Utilization Of Liquid Organic Fertilizer From Local Microorganism Of Vegetables To The Productivity Of Cayenne Pepper Plant

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Abstract: This research aimed to determine the effect of give liquid organic fertilizer from local microorganism of vegetables to the productivity of cayenne pepper plant (Capsicum frutescens L.). The approach used in this research was a quantitative approach with experimental research method. The data measured was productivity of the cayenne pepper wet weight. The data analysis used ANOVA and followed by Least Significant Difference test (LSD) using SPSS version 18 program. The results show that the gived of vegetables local microorganism has a significantly effect on the productivity of cayenne pepper plant (Capsicum frutescens L.) with a significance value of 0.00 less than 0.05. The gived local microorganisms of vegetables at a dose of 100 ml gives a significantly different effect than other treatments.

Index Terms: Vegetables local microorganism, Productivity, Cayenne pepper plant (Capsicum Frutescens L.)

1 Introduction

CHILI plant is shrub plants that have long been planted in Indonesia. These plants have various types, one of which is cayenne pepper (Capsicum frutescens L.). The cayenne pepper plant is one of the agricultural plants that is a superior crop for chili farmers. This plant gets the attention of farmers because it has high economic value. This is evident from the area of cayenne pepper farmland which reaches 20% of the total vegetable land in Indonesia (Syukur et al., 2016: 6). Nevertheless, the need for cayenne pepper is still not sufficient for consumers. Based on interviews with cayenne pepper traders at the vegetable market Sintang District West Kalimantan, the price of cayenne pepper in the market is currently able to reach Rp. 90,000 / kg. This is because the need for cayenne pepper in the community is increasing every year. On the other hand, the price of cayenne pepper in the market is often higher than other types of chili. The high price of cayenne pepper is due to the lack of cayenne pepper due to farmers failing to harvest. Harvest failure is caused by low soil fertility accompanied by high pests that reduce the production of cayenne pepper. According to Julita et al (2013) that one of the causes of the low production of cayenne pepper is the low level of soil fertility and maintenance that is not optimal. In addition, the lack of supply is caused by increases in prices of production facilities such as fertilizer, pesticides, labor and land rent (Syukur et al., 2016: 7).

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Based on these problems, it is necessary to increase the productivity of cayenne pepper. In general, people use chemical fertilizers to increase the productivity of cayenne pepper. The use of chemical fertilizers plays an important role in spurring increased productivity such as in food crops, horticulture and plantation crops (Umah, 2012). Chemical fertilizers can provide nutrients for plants with high content. Nutrients in chemical fertilizers are one of the determining factors for increasing the productivity of cayenne. However, the use of chemical fertilizers over a relatively long period of time can adversely affect soil conditions. The soil becomes fast hardened and is less able to store water and will become acidic faster. Avoiding the use of chemical or inorganic fertilizers, the use of organic fertilizer is an alternative in increasing the production of cayenne. Organic fertilizers provide benefits for farmers because most consist of organic matter. This is because organic fertilizer is a fertilizer that comes from plants or animals that have gone through an engineering process, so that organic or solid fertilizer is produced and is useful for improving the physical, chemical and biological properties of the soil (Suriadikarta & Simanungkalit, 2006). One of the organic fertilizers that can be used to help overcome the production of cayenne is liquid organic fertilizer from local microorganisms (MoL). MoL is a collection of microorganisms that can be bred and functions as a starter in making bocations. Liquid organic fertilizer with MoL can be used as fertilizer for plants (Nisa, 2016: 2). According to Hermawati & Nappu (2012) MoL solution contains micro and macro nutrients as well as bacteria that have the potential to change organic matter, stimulate growth, and as controlling agents for pests and plant diseases, so that MoL can be used both as decomposers, biological fertilizers and as organic pesticides especially as a fungicide. In addition, MoL is another alternative as an effort to free plants from the adverse effects of chemical residues that have been used by the community to fertilize crops (Palupi, 2015). The ingredients for making MoL can come from our surrounding waste such as vegetable waste, bamboo shoots, golden snail (Pomacea canaliculata), fruit waste, gamal leaves (Glirisida sepium), banana humps, rice, rabbit urine and others (Suhastyo, 2011) . This is in line with the opinion of Fitriani et al (2015), that MoL is a fermented solution based on various resources that are widely available in various places. In general, MoL raw materials are various resources available around the

environment, such as rice, banana humps, vegetable scraps or market waste, household waste etc (Nisa, 2016: 9). These materials are places favored by microorganisms as a medium for living and developing microorganisms that are useful in accelerating the destruction of organic materials (decomposers) or as an additional nutrient for plants. Based on this background, it is necessary to do research related to the utilization of liquid organic fertilizer from local microorganisms (MoL) of vegetables to the productivity of cayenne pepper (Capsicum frutescens L.). The results of this study are expected to provide information to cayenne farmers to use organic fertilizer (MoL from vegetable waste) as an alternative in increasing the productivity of cayenne pepper (Capsicum frutescens L.).

2 METHOD

2.1 Research Design

This research used a quantitative approach to the type of experimental research using complete random design with five treatments and three replications. Each treatment was given different MoL concentrations of vegetables, namely P1 = 0%, P2 = 25%, P3 = 50%, P4 = 75%, P5 = 100%.

2.2 Object of Research

The object in this research was 30 cayenne pepper plants. The implementation of research utilizes vacant land in the yard of the house. Research location in Kajang Baru Village SP 4 Pandan, Sintang District, West Kalimantan province, Indonesia. The research time was conducted for 80 days (2-3 months).

2.3 Instruments and Materials of Research

The research instruments and materials used in this research can be seen in Table 1 and Table 2.

Table 1. *Instruments of Research*

No	Tools	Total	Function
1	10 Liter size container	1 piece	Accommodate liquid of MoL
2	Bottle of used mineral water	1 piece	The place where the fermented gas is released
3	1000 mL measuring cup	6 piece	Measuring mineral water, coconut water and rice washing water
4	Black duct tape	1 piece	Glue the lid of the container
5	Candle	1 piece	Close so that there is no gap connected to the container
6	Small transparent 3/8 inch hose	1 Meter	As a way out of gas from the container to a bottle of used mineral water
7	Knife	1 piece	Cut ingredients (vegetables)
8	Cutting board	1 piece	Cut ingredients (vegetables)
9	Matches	1 piece	Burning candles
10	Machete	1 piece	Clean the land area
11	Hoe	1 piece	Hoe the ground
12	Flower vase	2 piece	The place of plants seeding
13	Net	10 Meter	Protect plants from pest and livestock
14	Gage	1 piece	Measuring land and spacing
15	Ruler	1 piece	Measuring plant height.
16	Weigher	1 piece	Measuring wet weight and dry weight of chili fruit
17	Ballpoint	1 piece	Collect data in the field and make a list of treatment names
18	Spray tool	1 piece	Spraying plants with MOL
19	Measuring cup	1 piece	Measuring the concentration to be given to plants

Table 2. *Materials of research*

No	Materials	Total	Function
1	Seed of cayenne plant	±100 Seed	As the object to be studied
2	Mustard, Kale, Cabbage	1 Kg	Make MoL ingredient
5	Coconut water	2 Liter	Make MoL ingredient
6	Rice washing water	2 Liter	Make MoL ingredient
7	Brown sugar	±150 Gram	Make MoL ingredient
8	Water	2 Liter	As a MoL vegetable mixture to obtain different concentrations and as controls.

2.4 Research Prosedure

The procedure in this research included two steps, namely the procedure for making vegetable MoL and the procedure for planting and administering cayenne pepper plants. The research procedures can be seen in Table 3 and Table 4.

Table 3. *Procedure for making vegetable MoL*

No	Prosedures
1	Cut vegetables approximately 1cm
2	Put in container
3	Add 2 liters of coconut water and 2 liters of rice washing water
4	Enter 2 liters of mineral water
5	Add brown sugar
6	Stir until the brown sugar is completely dissolved

7	Punch the lid of the container and cover the bottle about the size of a hose
8	Cover container tightly
9	Tape the duct tape to cover the container. Be sure to glue it correctly
10	Insert the hose into the lid of the container that has been holes, not to hit the surface of the water
11	Connect the hose with the bottle cap that has been punched to the surface of the water
12	Fill the bottle with 350 ml of water
13	Close the bottle tightly
14	Light a candle and drip each hole that has been closed with a liquid candle so that the hole is completely closed and there is no air entering
15	Save, after 20 days MoL Local Microorganisms are ready

Table 4. *Procedure for planting and administering cayenne pepper plants*

No	Prosedures
1	Preparation Phase
	a. Prepare instruments and materials used during the research process.
	b. Cleaning and processing of land by making 5 beds with the size of each bend with 150 cm X 500 cm using a hoe.
2	Implementation Phase
	a. Planting of cayenne pepper is done in the morning before 09.00 or in the afternoon after 15.30 by making a hole using a 20 cm deep hoe with a distance of 50 cm X 60 cm from each plant.
	b. Protected plants from disturbances in livestock and plant pests, nets are placed around the beds.
	c. Giving treatment with MoL local microorganisms with different concentrations of vegetables carried out every two weeks during the research process, namely on the first day of planting, 14 HST, 28 HST, 42 HST and 56 HST.
	d. Doing observations when plants are 14, 28, 42, 56, 70 and 80 HST.

2.5 Data Analysis

The parameters measured in this research were the wet weight of cayenne fruit. The measurement of plant wet weight was obtained from weighing plants aged 80 HST. The data obtained were analyzed using descriptive and inferential analysis. Descriptive analysis aims to look at the mean values of wet weight of cayenne fruit from each treatment. Inferential analysis used the ANOVA test followed by the Least Significance Different (LSD) test at the level of 0.05% to see the real difference in each treatment. Data analysis was calculated using SPSS version 18 calculations.

3 Research Result

The results of measurements and descriptive counting of wet weight of cayenne fruit (Capsicum frutescens L.) can be seen in Table 5.

Table 5. *Summary of Results of Measurement of Wet Weight of Chili cayenne Plants*

Parameter	Treatment	Replication						Total	Average
		1	2	3	4	5	6		
Wet weight (gr)	I	90	90	95	95	90	80	540	90.0
	II	120	130	120	120	110	120	720	120.0
	III	140	135	140	144	132	150	841	140.2
	IV	172	175	178	160	156	180	1021	170.2
	V	200	210	206	200	180	204	1200	200.0
Total		722	740	739	719	668	734	4322	720.3
average									144.07

The wet weight of cayenne fruit (Capsicum frutescens L.) is obtained by weighing the cayenne fruit that has been harvested using a scale. The measurement of plant wet weight is done only once when the chilli has been harvested, i.e. when the plant is 80 days after planting. The results of measurements and calculation of the wet weight of cayenne fruit (Capsicum frutescens L.) in table 9 show that the average wet weight of cayenne fruit in Treatment I with a concentration of 0% as much as 90 gr, treatment II with a concentration of 25% as much as 120 gr, treatment III with a concentration of 50% as much as 140 gr, treatment IV with a concentration of 75% as much as 170 gr and treatment V with a concentration of 100% as much as 200 gr. The highest average wet weight of cayenne pepper (Capsicum frutescens L.) is found in treatment V with a concentration of 100% which is equal to 200 gr. This means that the best concentration for the growth of cayenne (Capsicum frutescens L.) is a concentration of 100% (200 ml). The wet weight of cayenne fruit was then analyzed by inferential analysis using ANOVA. The ANOVA analysis of wet weight of cayenne fruit can be seen in Table 6.

Table 6. *Summary of ANOVA Results for Chili cayenne Wet Weight*

Dependent Variable:Wet weight

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	44052.703[a]	5	8810.541	140.299	.000
Intercept	125664.370	1	125664.370	2001.073	.000
Replication	88.503	1	88.503	1.409	.247
Treatment	43964.200	4	10991.050	175.021	.000
Error	1507.164	24	62.798		
Total	668216.000	30			
Corrected Total	45559.867	29			

a. R Squared = .967 (Adjusted R Squared = .960)

The results of ANOVA analysis in Table 6 show that the significance number for the repeat covariate is 0.247. Because the significant value is more than 0.05, H0 is accepted, meaning that there is no linear relationship between repetition and wet weight. Then for the treatment significance value is 0,000 less than 0.05 so Ho is rejected, so it can be concluded that there is an influence between the treatment given and the wet weight of cayenne fruit. The difference in each treatment can be done through LSD further testing as in Table 7.

Table 7. *Summary of Test Results LSD for each treatment*

Treatment	Replication	Average	Standard Deviation	Value Co	LSD Notation
I	0%	29.2	5.4772	83.283	a
II	25%	32.9	6.3246	113.283	b
III	50%	34.9	6.4005	133.449	b
IV	75%	40.0	9.8877	163.449	c
V	100%	60.0	10.5071	193.283	d

The LSD test results in Table 7 show that the fifth treatment (100%) had the most significant effect on the wet weight of cayenne pepper (Capsicum frutescens L.).

4 DISCUSSION

Based on the results of the descriptive analysis showed the mean height of cayenne pepper (Capsicum frutescens L.) which was 39.4 cm, number of leaves cm, and number of leaves 97 strands and wet weight of fruit 144.07 gr. The analysis of the researchers showed that the growth of cayenne (Capsicum frutescens L.) using MoL vegetables can increase growth because vegetable MoL contains nutrients needed by plants. Microorganisms in vegetable waste solutions are substances that can stimulate plant growth and development (fitohormones) such as gibberellins, cytokines, auxins, and inhibitors. The analysis of researchers is supported by the results of the study (Jeremiah, 2016) which shows that the administration of MoL solution from bamboo shoots has a significant effect on stem height, wet and dry weight of mustard plants. This result is in line with the Handayani et al (2015) study which suggested that in papaya MoL solution, cabbage MoL and cow urine MoL contained N, P, K, Ca, and Mg macro nutrients as well as micro nutrients that met the standards set by the government so they could use as liquid organic fertilizer. Furthermore, based on the analysis test using ANOVA showed that H1 was accepted, namely there was a significant effect of vegetable MoL on plant height, number of leaves, number of leaves, and wet weight of cayenne fruit (Capsicum frutescens L.) with Sig <0.05, plant height (0,000 <0.05), number of leaves (0,000 <0,05), and wet weight (0,000 <0,05). Giving MoL vegetables has a significant influence on the growth of cayenne (Capsicum frutescens L.) plant because this vegetable MoL has a lot of nutrients, makes it easier to absorb nutrients, regulates plant growth and is safe for health and environmentally friendly. In addition, MoL vegetables consist of ingredients in the form of substances that can stimulate plant growth and development (fitohormones) such as gibberellins, cytokines, auxins and inhibitors (Yeremia, 2016). Based on further LSD tests showed that at the 5% level the effect of vegetable MoL on plant height, leaf number, and wet weight in the fifth treatment (200 ml dose) was significantly different from the effect of other doses. The results of the LSD test with (dose of 100 ml) MoL vegetables provide optimal results on the growth and productivity of cayenne pepper (Capsicum frutescens L.). This is because the 200 ml dose contains the most macro nutrients needed by plants so that the nutrient needs of cayenne (Capsicum frutescens L.) plants are fulfilled optimally so that chemical reactions that occur in the plant's body take place faster when compared to the treatment contain fewer nutrients. Plants need nutrients as an energy source and synthesis of various components, these nutrients include Nitrogen, Sulfur, Potassium, Calcium, Phosphorus, Magnesium, and Vitamin B1. The researcher gave the treatment of MoL watering vegetables, which in MoL vegetables contain various nutrients needed for plants in the process of plant growth and development (fitohormones) such as gibberellins, cytokines, auxins, inhibitors, carbohydrates, Pseudomonas, Aspergilus and Lactobacillus. This is supported by research (Handayani, Yusuf and Susilowati, 2015) which suggested that in papaya MoL solution, cabbage MoL and cow urine MoL contained N, P, K, Ca, and Mg macro nutrients as well as micro nutrients that met the standard determined by the government so that it can be used as a liquid organic fertilizer. This is in line with the opinion of Maspary (2012) who said that in MoL vegetables contain nutrients such as cytokines, carbohydrates, Pseudomonas, Aspergilus and Lactobacillus.

5 CONCLUSION

Based on the results of the research and discussion, the

following conclusions can be drawn: (1) The highest wet weight of cayenne (Capsicum frutescens L.) plants is found in treatment 5 with a concentration of 100% and lowest in treatment 1 with a concentration of 0%; (2) Giving Micro MoL of Local Organisms Vegetables have a significant influence on the productivity of cayenne (Capsicum frutescens L.) (p = 0.000 <0.05); (3) Giving MoL vegetables at a dose of 100 ml gives a significantly different effect than other treatments.

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