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THE EFFECT OF BIOLITE, HUMIC ACID AND NPK ON THE GROWTH OF PADDY RICE (ORYZA SATIVA L)

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ABSTRACT
The purpose of this study was the effect of giving Biolite, *Humic Acid* and NPK and their interaction on the growth of rice plants. This research was conducted in Tegal Sari , Dolok Masihul District , Serdang Bedagai Regency with a height of ± 40 meters in above sea level . Alluvial soil type with flat topography. This research was carried out in March 2022 to July 2022. This study was arranged based on a factorial Randomized Block Design (RBD) with 3 treatment factors and 3 replications. The treatment factors were the provision of NPK fertilizer, namely 3 levels and the provision of *Humic Acid*, namely 3 levels and Biolitee, namely 3 levels. Each treatment was repeated 3 times so that there were 3x3x3x3 = 81 experimental units. The results of the analysis showed that the application of NPK fertilizer had a significant effect on the parameters of paddy rice plant height. The administration of *Humic Acid* and Biolite had no significant effect on the growth of rice plants. The combination of various doses of NPK, *Humic Acid* and Biolite did not significantly increase the growth of rice plants. Provision of NPK fertilizer with recommended dose of 250 kg/ha and administration of *Humic Acid* : 3 kg and 20 kg Biolite are the best doses for growing rice plants.

KEYWORD: Lowland Rice, Humic Acid, Activated Biolite, NPK Fertilizer.

INTRODUCTION
Efforts to increase rice production are not only influenced by physical, chemical and biological aspects, but also socio-economic aspects. These aspects include farmer knowledge, farmer experience and arable land area.[1] Most farmers in Indonesia are very dependent on artificial fertilizers, which can have a negative impact on the development of agricultural production. According to Kaya (2018), the effect of inorganic fertilizers on the environment, especially on the soil, can have a negative impact if done continuously because it can have a negative impact on the development of microorganisms in the soil, namely many die so that these microorganisms are no longer able to decompose organic matter in the soil. As a result, the residues of fertilizers that are not absorbed by plant roots will accumulate in the soil and affect the condition of the soil to become hard, lumpy, and the pH decreases.[2]

In a long time the land will be barren and it is difficult to restore nutrients. Barren soil due to the use of chemical fertilizers, takes hundreds of years to restore its nutrients.[3] The development of food crop production in Indonesia is hampered by the problem of poor soil-physical chemical properties which dominate soils in Indonesia from the ultisol order. These soils generally have an acidic pH, C-Organic levels, low Cation.

Exchange Capacity (CEC), and very low nutrient elements.[4] Among the most problematic soil properties is the continuously decreasing soil organic matter content because farmers tend to use synthetic fertilizers continuously with no or little addition of organic matter to the soil. As a result, in addition to decreasing levels of organic matter, the soil becomes increasingly acidic and hard due to structural damage and the non-development of most soil microorganisms. In such conditions, the soil becomes unresponsive to fertilization, making it difficult to increase agricultural production (leveling off).[5]

Plants need nutrients to build the body and carry out metabolic processes in their life cycle and to produce goods of economic value that are useful for humans. Deficiency of one of these nutrients can be a limiting factor for plant growth and production.[6] To increase production and also improve soil chemical properties,

organic matter is used. Soil organic matter or humus is divided into humic materials and non-humic materials. Humic materials are divided into three groups, namely *Humic Acid* (AH), *Fulvic Acid* (AF), humin.[7] Humic *acid , which* is sometimes found in humate, is useful for stimulating plant growth and development, because there is an increase in plant cell energy which results in an intensification of ion exchange processes that accelerates the growth of the root system and makes roots longer and increases membrane penetration. plant cells that make it easier for nutrients to be absorbed into the cells and accelerate the process of respiration (respiration) of plants. Therefore the humic acid *contained* in humate is useful for increasing soil fertility.[8]

MATERIALS AND METHODS

Place and time of research

This research was conducted in Dolok Masihul District, Serdang Bedagai Regency with a height of ± 40 meters in above sea level, alluvial soil type with flat topography. Soil analysis was carried out in the laboratory of BPTP Medan and PT. Socfindo. This research was conducted from March 2022 to July 2022.

Materials and Tools

The study was arranged based on a factorial Randomized Block Design (RBD) with 3 treatment factors and 3 replications. The treatment factors, namely the application of NPK fertilizer has 3 levels and the provision of Humic Acid has 3 levels and Biolite has 3 levels, namely: Factor of NPK fertilizer dose: N_0 : Without fertilizer application (Control), N_1 : ½ recommended dose (125 kg/ ha), N_2 : 1 recommended dose (250 kg/ha). The second factor is the provision of *Humic Acid* (DSC) : D_0 : Without DSC , D_1 : 3 l/ha DSC, D_2 : 6 l/ha DSC. The third factor is the administration of Biolite: B_0: Without Biolite, B_1 : 20 kg, B_2 : 30 kg.

RESULTS AND DISCUSSION

1. Plant Height (cm)

The results of variance showed that the application of NPK fertilizer had a significant effect on plant height, while the application of *Humic Acid* and Biolite had no significant effect on plant height, while the interaction of the three has no significant effect on plant height is presented in Table 1.

Table 1: Effect of Interaction of NPK Fertilizer, *Humic Acid* and Biolite on Plant Height (cm).

NPK	*Humic Acid*	Biolite			N
		B0	B1	B2	
N0	D0	75,89	70,89	75.00	76.41c
	D1	75,89	75.00	82,33	
	D2	70,89	82,33	79.45	
N1	D0	75.00	79.45	82.78	78.17 b
	D1	82,33	82.78	80.78	
	D2	79.45	80.78	76,89	
N2	D0	82.78	76,89	80.33	80.03a
	D1	80.78	80.33	77.00	
	D2	76,89	77.00	71.55	
	B	77,77	78,38	78,46	
	D0	74,22			
	D1	78,93			
	D2	80.15			

Note: Numbers followed by unequal letters in the same treatment group are significantly different at the 5% level based on the DMRT test and those without notations are not significantly different

Table 1 shows that NPK application had a significant effect on plant height where N_1 treatment was significantly different from N_0 and N_2 treatment, while N_2 treatment was significantly different from N0 and N1 treatment. but even though it is significantly different from the control, this is likely to occur due to plasmolysis due to too high a given nutrient content so that a dose that is too high can suppress growth due to stress on the plant.

The highest application of NPK fertilizer was in the N_2 treatment, namely 80.03 cm, while the lowest N_0 was 76.35 cm, while the highest application of Humic Acid was in D_2, namely 80.14 cm and the lowest was D_0, 74.03. The application of Humic Acid had no effect on the possibility of the location of the soil research was not critical so it did not increase the plant height the dose of Humic Acid given was still lacking however the results of the analysis of plant height although the results of the analysis of variance (Anova) still did not show a statistically significant difference and the highest treatment Biolite B_2 was 78.46 and the lowest B0 is 77.70 cm. Plant height is one of the parameters used to determine vegetative growth of plants. The application of humic acid can also increase the growth of rice plants.[9] According to Paulus and Senduk (2019), stated that plant height is a plant measure that is often observed both as an indicator of growth and as a parameter used to measure environmental influences or the treatment applied.[10] Plant growth and development is influenced by several factors including the availability of nutrients. Giving humic acid can increase N-total. The N element in plants functions for vegetative growth, especially to enlarge and heighten plants.[9] Increasing the height of

rice plants is influenced by macro and micro elements in the soil. The need for other macro nutrients (P and K) is highly dependent on the supply of N nutrients. N fertilizers have been studied and have significantly increased plant height, number of productive tillers, grain production. This is in accordance with the opinion of Darmawan et al., (2019) stating that applying fertilizer to planting will increase vegetative growth of plants because nitrogen elements in the early phase are absorbed more to increase vegetative growth of rice plants, especially plant height.[11]

2. Total Filled Grain (grains)

The results of variance showed that the application of NPK fertilizer had no significant effect on the number of grain containing while administration of *Humic Acid* and Biolite did not significantly affect plant height whereas the interaction of the three had no significant effect on the amount of filled grain presented in Table 2.

Table 2: The Effect of Interaction of NPK Fertilizer, *Humic Acid* and Biolite on the Amount of Filled Grain.

NPK	*Humic Acid*		Biolite		N
		B0	B1	B2	
N0	D0	189.33	186.33	193.33	
	D1	189.33	193.33	190.73	190.44
	D2	186.33	190.73	194.53	
N1	D0	193.33	194.53	198.47	
	D1	190.73	198.47	193.53	194.99
	D2	194.53	193.53	197.80	
N2	D0	198.47	197.80	198,20	
	D1	193.53	198,20	193.73	
	D2	197.80	193.73	187.07	195,39
	B	192.60	194.07	194,16	
	D0	188.33			
	D1	192.87			
	D2	196.60			

Note: Numbers not followed by letters in the treatment group at the 5% level based on the DMRT test show no significant difference

Table 2 shows that the highest application of NPK fertilizer was on the highest filled grain weight with the N_2 level of 195.39 while the lowest treatment was at the N_0 level of 190.27 in the administration of *Humic Acid* the highest treatment was D_2 which was 196.00 and the lowest was D_0 187.800 and the highest treatment Biolite B_2 was 194.16 and the lowest B_0 was 192.42, According to Abu *et al.*, (2017), stated that the formation tillers, plant height, leaf area, and grain number are affected by the availability of nitrogen while the dry matter in seeds is obtained from the results of photosynthesis present in plant parts during growth, which can then be used for seed filling.[12]

3. Number of Tillers/Clump (Saplings)

The results of variance showed that the application of NPK fertilizer had no significant effect on the number of tillers/clump while the administration of *Humic Acid* and Biolite also had no significant effect on tillers/clump while the interaction of the three had no significant effect on the number of tillers/clump presented in Table 3.

Table 3: The Effect of Interaction of NPK Fertilizer, *Humic Acid* and Biolite on the Number of Tillers/Clump.

NPK	*Humic Acid*		Biolite		N
		B0	B1	B2	
N0	D0	26,53	27,33	27,47	
	D1	26,53	27,47	27,13	27,24
	D2	27,33	27,13	28,27	
N1	D0	27,47	28,27	27,53	
	D1	27,13	27,53	27,33	27,68
	D2	28,27	27,33	28,27	
N2	D0	27,53	28,27	27,93	
	D1	27,33	27,93	28.93	
	D2	28,27	28.93	28,87	28,22
	B	27,38	27.80	27.97	
	D0	27,33			
	D1	27,62			
	D2	27,71			

Note: Numbers not followed by letters in the treatment group at the 5% level based on the DMRT test show no

significant difference

Table 3 shows that the application of NPK fertilizer is the highest in the number of tillers/clump the highest with the N_1 level of 27.68 while the lowest treatment at the N_0 level was 27.42 in the administration of *Humic Acid* the highest treatment was D_2 which was 27.71 and the lowest was D_0 27.33 and the highest treatment given Biolite B_2 was 27.97 and the lowest was B_0 which was 27.56. This fact illustrates that the application of organic fertilizers and NPK fertilizers can increase the vegetative growth of rice plants (plant height and number of tillers/clumps). Doni *et al.*, 2017, that increased nutrients in inorganic fertilizers increase vegetative growth such as plant height, number of tillers, number of leaves and leaf area index.[13] Paat et al ., (2015), states that, if a plant is placed in conditions containing With the appropriate nutrients and mineral elements, the plant will experience upward growth and become taller.[14] This happens because NPK fertilizer can provide macro and micro nutrients in sufficiently balanced amounts for plant growth and development. Hadisuwito (2007) states that the function of the N nutrient is to form protein and chlorophyll, the function of the P element as an energy source that helps plants in the development of the generative phase.[15]

4. Productive/Clump tillers

The results of variance showed that the application of NPK fertilizer had no significant effect on productive tillers/clusters as well administration of *Humic Acid* and Biolite had no significant effect on productive tillers/clumps meanwhile the interaction of the three had no significant effect on productive tillers/clumps.

Table 4 : The Effect of Interaction of NPK Fertilizer, *Humic Acid* and Biolite on Productive/Clump Tillers

NPK	*Humic Acid*	Biolite			N
		B0	B1	B2	
N0	D0	15,73	15,73	14.80	
	D1	15.80	14.80	14.80	15,21
	D2	15,73	14.80	14.67	
N1	D0	14.80	14.67	15.00	
	D1	14.80	15.00	14.87	14.89
	D2	14.67	14.87	15,33	
N2	D0	15.00	15,33	14,27	
	D1	14.87	14,27	14.60	14.66
	D2	15,33	14.60	13.67	
	B	15,19	14.90	14.67	
	D0	15.76			
	D1	14.76			
	D2	15,067			

Note: Numbers not followed by letters in the treatment group at the 5% level based on the DMRT test show no significant difference

Table 4 shows that the application of NPK fertilizer is the highest in productive tillers/clumps the highest with the N_0 level of 15.21 while the lowest treatment was at the N_2 level of 14.66 in the administration of *Humic Acid* The highest treatment on D0 was 15.21 and the lowest on D1 was 15.756 and the highest treatment on Biolite was B1 which was 14.90 and the lowest on B_0 was 15.19. This shows that the number of off spring is very much determined by genetic factors. According to Husna (2010), the number of tillers will be maximized if the plant has good genetic properties coupled with favorable environmental conditions or in accordance with plant growth and development.[16] So this happens because fertilizer can provide nutrients in a fairly balanced amount for plant growth and development. This is reinforced by Yetti (2010), the number of tillers will be maximized if the plant has good genetic properties coupled with favorable environmental conditions or in accordance with plant growth and development.[17]

5. Number of rice cluster panicles

The results of variance showed that the application of NPK fertilizer had no significant effect on the number of panicles of rice clumps administration of *Humic Acid* and Biolite did not significantly affect the number of panicles whereas the interaction of the three has no significant effect on the number of rice clump panicles presented in Table 5.

Table 5: The Effect of Interaction of NPK Fertilizer, *Humic Acid* and Biolite on the Number of Panicles.

NPK	*Humic Acid*	Biolite			N
		B0	B1	B2	
N0	D0	12.50	13.00	13,29	
	D1	12.78	13,21	13.89	13,18
	D2	13,21	13,29	13.47	

N1	D0	13.48	13,26	13,27	
	D1	12.96	13,11	13,22	13.38
	D2	14.09	13.48	13.56	
N2	D0	13.45	13.89	13.69	
	D1	13.36	13.81	13.79	13.55
	D2	13,15	13,26	13.60	
	B	13,22	13.37	13.46	
	D0	13.31			
	D1	13.35			
	D2	13.46			

Note: Numbers not followed by letters in the treatment group at the 5% level based on the DMRT test show no significant difference

Table 5 shows that the highest application of NPK fertilizer was at the highest number of clumping panicles with the N2 level of 13.55 while the lowest treatment was at the N0 level of 13.18. Provision of *Humic Acid* the highest treatment was D_2 which was 13.46 and the lowest was D_0 which was 13.31 and the highest treatment given by Biolite was B_2 which was 13.53 and the lowest was B_0 which was 13.22.

The results of significant differences in rice panicles are influenced by the number of tillers in each planting system, the more the number of tillers, the greater the number of rice panicles, this is in line with research in Nararya *et al.,* (2017) which states that the greater the number of tillers per unit area, the greater the number of panicles per unit area and is in line with Nararya *et al.,* (2017) which states that the cropping system affects the number of rice panicles.[18]

CONCLUSION

1. The effect of giving Biolite had no significant effect on all treatments and their interactions for all parameters, namely plant height, number of panicles, number of filled grains, number of tillers/clumps, productive tillers
2. The effect of giving *Humic Acid had no significant* effect, namely plant height, number of panicles, number of filled grains, number of tillers/clumps, productive tillers.
3. The effect of NPK application had a significant effect on the height of paddy rice plants, but had no significant effect, namely the number of panicles, the number of filled grain, the number of tillers/clumps, and productive tillers.
4. The interaction effect of Biolite, *Humic Acid* and NPK had no significant effect on increasing the growth of rice plants, namely plant height, number of panicles, number of filled grain, number of tillers/clumps, productive tillers.

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