



# International Journal Of Engineering Sciences & Management Research

## EFFECT OF DIFFERENT RATE OF VERMICOMPOST ON GROWTH PERFORMANCE AND YIELD OF RICE (ORYZA SATIVA)

Noraida Mohd Radzi\*<sup>1</sup>, Norhasmira Mahadzir<sup>2</sup> & Nur Firdaus Abdul Rashid<sup>3</sup>

\*<sup>1,2&3</sup>Faculty of Plantation And Agrotechnology, Universiti Teknologi Mara

**Keywords:** Vermicompost, NPK, rice, growth, yield

### ABSTRACT

The use of organic fertilizers is a good alternative to reduce the use of chemical fertilizer and solutions for maintaining soil fertility and achieving sustainable agriculture. The purpose of this study was to investigate the effects of different doses of vermicompost organic fertilizer on the growth and yield of rice MR219. The experimental treatments were arranged in Complete Randomized Design including four vermicompost application level. The treatments included four levels of vermicompost organic fertilizer (30%, 50%, 70% and 100%) and four levels of urea chemical fertilizer (100%, 30%, 50 and 70%). At time vegetative and physiological maturity, plant height, number of leaves, number of tiller, fresh and dry weight and also yield were measured. The results indicated that the combined application of NPK fertilizer and organic fertilizer vermicompost had significant effects on growth parameter for plant height, number of leaves, number of tiller, fresh and dry weight. The plant applied with 70% vermicompost and 30% NPK shows the higher means for plant height and number of leaves. The plant applied with 50% vermicompost and 50% NPK shows higher means number of tiller, fresh weight and dry weight than other treatment. The maximum mean of yield recorded by the treatment of 70% vermicompost and 30% NPK fertilizer, but there is no significant difference between the treatment. Thus it can be concluded that the application of vermicompost organic fertilizer, can be reduced chemical fertilizer urea up to 70 percent.

### INTRODUCTION

Rice (*Oryza sativa L.*) is one of the most important staple food crops in the world especially in Malaysia (Jeyabal A. et al.,2000). Demand for rice in Malaysia keep increasing and receives attention by the government due to their importance as the staple food in our country. Because of that, many researcher and agencies find the way to improve the growth and production of rice. There is wide scope for the improvement of rice growth, production and quality through agriculture practices such as cultivation techniques, soil types and fertilizer management.

Fertilizer management is very important on the growth of rice. Fertilizers can be classified into two categories organic and inorganic. Organic fertilizers are environmentally friendly fertilizers that do not contain any chemicals. Organic fertilizers are fertilizers derived from animal or plant matter. It is natural mineral elements needed to restore soil fertility. Inorganic fertilizer, also known as synthetic fertilizer is manufactured artificially and contains minerals or synthetic chemicals

The use of organic fertilizer is a good nutrient management to reduce the use of chemical fertilizer. One of the best organic fertilizer is vermicompost. Vermicompost is a organic amendment resulted from the interactions between earthworms and microorganisms during the breakdown of organic matter. It is a stabilized, finely divided peat-like material with a low C:N ratio, high porosity and high water-holding capacity. Most of the nutrients in vermicompost in the form can be taken up by plants (Domínguez et al., 2010). Vermicompost provide the nutrient requirement for plant growth and production, improving the soil structure and fertility and also reduce the dependency on the inorganic fertilizer

Vermicompost encourages the growth of many plant species including vegetables, fruits, cereals and also been found to have positive effects on some aromatic and medicinal plants (Domínguez et al., 2010). Many research studies have shown the positive effects of vermicompost on plant. include encourage seed germination in several plant species such as petunia and pine trees. Vermicompost also has a positive effect on vegetative growth, stimulating shoot and root development. Another positive effect of vermicompost is to stimulate plant flowering, increasing the number and biomass of the flowers produced and also increasing fruit yield. In spite of increasing plant growth and productivity, vermicompost may also increase the nutritional quality of some vegetable crops such as tomatoes, Chinese cabbage and sweet corn (Lazcano et al., 2011). The effect of

## International Journal Of Engineering Sciences & Management Research

vermicompost is varied depending on the species of plant or variety. The purpose of this study was to evaluate the effect of different amount of NPK fertilizer and vermicompost on the growth and yield of rice.

### MATERIALS AND METHODS

Studies were performed at the rainshelter of UiTM, Melaka (Jasin Campus). The experimental treatments were arranged in complete randomized design including four vermicompost application level. All total five treatment were made T1-control, 100% of NPK fertilizer; T2-30% vermicompost with 70% of NPK; T3-50% vermicompost with 50% NPK; T4-70% vermicompost with 30% NPK and T5-100% of vermicompost. Each treatment was with six replicates. All the 30 seedling was top dressed with vermicompost and NPK fertilizer in three portions, one third at the time of planting, one third before flowering and the remaining at the time of grain filling. Grain yield, plant height, number of leaves, number of tiller, number of panicle and fresh and dry weight were measured. One way analysis of variance (ANOVA) was used to analyze the data collected using minitab software.

### RESULT AND DISCUSSION

Comparison means (Table 1) shows that application of vermicompost in combination with Chemical fertilizer, NPK significantly increase growth characteristic including plant height, number of leaves, number of tiller, fresh weight and dry weight. Treatment 4 which applied with vermicompost supplemented with chemical fertilizer (70% vermicompost + 30% NPK) shows the higher means result for plant height, number of leaves and yield. However, there was no significant different in yield between all treatments. Treatment 2 (50% vermicompost + 50% NPK) shows higher means number of tiller and fresh weight, but there is no significant different with treatment 2 (30% vermicompost + 70% of NPK). Treatment T5 receive 100% of vermicompost shows the lowest means value for most of parameters.

*Table 1: Effect of different rate of vermicompost on vegetative parameters and yield of rice MR219*

Treatments	Plant height (cm)	Number of leaves	Number of tillers	Fresh weight (g)	Dry weight (g)	Yield (g/plant)
T1	51.0 <sup>cd</sup>	73.2 <sup>c</sup>	13.3 <sup>b</sup>	799.8 <sup>b</sup>	302.0 <sup>b</sup>	5.7 <sup>a</sup>
T2	52.6 <sup>c</sup>	77.2 <sup>b</sup>	15.5 <sup>a</sup>	923.3 <sup>a</sup>	359.3 <sup>ab</sup>	7.0 <sup>a</sup>
T3	56.6 <sup>b</sup>	81.0 <sup>ab</sup>	17.5 <sup>a</sup>	995.3 <sup>a</sup>	394.6 <sup>a</sup>	5.8 <sup>a</sup>
T4	59.7 <sup>a</sup>	85.9 <sup>a</sup>	16.8 <sup>a</sup>	931.7 <sup>a</sup>	343.0 <sup>ab</sup>	7.6 <sup>a</sup>
T5	49.2 <sup>d</sup>	66.2 <sup>d</sup>	11.8 <sup>b</sup>	703.0 <sup>b</sup>	211.2 <sup>c</sup>	5.1 <sup>a</sup>

T1= (control, 100% NPK); T2=(30% vermicompost + 70% of NPK); T3=(50% vermicompost + 50% NPK); T4=(70% vermicompost + 30% NPK); T5=(100% vermicompost)

The positive effect of vermicompost when applying together with chemical fertilizer might due to nutrients rich of the vermicompost. Most of the nutrients in vermicompost in the form can be taken up by plants. Other than that, the interactions between earthworm and microorganism made more available nutrients and microbial metabolites are released into the soil. These help in improving the soil structure and fertility. Vermicompost producing improvements in the physical structure of the growth medium such as aeration and drainage for the soil. It could also have been due to biological effects such as increases in beneficial enzymatic activities, increased populations of beneficial microorganisms, or the presence of biologically active plant growth-influencing substances such as plant growth regulators or plant hormones in the vermicompost (Raha., 2015). This is consistent with Gopinath et al. (2008) and Khandwe et al. (2006) who reported that combination treatments of urea fertilizer and vermicompost increased wheat growth. In the early stage of plant growth, NPK fertilizer provides readily available forms of nutrients for plants. Vermicompost releases nutrients as undergo mineralization and continuous supply nutrients thus enhance the growth of plant reproductive (Havlin et al 1999). While application of vermicompost alone does not provide crop nutrient requirement. It has been reported that nitrogen, phosphorus and potassium of organic fertilizer require more time for their utilization by plants because slow releasing of N,P and K.

### CONCLUSIONS

The results of this study clearly revealed that combination NPK fertilizer and vermicompost organic fertilizer were improves the growth and yield components of rice. The best combination was 70% vermicompost and 30% NPK. The use of vermicompost could reduce consumption chemical fertilizer up to 70 percent.



## International Journal OF Engineering Sciences & Management Research

### REFERENCES

1. Domínguez, J., Aira, M. and Gómez Brandón, M. (2010). Vermicomposting: earthworms enhance the work of microbes. In: H. Insam, I. Franke-Whittle and M. Goberna, (Eds.), *Microbes at Work: From Wastes to Resources* (pp. 93-114). Springer, Berlin Heidelberg
2. Gopinath, K.A., Supradip, S., Mina, B.L., Pande, H., Kundu, S. and Gupta, H.S. (2008). Influence of organic amendments on growth, yield and quality of wheat and on soil properties during transition to organic production. *Nutrient Cycling in Agroecosystems*, 82 (1), 51-60.
3. Havlin, J.L., J.D. Beaton, S.L.Tisdale, and W.L. Nelson. 1999. *Soil Fertility and Fertilizers*. 6th Edition. Prentice Hall. Upper Saddle River, NJ. 499 p.
4. Jeyabal, G.Kuppuswamy. (2001). Recycling of organic waste for the production of vermicompost and its response in rice-legume cropping system and soil fertility. *European Journal of Agronomy*, 15, 153-170.
5. Khandwe R, Sharma RC, Pannase S. 2006. Effect of vermicompost and NPK on wheat yield in agri-silviculture system under Satpura plateau of Madhya Pradesh. *Internat. J. agric. Sci.* 2(2): 297-298.
6. Lazcano C, Gomez-Brandon M, Dominguez J. Comparison of the effectiveness of composting and vermicomposting for the biological stabilization of cattle manure. *Chemosphere*. 2008;72:1013–1019. doi: 10.1016/j.chemosphere.2008.04.016
7. Raha S., (2015). Studies on the Effect of Vermicompost on the Growth Yield and Quality of Chrysanthemum (*Chrysanthemum coronarium* L. CV Kasturba Gandhi). *International Journal of Environmental Sciences* Vol. 4 No. 2., Pp. 68-71