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# THE INFLUENCE *OF COCOPEAT* AND *EFFECTIVE MICROORGANISMS* ON THE GROWTH OF PLANTING MEDIA OF CAYYET CHILDREN *(CAPSICUM FRUTESCENS L)*

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## ABSTRACT

This research aims to determine the effect of giving EM4 and cocopeat on the growth of cayenne pepper plants. This research was carried out at the Workshop on Jln. Avoid it. Jeuleukat Blang mangat, Lhokseumawe. This research used 5 specified material treatments, namely: 5kg yellow soil, 3kg cow dung, 50g brown sugar while the materials varied were V.1 (Cocopeat 200g/ EM4 5ml), V.2 (Cocopeat 400g/ EM4 10ml), V. 3 (Cocopeat 600g/ EM4 15ml), V.4 (Cocopeat 800g/ EM4 20ml). V.5 (Cocopeat 1000g/ EM4 25ml). The parameters tested were (N), Phosphorus (P), Potassium (K), plant height and leaf width. Based on this research, it shows that the Nitrogen content is 0.56%, Phosphorus 0.24%, Potassium 0.05%, while in statistical testing the stem height is V.1= 34cm, V.2= 35cm, V.3= 33cm, V .4= 31.8cm, V.5= 28.8cm. then the statistical test results for leaf width are V.1= 8.4 cm, V.2= 8.9cm, V.3= 9.1cm, V.4= 7.8cm, V.5= 9.8cm. From this research it can be concluded that research using composition V.2 is more dominant in stem height growth, while composition V.5 is more dominant in leaf growth. The test results for the nutrients contained in the planting media do not yet meet SNI 7763.2018 standards

**Keywords**: Husk Charcoal, Cocopeat, EM4, Brown Sugar, Yellow Earthen Cow Dung

## INTRODUCTION

Cayenne pepper ( *Capsicum frutescens L.* ) is a type of horticultural vegetable that has small fruit with a spicy taste. This plant has many benefits, especially the fruit, namely as a cooking spice, a mixture for the food industry, and as a cosmetic ingredient. Apart from the fruit , other parts of this plant such as the stem, leaves and roots can also be used as medicine (Ashari, 1995).

The price is more expensive than regular chilies but many farmers experience crop failure. The occurrence of crop failure is caused by several obstacles, especially the level of soil fertility and pests that develop in the humid air, causing

damage to the flowers, leaves and plants of cayenne pepper, ultimately resulting in crop failure (Supriyanto, 2012)

One effort to maintain and increase soil fertility is by adding organic materials such as cocopeat or manure to the soil. Cocopeat is a product of processed coconut fiber, cocopeat is used as a planting medium because it contains nutrients that are really needed and is very useful because it absorbs more water and nutrients . According to Abad et al (2002) that cocopeat is a good planting media component with acceptable pH, electrical conductivity and other chemicals .

In cultivation activities, planting media is an important supporting factor success. Planting media is a material used for seedlings which functions as storage of nutrients, regulates humidity and air temperature and influences the root formation process. (Putri, 2013).

Cow manure can increase the availability of nutrient elements for plants, as well as develop the life of microorganisms in the soil. Microorganisms play a role in converting litter and plant remains into humus, certain compounds are synthesized into materials that are useful for plants (Lingga, 1991). Cow manure has advantages over other manures, namely that it has high levels of fiber such as cellulose, provides macro and micro nutrients for plants, and improves the water absorption capacity of the soil (Hartatik and Widowati, 2010).

The use of effective microorganisms (EM) is one technology that can be used in agricultural management efforts that can reduce negative impacts on the environment. EM4 consists of a mixed culture of naturally living and beneficial microorganisms and can be applied as an inoculum to increase the diversity of soil and plant microorganisms (Higa & Parr 1997). Therefore, it is necessary to carry out research on how the use of cocopeat and EM4 affects growth. This research aims to analyze the influence of microbes using EM4 on cayenne pepper plants and *Cocopeat* is used to maintain and increase soil fertility in the growth of cayenne pepper plants.

1.2 Supporting Theories

1.2.1 Manure

Organic fertilizer is very useful for increasing agricultural production, both quality and quantity, reducing environmental pollution, and improving land quality in a sustainable manner. Long-term use of organic fertilizer can increase land productivity and prevent land degradation. Apart from that, long-term application of organic fertilizer can increase the humus content in the soil. With humus, a lot of water will be absorbed and enter the soil , so the possibility of erosion of the soil and nutrients in the soil is very small. Organic fertilizers also have important chemical functions such as providing macro nutrients (nitrogen,

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phosphorus, potassium, calcium, magnesium and sulfur) and micronutrients such as zinc, copper, cobalt, barium, manganese and iron, even in small amounts, increasing capacity. exchange soil cations, and form complex compounds with metal ions that are poisonous to plants such as aluminum, iron and manganese (Benny, 2010).

The nutrient content of livestock manure varies depending on the type of food. The richer the nutrients N, P and K, the livestock manure will also be rich in these substances. Livestock manure usually has a low nutrient content, so it requires large quantities to use, and it is known that livestock manure on average contains 0.5% N, 0.25% $P_2O_5$, and 0.5% $K_2O$, so that one ton of livestock manure contributes 5 kg N, 2.5 kg $P_2O_5$, and 5 kg $K_2O$ (Widjajanto, 2005).

Table 2.1 Nutrient Content of Organic Fertilizer According to Indonesian National Standards (SNI).

Table 1.1 SNI for Organic Fertilizer Nutrient Elements

| Nutrient Content of Organic Fertilizer According to Indonesian National Standards (SNI) | | |
|---|---|---|
| Chemical properties % | SNI standards | Cow manure |
| C-Organic | 12 | 24.2 |
| N- Total | 0.4 | 2.02 |
| Phosphorus | 0.1 | 0.49 |
| Potassium | 0.2 | 1.42 |
| C/N ratio | 10 – 25 | 12.0 |
| Ph | 4-8 | 8.30 |
| Water content | 50 (maximum) | 16.72 |

Source: SNI 7763, 2018 Solid organic fertilizer

### 1.2.2 Cow dung

Cow manure is made from a mixture of cows, urine and leftover feed that is deposited in one place at some time. This organic fertilizer can improve soil structure and provide nutrients. To use cow dung as plant fertilizer, the cow dung must first be allowed to dry (ferment) or what is often called cold cow dung. Using fresh cow dung for plants will actually cause the plants to die. Cow manure can be categorized as compost. One cow can produce 23.6 kg of compost per day. The nutrient content in cow dung is very useful for nourishing plants so that plant growth will be more optimal. Cow dung contains nutrients in the form of nitrogen (N), phosphorus (P), and also potassium (K). (Pramono Echo, 2022).

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Figure 1.1 Cow dung

The use of cow dung as compost is highly recommended in the world of agriculture. Compost is an organic fertilizer that will not have a negative impact on plants or the natural environment. We have previously explained the nutrient content in cow dung, namely nitrogen (N), phosphorus (P) and potassium (K). All three are of great benefit to plant growth.

1.2.3 *Cocopeat*

Cocopeat has a pH between 5.0 to 6.8 so it is very good for the growth of any plant. Hydroponic planting media is usually mixed first with other materials such as burnt husks in a 50:50 ratio, the purpose of which is none other than to increase aeration in the planting media. *Cocopeat* has the property of easily absorbing and storing water. It also has pores, which facilitate air exchange, and the entry of sunlight. It contains *Trichoderma* molds, a type of enzyme from fungi, which can reduce disease in the soil. In this way, cocopeat can keep the soil loose and fertile.

Figure 1.2 *Cocopeat*

Benefits of *cocopeat* for plants:

1) Has a texture similar to soil
2) High water absorption capacity

3) Very environmentally friendly
4) Resistant to pest attacks
5) Suitable for beginners

1.2.4 *Effective Microorganisms e* (EM 4) Plants

*Effective Microorganism ( EM* ) is a mixed culture of microorganisms that are beneficial for plant growth. The currently known EM4 is EM4 which is applied as an inoculant to increase the diversity and population of microorganisms in soil and plants, which can then improve the health, growth, quantity and quality of plant production. Mixing organic materials such as manure or household waste and agricultural waste with EM4 is a very effective organic fertilizer for increasing agricultural production. Besides being able to be used as a starter for beneficial microorganisms in the soil, this mixture can also provide a positive response to plant growth and development (Wididana, 1994).

EM4 is formulated in liquid form with a yellowish brown color, sour odor with a pH of 3.5 containing 90% *Lactobacillus bacteria* sp and three other types of microorganisms, namely photosynthetic bacteria, streptomyces sp and yeast which work synergistically to fertilize the soil and increase plant growth. EM4 has quite unique properties because it can neutralize organic matter or soil that is acidic or alkaline. These microorganisms are in the resting phase and when applied can quickly become active in breaking down organic matter in the soil. The results of the breakdown of organic materials are in the form of organic compounds, antibiotics (alcohol and lactic acid), vitamins (A and C), and polysaccharides (Higa and Wididana, 1994).

Apart from producing these organic compounds , EM4 can also stimulate the development and growth of other beneficial microorganisms such as nitrogen fixing bacteria, phosphate solubilizing bacteria, microorganisms that are antagonistic to pathogens and can suppress the growth of soil borne pathogenic fungi (Wididana, 1994; Muntoyah, 1994 ) and what is more important is that it can reduce dependence on chemical fertilizers and pesticides, EM4 can be used to process waste materials into compost with a faster process compared to traditional waste processing. In general, the amount of EM4 used is 1-2 cc per liter of water for soil bokashi, and 30 cc per liter for fermenting plant extracts (Djuarni, 2005).

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Figure 1.3 EM 4 for plants

1.3 Special purpose

1. To determine the effect of the amount of *cocopeat* on the growth of cayenne pepper
2. To determine the effect of the amount of EM 4 on the growth of cayenne pepper

## METHOD

### 2.1 Research Place

This research was carried out by the Jl. Elak Workshop. Jeuleukat Blang Mangat. Lhokseumawe (near Brimop Company)

### 2.2 Tools and materials

2.2.1 Tools used

- Scales
- Hoe
- Scope
- Bag
- Bucket
- Wheelbarrow
- Polybag
- Cement spoon

2.2.2 Materials used

- Cow dung

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- *Cocopeat*
- *Effective Microorganisms* (EM4)
- Water
- Brown sugar
-

**2.3 Experimental Treatment Design**

2.3.1 Fixed/Controlled Variable

- Cow dung : 3kg
- Yellow soil : 5kg
- Water : 1 Liter
- Brown Sugar : 50 grams
-

2.3.2 Independent Variable

- Cocopeat: 200,400,600,800,1000 grams
- Em4 : 5,10,15,20,25 mL

2.3.3 Dependent variable

- Test Nitrogen content
- Phosphorus Content Test
- Potassium Content Test
- Stem Growth Test

**2.4 Experimental and Research Procedures**

2.4.1 Work Procedure for Making Planting Media

1. Prepare 5kg of yellow soil
2. Prepare 3kg of cow dung then mix it with yellow soil
3. Then add 200 grams of *cocopeat* and mix
4. Prepare 5 ml of EM 4 in a bucket containing 1 liter of water and 50 grams of brown sugar then stir until dissolved (homogeneous)
5. Then pour in the mixture, then stir until evenly mixed
6. If it is evenly distributed, put the material in a sack and store it in a place that is not exposed to direct sunlight
7. Water every 7 days using water mixed with brown sugar and EM4 to provide microorganisms in the fertilizer
8. Do it for up to 28 days

2.4.2 Nitrogen Content Testing Procedure

1. The sample is ground first
2. then weigh 1 gram and put it in a 100 ml Kjedahl flask
3. then add 1 gram of selenium mixture and 3ml concentrated $H_2SO_4$.

4. The mixture was heated above the digestion, first lit on low for 15 minutes, then raised until the solution became clear. The heating process is carried out for 15 minutes and cooled.
5. After cooling, 10 ml of distilled water was added, then transferred into a kjedahl flask and diluted using distilled water to 100 ml.
6. After dilution, add boiling stone 25 NaOH 30%
7. Next, the Kjedahl flask was immediately connected to a cooler and the distillation was collected in a 100 ml elemyer which had been filled with 15 ml of 1% boric acid and 3 drops of BCG+MR indicator.
8. Distillation was stopped after 10 minutes from the first drop
9. The distilled ammonia is titrated with $H_2SO_4$ 0.05 N from green until the color starts to turn pink .

2.4.3 Phosphorus Testing Procedure

1. The sample was weighed at 0.5 gram, then the ashing process was carried out by adding concentrated $H_2SO_4$ and concentrated $HNO_3$ after which it was heated on *a hot plate.*
2. Next , 2.5 ml was added, so that it turned black like ash, then concentrated $HNO_3$ was added until the smoke from the sample was not black.
3. Add $HNO_3$ gradually until the sample does not emit black smoke after adding $HNO_3$ . After the ashing process, the sample was added with distilled water to 50 ml and shaken.
4. Next, it is filtered and put into a container, then 2.5 ml of vanadate molybdate is added to the container which will produce a yellow color.
5. After that, the phosphorus content was determined using a UV-Vis spectrophotometer at a maximum wavelength of 400 nm.
6. 2.4.4 Potassium Test Procedure
7. The sample was weighed at 0.5 gram, then the ashing process was carried out by adding concentrated $H_2SO_4$ and concentrated $NHO_3$ after which it was heated on *a hot plate* .
8. Next, 2.5 ml of concentrated $H_2SO_4$ is added , so that it turns black like ash
9. Then concentrated $HNO_3$ was added until the smoke from the sample was not black. The addition of $HNO_3$ to the sample did not emit black smoke after adding $HNO_3$
10. After the ashing process was complete, the sample was added with distilled water to 50 ml and shaken.
11. Then filtered and put into a container.

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12. Next, potassium levels are determined directly using *Inductively Coupled Plasma* (ICP).

## RESULTS AND DISCUSSION

### 3.1.1 Research Results

Table of organic fertilizer nutrient analysis test results Variable -2

| Test Parameters | Unit | Test results | SNI Standard 7763.2018 |
|---|---|---|---|
| Nitrogen (N) | % | 0.56 | 0.4 |
| Phosphorus as $P_2O_5$ | % | 0.24 | 0.1 |
| Potassium as $K_2$ | % | 0.05 | 0.2 |

Table of Results of Research on Stem Height Growth of Cayenne Pepper Plants

| No | Until l | HST Week I (cm) | HST Week II (cm) | HST Week III (cm) | HST Week IV (cm) | HST Week V (cm) |
|---|---|---|---|---|---|---|
| 1. | Variable 1 | 4.5 | 5.7 | 8.3 | 10 | 11.2 |
| 2. | Variable 2 | 3.9 | 5.2 | 9 | 10.5 | 11.8 |
| 3. | Variable 3 | 4 | 5,6 | 7.4 | 10.3 | 11.5 |
| 4. | Variable 4 | 4.5 | 6.2 | 7.2 | 9.4 | 10.6 |
| 5. | Variable 5 | 4.2 | 5.8 | 7.3 | 9.1 | 10.8 |

Information: V1= 5kg soil + 200gram *cocopeat* + 5ml EM4, V2= 5kg soil + 400gram *cocopeat* + 10ml EM4, V3= 5kg soil + 600gram *cocopeat + 15ml EM4, V4*= 5kg soil + 800gram cocopeat+ 20ml EM4, V5= 5kg soil + *cocopeat* 1000gram + EM4 25ml.

Table: Results of stem growth of cayenne pepper plants for weeks 6-10

| No | Samples | HST Week VI (cm) | HST Week VII (cm) | HST Week VIII (cm) | HST Week IX (cm) | HST Week X (cm) |
|---|---|---|---|---|---|---|
| 1. | Variable 1 | 11.9 | 12.7 | 13.4 | 14.1 | 14.8 |
| 2. | Variable 2 | 12.2 | 13.2 | 14 | 14.8 | 15.6 |
| 3. | Variable 3 | 12 | 12.5 | 13.3 | 13.9 | 14.5 |

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| | | | | | | |
|---|---|---|---|---|---|---|
| 4. | Variable 4 | 11.6 | 12.4 | 12.9 | 13.5 | 14.2 |
| 5. | Variable 5 | 11.4 | 12.1 | 12.7 | 13.2 | 13.9 |

Table Growth results of cayenne pepper plants for weeks 11-15

| No | Samples | HST Week XI (cm) | HST Week XII (cm) | HST Week XIII (cm) | HST Week XIV (cm) | HST Week XV (cm) |
|---|---|---|---|---|---|---|
| 1. | Variable 1 | 15.7 | 18.8 | 20.2 | 25.8 | 34.2 |
| 2. | Variable 2 | 16.8 | 19.6 | 21.1 | 28.5 | 35.5 |
| 3. | Variable 3 | 15.5 | 18.4 | 17.9 | 24.6 | 33 |
| 4. | Variable 4 | 15.3 | 18.1 | 17.6 | 23.8 | 31.8 |
| 5. | Variable 5 | 14.8 | 17.7 | 16.8 | 22.9 | 28.8 |

### 3.2 Discussion

In research on making solid organic fertilizer using basic ingredients from cow dung, husk charcoal, yellow soil and brown sugar, which are varied with different fermented ingredients including:

3.2.1 Effect of EM 4 Amount on the Growth of Cayenne Pepper

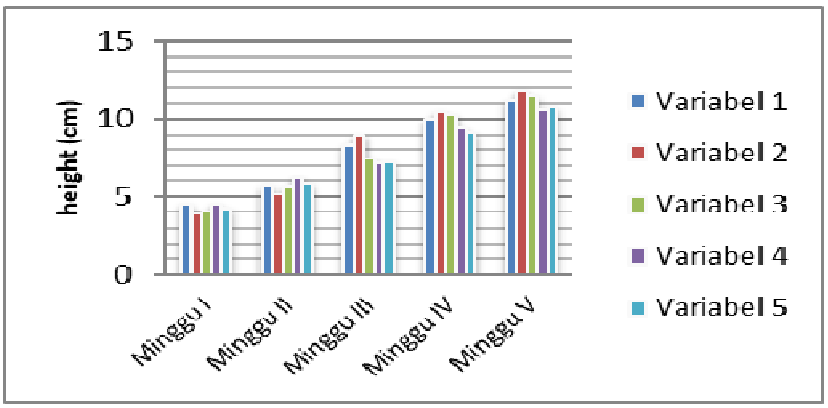


Figure 3. 1 Graphic data Plant growth processes ignore each variable from Week 1 - Week 5

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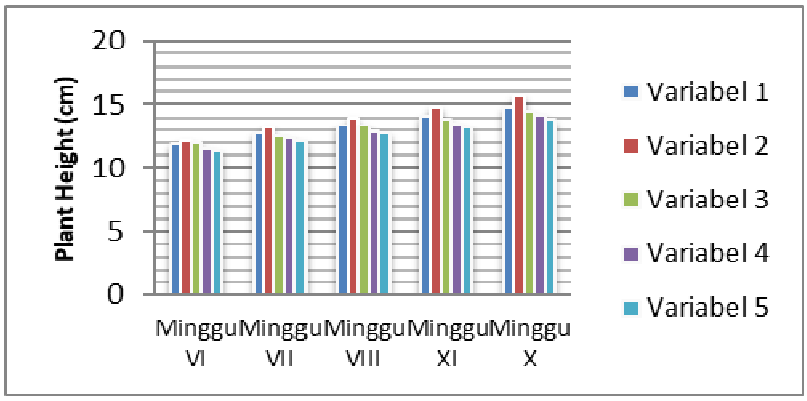


Figure 3 .2 Stem growth of cayenne pepper plants from week 6 to week 10

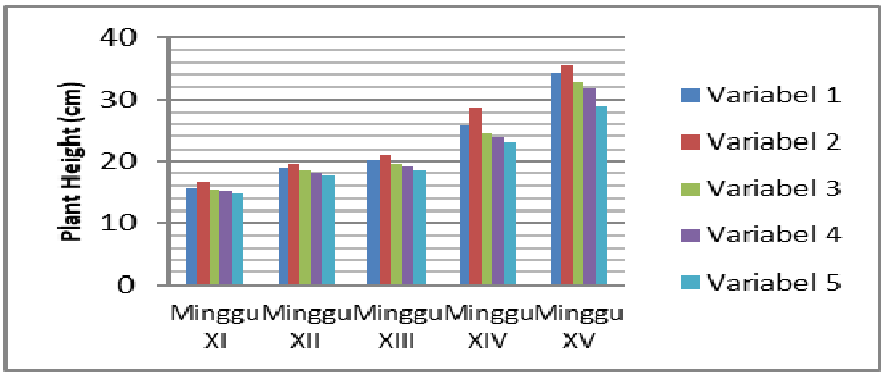


Figure 3 .3 Stem height growth of cayenne pepper plants from week 11 to week 15

The growth rate of cayenne pepper ( *Capsicum Frutencens L* ) plants was measured every 1 week at intervals of 1, 2, 3, 4 to 15 weeks after planting the cayenne pepper. Plant growth is measured by measuring the height of the plant from the top of the ground to the top of the highest leaf.

Figures 3.1, 3.2, and 3.3 show that the dosage of EM4 in the fertilization process varies with plant height. The treatment of giving EM4 at a dose of 10ml/L with an application time of 15 weeks had an average plant height of 35.5 cm, the lowest average plant height was 28.8cm. The most appropriate dose for giving height parameters to cayenne pepper plants is the EM4 fertilization treatment type with a dose of 10ml/L.

The results of statistical tests stated that the growth of cayenne pepper ( *Capsicum Frutencens L* ) plants with EM4 had different results in terms of plant height parameters with EM4 at doses of 5,10,15,20 and 25ml/L. Based on the average height of the treatment plants, giving EM4 at a dose of 5ml/L can be an alternative choice for plant height parameters. This shows that EM4 is able to provide the necessary nutrients such as N, P and C (Cambell et al, 2003). These elements are fulfilled by the specific function of the microbial formulation in EM4 which

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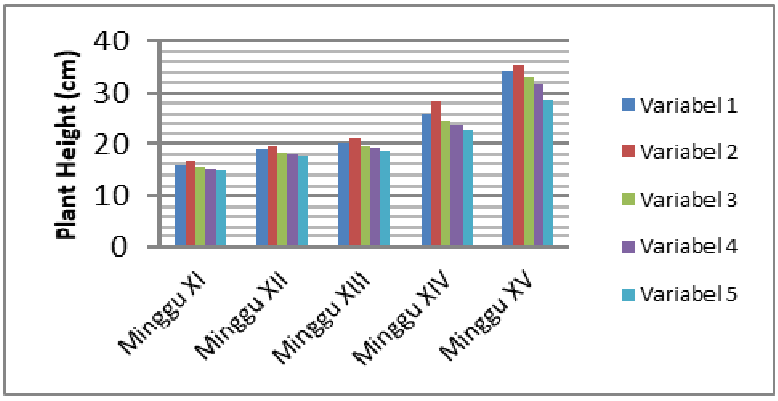
consists of *Azotobacter sp., Azosprillum sp., Bacillus megaterium, Pseudomonas sp.,* and *Cellulomonas cellulans.* An adequate nutrient supply helps the photosynthesis process occur in plants which produces organic compounds which will be converted into adenosia triphosphate (ATP) during respiration, then the ATP is used by plants for plant growth (Campbell et al , 2003 ).

Novizan (2005), also stated that effective fertilization involves quantitative and qualitative requirements. Qualitative requirements are fertilizer dosage, amount of fertilizer, fertilization time and fertilization method . Meanwhile, qualitative terms include nutrients provided through fertilization that are relevant to the existing nutrients, timing of fertilization and proper placement of fertilizer so that these nutrients can be absorbed by plants. Plants can use the nutrients absorbed by the roots to increase growth and production so that applying fertilizer at the right time, dose, amount and method will stimulate growth and increase plant yields.

*Cocopeat* Amount on the Growth of Cayenne Pepper Plants




The results of statistical tests stated that the growth of stem height in cayenne pepper plants *(Capsicum frutetences. L)* by administering *cocopeat* at a dose of *cocopeat* 200; 400; 600; 800 and 1000 grams have different characteristics, based on statistical data, it is stated that the difference in dosage of variable-2, namely 10 ml/ 400 grams of *cocopeat* , dominates the growth of stem height in cayenne pepper plants.

So that plants can grow optimally, the growing media needs to be considered. The growing medium has a big direct impact on the seedling which can affect root development as well. Growing media can be organic and inorganic materials. The function of the growing medium is the growth and development of plant roots, providing nutrients for plants, supporting plants and tubers so that they grow well and providing water for plants.

*Cocopeat* is the only planting medium made from coconut processing residue. From the coconut fiber process, fiber is obtained, as well as *cocopeat* (Irawan &

Hidaya, 2014) . *Cocopeat* is an organic material that is easy to obtain and is currently abundantly available.

Several studies that used *cocopeat* as a planting medium showed that the number of leaves, number of stems and length of mixed legumes increased when treated with the addition of organic and inorganic materials, and the soil cover performance of treated legumes was highest with the addition of organic materials in the form of coconut powder and organic fertilizer. or inorganic) (Dara Andika, 2013).

## CONCLUSION

4.1.1 Conclusion

1. The effect of EM4 on the growth of cayenne pepper using 10ml EM4 more quickly affects the growth of the stem height of the chili plants
2. The effect *of Cocopeat* on the growth of cayenne pepper is that using 400g has a faster effect on the growth of the stem height of the chili plants
3. The composition using a dose of EM4 10ml/ *Cocopeat* 200g is better for the growth of cayenne pepper plant leaves

4.1.2 Suggestions

*Cocopeat* fermentation application, make changes that include increasing the Potassium (K2) value based on the specified SNI, therefore in the future you need to increase the amount of cow dung soil material.

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