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The Effect of Chicken and Cow Manure Dose Combination on The Growth and Production of Red Chili (*Capsicum annum* L.)

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Abstract

Chili is one of the plants that are needed by the community so that proper cultivation techniques are needed, in this case related to fertilization by utilizing organic animal waste.This study aims to determine the response of the growth and production of red chili (*Capsicum annum L.*) to chicken and cow manure dose combination. The method used is an experimental method with a factorial completely randomized design which consists of two factors, namely the first factor is the type of animal manure which consists of two levels, namely cow dung and chicken manure, the second factor is the dose of fertilizer there are three levels, namely 200 grams, 300 grams and 400 grams. The total combination of treatments was 9 treatments and 3 replications so that in total there were 27 units. The parameters observed were chili growth (height and number of branches) and chili production (number of fruits and fruit weight). The data were analyzed of variance with 5% and 1% levels, followed by Duncan's 5% further test. The results of the analysis showed that the combination of treatments had a very significant effect on plant height and fruit number (12.77 and 5.00), significantly affected the number of fruits (3.55), but did not affect the wet weight of fruit (2.46).Further test results showed that the best treatment for the parameters of plant height, number of branches, and number of fruit was a combination of 300 grams of chicken manure and 200 grams of cow manure.

Keywords: dose, chicken manure, cow manure, growth, production

A. Introduction

Red chili plants are shrubs from the Solanaceae family, rich in vitamin C, and are often used as food ingredients. Besides functioning as food and medicine, chili is also one of the horticultural commodities with high economic value if managed properly. In Indonesia, the production of fresh red chili tends to increase along with the increase in population. Therefore, efforts are needed to meet the need for chili, one of which is through cultivation techniques. The right cultivation technique can affect the growth and production of chili plants, as revealed by Djuniwati (2003 in Idris, 2008) that the growth and production of chili plants can be influenced by several factors, including the use of disease-sensitive cultivars, farming techniques and environmental conditions. that support optimal plant growth such as fertilizer application.

Fertilizer is a material that is applied to the soil, both organic (natural fertilizer) and inorganic (artificial fertilizer) to meet the nutrient needs of plants. Fertilization can be done through soil and leaves. Fertilization aims to improve the physical, chemical, and biological properties of the soil. Fertilizers circulating in the market can be in the form of inorganic fertilizers and organic fertilizers. The use of inorganic fertilizers has an effect that is not friendly to the environment, as revealed by Adisarwanto (2008) that the use of inorganic fertilizers is always followed by environmental problems both on biological fertility and soil physical conditions. For this reason, the use of organic fertilizers is highly recommended because organic fertilizers have various benefits as revealed in Sentana et al (2010) that organic fertilizers have benefits, including: 1) increasing soil fertility, 2) improving chemical, physical and biological conditions of the soil, 3) safe for humans and the environment, 4) increase agricultural production, and 5) control certain diseases. One of the organic fertilizers that can be used is organic animal manure. Organic manure or animal manure can be used to increase plant growth and production. According to Sutejo (2002) manure is one of the organic fertilizers that can increase the availability of food (nutrients) for plants that can be absorbed from the soil and also develop the life of microorganisms (microorganisms) in the soil. Microorganisms are very important for soil fertility and plant residues that can be converted into humus, certain compounds are synthesized into useful materials for plants.

Manure is fertilizer produced from animal waste (Prasetyo, 2014). Animals whose feces are often used for manure are animals that can be kept by the community, such as chickens and cows. The nutrient content of the two types of animals is also different. Chicken manure contains 2.44% nitrogen, 0.67% phosphorus and 1.24% potassium (Sari et al, 2016). While cows contain 2.33% nitrogen, 0.61% phosphorus, 1.58% potassium, 1.04% calcium, 0.33% magnesium, 179 ppm manganese and 70.5 ppm zinc (Rukmini, 2017). This difference in nutrient content becomes an inspiration to combine the two types of animal manure in one fertilizer dosage formula, as was done in this study.

The support from several previous research results also strengthens this research, where the results of this study show that organic chicken manure can increase the height of flower cabbage plants along with the dose of fertilizer (Sari et al, (2015), organic cow manure can increase the height of kale plants. along with the dose of fertilizer (Hariyadi, 2015), cow and chicken manure affect the wet and dry weight of chili plants (Prasetyo, 2014), the combination of chicken manure and cow manure on the growth and production of soybean plants (Natsir, 2018), and the combination of POC Nasa with cow dung manure on the growth and production of red chili plants (Fitria, 2013). Based on Prasetyo (2014) and Natsir (2018), in this study he combined animal manure with several different doses to find the best combination of doses to stimulate plant growth and development.

Based on the advantages possessed by manure, and from the results of relevant research, the authors are interested in conducting research by combining chicken and cow manure with different doses. By combining chicken and cow manure, it is hoped that it can meet the needs of nutrients in the soil which can later increase the growth and production of chili plants. That way, the needs of chili by the community can be met.

B. Literature Review

One of the organic fertilizers is organic animal manure or known as manure. Manure is a fertilizer derived from solid and liquid manure of livestock, both ruminants and poultry. The advantages of manure can increase humus, improve soil structure and texture, increase soil absorption of water, and increase the life of decomposing microorganisms (Baharudin, 2016, Safitri, 2018). In addition, organic animal manure contains macro (N, P, K) and micro (Ca, Mg,

Fe, Mn, Bo, S, Zn and Co) nutrients which can improve soil structure and porosity. The use of organic fertilizers on clay will reduce stickiness so that it is easy to process, while on sandy soils it can increase the binding capacity of the soil to water and air. Organic matter can react with metal ions to form complex compounds so that metal ions that are toxic to plants or inhibit the supply of nutrients such as Al, Fe and Mn can be reduced (Sentana et al, 2010).

Organic fertilizers have been proven to increase the production of various types of plants. Lingga and Marsono (2007) said that solid organic fertilizer increased rice production from 3-3.6 tons GKG/ha to 9.6 tons GKG/ha. Phosphorus (P) and 1.24% Potassium (K) (Sari et al, 2016). The results of the study on the application of organic chicken manure always gave the best plant response because chicken manure decomposed relatively quickly and had sufficient nutrient levels when compared to the same number of units as other manure (Widowati et al, 2004).

On the other hand, organic cow dung fertilizer has advantages over other manure, namely it has high fiber content such as cellulose (Widowati et al, 2004), provides macro and micro nutrients for plants, and improves water absorption in the soil. Organic cow manure is an organic fertilizer derived from cow dung which is good for improving fertility, physical, chemical and biological properties of the soil, increasing macro and micro nutrients, increasing water holding capacity and increasing cation exchange capacity (Rukmini, 2017).

The high levels of C in cow manure inhibits direct use to agricultural land because it will suppress the growth of the main crop. The maximum use of cow manure must be composted so that it becomes cow manure compost with a C/N ratio below 20, in addition to the problem of the C/N ratio, the use of cow manure is also directly related to high water content. Prajnanta (2007) stated that manure that is not ripe or composted will be harmful to plants because it still emits gas during the decomposition process.

C. Methodology

1. Research Design

The design of this study used a completely randomized design (CRD) which consisted of two factors, namely: manure type (chicken manure/A and Cow manure/S)and doses (200g/I, 300g/II, and 300g/III). The total combination of treatments was 9. The repetition was 3 times so that the total unit of observation was 27. The treatment combinations were: AISI = 200 g chicken manure + 200 g cow manure / polybag AISII = 200 g chicken manure + 300 g cow manure/polybag AISIII = 200 g chicken manure + 400 g cow manure/polybag AIISI = 300 g chicken manure + 200 g cow manure / polybag AIISII = 300g chicken manure + 300 g cow manure / polybag AIISIII = 300 g chicken manure + 400 g cow manure / polybag AIISI = chicken manure 400 g + cow manure 200 g/polybag AIISII = 400 g chicken manure + 300 g cow manure / polybag AIISIII = 400 g chicken manure + 400 g cow manure/polybag

2. Instruments

The tools used in this research are: Polybag, sprayer/sprinkler bottle, trowel/shovel, plastic bucket, label paper, stationery, measuring instrument, and camera. While the materials used in the study, namely: red chili seeds, chicken manure, cow manure, soil, and water.

3. Research Procedure

Healthy seed were chosen and then grown for 4 weeks until each plant developed 4 leaves.4 weeks old seedling transplanted into polybags containing a mixture of soil and organic manure according to the treatment as much as 3 kg per polibag.Plants were watered twice a day at a dose of 500 ml per polybag. Fertilization was carried out twice during the study. The first fertilization when mixing with soil media as basic fertilizer. The second administration was done when the plant was 7 weeks after planting. Observations on growth (plant height and number of branches) were carried out in the 10th weeks, while plant production (number and fruitfresh weight) was carried out during harvesting.

4. Technique of Data Analysis

Growth and production data were analyzed by variance (ANOVA) to determine whether there was an effect of treatment. If there is an effect, continue with Duncan's 5% test(Nurmeidiansyah, 2014).

D. Findings and Discussion

1. Findings

The recapitulation of the results of the analysis of variance on the growth data is represented by plant height and number of branches, while plant production is represented by variables and the number of fruits and fruit wet weight can be see Table 1.

Table 1. Recapitulation of Anava Yield Growth and Production of Chili Plants

Treatment	$F_{calculate}$ Growth and Production Variables				F_{table}
	Plant height	Number of branches	Number of fruits	Fruit fresh weight	
Fertilizer Type	40.59 **	9.88 **	8.77**	4.88*	6.01
Fertilizer Dose	1066.91 **	9.88 **	11.23**	8.04**	6.01
Combination	12.77 **	5.001 **	3.558*	2.461^{tn}	4.58

Description: **: very significant effect, *: significant effect, tn: no significant effect

Table 1 shows that for the variable plant height, number of branches and number of chili plants, both the type of fertilizer treatment, fertilizer dose and combinations showed a very significant effect, while for the number of plant fruits showed a significant effect. The variable fruitfreshweight did not show any effect.Therefore, the variables of plant height, number of branches and number of chili plants were further tested using Duncan's 5% test, while the variable fruit freshweightof fruit was not further tested.The complete further test results can be seen in Table 2.

Table 2. Recapitulation of Duncan Test Results of Chili Plant Growth and Production

Treatment Combination	Average		
	Plant height	Number of branches	Number of fruits
$A_{II}S_{I}$	59.17^{a}	17.00^{a}	20.33^{a}
$A_{III}S_{I}$	58.33^{b}	16.33^{ab}	17.33^{ab}
$A_{II}S_{II}$	56.27^{c}	16.33^{ab}	17.00^{ab}
$A_{I}S_{I}$	56.23^{c}	15.67^{ab}	17.00^{ab}
$A_{III}S_{II}$	55.90^{c}	15.67^{ab}	15.67^{b}
$A_{I}S_{II}$	54.83^{d}	15.67^{ab}	15.00^{b}
$A_{III}S_{III}$	50.40^{e}	14.33^{b}	14.67^{b}
$A_{II}S_{III}$	50.37^{e}	12.33^{b}	13.67^{bc}
$A_{I}S_{III}$	50.30^{e}	12.33^{b}	11.33^{c}
Different Value	0.698	2.138	3.339

Note: The numbers followed by the same letter do not show a difference in the different values listed in each variable

Table 2 shows that for the plant height variable, each treatment showed differences. Of all the existing treatments, the best treatment was AIISI (a combination of 300 g of chicken manure and 200 g of cow manure)for all variables measured both plant height, number of fruit and fruit fresh weight.

2. Discussion

Based on the results of the statistical analysis of the ANOVA test for the variable plant height, number of branches and number of chilies, it shows that the interaction value between chicken manure and cow manure has a very significant effect. This very real effect is because the combination of doses of chicken manure and cow manure is different, of course it affects the supply of nutrients, both micro nutrients and macro nutrients as a food source that is absorbed by chili plants as well. The results of this study are in line with those of Prasetyo (2014) that cow and chicken manure affect the wet and dry weight of chili plants, and Natsir (2018) that the combination of chicken manure and cow manure on the growth and production of plants (Natsir, 2018). And from the results of further tests, it was found that the best combination treatment was a combination of 300 grams of chicken manure and 200 grams of cow manure. These results indicate that the combination with these doses is suitable for the growth and production of chili plants. Heigher growth is caused by the nutrients contained in chicken manure and cow manure such as nitrogen (N), phosphorus (P) and potassium (K) which affect

the process of cell division such as increasing size in this case the increase in plant height (Salisbury and Ross, 2003). These nutrients play a very important role in the vegetative growth process including the growth of roots, stems and leaves of red chili plants.

The results of observations throughout the study took place during the growth period of chili plants that continued to increase in height and branches, had strong stems and were in a healthy condition and were not stressed. This healthy and stress-free chili plant condition proves that its vegetative development, both root, stem and leaf development of red chili plants is good, so that energy transport in the body of chili plants can take place optimally. This proves that the nutrients nitrogen (N), phosphorus (P) and potassium (K) in this planting medium have played a role in the vegetative growth process of chili plants. This is in line with what was revealed by Natsir (2018) that the NPK nutrient contained in the combination treatment of chicken manure and cow manure serves as a growth factor for soybean plants, namely nitrogen (N) nutrients as a constituent of leaf green matter (chlorophyll) and increases the protein content of the soybeans. harvest. While the nutrient phosphorus (P) plays a role in cell division and albumin formation, the formation of flowers, fruit, and seeds, accelerates maturation, strengthens stems so that they do not easily collapse and root development and improves plant quality. Potassium (K) is a nutrient for the formation of starch, activates enzymes, stomata opening (regulates respiration and evaporation, regulates physiological and metabolic processes in plant cells, affects the absorption of other elements, root development and enhances resistance to drought and disease.

In addition, it is also suspected that the nutrient composition of both micro and macro nutrients contained in chicken manure and cow manure with the right combination has a good effect on the growth and production of chili plants. The nutrient content in manure has perfect elements and is easily decomposed by the soil and of course manure does not leave chemical residues in the soil that can damage the structure and texture of the soil so that it can affect all physical properties of the soil such as water absorption, circulation. air and soil temperature. Furthermore, Musnamar (2003) and Dewanto et al (2013), said that organic fertilizers have various benefits, including the following: 1) increasing soil fertility, 2) improving the chemical, physical and biological conditions of the soil, 3) being safe for humans and environment, 4) increase agricultural production, and 5) control certain diseases. In addition to the effect of fertilizer application, plant height can also be influenced by environmental factors. As it is known that plant height is a response from the plant itself to get light for photosynthesis to take place. Chili plants can be planted from an altitude of 0-2,000 meters above sea level and can adapt well at temperatures of 24^0C-27^0C with humidity that is not too high, and during the dry season and rainy season. In addition, chili plants can also be planted in paddy fields or fields that are loose, fertile, not too clayey and have enough water.

Good soil for chili plants is loam, sandy loam, and loamy loam, and also has high organic matter so that plants can grow and develop optimally. Soil acidity (PH) 5.5 - 6.5. If the soil pH is less than 5.5 then liming must be done, otherwise it will result in a little or not optimum production (Wahyudi, 2011). Soil texture and structure in chili cultivation greatly affect all physical properties of the soil, such as water absorption, air circulation, temperature in the soil and contains a lot of organic matter. If the organic matter is low, it can be alleviated by applyingbokasi fertilizer or manure.

E. Conclusion

Based on the results of the research and discussion that have been stated, it can be concluded that the difference in the dose of the combination of chicken and cow manure has a very significant effect on the growth of chili plant height, as well as the parameters of the number of branches and the number of red chili plants only have a significant effect.Meanwhile, the fresh weight parameter of chili plants had no significant effect.The results showed that a combination of 300 g of chicken manure and 200 g of cow manure resulted in the highest plant growth parameters (plant height, number of branches, and number of fruit).

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