

## Yield Response of two Varieties of Rye Wheat to amino acids and nano-fertilizers

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**Abstract:** This study was applied in season 2021-2022 in Telkaif district, north of Mosul city, in order to find out the response of two use varieties of rye wheat (Sara, Rizan) and seven levels of seed treatments of nano fertilizer and amino acids (polyamine) to yield traits and its components. Where is used design of R.C.B.D according to the split panels system and with 3 replicate. The variety Sara was significant superior in no. the spikes.m<sup>2</sup>, no. the grains. spike-1, biological yield, grain yield , which amounted to (146.2, 35.2, 375.5, 122.5) respectively, and the second and third treatments were superior to the number of spikes.m<sup>2</sup>, and the second treatment to the biological yield and straw yield, while the fourth, fifth, sixth and seventh treatments record the highest average for yield of grain and the interaction between the variety Sara and the sixth treatment gave a significant superiority in trait of spike length, biological yield and grain yield.

**Key words:** rye wheat, amino acids, nano-fertilizers, traits yield

### Introduction

The rye wheat (Triticale) is the first cereal crop produced by man through cross-breeding between wheat and rye, as it has new traits that may outperform the current cereal crops , This crop can be grown in areas that are not guaranteed rain, along with barley or as a substitute for it, as it is more tolerant of drought, and it is used in soils that are not suitable for other crops, such as sandy and acidic soils and poor soils that suffer from a deficiency in mineral elements (1), The rate of production of rye wheat per unit area in Iraq is below the required level compared to neighboring countries such as Jordan and Kuwait (2) the process of revitalizing seeds before planting them by soaking in different solutions is known as seed soaking, It is the process of encouraging seed germination and growth. The seeds are then replanted (3) .

The use of nano-fertilizers significantly affects the yield of grain compared to the control treatment (4) ,also the use of nano fertilizer for plants is a good alternative to conventional fertilizer, as nanofertilizers availability large

area for vital processes in plant, as photosynthesis, which increase dry matter and therefore crop yield (5). Nano-fertilizers also increase nutrient uptake by plants, improve ( 17 - 54 % ) in crop yield, and release many different beneficial enzymes to improve soil health , nutrient uptake (6).Using (7) soaking technique on bread wheat and its influence on yield and Its components in rain fed area. 2000ppm nano-fertilizer soaking wheat seeds .

As for amino acids, they are natural compounds that work on a good balanced growth of plants, and benefit from fertilizer and its resistance to diseases, in addition to the micro-elements that stimulate the flowering process in field crops and increase the strength of their resistance to diseases. Amino acids are one of the main components of the plant that participate in the process of photosynthesis , increase The no. of branches in the plant and thus the increased in yield and its components (8).

The agricultural field faces many challenges, the most important of which is climate change 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 (9) .

### Materials and Methods

This research Conducted in the 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 cultivars 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

and reduction of agricultural areas, This on the traits of germination, growth and yield.

### 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 .

POLY AMIN: 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.



The study factors were as follows:

Items : (Sara, Rizan)

Seeds of both cultivars 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 transaction (0) control

The second treatment (1500 ppm nano fertilizer)

The 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 )

### 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

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

### Statistically analyzed

The using design of R.C.B.D accordingly to the split plots arrangement with three replications, and each replicate consists of (14) experimental units. The varieties occupied the major plots and the soaking coefficients the secondary plots. Duncan test was used to compare the means of the coefficients .

### 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 / m<sup>2</sup>) 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 the planting date was on 8/12/2021 and harvest on 28/5/2022 .

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

Clay %	Gren %	Sand %	Textural	Available nitrogen ppm	Available phosphorous ppm	Available potassium ppm	organic matter	PH	EC )dc/ m(
20.30	45.20	34.50	Loam	670	48.07	260	1.22	7.3	0.268

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

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

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

Source: Nineveh Agriculture Directorate / Planning Department

### Studied traits

Number the spikes .  $m^{-2}$  (NS)

Number the grains .  $spike^{-1}$  (NGS)

Weight the grains .  $spike$  (WGS) (g)

Weight 1000 grain (W1000G) (g)

Length of spike (LS) (cm) : The lengths of 10 spikes were measured from their base to their top (no spike) and then their average lengths were extracted.

Biological yield(BY)  $g/m^2$ : It is the weight of grain and straw harvested from an area of  $1 m^2$  . (10) .

Grain yield(GY)  $g/m^2$ : It was calculated for square meter, where the resulting seeds were harvested and collected from the square meter, and the yield was calculated in  $g/m^2$  .

Straw yield(SY) ( $g/m^2$ ) : It was calculated from the following equation

$$SY = BY - GY$$

Harvest index(HI) %

### Results and Discussion

#### Number the Spikes. $m^{-2}$ (NS)

Table (3) showed that Sara was superior to the variety of  $spike.m^2$  in terms of the number the spikes. $m^{-2}$  over Rizan, which gave (146.2 spikes. $m^{-2}$ ), As for Rizan cultivar record low rate of spikes. $m^{-2}$  which amounted to (114.5 spikes. $m^{-2}$ ). As for the soaking treatments, it

was noticed from Table (4) that the second and third treatments record high rate for the character which reached 149.3, 150.1, respectively. Table (5) also explain that there is a significant(sig.) increase between the varieties and the soaking treatments, where the interaction between the variety gave Sara with The third treatment record high rate of the character reached (186.33 spike. $m^{-2}$ ).

#### Number the Grains . $spike^{-1}$ (NGS)

Table (3) indicated that Sara was significantly superior to the number the grains in the spike (35.2 grains. $spike^{-1}$ ), while Rizan cultivar record the lowest value (27.7 grains. $spike^{-1}$ ). As for the soaking treatments, Table (4) explain that there is significant variance between the treatments, the fifth treatment achieved the highest value (34.8 grains. $spike^{-1}$ ), while the first and second treatments achieved the lowest value (29.6 27.4grain. $spike^{-1}$ ) respectively, and the interaction was shown in Table (5). Sara was superior to the intervention with all soaking treatments except for the first treatment on Rizan and its interactions with soaking treatments amounted to 37.43 (grain. $spike^{-1}$ ) for Sara's intervention with the fourth treatment, while intervention between cultivar Rizan with the first treatment (control) record the lowest rate reached (22.50 grains. $spike^{-1}$ ) .

#### Weight the Grains . $spike^{-1}$ (WGS) (g)

Table (3) explain the varieties(Sara, Rizan) did not have a significant effects on the grains weight .  $spike^{-1}$ .As for the soaking treatments, we notice from Table (4) that the fourth, sixth and seventh treatments record the highest rate (1.38, 1.38, 1.41 g) for the

treatments respectively, while the first treatment (control) record the lowest value (1.22 g). It was shown in Table (5) that there was an overlap between the varieties and the soaking treatments, where the cultivar Sara, in combination with the fourth treatment, record high rate for the character (1.63 g) .

**Weight 1000 Grain (W1000G) (g):** Table (3) explain that weight 1000 grain was not significantly differ between the varieties factor, as there were no significant differences between them. While the Table (4) indicated that the fourth treatment achieved significantly increase in this trait reached (44.41 g), while the third treatment record the lowest value (36.71 g). It was shown in Table (5) that there was an overlap between the varieties and the soaking coefficients for this trait, where the variety Sara, in combination with the fourth treatment, recorded the highest rate (46.73g).

### **Spike Length (SL) (cm)**

We note from Table (3) that the characteristic of spike length was not significantly affected by the varieties factor, as there were no significant contrast between them. In for the soaking treatments, the Table (4) indicated that the sixth treatment had the highest rate (10.46 cm) , while control treatment gaved lowest rate (9.33 cm), and as for the interaction, we notice from Table (5) The variety Sara outperformed with the six treatment significantly and gave the highest rate (11.63 cm), while the interaction between the variety Rizan with the first treatment (control) recorded the lowest value (8.50 cm).

### **Biological Yield (BY) ( g.m<sup>-2</sup>)**

Table (3) shown that the varieties did not have a significant effects on the biological yield, the variety Sara record the highest value (375.5 g), As for the variety Rizan record the lowest value (323.5 g), The Table (4) indicates the significant variance between soaking treatments, second treatment record the highest rate of the trait amounted to (395.67

g), As for control treatment achieved the lowest rate (263.67 g). Table (5) There is a significant interaction between the cultivars and the soaking treatments, where the interaction between the variety Sara and the sixth treatment achieved the highest rate of (420g), As for the overlap between variety Rizan and without soaking treatment gave lowest rate of (240 g).

**Grain Yield (GY) ( g.m<sup>-2</sup>) :** Table (3) explain that grain yield did not affected by different varieties, where the variety Sara record the highest rate (122.5 g), As for the variety Rizan record the lowest rate (91.2 g), In soaking treatments, the Table (4) show that the fourth, fifth, sixth and seventh treatments record highest rate (124.50, 110.16, 119.00, 121.66 g), respectively, while the first, second and third treatments achieved the lowest rate (85.500, 95.00 , 92.50 g), respectively, and the reason for this is that the nano-fertilizer active vegetative growth at the expense of fruit growth and thus a decrease in grain yield. Table (5) indicate that there is a significant overlap between the varieties and the soaking treatments, where the fourth and sixth treatments gave the highest rate for the variety reached (152.23 and 159.00 g), respectively, As for the overlap between variety Rizan and without soaking treatment gave lowest rate for the variety reached (75.00 g).

### **Straw Yield (SY)( g.m<sup>-2</sup>)**

We note from Table (3) that the characteristic of straw yield was not significantly affected by the varieties factor, as there were no significant differences between them, While Table (4) indicated that there were a significant variance between soaking treatments, the second treatment achieved the highest rate of the trait (300.83 g), As for the first treatment (control) record low rate of the character reached (193.50 g.m<sup>-2</sup>). we note from Table (5) There was a significant superiority of the variety Sara and Rizan with the interaction with the second treatment, and it gaved the highest value (303.33 and 298.33g) for the two interventions

respectively, As for the overlap between variety Sara and Rizan with without soaking treatment gave lowest rate of the phenotype amounted to 191.33 and 195.67 g) for the two interventions. Straight . The reason for this is that the nucleated manure and this active vegetative growth at the expense of fruitful growth, and thus rise straw yield.

**Harvest Index (HI) (%) :** We note from Table (3) that harvest index was not significantly affected by the varieties factor. between them As for the, Table (4) indicated that did not have a significant effects on the harvest index between soaking treats, where the fourth, sixth and seventh treatments record the highest rate of the trait (33.58, 32.61, 33.76%) for the above treatments, respectively, the second treatment record the lowest rate for the trait (23.25%). The table (5) shows that there is a significant interaction between the variety Sara and the fourth treatment, which achieved the highest rate of the phenotype reached (39.00%), As for the overlap between variety Sara and the second

treatment record lowest rate of the phenotype amounted to (23.40%).

### Conclusions

1- The Sara variety outperformed in most of the yield traits.

2 - The use of soaking treatments (nano fertilizers) gave significant increase in in yield of biological.

3- Use the soaking treatments (amino acids) record significant increase in yield of grain.

### Recommendations

1- Use Sara variety in agriculture for its superiority in most of the yield traits .

2 - Use 1500ppm soaking treatment of nano-fertilizer

3 - Using the 2000ppm soaking treatment of amino acids

**Table (3) : Effect of varieties (Sara, Rizan) on the studied traits.**

<b>Traits</b> <b>Varieties</b>	<b>NS</b>	<b>NGS</b>	<b>WGS</b>	<b>W1000 G</b>	<b>SL</b>	<b>BY</b>	<b>GY</b>	<b>SY</b>	<b>HI</b>
<b>Sara</b>	146.2 a	35.2 a	1.4 a	40.8 a	10.8 a	375.5 a	122.5 a	252.4 a	32.6 a
<b>Rezan</b>	114.5 b	27.7 b	1.2 a	39.4 a	9.8 a	323.5 b	91.2 b	236.6 a	28.1 a

Similar characters within the column and row are not significantly different from each other at the probability level (5%).

Table (4): Effect of Soaking treatment on the studied traits.

Traits Soaking treatment ppm) (	NS	NGS	WGS	W1000 G	SL	BY	GY	SY	HI
0	93.0 d	29.6 bc	1.22 b	40.90 bc	9.33 b	263.67 c	85.500 b	193.50 c	31.01 ab
1500 (Na)	149.3 a	27.4 c	1.31 ab	38.51 cd	9.91 ab	395.67 a	95.00 b	300.83 a	23.95 c
3000 (Na)	150.1 a	33.4 ab	1.23 b	36.71 d	10.15 ab	333.33 b	92.50 b	240.83 b	28.70 b
2000 (p)	146.0 ab	33.0 ab	1.38 a	44.41 a	10.03 ab	362.33 ab	124.50 a	237.83 b	33.58 a
4000 (p)	131.1 bc	34.8 a	1.32 ab	39.30 b-d	9.98 ab	372.67 ab	110.16 a	262.50 b	29.35 b
1500 +2000	127.8 b	31.7 ab	1.38 a	40.25 bc	10.46 a	360.00 ab	119.00 a	240.83 b	32.61 a
3000+ 4000	115.5 c	32.9 am	1.41 a	42.06 ab	10.16 ab	359.33 ab	121.66 a	235.67 b	33.76 a

Similar characters within the column and row are not significantly different from each other at the probability level (5%).

Table (5) : Effect of the overlap between Varieties and Soaking treatment on the studied traits.

Traits										
Varieties	soaking treatment ( ppm)	NS	NGS	WGS	W1000 G	SL	BY	GY	SY	HI
Sara	0	93.33 g	32.20 a-c	1.43 b-d	41.36 b-d	10.16 a-d	287.33 gh	96.00 cd	191.33 c	33.13 b-e
	1500 n	149.67 bc	36.83 a	1.16 e	35.36 ef	11.13 ab	396.00 a-c	93.00 cd	303.33 a	23.40 i
	3000 n	186.33 a	38.00 a	1.30 c-d	32.60 f	10.66 a-c	345.00 a-g	90.00 cd	255.00 ab	27.73 f-h
	2000 a	105.67 f-g	37.43 a	1.63 a	46.73 a	10.73 a-c	406.00 ab	159.00 a	247.00 a-c	39.00 a
	4000 a	117.33 d-f	36.00 a	1.30 c-e	37.26 de	10.66 a-c	386.00 a-b	129.00 b	257.00 ab	33.40 b-d
	1500 +2000	114.00 e-g	35.30 ab	1.50 a-c	42.36 bc	11.63 a	420.00 a	152.33 a	267.33 ab	36.23 a-b
	3000+ 4000	92.00 g	36.10 a	1.53 ab	42.80 ab	10.60 a-c	388.67 a-c	138.33 ab	246.33 a-c	35.80 a-c
Rizan	0	92.67 g	22.50 d	1.33 c-e	40.43 b-d	8.50 e	240.00 h	75.00 d	195.67 c	28.90 f-g
	1500 n	149.00 bc	22.60 d	1.23 d e	41.80 b-d	8.70 d-e	395.33 a-c	97.00 cd	298.33 a	24.50 hi
	3000 n	170.33 ab	28.90 c	1.16 e	40.86 b-d	9.63 c-e	321.67 d-g	95.00 cd	226.67 bc	29.66 d-g
	2000 a	130.00 d-e	28.73 c	1.13 e	42.10 bc	9.33 c-e	318.67 e-f	90.00 cd	228.67 bc	28.16 f-h
	4000 a	145.00 c	33.70 a-c	1.30 c-e	41.33 b-d	9.30 c-e	359.33 a-f	91.33 cd	268.00 ab	25.30 g-i
	1500 +2000	141.67 c	28.23 c	1.13 e	38.13 c-e	9.30 c-d	300.00 f-h	85.66 cd	214.33 bc	29.00 f-g
	3000+ 4000	139.00 cd	29.76 bc	1.30 c-e	41.33 b-d	9.73 b-e	330.00 c-g	105.00 c	225.00 bc	31.73 d-f

Similar characters within the column and row are not significantly different from each other at the probability level (5%).

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