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INFLUENCE OF ORGANIC AND INORGANIC FERTILIZER COMBINATION ON THE GROWTH AND YIELD OF RICE

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Abstract – *Rice is one of the most important agricultural crop in the country. It is considered as the staple food of Filipinos. Several factors influenced crop yield. One of the important factor that influences the yield of rice is fertilizer management which should be applied at the right amount in order to have higher yield. The used of organic fertilizer is now on a high gear due to the benefits it can provide in the soil such as improvement of the soil fertility, soil structure, water holding capacity and others. This study aims to determine the best organic and inorganic fertilizer combination that would give better growth and higher yield of rice. It was conducted at the Pangasinan State University, Sta. Maria Experimental Station from June to November 2017 during the 2017 wet season. Randomized Complete Block Design with six treatments and three replications was used in this study. In the comparison among treatment means Tukey's Honest Significant Difference (HSD) Test was used. Results showed that Treatment 6 (90-60-60 + 1 ton Vermicompost) registered the tallest plant height at maturity, more number of productive tillers, longer length of panicle, more number of filled grains, higher yield per plot and computed yield per hectare. Based on the result of the study, it is recommended that application of organic and inorganic fertilizer combination be used in rice production in order to have better growth and development and higher yield of rice.*

Keywords – *Inorganic fertilizer, Organic fertilizer, Rice, Vermicompost*

INTRODUCTION

Rice (Oryza sativa L.) is one of the most important agricultural crops in the country. It is considered as the staple food of Filipinos. Since the Philippines is an agricultural country and almost all the people eat rice, high level production must be attained in order to cope with our increasing population. Due to the importance of this crop to our population, the government has launched several programs, the latest of which is the MAN (Maunlad na Agrikultura sa Nayon) Program of the present administration in order to increase the production of rice toward the country's self-sufficiency in the commodity.

Several factors influence rice yield. One of the important factor that influences the yield of rice is fertilizer management which should be applied at the right amount in order to have higher yield. The main sources for replenishing plant nutrients in agricultural soils are inorganic, organic and biofertilizers. [1]

The used of organic fertilizer is now on a high gear due to benefits it can provide in the soil such as the improvement of the soil fertility, soil structure, water holding capacity and others. Likewise the continuous use of inorganic fertilizers leads to deterioration in soil chemical, physical, and biological properties, and soil health [2]. The increasing price of inorganic fertilizer have trigger the shift on the use of organic fertilizer [3].

Vermicompost is an organic manure produced as the vermicast by earthworm feeding on biological waste material, plant residues [4]. It is

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one of the best source of nutrients that improves the physical and chemical properties of crops [5].

Vermicompost is considered as a soil additive to reduce the use of mineral fertilizers as it provides required nutrient amounts, increases cation exchange capacity and improves water holding capacity [6]. Vermicompost is an organic fertilizer derived from plant and animal source with the used of African night crawler that hastens decomposition. This organic fertilizer contains macro and micro nutrients that provides additional nutrients and also enhances the growth of microorganisms in the soil that could help in increasing the availability of nutrient needed for the growth and yield of rice [7].

OBJECTIVES OF THE STUDY

This study is designed to evaluate the influence of organic and inorganic fertilizer combination on the growth and yield of rice.

Specifically it sought to answer the following questions:

1. What fertilizer combinations would gave better growth and higher yield of rice?
2. What fertilizer combination will provide higher economic return in rice production?

MATERIALS AND METHODS

Land Preparation

An area of 1,000 square meters was plowed and harrowed thoroughly following the wet land preparation.

Experimental Design

The field was laid out following the Randomized Complete Block Design with six treatments and was replicated three times. The area per plot was 20 square meters (4x5m).

Transplanting

Twenty five day old rice seedlings (NSIC Rc 222) was transplanted with a distance of 20 x 20 cm between rows and hills, respectively.

Treatments

Table 1: Treatments used in the study

Treatment	Fertilizer
Treatment 1	Control (No Fertilizer)
Treatment 2	RR (90-60-60)
Treatment 3	RR + ½ rr
Treatment 4	½ RR + rr
Treatment 5	rr (Vermicompost) 1 ton/ha
Treatment 6	RR + rr

Legend: RR = Recommended Rate based on the general recommendation of PhilRice during the wet season planting for inbred rice.

rr = Recommended rate of the organic fertilizer (Vermicompost)

Fertilizer Application

Fertilizer was applied following the different treatment used in the study. Vermicompost at 1 ton/ha was applied basally while the complete fertilizer (60-60-60) was applied at 14 DAT and nitrogen fertilizer (30-0-0) was applied at 28 DAT.

Good Agricultural Practices

The good agricultural practices on rice production was followed in terms of pesticide application and water management.

Data gathered

1. Plant height at maturity (cm). This was done by measuring from the based of the plant to the tip of the highest part from the 10 sample plants.
2. Number of productive tillers. This was done by counting the tillers with filled grains.
3. Length of panicles. This was done by measuring the panicle from the panicle base up to the tip of the last grain in the

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panicle

4. Number of Filled Grains. This was taken by counting the filled grains in the panicle from the 10 sample plants.
5. Grain yield per plot (kg) and compute yield (tons) per hectare. This was done by weighing the threshed grains per plot and convert to yield per hectare.

Statistical Analysis

The data gathered was analyzed following the analysis of variance of the randomized complete block design while the comparison among treatments means was done following the Tukey's Honest Significant Difference (HSD) Test.

RESULT AND DISCUSSION

Plant Height at Maturity (cm)

The plant height at maturity is presented in Table 2. It can be seen that Treatment 6 registered the tallest height with a mean of 104 cm while the shortest was observed in Treatment 1 with a mean of 73 cm. Analysis of variance showed a highly significant result among the different treatments used in the study. Significant result was due to higher level of nutrients applied which promotes better growth and development of plants.

Table 2. Plant height at maturity (cm)

Treatment	I	II	III	Total	Mean
Treatment 1	74	72	73	219	73d
Treatment 2	85	90	95	270	90b
Treatment 3	98	100	102	300	100a
Treatment 4	80	90	82	252	84bc
Treatment 5	70	78	80	228	76cd
Treatment 6	90	105	108	312	104a

*all means having the same letter are not significant to each other.

Number of Productive Tillers

Table 3 revealed the number of productive tillers as affected by different organic and inorganic fertilizer combination. It can be noted that Treatment 6 obtained the most number of productive tillers with a mean of 21.3 but comparable to Treatment 3, 2 and 4 with a means of 20.7, 15.3 and 13.3, respectively while the least number of productive tillers was observed in Treatment 1 with a mean of 10.7. Analysis of variance showed a significant result among the different treatments used in the study. The significant result could be due to the more available nutrients applied in Treatment 6, 3, 2 and 4 which promotes the development of more tillers in rice.

Table 3. Number of Productive Tillers

Treatment	I	II	III	Total	Mean
Treatment 1	14	10	8	32	10.7d
Treatment 2	12	16	18	46	15.3ab
Treatment 3	18	20	24	62	20.7a
Treatment 4	14	16	10	40	13.3ab
Treatment 5	10	14	12	36	12.0b
Treatment 6	18	24	22	64	21.3a

*all means having the same letter are not significant to each other.

Length of Panicle (cm)

Presented in Table 4 is the length of panicle of the different treatment used in the study. It can be noted that Treatment 6 garnered the longest panicle with a mean of 24 while the shortest was registered by Treatment 1 with a mean of 18.33. Analysis of variance revealed a significant result among the different treatment used in the study. However, Treatment 6, 3, 2, 4 and 5 are comparable to each other. Significant result was due to the fertilizer that was applied which helps in the development of longer panicle in rice.

Table 4. Length of Panicle (cm)

Treatment	I	II	III	Total	Mean
Treatment 1	20	17	18	55	18.3b
Treatment 2	19	23	24	66	22.0ab
Treatment 3	22	24	23	69	23.0ab
Treatment 4	20	21	23	64	21.3ab
Treatment 5	21	20	19	60	20.0ab
Treatment 6	24	25	23	72	24.0a

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*all means having the same letter are not significant to each other.

Treatment	I	II	III	Total	Mean	Yield/Ha
Treatment 1	4.75	4.25	4.5	13.5	4.5d	2.25
Treatment 2	10	9.5	10.5	30.0	10.0b	5.00
Treatment 3	10.5	11	10.75	32.25	10.75ab	5.38
Treatment 4	8.5	8	9	25.5	8.5c	4.25
Treatment 5	5.25	5.75	5.5	16.5	5.5d	2.75
Treatment 6	11.5	10.5	12.5	34.5	11.5a	5.75

Number of Filled Grains

Table 5 presents the number of filled grains as affected by the different organic and inorganic fertilizer combination. It can be observed that Treatment 6 obtained the most number of filled grains per panicle with a mean of 72.0 while the least number of filled grains per panicle was seen in Treatment 1 with a mean of 34.7. Analysis of variance showed a highly significant difference among the different treatments used in the study. Highly significant result was due to the effect of more nutrients applied to the plants which promotes the development of more filled grains per panicle.

Table 5. Number of Filled Grains.

Treatment	I	II	III	Total	Mean
Treatment 1	30	35	39	104	34.7d
Treatment 2	55	51	50	156	52.0bc
Treatment 3	65	60	54	179	59.7b
Treatment 4	47	50	49	146	48.7c
Treatment 5	42	40	45	127	42.3cd
Treatment 6	69	72	75	216	72.0a

*all means having the same letter are not significant to each other.

Grain Yield per Plot (kg) and Computed Yield per Hectare (ton)

Table 6 revealed the grain yield per and computed yield per hectare. It can be noted that Treatment 6 garnered the highest yield per plot and computed yield per hectare with a mean of 11.5 kg and 5.75 tons, respectively. The lowest yield was obtained by Treatment 1 with a mean of 4.5 kg and 2.25 tons, respectively. Analysis of variance revealed a highly significant result among the different treatments used in the study. Highly significant result could be due to the higher nutrients applied to the plants which promotes the development of more productive tillers, longer panicle and more filled grains per panicle.

Table 6. Yield per Plot (kg) and Computed Yield per Hectare (tons)

*all means having the same letter are not significant to each other.

CONCLUSION AND RECOMMENDATION

Conclusion

Based on the result of the study, it can be concluded that application of organic and inorganic fertilizer combination in rice production promotes better growth and development as well as higher yield of rice.

Recommendation

The researchers recommend the used of organic and inorganic fertilizer combination in rice production in order to obtain better growth and development as well as higher yield of rice.

It is also recommended that further study along this line be done and with the used of higher level of vermicompost in order to have a more conclusive result.

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