

# Effect of Concentration of NASA POC and Various Organic Mulch on Growth and Yield of Purple Eggplant (*Solanum melongena* L.)

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## Abstract

*Effect of Concentration of NASA POC and Various Organic Mulch on Growth and Yield of Purple Eggplant (*Solanum melongena* L.). The research location was carried out in Tapis Village, Tanah Grogot District, Paser Regency with a study period of 7 months from March 10 to September 03. The aim of this study was to determine the effect of giving NASA POC concentrations and various types of organic mulch using a two-factorial randomized block design which was repeated three times. The first factor is the treatment of various NASA POC concentrations consisting of 3 levels, namely p1 = (without NASA POC), p2 = (20cc/10 liters of water), p3 = (40cc/20 liters of water). The second factor was the treatment of various types of organic mulch which consisted of three levels, namely m1 = (without organic mulch), m2 = (alang-alang mulch), m3 = (rice straw mulch), the purpose of randomization in a study was to reduce the level of harmony. The randomization system used in this study was a randomization system using arisan. Based on the results of the study, the administration of NASA POC concentrations significantly affected the observed parameters, including the average fruit weight per sample plant at harvest 1, 2, 3, 4, and 5, fruit weight per plot at harvest 1, 2, 3, 4, and 5, fruit weight per hectare at harvests 1, 2, 3, and 4. And significantly affected the parameters of plant weight per sample at harvest 5. While the treatment of various types of organic mulch had a significant effect on the parameters observed including fruit weight per plant sample harvest 5, fruit weight per plot at the 5th harvest, and fruit weight per hectare at the 5th harvest, and significantly affected the parameters of fruit weight per plot at the 2nd harvest, and fruit weight per plot at the 2nd harvest. The combination of NASA POC concentration treatment and organic mulch with a concentration of 40cc/20 liters of water and the use of rice straw type mulch resulted in the best purple eggplant plant growth. The interaction treatment between NASA POC concentrations and various types of organic mulch had no significant effect on all observed parameters.*

**Keywords:** Eggplant, POC, Mulch.

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## I. INTRODUCTION

Eggplant plants are widely cultivated in Indonesia and spread to almost all corners of the archipelago. Eggplant is a type of vegetable that is liked by everyone, both as fresh vegetables and processed into various types of dishes (Jumini et al, 2009). Eggplant is used as a vegetable because it contains protein, vitamin A, vitamin B, vitamin C (Saparinto, 2013). Eggplant has a fairly complete mineral and vitamin content, but eggplant has a low phosphorus content (Nugraheni, 2016). In addition, eggplant is also used as a cure for cancer, hypertension, hepatitis, diabetes, arthritis, asthma, and bronchitis (Kandoliya et al, 2015).

Eggplant production in East Kalimantan in 2011 was 7,032 tons, in 2012 it increased by 7,421 tons, in 2013 eggplant production experienced a fairly high increase of 11.167 tons, then in 2014 eggplant production increased not too far from 2013 which was 11,724 tons, but in 2015 eggplant production experienced a drastic decline of 9.901 tons (BPS KALTIM, 2017).

The use of mulch is highly recommended in cultivating horticultural crops, especially vegetables, using mulch can reduce production costs. The main purpose of mulching is to protect the soil and plant roots from the effects of raindrops, cracks, evaporation, suppress weed growth, and to maintain soil productivity. The mulch used in general is sheet plastic mulch or using crop residues (organic) in the form of straw, plant stems, sawdust, etc. Using organic mulch on the land surface can inhibit the loss of groundwater from the soil (Yunindanova et al, 2010). From the description above, it is considered important to conduct a research entitled The Effect of Concentration of NASA POC and Various Types of Organic Mulch on the Growth and Yield of Purple Eggplant (*Solanum melongena* L.).

## **II. RESEARCH METHODE**

The study was conducted for 7 months from March 10, 2021 to September 03, 2021, in Tapis village, Tanah Grogot sub-district, Paser Regency with an altitude of >500 MDPL, temperature around 26°C, rainfall in Paser Regency, Tanah Grogot area in the last five years. reach 158.75 m.

The design used in this study was a Randomized Block Design. Which is arranged in factorial with 2 factors. The first factor is NASA's POC (P) consisting of 3 levels, namely: p1= No NASA POC, p2= POC Nasa 20 ml/10 liters of water and p3= POC Nasa 40 ml/20 liters of water. The second factor is the provision of Organic Mulch (M) consisting of 3 levels, namely: m1 = without using mulch, m2 = mulch with a thickness of 2cm/bed and m3 = straw mulch thickness 2cm/bed.

## **III. RESULT AND DISCUSSION**

### **3.1. Effect of Giving NASA POC Concentration on Growth and Yield of Purple Eggplant (*Solanum melongena L.*)**

Based on the results of analysis of variance, it showed that the NASA POC concentration treatment had a significant effect on the observed parameters, including the average fruit weight per sample plant at harvest 1, 2, 3, 4, and 5, fruit weight per plot at harvest 1, 2, 3, 4, and 5, fruit weight per hectare at the 1st, 2nd, 3rd, and 4th harvests, and significantly affected plant weight parameters per sample at the 5th harvest.

The increased growth of eggplant plants at a concentration of 40cc/20 liters of water was caused by the concentration of nutrients contained in the NASA POC which can meet the nutrient needs of eggplant plants and trigger better plant growth. According to Lansida (2009), the provision of macro and micro nutrients in sufficient and balanced amounts can increase the nutrients needed by plants and be used as an energy source for plants. In addition, to get optimal growth and yields, fertilizers must be given with the right concentration or dose. Lingga et al (2002), added that the concentration of nutrients is a very vital factor and has a great influence on the success of fertilization, especially fertilization through leaves. The solution to overcome dependence on the use of inorganic fertilizers is to provide organic fertilizers. The use of the right concentration of liquid organic fertilizer can improve growth, accelerate harvesting, extend the production period or age and can increase crop yields (Rizqiani, et al 2007).

In the p1 treatment (without NASA POC) plant growth was not so optimal because in the p1 treatment the plants did not get enough nutrients, if the nutrient needs of the plant were not sufficient then the growth process was hampered by disrupted plant metabolism and plants lacking nutrients will show symptoms in a specific organ. The ideal fertilization is if the nutrients provided are in accordance with the plant's needs. So that sufficient nutrients can provide maximum results for plant growth and production (Putri, 2016).

On the growth of plant height, and the number of leaves, giving different concentrations did not give a real effect, but the best plant growth was found in the addition of a concentration of 20cc/10 liters of water, the increase in eggplant plant growth at that concentration was caused by the availability of nutrients in a balanced state so that it could trigger better growth. Haryati (2004), explained that fertilization through leaves is not to meet plant nutrients as a whole but only as a balance and complement.

Observation of the number of fruit and fruit weight of the plant showed that the p3 treatment (40cc/20liter of water) gave the highest number and weight of fruit. The increase in fruit weight at this concentration is because the nutrients needed by plants are fulfilled both macro and micro nutrients so that these nutrients can be absorbed by plants properly and can trigger good plant growth and production. In line with the research of Susana et al. (2017), POC Nasa can increase the nutrients needed for eggplant plant growth. In addition to increasing the availability of nutrients for plants, POC Nasa is able to increase soil fertility and increase soil microbial activity.

Provision of liquid organic fertilizer in optimum quantities can increase plant vegetative and generative growth (Wasis, et al 2018). The availability of nutrients in sufficient and balanced quantities and supported by a favorable environment can trigger plant growth in a better direction and the photosynthesis process takes place smoothly so as to increase assimilation which is then utilized by plants for growth and fruit formation. The more assimilate used for growth and as a supply material for fruit formation, the growth will increase and the fruit formed will be more numerous and have a greater weight (Harjadi, 2003).

### **3.2. The Effect of Various Organic Mulches on the Growth and Yield of Purple Eggplant Plants (*Solanum melongena L.*)**

Based on the results of the analysis of variance, it showed that the organic mulch treatment (M) had a significant effect on the observed parameters including fruit weight per plant sample at Harvest 5, fruit weight per plot at Harvest 5, and fruit weight per hectare at Harvest 5, and had an effect on significantly on the parameters of fruit weight per plant plot at Harvest 2, and fruit weight per plot at Harvest 2.

The organic mulch treatment showed that the m3 treatment (Straw mulch) had better plant growth, namely the parameters of plant height, number of leaves, number of fruit, fruit weight per sample plant, fruit

weight per plot, and fruit weight per hectare. Plant growth in m3 (straw mulch) and m2 (alang-alang mulch) treatments was not much different. While the lowest plant growth was found in the m1 treatment (without mulch).

The increased growth of eggplant plants in the m3 treatment (Straw Mulch) was caused by the organic matter contained in the straw mulch weathering and decomposing, so as to increase the amount of organic matter that can activate soil microorganisms so that the soil becomes loose and fertile. Decomposition of organic mulch material can supply nutrients for plants as well as environmental conditions and make it easier for minerals from organic matter to be used by plants (Damayanti et al, 2013). Giving organic mulch can also increase the amount of organic matter and nutrients into the soil (Sarief, 2001).

In the m2 treatment (alang-alang mulch) plant growth was not significantly different, the use of Imperata mulch had lower growth than the use of rice straw mulch, this was due to the Imperata mulch used not contributing sufficient nutrients to plants but only suppressing growth. weeds and transpiration, so it does not show real results.

The temperature on land covered with alang-alang mulch is lower in line with the higher moisture content and reflects the availability of water for plants, this results in better soil porosity for the entry and exit of water and air freely so that plants grow taller, increasing leaf area. As a result, photosynthesis for vegetative growth goes well which in turn supports generative growth (Tri et al, 2015). Imperata mulch is able to modify the microclimate needed by plants and can maintain soil moisture and temperature so that plant roots can absorb nutrients better (Pujisiswanto, 2011). Soil temperature will affect the temperature of the roots which will then be transferred to other plant parts. This of course will affect the physiological processes of plants (Umboh, 2002). The increase in soil temperature is influenced by the amount of absorption of solar radiation by the soil surface (Lakitan, 2011).

Soil that is not given mulch will grow weeds faster so that there is competition for nutrient absorption between plants and weeds, thus inhibiting plant growth. Treatment without mulching showed high competition with weeds compared to treatment with weed mulching and straw mulching treatment which was sufficient to suppress the presence of weeds without disturbing the vegetative growth of plants (Sumarni et al., 2011).

On the growth of plant height and number of leaves, the application of various organic mulches did not have a significant effect. This is because the temperature where plants grow is ideal so that the function of mulch is no longer used by plants. In line with the statement of Wisudawati et al, (2016), that increasing the temperature to the optimal limit can increase the photosynthetic yield but at the maximum temperature limit the yield decreases sharply due to an increase in respiration.

Although there was no significant effect on plant growth, the best plant growth was found in the application of rice straw mulch, the increase in eggplant growth in the application of rice straw mulch was due to changes in the temperature where the plants grew. Rice straw mulch can provide moisture, suppress weed growth, slow the process of evaporation of groundwater, improve soil fertility, structure, and groundwater reserves. In addition, straw mulch can buffer the soil temperature so it is not too hot and cold (Yetnawati et al, 2001). Rice straw mulch can reduce temperature fluctuations and increase humidity and reduce evapotranspiration (Mayun, 2007).

Observation of fruit weight per sample plant, fruit weight per plot and fruit weight per hectare showed that the m3 (Straw Mulch) treatment gave the highest fruit weight yield. The increase in fruit weight in the provision of straw mulch is because the organic matter contained in the mulch can increase the availability of nutrients in the soil and increase the number of microorganisms in the soil. The use of organic mulch can help in improving the structure of the soil so that it becomes loose and is a source of nutrients for plants. In addition, the use of organic mulch helps improve aeration and soil drainage (Saragih, 2008). Rice straw also contains various elements needed by plants and does not have chemicals that can damage the environment, the nutrients contained in straw are N.0.5-0.8%, P<sub>2</sub>O<sub>5</sub>, 0.07-0.12 %, an K<sub>2</sub>O, 1.2-1.7%. Straw mulch is an important source of micro-nutrients such as (Zn) and silicon (Si) (Parman, 2007). Giving stubble and straw into the soil is an effort to restore most of the nutrients that have been absorbed by plants and help preserve nutrient reserves in the long term (Doberman et al, 2002).

### **3.3. Interaction of NASA POC Concentrations and Various Organic Mulches on Eggplant Plant Growth and Yield (*Solanum melongena* L.).**

The results of variance showed that the interaction of NASA POC concentrations (P) and Organic Mulch (M) had no significant effect on all observed parameters. This is due to differences in the response of eggplant plants to NASA POC concentrations that do not depend on the type of organic mulch and vice versa so that when combined they do not affect each other. If the treatment does not show any interaction, then the treatment only gives each response as a single factor, and acts independently of each other (Irfan, 2016). If the interaction is not real, it can be concluded that these factors only encourage the growth of each (Steel, 1993).

Tabel 1. Average Fruit Weight Per Hectare Treatment of NASA POC Concentration and Various Organic Mulches.

POC NASA (P)	Organic Mulch (M)			Rata - rata
	m1 (tanpa mulsa)	m2 (alang2)	m3 (jerami padi)	
p1 (without of POC NASA)	17,89	18,50	19,67	18,69 <sup>c</sup>
p2 (20cc/10 liter air)	20,56	22,72	23,56	22,28 <sup>b</sup>
p3 (40cc/20 liter air)	21,39	23,50	25,94	23,61 <sup>a</sup>
Average	19,94 <sup>c</sup>	21,57 <sup>b</sup>	23,06 <sup>a</sup>	

\* The average number followed by the same letter shows that it is not significantly different in the test BNT 5% (BNT = 1.11).

Another possibility that causes no significant effect on all observed parameters is thought to be the interaction of the two treatments less supportive of each other, so that the effect of plant roots is not factorial. Good plant growth can be achieved if the factors that affect growth are balanced and profitable. Sometimes a combination of treatments will encourage growth, inhibit growth or not respond at all to plant growth and development (Munawar, 2011).

## IV. CONCLUSSION AND SUGGESTION

### 4.1. Conclusion

Based on the results of research and discussion, it can be concluded, as follows:

1. The effect of NASA POC concentration (P) had a significant effect on the average plant weight per sample at the 1st, 2nd, 3rd, and 4th harvests, plant weight per plot at the 1st, 2nd, 3rd, and 4th harvests, plant weight per plot. hectares at the 1st, 2nd, 3rd, 4th, and 5th harvests. It also had a significant effect on the parameters of fruit weight per plant in the 5th harvest sample. The use of NASA POC with a concentration of 40cc/20 liters (p3) of water gave the best purple eggplant plant growth.
2. The effect of various organic mulches (M) had a significant effect on the parameters of fruit weight per plant in the 5th harvest sample, fruit weight per harvest plot of the 5th, and fruit weight per hectare of 5th harvest. 2nd and 3rd, plant weight per 2nd harvest plot, and fruit weight per hectare of 2nd harvest. The use of organic mulch type Rice straw (m3) provided the best plant growth.
3. There is no interaction between the effect of NASA POC concentration and various types of organic mulch (P x M) on all observed parameters. This shows that the difference in the response of eggplant plants to NASA POC concentrations does not depend on the type of mulch and vice versa.

### 4.2. Suggestion

Based on the results of research conducted, it is recommended:

1. Further research is needed on the concentration of NASA POC and organic mulch in other soil types and locations, with different growing seasons.
2. Farmers are advised to use NASA POC with a concentration of 40cc/20 liters of water.
3. Farmers are advised to use organic rice straw mulch to suppress weed growth and increase soil fertility.

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