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The Dosage Effect of Cow Manure and Npk Pearl Fertilizer on Growth and Production of Cucumber (*Cucumis sativus L.*)

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Abstract
The study aims to determine the dosage effect of cow manure and NPK pearl fertilizer on growth and production of cucumber (Cucumis sativus L). The study used two factorial Randomized Block Design (RAK), the first factor was cow manure at three levels, namely: k1 = 3 kg plot^{-1} equivalent to 10 ton ha^{-1}), k2 = 4.5 kg plot^{-1} equivalent to 15 ton ha^{-1}) and k3 = 6 kg plot^{-1} equivalent to 20 ton ha^{-1}) the second factor was NPK Pearl fertilizer namely: n1 = 60 g plot^{-1} equivalent to 200 kg ha^{-1}), n2 = 90 g plot^{-1} equivalent to 300 kg ha^{-1}) and n3 = 120 g plot^{-1} equivalent to 400 kg ha^{-1}). The results showed that the dosage of cow manure (k) had a significant effect on the number of fruits harvested (first harvest). While the dosage of NPK Pearl fertilizer (n) had a significant effect on the average number of leaves at 14 DAP. The interaction both factors had a significant effect on the number of leaves at 21 DAP.

Keyword: Cow manure, NPK Pearl fertilizer, cucumber *(Cucumis sativus L.)*

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I. Introduction

Cucumber (*Cucumis sativus* L.) is one vegetable plant from the Cucurbitaceae family. Cucumber cultivation extends throughout the world, both in hot (tropical) and temperate (sub-tropical) climates. In Indonesia, cucumber are widely grown in the lowlands (Wijoyo, 2012). Cucumbers are believed to contain saponins, protein, fat, calcium, phosphorus, iron, sulfur, vitamins A, B1 and C. Raw cucumbers reduce body heat and increase stamina. Cucumber also contains malonic acid which able to suppress blood sugar so it does not turn into fat, good for weight loss. The high fiber content is useful for bowel movements, lowering cholesterol, and neutralizing toxins (Kementrian Pertanian, 2012).

Fertilization is input to be able to maximizing crop yields. Its carried out as an effort to meet plant nutrient needs so that production goals can be achieved. However, if its used is not wise or excessive, it can cause problems for plants such as being susceptible to pests and diseases, low production quality and in addition to high production costs and can cause environment pollution. The application of cow manure is expected to increase soil fertility and ultimately improve plant growth and yield. Cow manure can also improve soil structure to optimize plant growth. The characteristics of cow manure are being cold, its original form is not visible, and the smell has been reduced. The use of immature cow manure will inhibit plant growth, it can even kill plants. The use of good cow manure is by immersing it, so that the evaporation of nutrients due to chemical processes in the soil can be reduced (Wijoyo, 2012).

NPK pearl fertilizer is one of the inorganic fertilizers. Its very efficient to increasing the availability of macro nutrients (N, P and K) to replace single fertilizers such as Urea, SP-36, and KCl which are difficult to obtain in the market and expensive. NPK pearl fertilizer (16; 16; 16) is one of the NPK fertilizer products that have been circulating in the market and its contain of Nitrogen (N) 16%, Phosphorus (P_2O_5) 16%, Potassium (K_2O) 16%, Sulfur (S) 10% and a maximum water content of 2%. This type fertilizer is almost completely soluble in water, so the nutrients it contains can be absorbed and circulate by plants effectively (Kaya, 2013). The objective of this study to determine the dosage effect of cow manure and NPK pearl fertilizer on growth and production of cucumber (*Cucumis sativus* L.).

II. Material dan Methode

Field experiment was conducted from Oktober through December 2018. The research location was in UPT BPP, Long Ikis District, Paser Regency, with altitude 20-30 m above sea level, daily temperature of 24 ^oC – 32 ^oC, and soil pH around 6.

The experiment commenced on the 15th of October, 2018 by planting of a seed of Zatavy F1 Cap Panah Merah variety of cucumber at a spacing of 40 by 40 cm and depth 20-30 cm. The treatment used were three levels of cow manure (3 kg, 4.5 kg, 6 kg plot^{-1}) dan three levels of NPK pearl fertilizer (60 g, 90 g, 120 g plot^{-1}). The experiment was laid out in two factorial scheme with three replicates. The plot size was 1.5 m × 2 m with 50 cm pathways. The cow manure was uniformly spread on the plots and a hoe was used to turn the manure into the soil two weeks before planting. Two weeks after planting, NPK peral fertilizer 16;16;16 was applied at the rate of 60 g, 90 g, 120 g to the plots; this is the period recommended for the application of NPK pearl fertilizer in this zone twice at 7 and 14 days after planting (DAP). Manual weeding was carried out at 2 and 4 weeks after planting (WAP). Nematodes were controlled with Furadan 3G. In 3 WAP for effective insect control using Darmabas 500 EC applied in the afternoon. Growth parameters were assessed at 7, 14 and 21 DAP. Cucumber vine length was measured by using a flexible tape rule. Number of leaves was assessed by visual count of the green leaves. At every harvest the fruit length was measured by using a flexible tape afterwards the fruits were weighed using a 10 kg scale. The cumulative weights of the entire harvests (2 times in 3 days apart) were summed up for data analysis.

III. Results

The results in view parameters like cucumber vine length, first and second harvested fruits length, first and second harvested fruits diameter, first and second harvested fruits weight, first and second production per plot were showed insignificantly affected in all of the treatment observed. There were higher number measured in treatment k1n2, k3n1 and k2n2 compared to others at all parameters.

The results in cucumber number of leaves parameter at 7 DAP showed insignificantly affected treatment only treatment k1n1 and k2n1 gave the higher number of leaves compared to others (2.83 sheet). While observation at 14 DAP showed significantly affected in treatment NPK Pearl fertilizer (n2) while in treament cow manure and its interaction combined with NPK Pearl fertilizer showed no effect. And at 21 DAP, the interaction treatment of cow manure and NPK Pearl fertilizer gave significantly effect in number of leaves (k3n3) showed in **tabel 1.**

Tabel 1.Average number of leaves in 14 DAP and 21 DAP (cm)

Cow manure (k)	NPK Pearl Fertilizer							
	14 days after planting (DAP)				21 days after planting (DAP)			
	n1 (60 g)	n2 (90 g)	n3 (120 g)	Average	n1 (60 g)	n2 (90 g)	n3 (120 g)	Average
k1 (3 kg)	7.58	7.5	7.58	7.56	19.75^{a}	18.33^{b}	19.75^{b}	19.28
k2 (4.5 kg)	7.67	8.25	7.67	7.86	19.5^{b}	20.58^{ab}	19.58^{b}	19.89
k3 (6 kg)	6.75	8.58	7.58	7.54	16.33^{c}	20.42^{ab}	22a	19.58
Average	7.33^{b}	8.11^{a}	7.61^{b}		18.53	19.78	20.44	

Average number which followed by the same letter showed there is no difference with 5% BNT experiment (BNT=0.33 14 DAP); (BNT=1.63 21 DAP)

The results in cucumber number of fruit harvested parameter showed that in the first harvest the cow manure treatment gave significantly effect (k3) compared to NPK Pearl fertizer treament and its interaction showed in **table 2**. While at the second harvest, all the treatment gave insignificantly effect to this parameter.

Tabel 2. Average number of fruit harvested (first harvest)

Cow manure (k)	NPK Pearl Fertilizer (n)			
	n1 (60 g)	n2 (90g)	n3 (120 g)	Average
k1 (3 kg)	1.56	1.08	1.44	1.36^{b}
k2(4.5 kg)	1.44	1.25	1.67	1.45^{b}
k3 (6 kg)	2.06	1.89	2.08	2.01^{a}
Average	1.69	1.41	1.73	

Average number which followed by the same letter showed there is no difference with 5% BNT experiment (BNT=0.33)

IV.Discussion

The Effect of Cow Manure

Based on the analysis, cow manure treatment in cucumber number of fruit harvested parameter gave the best and significantly result. By giving the highest amount of manure (6 kg plot^{-1}) helps to increased the number of fruit because the Nitrogen and Phosphor in it. Nitrogen in manure helps stimulate vegetative growth of plants, especially tall plants and stimulates shoots (Jumin, 2002). Phosphor increase the percentage of the number of flowers into fruit and the number of fruit formed is influenced by the carbohydrates produced during the photosynthesis process namely fruit, as well as the potassium nutrient in cow manure is useful for fertilization, formation, increasing fruit weight and reducing fruit loss also improved the physical condition of soil for plant growth and development. Manure treatment can increase the number of *Azospirillum* population and contribute microorganisms to the soil. *Azospirillum* bacteria make the use of nitrogen fertilizer more efficient. In addition, *Azotobacter* and *Azospirillum* also have the ability to produce growth hormone which is useful for root growth, so it will increase the plant growth (Mujiyati & Supriyadi, 2009; Enujeke, 2013; Khan, et.al., 2017). The same result also found in other journal, poultry manure compost is comparably better than NPK fertilizer in improving soil fertility status for tomato plant (Eliakira and Heri, 2014).

The Effect of NPK Pearl Fertilizer

Based on the analysis, NPK Pearl fertilizer treatment in cucumber number of leaves at 14 DAP parameter gave the best and significantly result. By giving 90 g plant-1 of it, is enough to supported plant needs. This is presumably because the phosphorus contained in NPK Pearl fertilizer can provide a positive response so that it helps in the process of good leaf formation. If enough nutrients are available then the formation of carbohydrates and proteins will also increase will have an impact on plant growth, especially the number of leaves. The main function of nitrogen is to stimulate growth or the formation of vegetative parts in plants, such as stems, roots and leaves (Sutedjo, 2002; Nwofia, *et.al.*, 2015). The provision of artificial fertilizers is very effective on the production of chili, namely increasing the production of chili up to 8.7 % when its compared with the manure treatment (Mujiyati & Supriyadi, 2009). Application of NPK fertilizer significantly increased growth such as plant height, crop dry weight, crop growth rate, and yield. Application between 250 and 280 kg ha^{-1} NPK fertilizers was found efficient for total tomato fruit yield (Isah, et.al., 2014).

The Effect of Cow Manure and NPK Pearl Fertilizer

Based on the analysis, the interaction treatment in cucumber number of leaves at 21 DAP parameter gave the best and significantly result. The vigorous growth of cucumber plant had enough nutrients for rapid growth and development considering the composition of the cow manure and NPK Pearl Fertilizer. The nutrients from mineral fertilizers enhanced the establishment of crops while those from the mineralization of organic matter promoted yield when manures and fertilizers were combined both in cucumber and tomato plants (Adekiya and Agbede, 2009; Fuchs *et al*., 1970 in Eifediyi, 2010).

V.Conclusion

On the basis of above findings, it can be concluded cow manure significantly increased the yield in cucumber. While the NPK Pearl fertilizer significantly increased the growth in cucumber. And the interaction of both was determined to be the most appropriate amount for enhancing all the parameters of growth and yield.

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