Testing of Organic Liquid Fertilizer from Water Plugs (*Brassica crassipes*) on Growth and Results of Plants Cucumber (*Cucumis sativus L.*)

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Abstract: This study aims to determine the testing of liquid organic fertilizer from water hyacinth on the growth and yield of cucumber plants. This research was conducted in the experimental garden of the Faculty of Agriculture, Teuku Umar Meulaboh University, West Aceh, starting from August 2019 until completion. The materials used in this study were the Hercules variety cucumber seeds, water hyacinth POC, babybags and polybags. While the tools that will be used include hoes, machetes, fansticks, measuring cups, analytical scales, wheelbarrows, gauges, nameplates, cameras and writing instruments.
This study used an experimental design used in this study was a non-factorial randomized block design with 3 replications in total, there were 8 treatments. The factors studied were the concentration of liquid organic water hyacinth (K) consisting of eight levels including K0 = 0 (control), K1 = 100 ml, K2 = 150 ml, K3 = 200 ml, K4 = 250 ml, K5 = 300 ml, K6 = 350 ml and K7 = 400 mm. Variables observed were plant length, stem diameter, number of fruits, fruit length, fruit diameter, fruit weight and production per ha. F test results on the analysis of variance showed that the water hyacinth POC had a very significant effect on plant length of 10 HST, stem diameter of 20 HST, number of fruits, fruit weight and production per ha. significant effect on plant length 20 and 30 HST, stem diameter 10 and 30 HST, fruit diameter and fruit length.
Keywords: Liquid Organic Fertilizer, Water Hyacinth, Concentration, Plants

Introduction

Cucumber fruit vegetables are mostly consumed by Indonesian people in fresh form. The nutritional value of cucumber is quite good because this fruit vegetable is a source of vitamins and minerals. Nutritional content per 100 g of cucumber consists of 15 calories, 0.8 g protein, 0.1 g starch, 3 g carbohydrates, 30 mg phosphorus, 0.5 mg iron, 0.02 thianine, 0.01 riboflavin, 14 mg acid , 0.45 vitamin A, 0.3 vitamin B1, and 0.2 vitamin B2 (Sumpena, 2001). The growth and production of cucumber plants are strongly influenced by the availability of nutrients.

Fertilizer plays an important role in plant cultivation because it can fulfill plant nutrients so that it can grow and develop properly. Fertilizer material can be in the form of organic material and inorganic material. In Indonesia, the intensity of using chemical fertilizers has been shown to increase over time (Jusuf, 2006). Without realizing it, the continuous use of inorganic fertilizers has a bad impact on the physical, chemical, and biological properties of the soil, this causes the ability of the soil to support nutrient availability and the life of microorganisms in the soil to decrease (Parmata, 2004 in Seni et al, 2013). The use of chemical fertilizers has many negative impacts if it is used continuously and for a relatively long time. The negative effects that are given include the soil becoming hardy quickly, the soil is less able to store water and becomes acidic, and ultimately results in decreased productivity of the plant itself (Indrakusuma, 2000).

The use of organic fertilizers is more dominant because it can increase plant productivity (Anonymous, 2013). Organic fertilizers are fertilizers made from organic materials such as

vegetable scraps, livestock manure, and so on and also come from living things that have died. The decay of organic materials and dead living things causes changes in physical properties from their previous forms (Hadisuwito, 2012). Liquid organic fertilizer is a fertilizer whose chemical content can provide nutrients according to the needs of plants in the soil (Taufika, 2011). One alternative solution that can be utilized is the use of organic fertilizers from plant debris, namely the water hyacinth plant.

Water hyacinth (Eichornia *crassipes*) is one of the largest types of aquatic plants that have very large adaptability to new environments (3% per day). Water hyacinth is an aquatic weed that grows at a growth rate, namely from two parents in 23 days it can produce 30 tillers and 1200 tillers within 4 months with a production of 470 tons/hectare. Water hyacinth is very difficult to destroy, so an alternative is made to reduce its productivity by processing water hyacinth as a liquid fertilizer. The chemical composition of water hyacinth in the form of organic material is 78.47%, 21.23% organic C, 0.28% total N, 0.0011% total P, and 0.016% total K so that with the composition it has the potential for water hyacinth used as organic fertilizer that plants need to grow (Rozaq and Novianto, 2000 in Kristanto et al, 2003).

The results of Juarni's (2017) research show that giving water hyacinth liquid fertilizer at various concentrations can increase plant height growth and the number of leaves of celery plants. The best growth of plant height and number of leaves was in the treatment of 300 ml of water hyacinth liquid fertilizer.

This study aims to determine the testing of liquid organic fertilizer from water hyacinth on the growth and yield of cucumber plants.

Methods

This research was conducted in the experimental garden of the Faculty of Agriculture, Teuku Umar University, Meulaboh, West Aceh from August to December 2019. The materials used in this study were Hercules cucumber seeds, POC water hyacinth, baby bags, and polybags. Meanwhile, the tools that will be used include hoes, machetes, member, measuring cups, analytical scales, wheelbarrows, calipers, and writing instruments.

This study used a non-factorial randomized block design (RBD) with 3 replications in total, there were 8 treatments. The factors studied were the concentration of water hyacinth liquid organic fertilizer (K) which consisted of eight levels including: K0 = control, K1 = 100 ml, K2 = 150 ml, K3 = 200 ml, K4 = 250 ml, K5 = 300 mm (Juarni , 2017), K6 = 350 ml and K7 = 400 mm. Thus there are 8 treatment combinations with 3 replications and overall there are 24 experimental units.

Seedlings are sown in baby bags 0.5-1 cm deep as much as 1 cucumber seed per baby bag for 14 days. The soil used is alluvial soil, put into polybags measuring 40 x 50 cm with a weight of 12 kg per polybag and the soil is arranged according to the treatment on the prepared land.

Water hyacinth liquid organic fertilizer is given 1 week before planting, then given again when the cucumber plants are 15 days after. Water hyacinth liquid organic fertilizer that has been fermented, first thawed according to each treatment. The liquefied fertilizer is poured into the poly bag. Cucumber plants are watered with a liquid fertilizer every 5 days until the

plants are 35 days old with the concentration according to each treatment. Maintenance of cucumber plants carried out is watering, chanting, embroidery, weeding, controlling pests, and diseases.

Harvesting is carried out at the age of the plant 35 days after planting, after which the harvest is carried out in stages 3 times in 1 week. The parameters observed were; plant length (cm), number of fruit, fruit length, and diameter (Cm), fruit weight per hectare (grams), production per hectare (tonnes).

Result

The factors studied were the concentration of liquid organic water hyacinth (K) consisting of eight levels including K0 = 0 (control), K1 = 100 ml, K2 = 150 ml, K3 = 200 ml, K4 = 250 ml, K5 = 300 ml, K6 = 350 ml and K7 = 400 mm. Variables observed were plant length, stem diameter, number of fruits, fruit length, fruit diameter, fruit weight and production per ha. F test results on the analysis of variance showed that the water hyacinth POC had a very significant effect on plant length of 10 HST, stem diameter of 20 HST, number of fruits, fruit weight and production per ha. significant effect on plant length 20 and 30 HST

Discussion

The results of the analysis of variance showed that the longest cucumber plants at 10, 20, and 30 DAS were found in water hyacinth POC treatment with a concentration of 400 ml (K7) which was significantly different from treatment K0, K1, K2, K3, K4, and K5, but not significantly different. with POC treatment of a water hyacinth concentration of 350 ml (K6). The increase in the length of cucumber plants in water hyacinth POC treatment with a concentration of 400 ml (K7), presumably because at this concentration (400 ml) water hyacinth POC contains elemental N which can trigger plant length growth, where the N nutrient needed by plants is available balanced. According to Rozaq and Novianto (2000) in Kristanto et al. (2003) stated that one of the chemical compositions of water hyacinth was 0.28% total N. Munawar (2011) reported that the adequacy of plant N supply as indicated by good plant growth. Sutedjo (2008) states that nitrogen is the main nutrient for plant growth, which is generally very necessary to stimulate the formation or growth of vegetative parts of plants, one of which is plant height growth.

If the nutrients needed for growth and development are in a balanced state and an optimum dose and are supported by environmental factors, good plant growth will be achieved (Wibawa, 1998 in Marlina et al., 2015). Dartius (1990) in Zuyasna et al. (2010) added that the availability of the elements needed by plants that are insufficient condition, the results of their metabolism will form proteins, enzymes, hormones, and carbohydrates, so that cell enlargement, extension, and division will take place quickly.

Based on the analysis results showed that the highest number of cucumber plants was found in the POC treatment of water hyacinth with a concentration of 400 ml (K7) which was significantly different from the treatment of K0, K1, K2, K3, K4, but not significantly different from the treatment of water hyacinth POC with a concentration of 300 ml. (K5) and 350 ml (K6).

In the POC treatment of water hyacinth with a concentration of 400 ml (K7), the phosphorus content contained in POC can be absorbed and utilized by cucumber plants as an energy source for growth and development processes. As it is known that phosphorus functions as a

source of energy in metabolic processes in plant tissues. Sutedjo (2010, added that the element of Phosphate plays a role in helping the growth of protein and minerals which are very high for plants, can accelerate root growth, can accelerate and strengthen the growth of young plants into mature plants, can accelerate flowering and fruit ripening.

The diameter of the cucumber plant, based on the results of the analysis of variance, showed that the largest fruit diameter was found in the POC treatment of water hyacinth with a concentration of 400 ml (K7) which was significantly different from the K0, K1, K2, K3, K4 treatment, but not significantly different from the POC treatment. Water hyacinth with a concentration of 300 ml (K5) and 350 ml (K6).

The increase in fruit diameter in water hyacinth POC treatment with a concentration of 400 ml (K7) was thought to be related to the availability of phosphorus at that concentration available to plants. According to Indriati (2009), phosphorus plays a role in seed formation, accelerates flower formation, and ripens fruit. Sutedjo (2002) states that the element of phosphorus plays a role in increasing the enlargement of the fruit and seeds of plants so that giving high phosphorus will increase fruit enlargement. The more phosphorus is available to plants, the more it can be absorbed by plants so that photosynthesis will increase and ultimately will increase fruit formation.

The longest cucumber fruit weight per plant was found in water hyacinth POC treatment with a concentration of 400 ml (K7) which was significantly different from treatment K0, K1, K2, and K3, but not significantly different from the POC treatment of water hyacinth with a concentration of 250 ml (K4), 300 ml (K5) and 350 ml (K6). Increasing fruit weight in water hyacinth POC treatment with a concentration of 400 ml (K7), it is assumed that the application of organic fertilizers at the right concentration has a positive role in providing nutrients for plants. The availability of nutrients in the soil allows plant growth and production to take place properly. According to Karson et al. (2000) in Yadi et al. (2012) stated that plant growth and production are determined by the rate of photosynthesis which is controlled by nutrient availability. Excess and deficiency of nutrients given to plants result in the photosynthesis process being ineffective and the resulting photosynthate is reduced, causing the amount of photosynthate translocated to the fruit to decrease, this causes a decrease in fruit weight and fruit quality (Gardner, 1991 in Yadi et al., 2012).

The highest production per hectare of cucumber was found in the POC treatment of water hyacinth with a concentration of 400 ml (K7) which was significantly different from the K0, K1, K2, and K3 treatments, but not significantly different from the POC treatment of water hyacinth with a concentration of 250 ml (K4), 300 ml (K5) and 350 ml (K6).

The increase in production per ha of cucumber plants in water hyacinth POC treatment with a concentration of 400 ml (K7) is presumably because, at these concentrations the required N, P, and K nutrients are available. According to Yanuarismah (2012), water hyacinth contains complex substances that are needed by plants, such as nitrogen nutrients N, Ca, Mg, K, Na, Cl, Cu, Mn, and Fe. Water hyacinth contains 78.47% organic matter, 21.23% organic C, 0.28% total N, 0.0011% total P, and 0.016% total K so that water hyacinth has the potential to be used as an organic fertilizer because water hyacinth has the nutrients needed by plants to grow and produce well (Anastasia et al., 2015).

Conclusion

Based on the results of the research that has been done, it can be concluded that the POC of water hyacinth has a very significant effect on plant length 10 DAS, stem diameter 20 DAS, number of fruits, fruit weight and production per ha. significant effect on plant length 20 and 30 DAS, stem diameter 10 and 30 DAS, fruit diameter. The best growth and production of cucumber plants was found in the POC treatment of water hyacinth with a concentration of 400 ml (K7).

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