduction of agricultural areas, This requires the advancement of agriculture to support the agricultural and economic aspects, And here comes the importance of nano-fertilizers to address the problem of low crop productivity and loss of resources, including water, fertilizers and pesticides. As well as achieving self-sufficiency for the growing number of people, which can be solved through modern technologies (Al-Qudsi, et al., 2021) .

2. Materials and Methods

This research Conducted in field for winter season 2021-2022 in Telkaif district (25 km) north The city of Mosul, its location within the belt of semi-precipitated areas with rainfall rates ranging between 350-500 mm per year to study the impact of seed activation treatments using the method of soaking seeds before planting seed priming with soaking treatments (nano fertilizers, amino acids) for two varieties of rye wheat and studying the extent of their effect on reviving and revitalizing seeds and reducing the harmful effects of temperature and low humidity and increasing the plant's ability to absorb the largest possible amount of fertilizer elements and its reflection on qualitative traits .

2.1. Experiment Parameters

The experiment included 14 factorial treatments that represented the compatibility between two varieties of Triticale (Sara, Rizan) and seven Soaking Coefficients .

Nano-fertilizer NPK 20:20:20: a fertilizer with ultra-fine particles that dissolves completely in water and is used to legalize the use of fertilizers figure (1).

POLYAMIN: It is an organic compound in the form of a water-soluble powder that contains 90% amino acids that has the ability to stimulate the plant to overcome stress conditions figure (2).



Figure(1) : Nano-fertilizer NPK 20:20:20



Figure (2) : POLYAMIN

The study factors were as follows:

Items : (Sara, Rizan)

Seeds of both varieties were obtained from the General Authority for Seed Examination and Certification/Erbil.

Soaking Coefficients : The seeds were soaked in distilled water for 24 hours, then dried using air, the treatments were:

First treatment (0) control

Second treatment (1500 ppm nano fertilizer)

Third treatment (3000 ppm nano fertilizer)

Fourth treatment (2000ppm amino acids

Fifth treatment (4000 ppm amino acids)

Sixth treatment (1500 ppm nano fertilizer + 2000 ppm amino acid)

Seventh treatment (3000 ppm nano fertilizer + 4000 ppm amino acids)

2.2. Statistically analyzed

The using design of R.C.B.D accordingly to the split plots arrangement with three replications,. The varieties occupied the major plots and the soaking coefficients the secondary plots. Duncan test was used to compare the means of the coefficients .

2.3. Agricultural operations

Planting lines were opened using a specialized seed for preservative cultivation (Zero Tillage) called Ras al-Rahm, which is a locally-made seed for the preservative agriculture program (300 grains / m²) was planted manually . The experimental unit included four lines, each with a length of (100cm), and a distance of (25cm) between each of them. Seed rate was 100kg/ha t,he planting date was on 8/12/2021 and harvest on 28/5/2022 .

2.4. Soil analysis

Soil taken from different sites at a depth of (zero - 30 cm) before planting and mixed to ensure the consistency of the experiment soil, air-dried, then ground and analyzed in the Environmental Protection and Improvement Department / Dohuk Environment / Laboratories Division. To determine the chemical and physical traits Table (1), the rainfall rates were taken from the Al-Anwa station for the Telkaif site for the season 2021-2022 affiliated to the Nineveh Agriculture Directorate Table (2)

Table (1) Results of soil sample analysis for Telkef site

Clay %	Gre n %	Sand %	Textura l	Availabl e nitrogen ppm	Available phosphorou s ppm	Available potassiu m ppm	organi c matter	P H	EC (dc/ m)
20.30	45.20	34.50	Loam	67.0	48.07	260	1.22	7.3	0.268

Source : Department of Environmental Protection and Improvement / Dohuk Environment / Laboratories Division

Table (2) The average rainfall for the season 2021-2022 for Telkef site

Month – year	Octo. 2021	Nove. 2021	Dece. 2021	Janu. 2022	Febr. 2022	March 2022	April 2022	May 2022	Total /mm
Telkif	0	0	76	117	16.5	24	13	31	278

Source: Nineveh Agriculture Directorate / Planning Department

2.5. Studied traits

1. Moisture Content % (MC%)

2. Protein Content % (PC%)

3. Ash Content (AC%)

estimated the above traits by grinding 20 g of grain with an electric grinder and placing it in (Inframatic 8600 device) equipped by the Swiss company Perten to read these traits (Figure 3).

4. Fat Content (FC%) : Estimated by Soxhlet device , and According to the method mentioned in (AOAC,2000).

5. Carbohydrate Content %(CC%): Calculated according to the following formula:

Total Carbohydrates (%) = 100- (Moisture% + Protein % + Fat% + Ash%).

6. Wet Gluten Content % (WGC%): Estimated by glutamic washing device.

7. Grain Hardness % (GH%): The estimate was put 20 g of unground grains in (Inframatic 8600 device) to read this trait.



Figure 3 : Inframatic 8600 device

3. Results and Discussion

Moisture Content % (MC%)

Table (3) showed that Sara variety was superior in MC% which gave (10.41%) compared with Rizan variety which amounted (10.05%) , The reason may be due to the genetic factors of the varieties in creating a sufficient root system able to increase efficiency of water absorption from the soil down to the grain, especially at last stages of plant growth and grain filling, This is consistent with (Al-Ajrawy et al., 2023) . As for the soaking treatments, it was noticed that control treatment record high rate in MC% (10.70%) compared with PA 2000 ppm + NPK 1500 ppm which record the low value in MC% (9.70%) . As for the interaction between the varieties and soaking treatments , it was showed superior interaction of Sara variety with control treatment (10.90%) compared with interaction of Rizan variety with PA 2000 ppm + NPK 1500 ppm which record (9.60%).

Table(3):Effect of Varieties and Amino acids and Nano fertilizers on Moisture Content % .

Amino acids and Nano fertilizers	Varieties		Means of Amino acids and Nano fertilizers
	Sara	Rizan	
Control	10.90 a	10.50 b-d	10.70 a
PA 2000 ppm	10.80 ab	10.30 c-e	10.55 ab
PA 4000 ppm	10.60 a-c	10.20 d-f	10.40 bc
NPK 1500 ppm	10.10 e-g	9.80 gh	9.95 d
NPK 3000 ppm	10.50 b-d	10.07 e-f	10.28 c
PA 2000 ppm + NPK 1500 ppm	9.80 gh	9.60 h	9.70 e
PA 4000 ppm + NPK 3000 ppm	10.20 d-f	9.90 f-h	10.05 d
Means of Varieties	10.41 a	10.05 b	

The treatments of same letter no differ significantly at level of probability 5 percent.

Protein Content % (PC%)

Table (4) indicated that Sara variety was significantly superior in PC% (13.54%) compared with Rizan variety which record (12.96%), The variation in protein content between varieties is due to the genetic factors of variety and the nature of its growth, in addition to variation in efficiency of shoots of different varieties in reassembling the protein produced in plants, which results in a variation in the content of protein in grains, and this is what was indicated (Lalevic, et al.,2022 and Dziki et al., 2023) . As for the soaking treatments, PA 2000 ppm + NPK 1500 ppm achieved significantly increase in PC% (14.62%) compared with control treatment which achieved (11.95%), increase in percentage of protein in grains at the sixth treatment is due to nitrogen available in the nano composite fertilizer and amino acids which is involved in protein synthesis. This result is agreed with (Jaskiewicz and Szczepanek ,2018 and Al-Obaidi and Alrijabo ,2021). As for the interaction, Sara variety with NPK 1500 ppm and PA 2000 ppm + NPK 1500 ppm achieved significantly in this trait (14.70 and 15.10%) compared with Rizan variety with control treatment (11.80%).

Ash Content (AC%): Table (5) showed that Sara variety significantly superior on Rizan variety in AC% amounted to (2.15%) while Rizan variety recorded the low rate in AC% (2.01%), The increase in ash content in grains is due to the decrease in moisture content (Table 3). This result agreed with (Rozewicz ,2022 and Dziki et al., 2023) . As for the soaking treatments, PA 2000 ppm + NPK 1500 ppm gave high significant mean in AC% (2.25%) compared with control treatment (1.90%), The reason may be attributed to low moisture content in the grains (Table 3), which increased ash content. As for the interaction, Sara variety with PA 2000 ppm + NPK 1500 ppm record high value in this trait (2.31%) compared with Rizan variety with control treatment (1.83%).

Table(4):Effect of Varieties and Amino acids and Nano fertilizers on Protein Content % .

Amino acids and Nano fertilizers	Varieties		Means of Amino acids and Nano fertilizers
	Sara	Rizan	
Control	12.10 ef	11.80 f	11.95 f
PA 2000 ppm	12.60 de	12.20 ef	12.40 e
PA 4000 ppm	13.10 c	12.57 de	12.83 d
NPK 1500 ppm	14.70 a	13.80 b	14.25 b
NPK 3000 ppm	13.30 c	12.90 cd	13.10 d
PA 2000 ppm + NPK 1500 ppm	15.10 a	14.13 b	14.62 a
PA 4000 ppm + NPK 3000 ppm	13.90 b	13.30 c	13.60 c
Means of Varieties	13.54 a	12.96 b	

The treatments of same letter no differ significantly at level of probability 5 percent.

Table(5):Effect of Varieties and Amino acids and Nano fertilizers on Ash Content %.

Amino acids and Nano fertilizers	Varieties		Means of Amino acids and Nano fertilizers
	Sara	Rizan	
Control	1.98 d-f	1.83 f	1.90 e
PA 2000 ppm	2.03 c-e	1.90 ef	1.97 de
PA 4000 ppm	2.09 cd	1.96 d-f	2.02 c-e
NPK 1500 ppm	2.28 ab	2.12 b-d	2.20 ab
NPK 3000 ppm	2.14 a-d	2.00 d-f	2.07 cd
PA 2000 ppm + NPK 1500 ppm	2.31 a	2.20 a-c	2.25 a
PA 4000 ppm + NPK 3000 ppm	2.20 a-c	2.06 c-e	2.12 bc
Means of Varieties	2.15 a	2.01 b	

The treatments of same letter no differ significantly at level of probability 5 percent.

Fat Content (FC%)

Table (6) explain that Sara variety significant effect in FC% and gave high rate (2.09%) compared with Rizan variety (2.01%), This attributed to the nature of two varieties, as well as the difference in collection and accumulation of fat in the grains, which resulted in a difference in content of fat in grains

of two varieties. This finding is in agreement with (Watanabe, et al.,2019 and Rozewicz ,2022) . In soaking treatments, we notice that NPK 1500 ppm record high significant rate in FC% (2.16%) compared with control treatment (1.95%), This attributed to the role of nitrogen, phosphorus and potassium in participating in all physiological processes and the enzymes accompanying them in the process of photosynthesis, which led to an increase in accumulation of the products of this process in the grains as a result of the transformation of a large amount of carbohydrates into fat. As for the interaction, Sara variety with NPK 1500 ppm and PA 2000 ppm + NPK 1500 ppm record high rate in this trait (2.18 and 2.15%) compared with Rizan variety with control treatment (1.90%).

Table(6):Effect of Varieties and Amino acids and Nano fertilizers on Fat Content %.

Amino acids and Nano fertilizers	Varieties		Means of Amino acids and Nano fertilizers
	Sara	Rizan	
Control	2.00 c-e	1.90 e	1.95 d
PA 2000 ppm	2.06 a-d	1.96 de	2.01 cd
PA 4000 ppm	2.08 a-d	1.99 c-e	2.04 b-d
NPK 1500 ppm	2.18 a	2.14 ab	2.16 a
NPK 3000 ppm	2.08 a-d	1.99 c-e	2.04 b-d
PA 2000 ppm + NPK 1500 ppm	2.15 a	2.07 a-d	2.11 ab
PA 4000 ppm + NPK 3000 ppm	2.10 a-c	2.02 b-e	2.06 bc
Means of Varieties	2.09 a	2.01 b	

The treatments of same letter no differ significantly at level of probability 5 percent.

Carbohydrates Content % (CC%)

We note from Table (7) that trait CC% was not significantly affected by the varieties factor, .This result is not agreed with (Salehi and Arzani, 2013). In soaking treatments, control treatment record high rate in CC% (73.50%) compared with PA 2000 ppm + NPK 1500 ppm which record low value in CC% (71.32%), This finding in correspond with (Burhan and. AL-Hassan ,2019), This may be due to difference between the chemical components of grain of treatments which effect on content carbohydrate. and as for the interaction, we notice that Rizan variety with control treatment gave high rate in this trait (73.97) compared with Sara variety with PA 2000 ppm + NPK 1500 ppm (70.64%).

Wet Gluten Content % (WGC%)

Table (8) shown that that Sara variety was superior in WGC% which achieved (31.97%) compared with Rizan variety (29.43%) , This is due to the increased protein content (Table 4).This result in correspond with (Zhukov et al.,2022) , Who found a direct relationship between content of protein and gluten in grains. In soaking treatments,PA2000ppm +NPK1500ppm achieved significantly increase in this trait (%34.43) compared with control treatment which achieved (26.68%),the effect of soaking treatments on increasing percentage of gluten in grains results from increasing percentage of protein in them (Table 4).This finding agreed with (Burhan and. AL-Hassan ,2019) .As noted significant interaction between varieties and soaking treatments, where the interaction between Sara variety and PA2000ppm

+NPK1500ppm achieved high rate (35.50%) while achieved interaction between Rizan variety and control treatment gave low rate (25.80%).

Table(7):Effect of Varieties and Amino acids and Nano fertilizers on Carbohydrates Content % .

Amino acids and Nano fertilizers	Varieties		Means of Amino acids and Nano fertilizers
	Sara	Rizan	
Control	73.02 b-d	73.97 a	73.50 a
PA 2000 ppm	72.51 d-f	73.64 ab	73.03 ab
PA 4000 ppm	72.13 e-g	73.28 bc	72.71 bc
NPK 1500 ppm	70.74 h	72.14 e-g	71.44 e
NPK 3000 ppm	71.98 fg	73.04 b-d	72.51 cd
PA 2000 ppm + NPK 1500 ppm	70.64 h	72.00 fg	71.32 e
PA 4000 ppm + NPK 3000 ppm	71.60 g	72.72 c-e	72.16 d
Means of Varieties	71.80 a	72.97 a	

The treatments of same letter no differ significantly at level of probability 5 percent.

Table(8):Effect of Varieties and Amino acids and Nano fertilizers on Wet Gluten Content % .

Amino acids and Nano fertilizers	Varieties		Means of Amino acids and Nano fertilizers
	Sara	Rizan	
Control	27.57 f-h	25.80 h	26.68 e
PA 2000 ppm	29.10 fg	27.30 gh	28.20 d
PA 4000 ppm	31.87 c-e	28.03 fg	29.95 c
NPK 1500 ppm	34.50 ab	31.10 e	32.80 b
NPK 3000 ppm	32.23 c-e	29.20 f	30.72 c
PA 2000 ppm + NPK 1500 ppm	35.50 a	33.37 bc	34.43 a
PA 4000 ppm + NPK 3000 ppm	33.00 b-d	31.20 d-e	32.10 b
Means of Varieties	31.97 a	29.43 b	

The treatments of same letter no differ significantly at level of probability 5 percent.

Grain Hardness % (GH%) : Table (9) explain that GS% was significantly affected by variation the varieties, where the Rizan variety record the highest rate(15.79%), As for the Sara variety record the lowest rate (13.98%) , This is due to the genetic nature of the varieties. This result is similar in correspond with (Kselikova et al., 2020 and Zhukov et al.,2022) .In soaking treatments, NPK1500ppm record highest significant rate (15.50%), compared with control treatment which achieved (14.17%), This is attributed to nature of the genetic factors controlling the hardness trait of the variety to produce better growing and stronger plants and produce fuller grains, which is reflected in the intensity of the accumulation of nutrients in the grains and thus increasing their hardness. As for the interaction, Rizan variety with NPK 1500 ppm record significant high in this trait (16.37%) compared with Sara variety with control treatment (13.23%).

Table(9):Effect of Varieties and Amino acids and Nano fertilizers on Grain Hardness %.

Amino acids and Nano fertilizers	Varieties		Means of Amino acids and Nano fertilizers
	Sara	Rizan	
Control	13.23 j	15.10 e	14.17 f
PA 2000 ppm	13.70 i	15.60 d	14.65 e
PA 4000 ppm	13.80 i	15.77 cd	14.78 d
NPK 1500 ppm	14.63 f	16.37 a	15.50 a
NPK 3000 ppm	14.07 h	15.90 bc	14.98 c
PA 2000 ppm + NPK 1500 ppm	14.40 g	16.03 b	15.21 b
PA 4000 ppm + NPK 3000 ppm	14.00 h	15.73 cd	14.87 cd
Means of Varieties	13.98 b	15.79 a	

The treatments of same letter no differ significantly at level of probability 5 percent.

4. Conclusions

The interaction of genetic and environmental factors led to variance between the Sara and Rizan varieties in qualitative traits, where the Sara variety achieved high percentages in all traits except carbohydrate content and grain hardness. As well as the use of soaking treatments (PA2000ppm +NPK1500ppm) gave significant increase in most of qualitative traits compared control treatment , Therefore, we find that it worked to provide the basic nutrients necessary for germination seedlings, increase the speed of division and expansion, and accelerate their growth to escape drought, and this is reflected in the manufacture of proteins from add amino acids and nano fertilizer, as well as carbohydrates, and storing them in the seeds, which improved the qualitative traits .

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