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PROVIDING LIQUID TOFU WASTE, RICE WASH, FRUIT AND EGG SHELLS CAN INCREASE TOMATO PLANT PRODUCTION IN DRY LANDS

Sofyan Samad[1,*], Shubzan A. Mahmud[1], Helda Sabban[1]

[1]*Agrotechnology Programme, Faculty of Agriculture, Khairun University, North Maluku, Indonesia. e-mail : sofyan.samad1970@gmail.com*
[1]*Agrotechnology Programme, Faculty of Agriculture, Khairun University, North Maluku, Indonesia. e-mail : shubzanandimahmud901@gmail.com*
[1]*Agrotechnology Programme, Faculty of Agriculture, Khairun University, North Maluku, Indonesia. e-mail hildasabban11@gmail.com*
**Corresponding Author : sofyan.samad1970@gmail.com*

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Abstract. *Tomatoes are climbing plants. The aim is whether there are differences in vegetative, generative and productive growth at various concentrations with various waste applications. Tofu waste, rice water, fruit and egg shells are waste that encourage accelerated growth, flowering, fruiting, ripening, production and resistance to disease while reducing soil damage due to chemical fertilizers. This research uses RAK, namely 5 treatments, repetitions of 3 to 15 experiments. The results of various liquid wastes with different concentrations have a real influence on all plant height, primary, secondary, flower and fruit branch characteristics. Treatment of egg shell liquid waste with a dose of 1000 ml resulted in the best tomato production in all plant height observations 34.00 cm observed at 21 DAT, 44.00 cm observed at 28 DAP, 56.00 cm observed at 35 DAP, 71.00 cm observed at 42 DAP, 85.00 cm gain 49 HST, 83.00 cm observation 56 HST. The character of the number of primary branches obtained was 4 primary branches, 32 secondary branches, 25 flowers, 19 fruits in the first harvest, 21 in the second harvest, 20 in the third harvest, and the character weight was 92g in the first harvest, 73g for the second harvest and 99g for the third harvest.*

Keywords : *Tomato plants, tofu liquid waste POC, rice water waste, fruit liquid waste, egg shell liquid waste, tomato production*

1. INTRODUCTION

Tomato (Lycopersicum esculentum Mill) is a garden and home garden plant that is consumed (Mehdizadeh Mohammad et al 2013). Planting tomatoes in the central plains with sufficient watering produces good results. The problem is that the demand for tomatoes by the public is increasing while the availability of tomatoes on the market is decreasing. Apart from that, tomatoes are needed as vegetables, fresh drinks and so on (Maryanto, et al. 2015). In 2017, Indonesia had a productivity of 17.31 tonnes/ha with a harvest area of 55,623 ha, and North Maluku produced tomatoes of 1,833 tonnes (BPS, 2017)

The impact of using chemical fertilizers on soil fertility is damaged (Adnan et al, 2015). Various types of organic fertilizers provide healthy and fertile plants, while chemical fertilizers reduce soil health and cause soil damage (Wiwik Hartatik et al. 2015). Plants with organic fertilizer become healthy and fertile (Kurnia Suri Dwijaniati et al. 2019). Based on these problems, organic fertilizer is used because it is healthy for plants and cheap for the community. Fertilizer waste from eggs, fruit, tofu and rice water, which if left untreated can give an

unhealthy appearance to the community, to reduce the accumulation of this waste is used as POC.

This research used the best treatment, namely 1000 ml of Tofu Waste + 600 ml of Water (Endah S.A. et al. 2020), 800 ml of Rice Water Waste (Wardiah et al. 2014), 200 ml of POC Fruit Waste + 800 ml of Water (Marjenah et al. 2017), and 1000 ml POC Egg Shell (Bimasri John et al (2017). Can tomato plants grow by giving POC tofu dregs, rice water dregs, fruit dregs, and egg shells, which concentration of POC can provide growth, with the aim of whether there are different concentrations?
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2. METHODS

According This research location is in Sanana from June to October 2023. Polybags, seedling containers, raffia rope, markers, measuring tape, sieve. This research used ingredients including: tomato seeds, soil, tofu dregs, rice water dregs, vinegar, egg shells, fruit dregs (papaya, pineapple skin and dragon fruit skin), EM4, brown sugar, coconut water and clean water. This research used RAK with 3 replications, 5 treatments and 15 experiments. (1 experimental unit contains 3 polybags). The treatment is as follows:

B0 = no POC
B1 = 1000 ml POC of tofu liquid waste
B2 = 1000 ml POC rice washing waste
B3 = 1000 ml POC fruit liquid waste
B4 = 1000 ml POC liquid egg shell waste

Tofu liquid waste, rice water, fruit and egg shells are made using conventional methods. Tofu liquid waste contains NPK and protein, weakly, carbohydrates (Teguh E. S. et al. 2021). Household rice washing is used as plant nutrition (Ervina D et al. 2021), liquid fruit waste contains NPK (Bangun W. et al. 2019). Eggshell liquid waste contains proteins that produce enzymes, hormones, repairs cells, maintains cell function, increases Umar's immunity (Hasibuan S., et al. 2021) apart from containing calcium carbonate and plays a role in neutralizing acidic soil that has a low pH to increase nutrient absorption in plants (Sanurizal I. Irna, Dwi K. R. 2020).

Soil Cultivation. The first step in preparing planting media is to cultivate the soil. The soil to be used is hoed first on the top soil because that is where there is a lot of organic material, then crushed and loosened while cleaning out the remaining weeds. Soil processing aims to improve the texture of the soil, which was originally rather dense, becoming more loose so that there are cavities for water and air to facilitate rooting. Land has been provided filled with 10 kg per polybag for 45 polybags.

Apart from that, put them in a container and spread the seeds and water them using a hand sprayer on the tomato plant seedling media. After that, the tomato seeds can be transferred to polybags containing soil mixed with compost. It is given by watering the plants and fertilizing once every fourteen days. The fertilizer concentrations given are POC of tofu waste/polybag 1000 ml, POC of rice water waste/polybag 1000 ml, POC of fruit waste/polybag 1000 ml, and POC of liquid egg shell waste/polybag 1000 ml.

Maintenance. In conducting this research there are several forms of maintenance, including:

- Water every rainy day, water only one day or adjust to soil moisture conditions.
- Stitching on tomato plants is done to prevent damage or abnormalities to the plant core which is thought to be caused by environmental factors or other things.
- Weeds that grow can cause harm to tomato plants in the form of stunted growth of tomato plants.
- Control it if you see symptoms of attack on tomato plants. Control is carried out to avoid damage to tomato plants.

Ajir Installation. Teaching tomatoes at 20 HST using bamboo that has been cut and then stuck into the ground. The aim of installing these stakes is so that the tomato plants can grow upright and not fall over when they are big, especially when they are bearing fruit. Tomato plant stems can be tied to poles using raffia rope.

Harvest. The first harvest of tomatoes is 70-90 days after planting. The readiness of tomato plants for harvest can be seen from the color of the tomatoes, which are orange to red, which is a sign of physiological maturity in plants that are ready to be harvested. Harvest time depends on the variety, soil fertility, and desired level of maturity. Meanwhile, the next harvest is 5 days and 4 harvests with the third harvest being the peak of the harvest

Observation of growth characteristics (cm). Measurement using a meter, end of vegetative period with a measurement interval of one week until the first harvest, 2) Number of Primary Branches. Primary branch counts were carried out on sample plants when the tomato plants were flowering, 3) Number of Secondary Branches. Secondary branches are counted at the time of harvest of tomato plants. Calculations are carried out on sample plants, 4) Number of Flowers. Observation of the number of flowers was only carried out once after three days of flowering. The number of flowers counted are the flowers found on the sample plant, 5) Number of

Fruits, 6) Weight of tomatoes (g) one poch per polybag starting from the first harvest at the age of 70 days with a harvest time of 5 days.

Data analysis technique. In this study, observational data was analyzed using Variance Analysis (Anova), the significant difference was followed by (BNT 0.05).

3. RESULT AND DISSCUSSION

Chemistry of tofu liquid waste, rice washing waste, fruit waste, and egg shell waste at the basic and integrated laboratory at Khairun University is presented in Table 1.

Table 1. Chemistry of tofu liquid waste, rice washing waste, fruit waste, egg shell waste

No	Sample	Character	Unit	Test result	Test Method Specifications
1	Tofu liquid waste	Magnesium	mg/L	68,949	Ion chromatography
		Potassium	mg/L	310,731	
2	Rice washing waste	Magnesium	mg/L	84,564	
		Potassium	mg/L	33,732	
3	Fruit waste	Iron (Fe)	mg/L	21,208	
		Magnesium	mg/L	149,225	
4	Egg shell liquid waste	Potassium	mg/L	88.911,85	
		Phosphate	mg/L	1.454,71	

Table 2. Recapitulation of the mean square value of the height growth characteristics of tomato plants treated with four waste fertilizers

Diversity Source	Plant Height Characteristics (cm) Days After Planting (DAP)					
	20	25	30	35	40	45
Group	63,01	16,22	6,06	46,54	182,99	276,26
Treatment	160,54*	205,53*	292,46*	420,06*	441,88*	454,34*
Error	31,77	52,73	71,94	108,4	107,06	115,6
K.K	22,89	23,74	20,72	19,76	15,6	15,12

Description: *real

Table 3. Recapitulation of the mean square values for the growth characteristics of the number of branches and the number of tomato flowers with four treatments of waste fertilizer

Diversity Source	Character		
	Number of Tomato Branches		Number of Tomato Flowers
	Primary	Secondary	Sheet
Group	0,27	25,8	6,47
Treatment	0,73*	217,27*	58,17**
Error	0,18	51,47	4,97
K.K	22,15	41,71	12,61

Description: ** very real, *real

Table 4. Recapitulation of mean square values for the number of fruits and weight of tomatoes treated with four waste fertilizers.

Diversity Source	Character					
	Number of Tomatoes Harvested to			Tomato Fruit Weight (g) Harvest to		
	1	2	3	1	2	3
Group	0,87	2,87	11,4	116,9	540,2	838,27
Treatment	57,83**	22*	69,07**	1447,14*	1251,51*	2077,17*
Error	4,53	4,2	3,57	242,84	300,3	402,03
K.K	17,26	12,55	14,99	23,64	30,65	30,95

Description: ** very real, *real

Based on the analysis of four wastes which had a significant effect at all times of observation and treatment B4 (1000 ml POC egg shell liquid waste produced tall plants when compared to other treatments. Histogram of comparison of administration of various POC wastes. without POC waste, tofu liquid waste POC, rice washing waste POC, POC of fruit liquid waste, POC of eggshell liquid waste on plant height (cm) characteristics are presented in Figure 1.

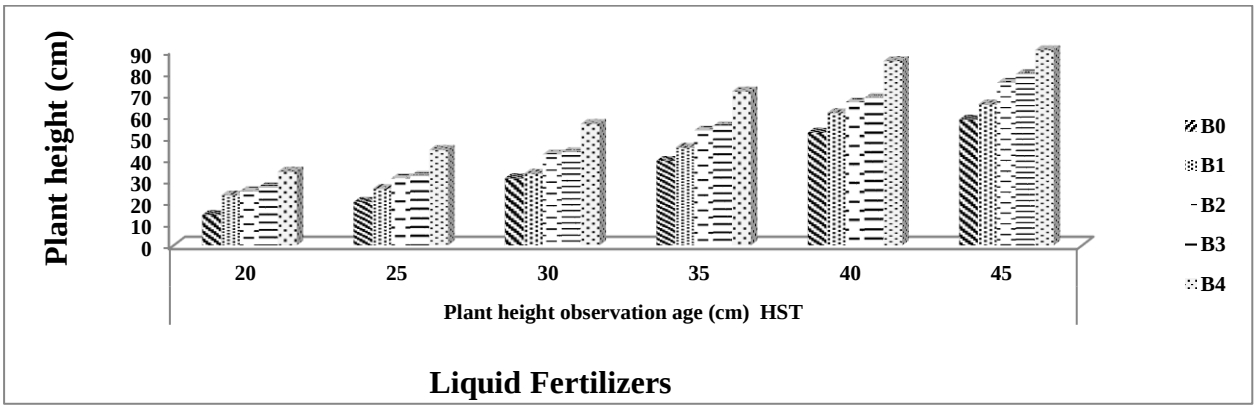

Figure 1. Provision of various POC waste. (BO) = no POC waste, (B1) = POC of tofu liquid waste, (B2) = POC of rice washing waste, (B3) = POC of fruit liquid waste, (B4) = POC of eggshell liquid waste on plant height characteristics (cm).

At the age of 20 DAT, treatment B4 (1000 ml POC liquid egg shell waste) produced the best plant height at all observation times, namely a plant height of 34 cm and a low of 14 cm produced by treatment B0, at age 25 DAP the height was 44 cm and the low was 20 cm in the treatment. B0, at 30 HST, plant height 71 cm and low 39 cm in treatment B0. 40 HST plant height was 85 cm and low was 52 cm in treatment B0. 45 HST plant height was 83 cm and low was 57 cm in treatment B0. When compared with the provision of other POC waste (Figure 1).

Providing various primary, secondary and flower liquid organic fertilizer (POC) waste. Histogram of comparison of the distribution of various POC wastes. without POC waste, tofu liquid waste POC, rice washing waste POC, fruit liquid waste POC, egg shell liquid waste POC on the average character of the number of primary branches in the image (2), the number of secondary branches in the image (3) and the number of flowers (cm) figure (4).

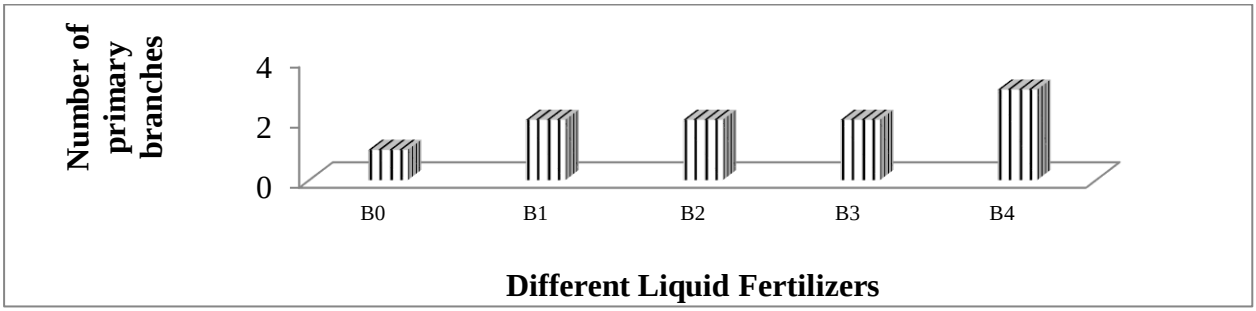

Figure 2. Provision of various POC waste. (BO) = no POC waste, (B1) = POC of tofu liquid waste, (B2) = POC of rice washing waste, (B3) = POC of fruit liquid waste, (B4) = POC of egg shell liquid waste relative to the number of branches primary

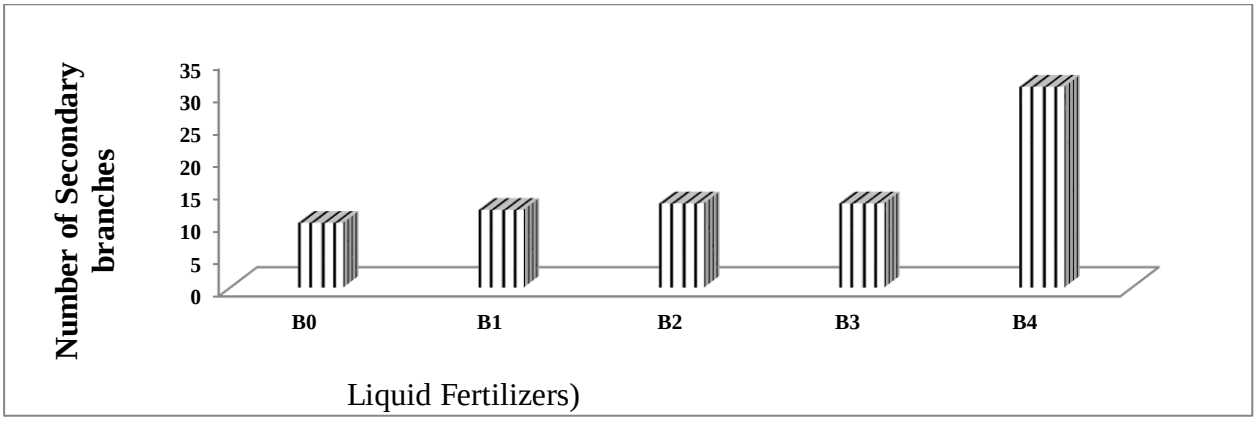

Figure 3. Provision of various POC waste. (BO) = no POC waste, (B1) = POC of tofu liquid waste, (B2) = POC of rice washing waste, (B3) = POC of fruit liquid waste, (B4) = POC of eggshell liquid waste on the character of the number of branches secondary

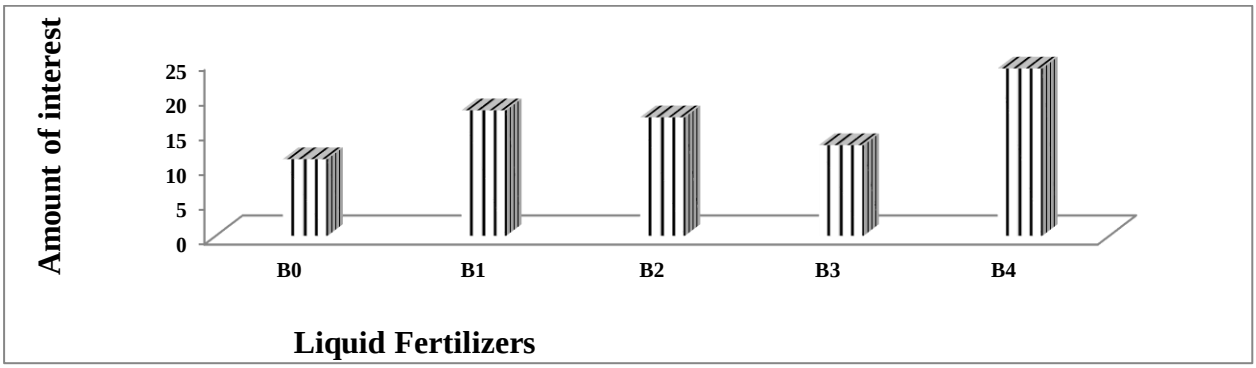

Figure 4. Histogram comparison of distribution of various POC waste. (BO) = no POC waste, (B1) = POC of tofu liquid waste, (B2) = POC of rice washing waste, (B3) = POC of fruit liquid waste, (B4) = POC of egg shell liquid waste on the character of the number of strands flower

The provision of various primary and secondary POC waste was very significant in terms of the number of flowers, however treatment B4 (1000 ml POC liquid eggshell waste) produced the best, namely three primary branches, 32 secondary branches and 25 flowers, when compared with other treatments.

Thus, the character of the number of tomatoes in the first and third harvests has a very real influence and the second harvest has a real influence. Histogram of comparison of the distribution of various POC wastes. without POC waste, tofu liquid waste POC, rice washing waste POC, fruit liquid waste POC, eggshell liquid waste POC on the

characteristics of the number of tomatoes harvested 1, II and III are presented in Figure 5.

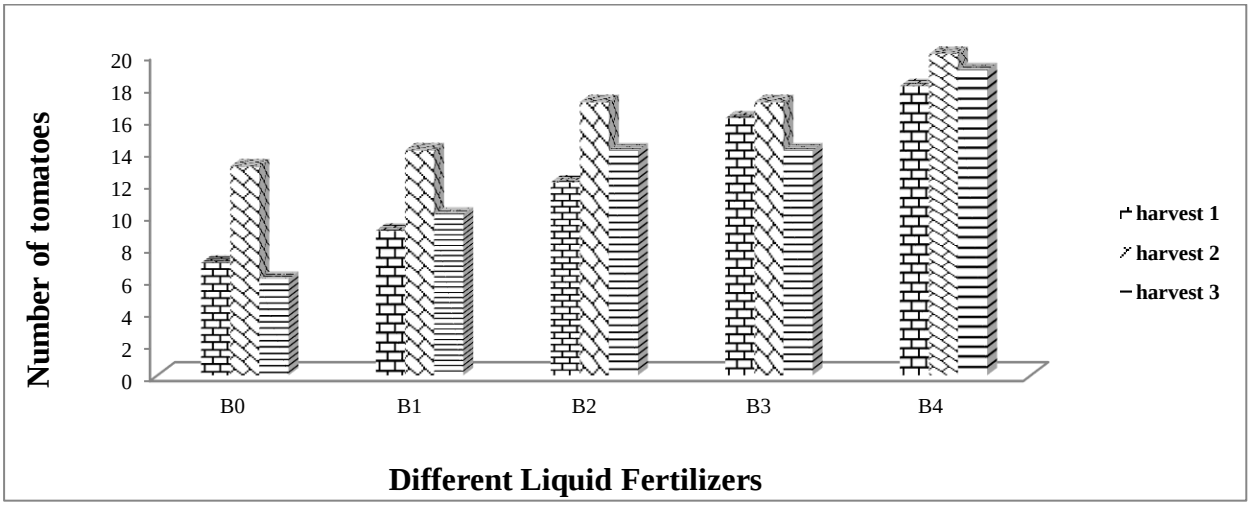

Figure 5. Histogram comparison of distribution of various POC waste. (BO) = no POC waste, (B1) = POC of tofu liquid waste, (B2) = POC of rice washing waste, (B3) = POC of fruit liquid waste, (B4) = POC of egg shell liquid waste on the characteristics of the number of fruits harvest tomatoes (I, II, III).

Based on the analysis, it shows that treatment B4 (1000 ml POC Eggshell Waste) produced 18 tomatoes for the first harvest, 20 for the second harvest and 19 for the third harvest. When compared to other treatments

Fruit weight characteristics (g). The results of analysis of variance showed that the weight of tomatoes had a significant effect on harvests I, II and III. Histogram of comparison of the distribution of various POC wastes. without POC waste, POC of tofu liquid waste, POC of rice washing waste, POC of fruit liquid waste, POC of eggshell liquid waste on the weight characteristics of harvested tomatoes (1, 2, 3) are presented in Figure 6.

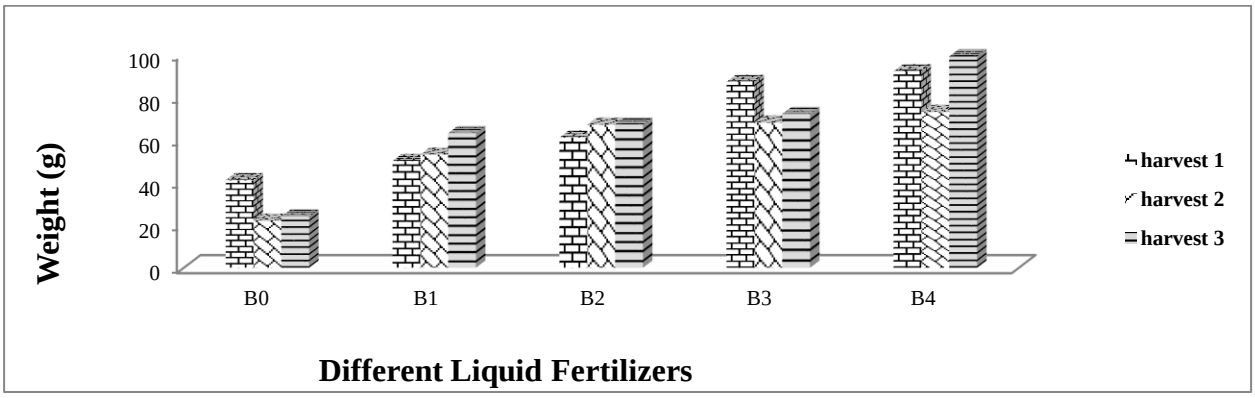

Figure 6. Distribution of various POC waste. (BO) = no POC waste, (B1) = POC of tofu liquid waste, (B2) = POC of rice washing waste, (B3) = POC of fruit liquid waste, (B4) = POC of egg shell liquid waste on fruit weight characteristics harvest tomatoes (I, II, III).

Treatment by administering 1000 ml of POC liquid eggshell waste (B4) resulted in a weight of 92 g for harvest I, 72 g for harvest II, and 98 g for harvest III when compared with administration of other POC waste.

Plant height is an increase in volume Bayu A. K et al (2014). Observed variables are measured to determine plant growth. By increasing plant height, we can estimate the influence of the treatment applied to a plant. According to Atma W. A. et.,al, (2018). This application (POC) indicates that the POC applied is working well on the tomato plants. According to Lakitan (2012) roots absorb nutrients. Nurjayanti (2012) continued, the elements Ca and Mg in egg shells influence plant growth

Eggshell) high growth and continues to increase in role. Ca, Mg. Statement supported by Hasibuan Saberina et al 2021. POC Waste P and Ca so that it can meet the needs of primary and secondary branch shoots. The POC that is applied has many elements contained in it, one of which is the element N, where this element has the function of helping the growth of shoots, stems and leaves. According to research by Febrianna (2018), the function of N for plants includes helping the growth of shoots, stems and leaves. Shows the number of tomato branches. POC is applied in increasing increments to the branches more quickly which is then translocated to the body parts of the nutrient limit according to the type and age of the plant Ervina Dewi et al. 2021.).

Flower. The generative reproductive organs of plants are called flowers. Flowers are the place where pollination occurs which will produce fruit and seeds. Shanti B. L. et al 2016,). The results of analysis of variance show very different treatments of tomato flowers. Treatment B4 (1000 ml POC egg shells, the number of flowers with the best results was found in tomato plants, this shows that the role of calcium in egg shells is very influential on the generative growth of tomato plants which can be seen in the greater number of flowers. Ca plays a role in helping increase the number of flowers through its ability as an agent for attaching P nutrients so that it is quickly available and can be absorbed by plants and neutral elements, and stimulates root growth, accelerating the percentage of ripening (Herul 2015)

Based on Table 4, the analysis results show that the character of the number of tomatoes has a significant effect on the various POC treatments for harvest II and has a very significant effect on harvests I, III. On the characteristics of tomato fruit weight, POC had a significant effect at all harvest times I, II, III.

According to plants, fertilizing via leaves is used more quickly, the only elements F and K (R. D. Sari, 2019).

It is known that the concentration of fertilizer given was 1000 ml POC of tofu waste / polybag, 1000 ml POC of rice water waste / polybag, 1000 ml POC of fruit waste / polybag, these three treatments had lower results, presumably because the composition in the three POCs was around 90% is water which, when compared to egg shell waste, has very little water content. Waste POC 1.6% water. This condition certainly affects the nutrient content of each POC.

Each POC given comes from different waste which will have an impact on the fertilizer content which is also not the same, also the results are different for each plant (Riyanti, M. et al 2018). Egg shells contain several minerals with sulfur found in egg shells which can cause an increase in pH. Soil encourages root formation. Waliyuddin A.W, Arifin S. (2023). Furthermore, Gunawan, et al (2019), stated that in ideal conditions it helps and absorbs nutrients well which will then have an impact on tomato plant production.

The analysis results in Table I show that tofu liquid waste is 88,911.85 mg/L, magnesium is 68,949 mg/L and potassium is 310,731 mg/L. rice washing waste magnesium 84,564 mg/L and potassium 33,732 mg/L. Fruit wastewater contains 21.208 mg/L of iron (Fe) and 149.225 mg/L of magnesium, egg shells contain 88,911.85 mg/L of calcium and 1,454.71 m/L of phosphate (Leb. Basis Unkhair 2022). This provides a soil medium with lots of nutrients available so that tomato plants grow quickly, freshly and speed up flowering, fruiting, ripening of fruit and harvest, but a lack of potassium causes rotting of tomatoes or other vegetables. Apart from that, it is supported by previous research, namely in 25 ashes (Sanurizal I. Irna, Dwi K. R. 2020). This element encourages, provides fertile soil media for the growth of tomato plants and other vegetables to grow and develop and produce

Tomato fruit is part of the crop that can be used as a benchmark for whether a plant is growing well. Edgar Mowa et al 2017. The weight of the fruit will affect plant production, the heavier the weight of the fruit, the higher the production obtained (Bangun Wahyu et al 2019. Based on Figure 6, it shows that the use of various waste-based POCs has a significant impact on harvest I, II and III. When compared with other treatments, the weight of tomatoes with POC increases the volume and weight of tomatoes in Lingga and Maryanto et al (2015). Figure 6. The best fruit weight in the B4 treatment (1000 ml POC egg shell), B4 can fulfill what tomatoes need, namely nutrients and calcium compounds which are the largest components that make up egg shells. Calcium is always related to minerals or other natural elements (one of which is) the element P is soluble in water and reacts very quickly with calcium and accelerates the processes of vegetative, generative, productive growth of plants, formation of flowers, fruit and ripening of tomatoes Toyip (2013).

5. CONCLUSION

POC of fruit, and egg shells with different concentrations in all plant height, primary, secondary, flower and fruit characteristics. Treatment of egg shell liquid waste with a dose of 1000 ml resulted in the best tomato production in all plant height character observations 34.00 cm observation at 21 DAP, 44.00 cm observation at 28

DAP, 56.00 cm observation at 35 DAP, 71.00 cm observation 42 HST, 85.00 cm observation 49 HST, 83.00 cm observation 56 HST. The character of the number of primary branches is 4 primary branches, 32 secondary branches, 25 flowers, 19 fruits from the first harvest, 21 fruits from the second harvest, 20 fruits from the third harvest and the character weight is 92 g for the first harvest, 73 g for the second harvest and 99 g for the harvest. to III.

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