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IMPACT OF LEVELS AND TIME OF FOLIAR APPLICATION OF NANO FERTILIZER (SUPER MICRO PLUS) ON SOME COMPONENTS OF GROWTH AND YIELD OF RICE (*ORIZA SATIVA* L.)

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Abstract

A field experiment was conducted in Al–Najaf Governorate during summer season 2017 to study the effect of foliar application of Nano fertilizer with three levels (0 & 1 & 2) gm L^{-1} (super micro plus that contains (N 5% & P 3% & K 3% & Fe 4.5% & Zn 8% & Ca 6% & Mg 6% &Mn 0.7% & Cu 0.65 % & B 0.65% & Mo 0.1%) and three times of application at (tillering stage, booting stage, flowering stage) on some components of growth and yield of rice (*Oriza sativa L.*) Amber 33 variety. according to RCBD with three replicates was designed . The following results were obtained Superior the level 2g L^{-1} Nano fertilizer on plant height (125.67 cm) and panicle length (25.22 cm) and flag leaf area (26.53 cm^2) and number of seeds per panicle (123.33) and number of panicle per m^2 (323.8) and percent of fertility (16.67 %) and weight of 1000 seed (20.31 gm) and grain yield (540 $gm.m^{-2}$).Superior time of adding Nano fertilizer in tillering stage on panicle length (24.78 cm) and flag leaf area (25.34 cm^2) and number of seeds per panicle (119.22) and percent of fertility (18.67 %) and weight of 1000 seed (19.64 gm). Superior the inter action between levels and times of foliar application in level $2gm.L^{-1}$ in tillering stage on plant height (127.67 cm) and panicle length (26 cm) and flag leaf area (27.11 cm^2) and number of seeds per panicle (125.67) and number of panicle per m^2 (329) and percent of fertility (15.67 %) and weight of 1000 seed (20.53 gm) and grain yield (547 $gm.m^{-2}$).

***Key words*:** Nano fertilizer, growth, yield of rice.

Introduction

Oryza sativa L. is the main food for more than half of the world's population of more than 7 billion people. Lemraski *et al*. (2017). The world's population is estimated to reach 9 billion people in 2050 (Girgis *et al*., 2015). Rice is one of the world's major crops, especially in Asia, because it contains proteins, carbohydrates, vitamins and many important nutrients and compounds that have a significant impact on health and reduce the risk of disease, especially cancer. Aguilar-Garcia *et al*. (2007) and Liu (2007). Nano-fertilizers are the effective means of increasing the quantity and quality of the yield in conditions unsuitable for expansion in the reclamation of agricultural land, especially in the absence of water resources. Baruah and Dutta (2009). when adding nano-fertilizer and release the ions of elements containing a high surface area as well as High energy and effective penetration of the cell wall, they enter directly into the metabolism of food. Naderi and Danesh-Sharaki (2013). The aim of this study is to study and evaluate the level and timing of super micro plus fertilizers in some of the growth and yield components of the rice crop.

Materials and Methods

A field experiment was carried out in the summer season 2017 in clay soil (Table 1) used randomized block design and distributed the parameters in a random distribution and three replicates. The treatments included three levels of SUPER MICRO PLUS nanofertilizer containing the following elements: N 5%, P 3%, K 3%, Fe 4.5%, Zn 8%, Ca 6%, Mg 6%, Mn 0.7%, Cu 0.65%, B 0.65% and Mo 0.1%) is (0, 1 and 2 g L^{-1}) and three additional dates (at the tillering stage, at the booting stage and at the flowering stage). Nitrogen fertilizer was added at two dose, after month and two months after planting 50 kg N^{-1} of urea fertilizer 46% nitrogen and phosphorus added by 80 kg P^{-1} (Jadoo 1999) and potassium by (62.5 kg K^{-1}). Jassim (2005) was added with phosphorus before planting and equally For all transactions. The experiment was planted in a wet way on 20/6. Crop service operations and removal of weeds were carried out as needed. The harvest was done on 18/11. Statistical analysis of the data was performed and the least significant difference was used for LSD below the probability level of $p > 0.05$.Soil and Plant Samples: Soil samples were randomly selected from different sites of experimental plates before adding fertilizer parameters for chemical and physical analysis of soil as shown in Table (1). Harvest a square meter of each treatment at maturity after measuring its height for the purpose of making some measurements. The grains were crushed and dried at 65 °C for 48 hours to calculate grain yield.

Table 1: some chemical and physical properties before sowing .

Character	Unit	Method
Carbonates minerals	276 gm.kg^{-1} soil	Page *et al*. (1982)
Gypsum	3.4 gm.kg^{-1} soil	Page *et al*. (1982)
Organic matter	8 gm.kg^{-1} soil	Page *et al*. (1982)
Available phosphor	8.9 mg.kg^{-1} soil	Page *et al*. (1982)
Available potassium	160 mg.kg^{-1} soil	Jackson (1958)
EC_e	5.6 Dsm.m^{-1}	Page *et al*. (1982)
pH	7.9	Page *et al*. (1982)
Soil texture	Loamy clay	Black (1965)
Minerals	360, 380, 260 gm.kg soil	Sand, clay, silt

Results and Discussion

Effect of levels and timing of spraying with nanofertilizeron plant height (cm)

Table (2) shows a significant superiority of the nanofertilizer spread in plant height increase. The addition of nanofertilizer (1 and 2) gm.L^{-1} was higher by (122.3) and (125.67) cm respectively, compared with the control treatment of plant height (116.11). This results is consistent with what Hiyasmin Rose *et al.* (2015) found when adding the nanofertilizer of the rice crop. In the same table, no significant differences were found in the fertilizer additive phase. This showed a significant overlap in the height of the plant, which was 127.67 cm when sprayed Fertilizer at level 2 g L^{-1} at the tillering stage was not significantly different from the interference 2 g L^{-1} when spraying in booting and flowering stages This may be due to containment of fertilizer on nitrogen, iron and zinc and their role in increasing growth and elongation of the plant. Ali at all (2014).

Effect of levels and timing of spraying with nanofertilizeron panicle length (cm)

Table (3) showed the superiority of the treatment of 2 g L^{-1} with a mean length of 25.22 cm, while the treatment did not exceed 1 g L^{-1} in the treatment of the non-addition of nanofertilizer and this shows the importance of concentration and quantity of nanofertilizer in this character, which increase the absorption, metabolism and used efficiency of addition fertilizer. This results was in contrast with Manjunatha (2016). The time of addition of nano-fertilizer did not have a significant effect on the length of panicle. The binary interaction between the concentration of the spray and the addition phase was significantly higher than the spraying treatment of 2 g L^{-1} at the tillering stage, The panicle length is 26 cm, this may be due to efficient nutrition and metabolic output From the addition of nanofertilizer at this stage, which give sufficient time for the plant to do its nutritional efficiency and growth better than reflected in the increase in the length of panicle.

Effect of levels and timing of spraying with Nanofertilizers on the flag leaf area

Table (4) shows tow treatment (1 and 2) g L^{-1} with a flag leaf of 25.68 and 26.53 cm^2 are superior to the comparison treatment with 22.53 cm^2. This may be because the fertilizer contains the necessary elements which contributed with the increase of flag leaf area. The stage addition of nanofertilizer did not have a significant effect in this character. The binary interference was significant for all stages of the addition at spraying level 2 gm^{-1}. The area of the flag leaf (27.11, 26.14 and 26.35 cm^2) was sprayed in the tillering and booting and flowering stage, this is due to the efficiency of Nanofertilizers and the reduction of waste This is consistent with what was fined Manjunatha *et al.* (2016).

Effect of levels and timing of spraying with nano-fertilizer on number of seeds per panicle

Table (5) shows the superiority of the spray treatment at 2 g L^{-1} with a number of grains of 123.33 grains in the two treatments (0 and 1) g L^{-1} and the superiority of the treatment 1 g L^{-1} on the treatment compared to the number of grains of 117 grain in the panicle and this may be Due to the role of effective nano-nutritional fertilizers, which contributed to the increase in the number of filled grains in panicle at the expense of empty grains because of its necessary elements and nanoparticles of high efficiency and the result is consistent with what Naderi and Danesh-sharaki (2013). Superior time addition at tillering stage in this character with 119.2 grain, this is due to the importance of spraying in the early stages of plant life to carry out its vital activities to the fullest, which was reflected in the increase in the number of grains in panicle. The two overlapping levels of nanofertilizer at the level of 2 g L^{-1} were superior achieved at all stages of addition to all the treatments, especially when spraying in the tillering stage, where the number of grains was 125.67 grains in panicle. This highlights the importance and role of nanofertilizer in the fertilizing efficiency, when used at suitable times and place.

The effect of levels and dates of spraying with nano-fertilizer on number of branches bearing of panicle

Table (6) shows the superiority of the spray treatments in nano fertilizers (1 and 2 g).L^{-1} they reached 313.8 and 323.8 respectively In comparison with the treatment of non-spraying with 279 branches and the treatment of spraying 2 g L^{-1} was significant for both treatments. The overlap between the two showed a significant superiority of spraying at the concentration of 2 g L^{-1} in the tillering stage with a number of branches of 329 branches. This may be due to the fact that nutrition in the early stages of plant life enough time for good nutrition which gives a greater chance of increasing branches.

Effect of spraying levels and timing of spraying of nanofertilizer on percentage of fertility

Table (7) showed significant differences in the level of spraying, which significantly exceeded the spray treatment of 2 g^{-1}lt with a low percentage of non-fertilization amounted to 16.67% This may be due to the supply of the plant quantity of nutrients Suitable for filling grains and increasing them at the expense of the number of empty grains. The spraying of manure did not have a significant effect in this capacity. Biodegradation was significantly higher than that of spraying 2 gL^{-1} in the forest with a low non-fertilization rate of 15.67%. This may be due to the efficiency of spraying when it is at the right time and place, which is positively reflected in the increase of grain filled and reduce the empty grain.

Effect of spraying levels and timing of spraying of nanofertilizer on weight of 1000 seed

Table (8) shows a significant superiority of spraying level of 2 g. L^{-1} in weight of 1000 seed with a weight of 20.31 g compared to spraying (0 and 1 g). Spray treatment 1 g L^{-1} was applied to the 19.46 g. This may be due to the efficiency of the Nanofertilizers that added to the increase in the food conversion, causing the grain to fill and increase its weight. No significant differences were shown in the fertilizer spraying stage. Overlap was significant when sprayed at 2 g L^{-1} at all stages of the addition. This may be due to the nutritional role of the nano-fertilizer added to the plants and its efficiency in the delivery of nutrients and their rapid and efficient metabolism and helped dictation of seeds.

Effect of spraying levels and timing of spraying of nanofertilizer on grain yield (gm.m^{-2})

Table (10) shows the superiority of the spraying treatment at 2 g L^{-1} with a grain yield of 540 gm .m^{-2}, this is due to the role of adding the nanofertilizer due to the high efficiency and the soil content before planting is below normal growth level (Table 1). The date of addition of nanofertilizer did not have a significant effect in this epithet. The overlap between the level and date of spraying of the nano-fertilizer showed a significant effect in this effect. The treatment of the interaction between the level of 2 g L^{-1} was higher when it was added at the flowering stage with a grain yield of 5.47 gm. m^{-2} and not significantly different from the addition of nanofertilizer at the same level in the two stages This may be due to the fact that this level (2 gL^{-1}) has blocked plant requirements from the micro-added elements which have led to an increase in yield.

Table 2 : Effect of levels and timing of spraying with nanofertilizer in plant height (cm) .

Foliar time / Concentration	Tillering Stage	Booting Stage	Flowering stage	Average
0	116.67	115.33	116.33	116.11
1 gm.L^{-1}	123.00	122.00	122.00	122.33
2 gm.L^{-1}	127.67	125.33	124.00	125.67
Average	122.44	120.89	120.78	---------
LSD C= 2.42	LSD T= n.s	LSD C*T=4.19	----------	**P>= 0.05**

Table 3 : Effect of levels and timing of spraying with nanofertilizer on panicle length (cm).

Foliar time / Concentration	Tillering stage	Booting Stage	Flowering stage	Average
0	23.33	22.67	22.00	22.67
1 gm.L^{-1}	25.00	24.00	24.67	24.56
2 gm.L^{-1}	26.00	24.67	25.00	25.22
Average	24.78	23.78	23.89	---------
LSD C= 1.91	LSD T= 1.91	LSD C*T=3.31	---------	**P>= 0.05**

Table 4 : Effect of levels and timing of spraying with Nanofertilizers on the flag leaf area cm^2

Foliar time / Concentration	Tillering stage	Booting Stage	Flowering stage	Average
0	22.52	22.18	21.90	22.53
1 $gm.L^{-1}$	26.40	25.19	25.44	25.68
2 $gm.L^{-1}$	27.11	26.14	26.35	26.53
Average	25.34	24.83	24.56	-------------
LSD C= 1.88	LSD T= 1.88	LSD C*T=3.16	-----------	P>= 0.05

Table 5 : Effect of levels and timing of spraying with nano-fertilizer on number of seeds per panicle.

Foliar time / Concentration	Tillering Stage	Booting stage	Flowering stage	Average
0	115.00	113.67	114.00	114.22
1 $gm.L^{-1}$	117.00	117.00	117.00	117.00
2 $gm.L^{-1}$	125.67	122.00	122.33	123.33
average	119.22	117.56	117.78	-------------
LSD C=1.48	LSD T= 1.48	LSD C*T=2.59		**P>= 0.05**

Table 6: The effect of levels and timing of spraying with nano-fertilizer on number of branches bearing of panicle.

Foliar time / Concentration	Tillering stage	Booting stage	Flowering Stage	Average
0	281.7	278.7	276.7	279.0
1 $gm.L^{-1}$	313.7	312.7	315.0	313.8
2 $gm.L^{-1}$	329.0	320.3	322.0	323.8
Average	308.1	303.9	304.6	-------------
LSD C= 8.62	LSD T= 8.62	LSD C*T=14.94	----------	**P>= 0.05**

Table 7 : Effect of spraying levels and timing of spraying of nanofertilizer on percentage of fertility %.

Foliar time / Concentration	Tillering stage	Booting stage	Flowering Stage	Average
0	21.00	21.67	21.00	21.22
1 $gm.L^{-1}$	19.33	18.33	18.67	18.78
2 $gm.L^{-1}$	15.67	17.33	17.00	16.67
Average	18.67	19.11	18.89	-------------
LSD C= 1.35	LSD T= 1.35	LSD C*T=2.34	---------	**P>= 0.05**

Table 9 : Effect of spraying levels and timing of spraying of nanofertilizer on weight of 1000 seed.

Foliar time / Concentration	Tillering Stage	Booting stage	Flowering Stage	Average
0	18.90	18.77	18.60	18.76
1 $gm.L^{-1}$	19.50	19.40	19.47	19.46
2 $gm.L^{-1}$	20.53	20.10	20.30	20.31
Average	19.64	19.42	19.46	-------------
LSD C= 23	LSD T= n.s	LSD C*=40		**P>= 0.05**

Table 10 : Effect of spraying levels and timing of spraying of nanofertilizer on grain yield ($gm.m^{-2}$).

Foliar time / Concentration	Tillering Stage	Booting stage	Flowering Stage	Average
0	450	433	441	441
1 $gm.L^{-1}$	472	476	477	475
2 $gm.L^{-1}$	532	542	547	540
Average	485	484	488	-------------
LSD C= 23	LSD T= n.s	LSD C*T=40	----------	**P>= 0.05**

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