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Response of Tomato (Solanum Lycopersicum L) Plant Production By Providing Solid (Oil Palm Empty Fruit Bunch) and Rice Husk Charcoal

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ABSTRACT

Provision of Solid Made from Oil Palm Empty Fruit Bunches and Rice Husk Charcoal on Production of Tomato Plants (Solanum Lycopersicum L) aims to determine the effect of various types of Solid (Oil Palm Empty Fruit Bunches) and Rice Husk Charcoal on Production of Tomato Plants (Solanum Lycopersicum L). This research was conducted in Sona Village with an altitude of 18 meters above sea level Labuhanbatu Regency from December 2019 to March 2020. The material used was tomato seeds, husk charcoal, solid water. The equipment used was a 35x40 polybag, cutter blade, analytical balance, ruler, scissors, mortar, measuring flask, bucket, calipers, neat rope, hoe. The research will be conducted with a factorial group design. The first factor is the provision of Solid namely S0: Without Solid (Control), S1: 0.50 kg / polybag, S2: 0.70 kg / polybag S3: 1kg / polybag. The second factor is the administration of rice husk charcoal P0: Without Husk Charcoal (Control), P1: 0.2 kg/polybag, P2: 0.4 kg/polybag. The number of treatment combinations is 12 combinations. The research results indicate that the provision of Solid and Rice Husk Charcoal Against Tomato Plant Production (Solanum Lycopersicum L) has no significant effect on Stem Diameter (cm), Total Number of Fruits per Plant (g), Total Weight of Fruits per Plant (g). However, the treatment interaction of 1 kg/polybag of Solid and 0.2 kg/polybag of Rice Husk Charcoal can increase Stem diameter (cm), Total Number of Fruits per Plant (g), Total Weight of Fruits per Plant (g).
Keywords*: Solid, Rice Husk Charcoal, Tomato Plant*

1. INTRODUCTION

Solid is a solid waste from the by-product of processing fresh fruit bunches (FFB) in palm oil mills into crude palm oil or Crude Palm Oil (CPO) (Kartika et al., 2015).

The content of nutrients and organic substances in the solid allows it to be used to add nutrients to plants. Thus the harmful palm oil mills waste can be utilized correctly (Kolo and Raharjo, 2016). The tomato plant (*Solanum Lycopersicum* L) is an agricultural commodities plant, and it has a unique taste, a combination of sweet and sour taste. This uniqueness makes tomatoes one of the fruits with many fans (Bua *et al.,* 2017). The market demand for tomato commodities continuous to increase year by year. The area of tomato cultivation keeps on increasing in Indonesia. Consequently, many centers of tomato production emerge. However, until today, tomato farmers still have many problems in the cultivation-

starting from applying the correct cultivation technique, pests and diseases problems, to marketing the crops yield problems (Caspersen *et al.,* 2016). One effort to increase tomato quality and quantity is by adding organic within the soil. Providing organic substance through Bokashi (fermented organic matter), besides increasing soil and plant productivity, organic matter utilization is one of the environmentally friendly components for plant cultivation.

In plant cultivation, including tomato, environmental factor holds a critical role in achieving maximum growth and yields. Hayati *et al.* (2012) state that environmental factors highly contribute to the plant's growth process. The growing medium is also one factor that needs to be considered. Afterward, it also stated that an excellent growing medium is usually a combination of sand, soil, fertilizer, and manure.

Using sand is very good to rectify soil's physical properties, especially for clay. Pinus *et al.,* 2016, convey that soil with good texture and structure highly supports agriculture. The soil structure that is good for the plant is loose, with pore spaces filled with water and air so that nutrient absorption can be optimal.

Lolomsait (2016) states that organic fertilizer positively affects onion growth and production. Wet weight, dry weight, tuber diameter, and the production of onion's tuber are faster in the plot provided with manure treatment. The high growth of onion vegetative with manure treatment causes interception of active photosynthetic radiation more optimal, which then accumulates a high assimilate stored in tubers. Sulardi (2018) also states that adding cow manure will generate better nutrient absorption and growth for soybean plants than without manure.

Rice Husk charcoal also can be used as growing media; according to Rifai and Rahmiati (2019), it is a by-product of burning rice husks. The nutrient contained in the husk charcoal is relatively quickly available for plants and can increase soil pH. Kolo and Rahajo's (2016) research result shows that the dose of rice husk charcoal 0.5 kg provides the highest yield of total crops per plant by 646g (1,9 t/ha). The watering frequency is once in three days, with the water level for 90 days being 120 liter/plant. This generates the highest yield of total crops per plant by 705,7g (2,075 t/ha).

Adding rice husk charcoal in the growing medium will be beneficial; among others, fertilization becomes effective because, aside from rectifying the soil properties (porosity, aeration), husk charcoal also functions as a nutrient binder (when excess nutrient) which will be used if the plant lacks nutrient. Then, it is released gradually, conforming to the plant's need or *slow-release* (wang *et al.* 2015). However, the current utilization of husk charcoal is mainly for decorative plant cultivation, and it has not yet found the exact dosage. Therefore, it needs to research how to use husk charcoal exact dosage and correct watering frequency to generate the most optimum tomato growth and yield.

Besides its type, composition, and dosage used, the effect of fertilizer also corresponds to the way and time of application. Wijaya (2015) states that the availability of sufficient and balanced nutrients is the crucial factor required by plants to support reasonable vegetative growth rates. Plant height growth corresponds to the plant's stem, leaves, and roots system growth. Meanwhile, according to Tautges *et al.* (2016), the stem diameter is an observation variable showing the power of growing tomato plants because being the center point of the plant's growth. Besides its type, composition, and dosage, the effect of fertilizer also corresponds to the way and time of application. Plant height growth is related to the plant's stem, leaves, and roots system growth. Sulardi & Sany's

(2018) research shows that nutrient availability will influence plants' growth and flourishment speed of leaves, stems, and roots. The amount of nutrient composition provided will influence the plant's growth.

This research determines the influence of various Solid types (Oil Palm Empty Bunches) and Rice Husk Charcoal on Tomato Plant (*Solanum Lycopersicum* L) Production.

2. RESEARCH METHOD

This research was conducted in Sona Village with an altitude of 18 meters above sea level, Labuhanbatu Regency, from December 2019 until March 2020. The materials used were tomato seeds, husk charcoal, solid, and water. The tool used is a 35x40 cm size polybag, cutter knife, analytical balance, ruler, scissor, mortar, volumetric flask, bucket, callipers, raffia rope, and hoe. The research will be conducted using a factorial group design. The first factor is by Solid allotment, S_0: Without Solid (Control), S_1 = 0,50 kg/polybag, S_2: 0,70 kg/polybag , S_3: 1kg/polybag. The second factor is rice husk charcoal allotment P_0: Without Husk Charcoal (Control), P_1: 0,2 kg/polybag, P_2: 0,4 kg/polybag. The quantity of treatment combinations is 12 combinations. (Gomes and Gomes, 1995)

3. RESULT AND DISCUSSION

The Provision of Solid (Oil Palm Empty Bunches) and Rice Husk Charcoal on Tomato Plant (*Solanum Lycopersicum L)* Production becomes the center of attention. In this research. The observation variables are Stem Diameter (cm), Total Fruit Quantity per Plant (g), and Fruit Total Weight Per plant (g).

Stem Diameter (cm)

The effect of solid and Rice Husk Charcoal on the observation parameter of stem diameter can be seen in Table 1. The analysis of variance result on the data of solid and Rice Husk Charcoal provision reveals that solid and Rice Husk Charcoal provision is not significantly affected on Stem Diameter (cm) of the Tomato plant (*Solanum Lycopersicum) L.*

The result on Table 1, it can be found out that even though it is not significantly different between Solid and Rice Husk Charcoal, it is seen the highest and the lowest average value on the stem diameter (cm) of the tomato plant, the highest average of S_3P_1 as much as 3.66 cm and the lowest is on S_0P_0 by 3.10 cm. It occurs stem diameter increment in every observation.

The stem diameter increment can also describe a plant's vegetative growth and flourishment. The plant's large diameter indicates that assimilation translocated to the stem is sufficient for assimilating accumulation. In addition to the leaves, the stem also has chlorophyll to carry out the photosynthesis process.

The proportion of plant height and stem diameter can make tomato plants sturdy stand. Thus, it supports the tomato plant's growth and flourishment (Yusrianawati, 2011). This yield is also supported by Masfufah *et al.* (2015), stating that organic matter can bind nutrients and maintain the nutrient so that it is not washed away; consequently, it makes the nutrient remain available within the soil. The plant spacing arrangement allows the plant to grow maximally without any competition in terms of taking water and nutrients within soil and sunlight.

Total Fruit Quantity per Plant (Piece)

The effect of solid and Rice Husk Charcoal provision on the observation parameter of Total Fruit Quantity per plant (g) can be seen in Table 2. The analysis of variance result on the provision of solid and Rice Husk

Charcoal shows that these two materials do not significantly influence tomato plant (*Solanum Lycopersicum L.)* stem diameter (cm).

The result in Table 2 shows that although treatment of Solid and Rice Husk Charcoal is not significantly different, it is observed the highest and the lowest average value of the tomato plant's total fruit quantity (piece). The highest value is in S_3P_1 as much as 7.80 pieces, and the lowest is in S_0P_0 as much as 1.57 pieces. This yield is because the planting distance is shorter, and the plant population is more prominent to produce more fruit. It occurs competition to attain nutrients on tomato plant; however, it has been fulfilled by providing rice husk charcoal not to influence its total fruit production.

Plants utilize the availability of macro and micronutrients in Bokashi fertilizer for generative growth, which influences total production quantity. The Solid and rice husk charcoal provision generates less fruit quantity per pot than the shorter plant spacing.

Table 1. Stem Diameter (cm) average

Solid	Rice Husk Charcoal			Average
	P_0	P_1	P_2	
S_0	3.01	3.31	3.39	3.24
S_1	3.42	3.45	3.46	3.44
S_2	3.41	3.61	3.32	3.45
S_3	3.22	3.66	3.51	3.46
Average	3.27	3.51	3.42	3.40

Table 2. Total Fruit Quantity Per Plant (g)

Solid	Rice Husk Charcoal			Average
	P_0	P_1	P_2	
S_0	1.57	4.10	2.90	2.86
S_1	5.90	3.77	4.87	5.55
S_2	4.77	6.53	5.33	4.42
S_3	5.67	7.80	4.57	4.67
Average	4.48	5.55	4.42	4.36

This is influenced by the nutrient balance that occurs in the soil. Good nutrient balance in the soil can affect production (Caspersen *et al.* 2016; Tautges *et al.* 2016) with a smaller plant population. Meanwhile, Solid and Rice Husk Charcoal produced a higher fruits quantity per plot for tomato plants. This occurs because the plant population is higher, producing more fruit per plot. The harmonious balance of nutrients in the soil dramatically affects excellent absorption, which is expected to increase crop production (Pincus *et al.*, 2016). Thus, it is suspected that giving Solid and Rice Husk Charcoal should be done simultaneously because biological fertilizers are filled with microbes which can help reorganize organic matter from the compost. It is expected to optimize the conversion of organic compounds into ionic forms that can be available and absorbed by plants, along with a production increase (Wang *et al.,* 2015).

Total Fruit Weight Per Plant (g)

The effect of solids and rice husk charcoal on the stem diameter observation parameters can be seen in Table 3. The analysis of variance results on the data provision of solid and Rice Husk Charcoal showed that providing Solid and Rice Husk Charcoal materials had no significant effect on Stem Diameter (cm) of Tomato Plant (*Solanum Lycopersicum) L*

The result in Table 3 shows that although it is not significantly different between the treatment of providing Solid and Rice Husk Charcoal, it can be observed the highest and the lowest average on the Total Fruit Weight per plant. The highest average in S_3P_1 is 271.10 grams, and the lowest in S_0P_0 is by 40,57 grams of total fruit weight in every treatment of Solid and rice husk charcoal. Photosynthate produced by plants is used for growth and development and stored as food reserves. Photosynthate contained in the leaves is transported throughout the plant body, the meristem at the growing point and to fruits in flourishment. If photosynthesis carried out by plants can take place optimally, the photosynthate produced will be optimal as well, which will ultimately affect the fruit size and weight.

Table 3. Total Fruit Weight Per Plant (g)

Solid	Rice Husk Charcoal			Average
	P_0	P_1	P_2	
S_0	40.57	120	87.70	82.79
S_1	187.90	120	262.23	190.04
S_2	136.53	226.67	173.33	178.84
S_3	166.57	271.10	151.13	196.27
Average	132.89	184.44	168.62	161.99

According to Soleh (2009), Organic matter in the soil for plants can also improve generative growth, especially the flower formation phase and the fertilization process.

If the vegetative growth is good, the more photosynthate produced causes the plants can form generative organs to become rocketing. With good spacing, the utilization of the existing growing space for plant growth and buffering capacity against adverse events can be made efficient. Fadhillah and Harahap (2020) convey that Tomato plants need to be planted with ideal spacing to increase production yields. There will be heavy competition between plants at close distances, such as high population density, resulting in inhibited growth and decreased crop yields. The closer the spacing, the competition between plants for light is also increasingly limited so that if there is a reduction in light during the fruit formation phase, it will produce relatively small fruit.

4. CONCLUSION

This research result shows that the provision of Solid and Rice Husk Charcoal on Tomato Plant (*Solanum Lycopersicum L)* Production did not affect significantly Stem diameter (cm), Total Fruit Quantity (g), Total Fruit Weight Per Plant (g); however, the treatment interaction of 1kg/polybag solid and 0,2 kg/polybag Rice Husk Charcoal can increase stem diameter (cm), Total Fruit Quantity per Plant (g), and Total Fruit Weight per Plant (g)

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