Al-Furat Journal of Innovations in Agricultural Sciences (FJIAS)

Response of Five Varieties of Rice to Nitrogen Fertilization Levels

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FJIAS 2025, 1(2): 82-89

Abstract: A field experiment was carried out for the 2020 agricultural summer season in Babylon Governorate / Al-Musayyab 45 km north of the governorate with the aim of evaluating the performance of five Varities of rice and the content of these Varities of some active substances by the effect of three levels of nitrogen fertilization (0, 175 and 225 kg/h^{-1}) The Varities are (Anber 33, Mishkhab 2, Furat, Yasmine and Al Aswad) which were obtained from the rice research station in Mishkhab using a factorial experiment with randomized complete block design (R.C.B.D) with three replicates.The results can be summarized as follows:- Varities differed significantly at the 5% probability level for all studied traits., The Anber 33 varities was significantly superior in most of the traits, while the black varities was superior in the amount of active substances.,The third level of fertilization (225 kg/h^{-1}) was superior to most of the studied growth and yield traits. While the second level of fertilization exceeded the content of the Varities of effective medicinal structures., The superiority of the black variety in the content of the rice plant from the active substances in all the effective medicinal structures.

Keywords: fertilization, varities, rice, nitrogen, anber

1. INTRODUCTION

Rice is one of the most important and major cereal crops in the world. It ranks second after wheat in terms of importance. It feeds about half of the world's population. It is the main economic resource for hundreds of millions of Asians [1]. The cultivated area of rice in the world is about (150 million) hectares, located between latitudes 45 North and 40 South, and the global production is (562 million) tons, with a yield rate of (3.73) tons/ha [2] . In Iraq, rice comes second after the wheat crop in terms of importance and production. It is one of the important strategic crops in our food security . The cultivated area of it for the year 2000 reached (119680) hectares and the total production reached (251650) tons, with an Means yield of (2102.69) kg/ha [3] . The production rate per hectare in Iraq is low compared to its productivity in the countries of the world, although Iraq is one of the countries known for cultivating this crop since ancient times, especially since the environmental conditions in Iraq are suitable for its cultivation [4] .Nitrogen affects the degree of delay , which is considered an undesirable characteristic Because of the losses it causes as a result of losing the grains by dropping them from the panicle in dormant plants, so this element must be added in the form of several batches to prevent the phenomenon of sluggishness or reduce it to the least possible extent[5]. Black rice is a type of medicinal rice that grows in a very limited number of countries in the world and has been successfully cultivated in Iraq. Therefore, the research aims to:

Evaluating the performance of the Varities used in the research and comparing them with the medical black variety , Determine the best level of nitrogen addition in the growth and yield of rice , Estimating the effective medicinal compounds in black rice and comparing it with the rest of the Varities used in the research.

2. MATERIALS AND METHODS

2.1. MATERIALS

A field experiment was carried out in the fields of a farmer in Al-Mussiab / 45 km north of Babylon Governorate in the summer season 2020 to study the Response of five Varities of Rice to Nitrogen Fertilization Levels using a factorial experiment with a randomized complete block design (RCBD) with three replications. The first factor represented the Varities (Anbar 33, Yasmin, Mishkhab 2, Furat in addition to black Varities), the second factor fertilizer levels represented (0, 175 and 225) kg N/ha on Urea 64% N formed. [6] .

2.2. METHODS

The experiment soil was fertilized with super phosphate fertilizer (150 kg h^{-1}) It was added all at once before planting and sowing was done manually on 15/6/2020 with a distance of 10 cm between one line and another and 5 cm between one plant and another and with a seed quantity of 35 kg / dunum. As for the nitrogen fertilization, it was added in three batches, as 25% of each level was added as a first batch after a month of planting and 50% of each level was added at the beginning of the tillers stage, i.e. (30 days after the first batch) as a second batch and the remaining 25% from each level It was added as a third batch at the beginning of the flowering stage.[7] .

Table 1. Some chemical and physical properties of field soil

K Ppm	P Ppm	N Ppm	Ec ds.m	PH	soil texture		
					% Sand	% Clay	% Silt
					18	55	27
167	11	33.17	4.3	.69	Clay loam		

Studied traits (field traits, yield and its components:

1-number of days from planting to 50% flowering.

2-Number of days from 50% flowering to physiological maturity.

3-Plant height (cm): measured from the level of the soil surface to the end of the panicle for 10 random plants at maturity from each experimental unit and according to their average.

4-The length of the panicle (cm): according to the measurement of the confined distance between the node of the panicle holder and the end of the panicle for 10 random panicles at maturity from each experimental unit and according to their average.

5- Number of tillers/panicle: The primary branches in the panicle were calculated for 10 random panicles at maturity and according to their average.

6- The area of the flag leaf (cm^2): was calculated for 10 random flag leaves at maturity according to the following equation:

Leaf area = leaf length x maximum width x 0.74. [8].

7- Plant yield t h^{-1}: This was done by harvesting three lines after excluding the guard lines, the length of each line being 3 m, and after leaving a distance of 50 cm from both ends line. The harvested plants are hand-harvested. the result was measured with a sensitive electric balance. [9].

Statistical analysis

The data were analyzed statistically by the method of analysis of variance and using the least significant difference test (LSD) under the 5% probability level to diagnose the statistical differences between the arithmetic means of the coefficients [10].

3. RESULTS AND DISCUSSION

3.1. Number of days from planting to 50% flowering

From Table (2) that there are significant differences between the Varities. The (Yasmin) varities outperformed by giving the least number of days for flowering amounted to (92.777 days), which did not differ significantly with the varities (Anber 33) which gave (92,887 days), while the Al Aswad variety gave the highest The number of days for flowering reached (104.780 days) and the reason is due to the genotypes of the variety. As for the levels of fertilizers, the first level was superior by giving it the least number of days for flowering, which amounted to (92.398) days, compared to the third level, which gave (99.868) days. The combination (Anber 33 X the first level) outperformed as it gave (88.330) days, while the combination (Al Aswad X the third level) gave the largest number of days (106.670) days. These results are consistent with what was found by [11] and[12] .

Table 2. Response of five varieties of Rice to Nitrogen Fertilization Levels of the number of days from planting to 50% flowering

Fertilization / Varities	0	175	225	Varities Means
Anber 33	88.330	94.330	96.000	92.887
Yasmin	90.330	93.000	95.000	92.777
Mishkhab 2	90.330	90.670	101.670	94.223
Furat	90.000	94.000	100.000	94.667
Al Aswad	103.000	104.670	106.670	104.780
LSD 5%	2.314			1.336
Fertilization Means	99.868	95.334	92.398	
LSD 5%	1.035			

3.2. Number of days from 50% flowering to physiological maturity

It was noted from Table (3) that there are significant differences between the Varities, as the variety (Anber 33) outperformed by giving it the least number of days to maturity amounted to (121.110 days), and the reason is due to the genetic structure of the variety, while the Al Aswad variety gave the highest number of days, which reached (144.110 days).As for the levels of fertilization, the first level gave the lowest number of days for ripening (128.998 days), while the third level gave the highest number of days (140.132 days). The reason is due to the role of nitrogen fertilization by supplying the plant with the element N, which encourages vegetative growth at the expense of maturity, which prolonged The duration of maturation. As for the interaction (Varities X levels of fertilization), the combination (Furat X control) outperformed by giving it (115,000 days), while the combination (Yasmin X third level) gave the highest number of days to maturity, which reached (148,670 days). These results are consistent with what was found by [13] , [14] .

Table 3. Response of five varieties of Rice to Nitrogen Fertilization Levels for the number of days from 50% flowering to physiological maturity

Fertilization / Varities	0	175	225	Varities Means
Anber 33	116.330	122.670	124.330	121.110
Yasmin	135.330	140.330	148.670	141.443
Mishkhab 2	135.000	141.000	147.330	141.110
Furat	115.000	128.330	135.330	126.220
Al Aswad	143.330	144.000	145.000	144.110
LSD 5%	3.657			2.111
Fertilization Means	128.998	135.266	140.132	
LSD 5%	1.635			

3.3. Plant height (cm)

From Table (4) that there are significant differences between the Varities, as the variety (Anber 33) outperformed by giving the highest plant height of (109.290 cm), while the variety (Mishkhab 2) gave the lowest height of (89,533 cm) and the reason is due to the genetic structure of the variety. Fertilization was superior to the third level (250 kg / ha) by giving the highest plant height (104.320), while the first level (comparison) gave the lowest plant height of (95,808). The reason is due to the role of nitrogen fertilization in encouraging growth by increasing cell division at Increasing the plant's supply of element N, which led to an increase in plant height. As for the interaction between (Varities X levels of fertilization) the combination (Anber 33 X level three) outperformed by giving it the highest plant height reached (116.170 cm), while the combination (Mishkhab 2 X level) gave The first) the lowest height of the plant reached (85,870 days). was found by [14] and [15].

Table 4 Response of five varieties of Rice to Nitrogen Fertilization Levels for plant height/cm

Fertilization / Varities	0	175	225	Varities Means
Anber 33	101.800	109.900	116.170	109.29
Yasmin	92.430	99.000	102.200	97.877
Mishkhab 2	85.870	88.600	94.130	89.533
Furat	100.170	100.400	107.230	102.600
Al Aswad	98.770	99.570	101.870	100.070
LSD 5%	2.083			1.202
Fertilization Means				
LSD 5%	0.931			

3.4. Panicle length (cm)

Table (5) shows that there are significant differences between the Varities, as the variety (Anber 33) outperformed by giving it the longest drupe of the plant, which reached (25,000 cm), while the variety (Anber 33) gave the lowest length of (18.966 cm) and the reason is due to the genetic structure of the variety, as for the levels of fertilization The third level (225 kg / ha) outperformed by giving it the longest length of the stalk of the plant reached (23.693 cm), while (the control) gave the lowest length of the stalk of the plant reached (21.707 cm), the reason is due to the role of nitrogen fertilization in encouraging growth by increasing Cell division when the plant was increased with element N, which led to an increase in plant height. As for the interaction between (Varities X levels of fertilization) the combination (Anber 33 X third level) outperformed by giving it the highest length of the stalk of the plant reached (26.633 cm) while the combination gave (Anber 33 X first level) the lowest height of the plant reached (18,333 cm).These results are in agreement with what was found by [16] .

Table 5. Response of five varieties of rice to nitrogen fertilization levels for panicle length (cm)

Fertilization / Varities	0	175	225	Varities Means
Anber 33	23.433	24.933	26.63	25.000
Yasmin	22.267	23.367	23.80	23.145
Mishkhab 2	22.400	22.800	23.03	22.744
Furat	22.100	23.567	25.56	23.745
Al Aswad	18.333	19.133	19.43	18.966
LSD 5%	0.435			0.251
Fertilization Means	21.707	22.760	23.693	
LSD 5%	0.195			

3.5. The number of branches of panicle

Table (6) appears that there are significant differences between the Varities, as (Anber 33) outperformed by giving the most number of branches to the panicle, reaching (10.117 branches. Panicle), which did not differ significantly from the variety Yasmine (10,022 branches. Panicle), while the variety gave (Al-Mashkhab 2) The least number of branches of the panicle (8.833 branches. panicle) is due to the genetic structures. As for the levels of fertilization, the third level (225 kg / ha) exceeded by giving it the highest number of branches of the panicle (9.953 branches. panicle), while the first level gave the lowest number of branches of the panicle (8,673 branches. Panicle) The reason is due to the role of nitrogen fertilization in encouraging growth by increasing cell division when increasing the plant's supply of the element N, which led to an increase in the number of branches of the panicle. As for the interaction between (Varities X levels of fertilization) the combination (C X level) outperformed The third) by giving it the highest number of branches of the panicle (11,000), while the combination (Al Aswad X first level) gave the lowest number of branches of the panicle, when it reached (7.833 branches. Daleya). These results agree with with what was found by [16] , [17].

Table 6. Response of five varieties of rice to nitrogen fertilization levels for the number of branches of panicle

Fertilization / Varities	0	175	225	Varities Means
Anber 33	9.200	10.150	11.000	10.117
Yasmin	9.700	10.033	10.333	10.022
Mishkhab 2	8.500	8.767	9.233	8.833
Furat	8.133	9.133	9.433	8.900
Al Aswad	7.833	9.500	9.767	9.033
LSD 5%	0.533			0.307
Fertilization Means	8.673	9.517	9.953	
LSD 5%	0.238			

3.6. Area of flag leaf (cm^2)

In Table (7) that there are significant differences between the Varities, as the variety (Anber 33) outperformed by giving it the highest leaf area (17.013 cm2), while the (Al Aswad) variety gave the least leaf area (12.287 cm2). The reason is due to the genetic structure of the variety. Fertilization levels exceeded the third level (225 kg / h) by giving it the highest leaf area, which amounted to (20,998 cm 2), while the first level (the control) gave the least leaf area for the plant, reaching (11,340 cm 2). The reason is due to the role of nitrogen fertilization in encouraging vegetative growth During the increase in cell division when the plant was supplied with fertilizer to increase the leaf area, as for the interaction between (Varities X levels of fertilization) the combination (Anber 33 X the third level) outperformed by giving it (23.670 cm2), while the combination (Al Aswad X control) gave the least leaf area as It reached (9,800 cm2.(These results are in agreement with what was found by with what was found by [18].

Table 7. Response of five varieties of rice to nitrogen fertilization levels for the characters area of flag leaf (cm^2)

Fertilization / Varities	0	175	225	Varities Means
Anber 33	12.470	14.900	23.670	17.013
Yasmin	11.130	13.500	21.230	15.287
Mishkhab 2	12.270	14.730	23.530	16.843
Furat	11.030	13.370	21.030	15.143
Al Aswad	9.800	11.530	15.530	12.287
LSD 5%	1.665			0.961
Fertilization Means	11.340	13.606	20.998	
LSD 5%	0.744			

3.7.Plant yield(t h^{-1})

It is noticed from Table (8) that there are significant differences between the Varities, as the varities (Ambar 33) giving the highest yield of (7.244 t h $^{-1}$), while the varities (Mishkhab$_2$) gave the lowest yield, reaching (5.878 t h $^{-1}$)., while the levels of fertilization exceeded the third level (225 kg / ha) by giving the highest yield of (7.080 t h^{-1}) while the first level gave the lowest yield, reaching (5.740 t h^{-1}) , and the reason is due to an increase Components of the yield by increasing the number of grains of these varieties and increasing the weight of the grain, which led to an increase in yield. As for the interaction between (varieties X levels of fertilization), the combination (Anber 33X the third level) giving the highest yield, reaching (8.233 t h^{-1}) while the combination gave (Mishkhab$_2$ X control) had the lowest result, which reached (5.267 t h^{-1}). These results are in agreement with what was found by [19] and [20] .

Table 8. Response of five varieties of Rice to Nitrogen Fertilization Levels for plant yield(t h^{-1})

Fertilization / Varities	0	175	225	Varities Means
Anber 33	6.200	7.300	8.233	7.244
Yasmin	5.433	5.900	6.533	5.955
Mishkhab 2	5.267	6.033	6.333	5.878
Furat	6.000	7.000	7.300	6.767
Al Aswad	5.800	6.433	7.000	6.411
LSD 5%	0.193			0.111
Fertilization Means	5.740	6.533	7.080	
LSD 5%	0.086			

4. CONCLUSIONS

The varities varied in their response to the fertilization according to the nature of growth for each varities to the extent that affects the change of growth characteristics and the yield of each variety, and the levels of addition varied with respect to nitrogen fertilization for what has to do with the construction of enzymes, amino acids, proteins, reducing energy compounds NADPH, chlorophyll and the activity of hormones, which are activities It has a relationship with carbon representation, dry matter production, division, elongation, and reducing competition between the vegetative, flowering and fruiting parts, which is reflected on the growth characteristics and the emergence of the flowering and fruiting parts, which is reflected on the characteristics of the panicle and the components of the yield and thus on the effectiveness of the mechanism of building and producing effective compounds.

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