Effect of Humic Acid on Growth and Yield Several Genotypes of Rice (Oryza Sativa L.)

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Abstract

A field experiment in the province of Muthanna during the summer season 2014-2015 to study the effect of three levels of humic acid on the growth and yield of five genotypes of rice, the experiment carried out using a design Split Plot Design with three replications as occupied the main panels three levels of Humic acid (0, 2 and 4) ml liter⁻¹ while genotypes occupied (IR-60819 and PR-2235 and Mchkab-1 and Jasmine and Amber-33) secondary panels. The results showed that there were significant differences between the humic acid levels, treatment 4 ml liter⁻¹ overtook in a period of flowering (109.88 days), plant height, (99.33 cm) area of flag leaf, (38.11 cm²) number of panicle 373.33 panicle/m² the number of grains 129.83 grains / panicle and yield grains 4.66 ton / h and there was no significant difference in grain weight, as well as the presence of significant differences between genotypes for all growth traits, as observed superiority of class dormitory -33 moral in the period of flowering, (110.88 days), Mchkab¹ in plant height, (111.34 cm) Yasmin in the flag leaf area, which amounted to 45.00 cm², as it gave the class Mchkab-1 highest number of Panicles totaled 400.00 Panicles / m², and the superiority of product was Jasmine and averaged 145.11 grain / Panicle, and the superiority of genotype RP -2235 average grain weight of 20 mg were given The interaction (4×Mchkab) higher average plant height was 118.27 cm whereas given the The interaction (2×IR-60819) less than an average of 98.66 grain/ Panicle, also was given The interaction (2×Mchkab -1) yield the highest average grain amounted to 5.82 tons / h, while the The interaction gave (0×IR-60819) less than the average stood at 3.05 tons / ha.

Keywords: Humic acid, Genotypes, Mchkab, Yasmin.

1. Introduction

Rice Oryza sativa L. is one of the most grain crops important in the world, particularly in developing countries, as food for more than half the world's population, as the annual global production of it is about 518 million tons in 89 countries [1], The environmental conditions in some parts of Iraq, mainly in the central region, especially the provinces of Najaf and Qadisiyah and Muthanna suitable for the cultivation of rice crop as well as its cultivation is limited, and in some provinces of the southern region, but the cultivated areas of it fluctuating between 120-572 thousand hectares, has reached 110 thousand hectares in 2002 150 thousand tons produced at a rate of very low productivity amounted to 1.36 ton ha⁻¹, and attributed the causes of low productivity to the lack of adoption of high-yield varieties and little or no use of modern technologies and the absence of appropriate price policy. [2-5], indicates Amber -33 gave the highest area and index of the leaf ,the weight of dry matter and yield grains totaled 4.759 ton ha⁻¹ in the first year compared with the rest of the studied species, humic substances on plant growth and yield depend on the source and concentration, and on the molecular fraction weight of humus. Humic acid improves the chemical, physical and biological characteristics of the growth of the soil and plant effects by influencing the growth of roots. Initiate and promote root growth and increase the roots can be followed up by addition of humic acid soil [6].

2. Materials and Methods

It implemented a field experiment in Muthanna province, in the soil of a field indicating the specifications in Table 1, so as to determine the effect of three levels of Humic acid in the growth and yield of five genotypes of rice crop is (IR-60819 and PR-2235 and Mchkab -1 and Jasmine and Amber -33 ), and it included the addition of three experience levels of the added
Hardcopy Humic acid (0, 2 and 4) ml liter⁻¹ were sprayed in two phases after 30 days of germination stage and in 25% when flowering. After preparation of the land of the experiment and softening and resolving field was divided into experimental units with an area 12:00 2 (16:00 along × 3 m width), and distributed by genotypes randomly for each level of the three levels according to the design RCBD in three replications, and the seeds were sown way the rain on June 15, and was conducted fertilization phosphates on the single payment amount of 80 kg P / hectare process (in the form of super fertilizer triple superphosphate 20% P) [7], while the added nitrogen fertilizer (in the form of urea 46% N) in three installments (25% in agriculture and 50% when forking and 25% at flowering) [8] and conducted irrigation and drainage operations and weeding according to need. Upon arrival plants to 75% flowering stage some of the qualities of growth calculated a number of days required to get to this stage and as plant height and flag leaf area (cm²) an average of ten randomly selected plants, and upon the arrival of the plants.

Table 1. Some of the physical and chemical characteristics of the soil site.

| organic matter (g / kg) | lime (g / kg) | Ready phosphorus (g / kg) | Total nitrogen (g / kg) | E.C. d.s/m | Ph  | Silt (%) | clay (%) | sand (%) |
|------------------------|--------------|--------------------------|------------------------|------------|-----|----------|----------|---------|
| 0.31                   | 28.89        | 8.12                     | 18.65                  | 2.66       | 7.7 | 38       | 24       | 38      |

Stage of maturity Physiological according to the number Panicles / m² and the number of grain / panicle (average of ten Panicles randomly selected) and yield the grain of the area of 1 m² and then about a tone / ha, after the completion of data collection was compiled and arranged and statistically analyzed according to the analysis of variance synthesis using Genstat12 statistical program was conducted compared to the averages of the transactions at the level of probabilistic 0.05. Table (1) some physical and chemical characteristics of the soil test.

3. Result and Discussion

3.1 The effect of humic acid

The results of Table (2) there were no significant differences between the transactions Add humic acid, as observed excellent treatment 4 ml liter⁻¹ in a period of flowering (109.88 days), plant height, which amounted to 99.33 cm and area of flag leaf, which amounted to 38.11 cm² and a number Panicles 373.33 Panicle / m² the number of grains 129.83 grain / Panicle and yield cereals 4.66 t / ha and there was no significant difference in grain weight, and attributed the cause of this effect moral to add humic acids in the recipe plant height has attributed the cause to the direct role and indirect acid Humic added bribes to the plant or to the soil the readiness of the necessary nutrients in the soil, especially when added to the container soil on the percentage of carbonate minerals, which led to positive results in the absorption of nutrients and increase dry matter [9]. The return to Humic which is one of the factors motivating and encouraging the proliferation and growth of neighborhoods that produce organic acids and hormones stimulant like Auxins and gibberellins stimulating the growth and elongation of stem cells and increase plant height, or perhaps due to the important role of bio-fertilize to increase the rate of plant height comes through acid its important role in increasing the readiness of the nutrients in the soil, especially micronutrients such as iron, which is a few Readiness in soils of limestone, in addition to the ability of these neighborhoods to stimulate the plant to produce plant hormones, particularly Auxins and its important role in increasing the plant high [10,11]. As well as for the positive role acid humic which has a positive impact on the effectiveness of the enzymes and nutrients plant metabolism and this leads to a high amount of carbohydrates for most plants, which has impact on plant production and increase yield this Mishkhab [12], as well as the impact of Humic acid in some metabolic processes of the plant, such as respiration and photosynthesis as well as the increase of antioxidants due keeps on securities content of chlorophyll from the demolition process [3].

Table 2. The effect of humic acid in some characteristics of growth and yield and its components.

| yield of grain(ton/ha) | weigh of grain(mg) | number of grains | number of panicles/m² | area of flag leaf(cm²) | plant height (cm) | period of flowering (day) | Humic ml. liter⁻¹ |
|-----------------------|--------------------|------------------|-----------------------|-----------------------|------------------|--------------------------|------------------|
| 4.05                  | 15.62              | 122.94           | 363.33                | 36.53                 | 95.22            | 100.16                   | 0                |
| 4.52                  | 15.79              | 127.05           | 366.66                | 37.06                 | 96.21            | 106                      | 2                |
| 4.66                  | 15.88              | 129.83           | 373.33                | 38.11                 | 99.33            | 109.88                   | 4                |
| 0.18                  | ns                 | 2.2              | 11.25                 | 0.77                  | 1.8              | 2.3                      | L.S.D            |
3.2 The effect of genotypes

Results from statistical analysis revealed significant differences among genotypes for all growth traits, as observed superiority of class dormitory -33 moral in the period of flowering, which amounted to 110.88 days, while the product was higher than Mishkhab -1 in plant height, which amounted to 111.34 cm and the superiority of class Yasmin in space the flag leaf, which amounted to 45.00 cm 2 (table 3), and attributed the reason for this difference in the traits between genotypes to genotype their structures varied, and agreed this result with [3,9, 10] they pointed out the different genotypes among them in the whole of the traits.

As for yield and its components, the results show that there were significant differences between genotypes in the qualities of yield and its components, as it gave the class Mishkhab -1 highest number of Panicles totaled 400.00 Panicle / m 2, and the superiority of product was Jasmine and averaged 145.11 grain / Panicle, and the superiority of genotype RP-2235 average grain weight of 20 mg (table 3), and can be the reason for the disparity between the genotypes in yield components are returned to the already differentiated in some growth traits studied in genetic composition and extent of adaptation, each with prevailing environmental conditions and agreed this result with [11,12] as pointed out different genotypes in the yield ingredients. Product was also higher than Mishkhab -1 morally in the yield of grain on the rest of genotypes 5.10 t / ha, while IR-gave 60,819 less than an average of 3.10 tons / haa, and attributed the cause to the superiority of class Mchkkab -1 morally in yield component (number Panicles / m²) ) and an increase having been offset by the relative lack of yield creators to yield the other two (the number of grain / panicle and weight of the grain), they agreed with this conclusion and the findings of his [10,12], they pointed out all the different genotypes in grain quotient.

Table 3. The effect of genotypes in some characteristics of growth and yield and its components.

| yield of grain(ton h) | weigh of grain(mg) | number of grains | number of panicles m² | area of flag leaf(cm²) | plant height (cm) | period of flowering (days) | genotypes |
|-----------------------|-------------------|------------------|-----------------------|------------------------|------------------|--------------------------|-----------|
| 3.10                  | 13.13             | 102.11           | 316.44                | 34.40                  | 80.14            | 104.55                   | IR-60819 |
| 3.57                  | 20                | 112.44           | 316.00                | 30.94                  | 84.95            | 97.88                    | RP-2235  |
| 5.10                  | 12.30             | 138.00           | 400.00                | 41.30                  | 111.34           | 104.33                   | Mishkhab-1|
| 4.26                  | 11.00             | 145.11           | 375.11                | 45.00                  | 104.26           | 101.88                   | jasamin  |
| 3.94                  | 17.90             | 123.44           | 377.33                | 33.48                  | 103.91           | 110.88                   | Anbar-33 |
| 0.51                  | 1.06              | 5.07             | 12.18                 | 2.15                   | 2.92             | 3.38                     | L.S.D    |

3.3 The interaction effect between humic levels and genetic compositions

The results of the statistical analysis of my experience that there is no significant effect of interaction between the workers (humic × genotypes) in all plant growth characters except the adjectives plant height and area of flag leaf, has given The interaction (4 × Mishkhab -1) higher average plant height was 118.27 cm while given the The interaction (0 × IR-60819) less than an average of 77.44 cm, either on the flag leaf area were given a The interaction (4 × jasmin) averaged 45.45 cm 2, while given the The interaction (0 × RP-2235) below average for this capacity reached 30.02 cm 2 table (4) As for yield and its components were all significantly affected by the interference between the studied workers except prescription grain weight, as given The interaction (level 2 × Mishkhab -1) the highest average number of Panicles 450.00 Panicle m 2 (table 4), As for the number of grains in the deltoid The interaction has given (2 × Yasmin) the highest average number of grains /Panicle grain totaled 150.00 / Panicle while given The interaction (4 × IR-60819) less than an average of 98.66 grain Panicle (table 4). As was given The interaction (4 × Mishkhab -1) the highest average for the sum of grain amounted to 5.82 tons ha, while the varied results of genotypes in terms of lower averages since given The interaction (0 × IR-60819) less than the average in reached 3.05 tons ha, the reason for the superiority of The interaction above yield grain to its superiority in the number originally Panicles m² increase of more than the shortfall as a result of the low number of deltoid grain.
Table 4. The effect of the interaction between the concentrations of humic and genotype in some characteristics of growth and yield and its components.

| yield of grain (ton h) | weigh of grain (mg) | number of grains | number of panicles/m² | area of flag leaf (cm²) | plant height (cm) | period of flowering (days) | Humic ml liter⁻¹ | genotypes |
|------------------------|---------------------|------------------|-----------------------|------------------------|------------------|--------------------------|-----------------|-----------|
| 3.05                   | 16.33               | 99.00            | 383.33                | 35.36                  | 77.44            | 103.00                   | 0               |           |
| 3.21                   | 16.16               | 109.33           | 327.66                | 33.49                  | 80.50            | 105.66                   | 2               | IR-60819 |
| 3.21                   | 15.89               | 98.66            | 373.33                | 34.36                  | 82.50            | 106.00                   | 4               |           |
| 3.66                   | 17.15               | 109.00           | 335.00                | 30.02                  | 82.89            | 98.66                    | 0               |           |
| 3.73                   | 17.33               | 117.66           | 294.66                | 34.44                  | 84.65            | 98.33                    | 2               |           |
| 3.33                   | 16.72               | 110.66           | 318.33                | 31.36                  | 87.31            | 96.66                    | 4               |           |
| 5.1                    | 16.15               | 139.00           | 386.66                | 41.35                  | 110.81           | 105.66                   | 0               |           |
| 5.6                    | 14.79               | 139.33           | 450.00                | 40.54                  | 116.94           | 103.66                   | 2               | Miskhab-1 |
| 5.82                   | 14.96               | 135.66           | 376.66                | 42.01                  | 118.27           | 103.66                   | 4               |           |
| 4.26                   | 14.16               | 139.33           | 371.00                | 44.45                  | 102.11           | 103.00                   | 0               |           |
| 4.84                   | 14.28               | 150.00           | 393.33                | 43.59                  | 104.66           | 102.33                   | 2               | jasamin  |
| 3.68                   | 13.58               | 141.00           | 361.00                | 45.45                  | 106.00           | 101.33                   | 4               |           |
| 3.89                   | 14.88               | 122.66           | 383.66                | 33.83                  | 102.79           | 110.33                   | 0               |           |
| 4.01                   | 15.16               | 123.33           | 374.66                | 34.10                  | 103.31           | 108.66                   | 2               | Anbar-33 |
| 3.92                   | 14.67               | 124.33           | 373.66                | 32.50                  | 105.64           | 107.66                   | 4               |           |
| 0.77                   | ns                  | 7.02             | 21.91                 | 3.27                   | 5.01             | ns                       | L.S.D           |           |

Conclusion

Found that the addition of humic acid concentration of 4 ml liter⁻¹ for the variety Mchkab -1 gave the best results so we recommend planting and the addition of humic acid concentration of 4 ml liter⁻¹ in the study area.

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