



Comparison of Cow Urine Bokashi, Green Bokashi and Chemical Fertilizer on Growth Of Pakcoy (*Brassica Rapa L. Subsp. Chinensis*) Utilizing Deep Flow Technique Hydroponic

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ABSTRACT

Hydroponic is a known technique in agriculture, using water instead of soil as growing media, where specific fertilizer were continuously added. Generally, chemical fertilizer were used in hydroponic system, i.e. AB mix fertilizer, a combination of several fertilizer, which certainly costly. This research aim to find alternative fertilizer for hydroponic where growth of the plants/crops is maintained. Two possible fertilizer easily found nearby UNAI campus were cow urine, and discarded parts of green vegetables. Fermentation of these urine and green compost were the main role to produce appropriate fertilizer, known as bokashi. Pakcoy (*Brassica rapa L. var. Chinensis*) seedling were used from its ready for planting time (approx. 4 days) in rockwool. Hydroponics system utilizing Deep Flow Technique (DFT), A shape model. Data of pakcoy growth including height of the plants, leaves width and root length were measured every week up to 5 weeks. Data were analyzed using Analysis of Variance (ANOVA) and continued with Duncan Multiple Range Test. The result showed that, on plants height, each fertilizer was differing each other, where AB mix is higher with average 22.71 cm, followed by green bokashi 18.74 cm, and cow urine bokashi 16.38 cm. On leaves width, AB mix is greater with average 9.22 cm, followed by green bokashi 8.03 cm and cow urine bokashi 7.00 cm. Analysis on root length, AB mix is higher with average 49.76 cm, followed with green bokashi 21.33 cm, and cow urine bokashi 21.21 cm. This research concludes that green bokashi and cow urine bokashi could be use as alternative fertilizer in hydroponics system, although AB mix gives higher growth.

Keywords: hydroponics, green bokashi, cow urine bokashi

INTRODUCTION

Agricultural cultivation is a business that has a high economic value, that is promising in the present and with the development of technological equipment in agriculture at this time can improve the quality of yields better (Putra, 2018). Hydroponic system cultivation is carried out in order to maintain plant growth so that it is truly optimally protected from climate, pests and diseases and rain (Indriani, 2006). Hydroponics is a cultivation of plants by utilizing water without soil media, the hydroponic system is basically a modification of a more

intensive crop cultivation management system to improve the quality of crop production and ensure the quality of plants (Susanto, 2002) Good plant quality is influenced by nutrition for success when planting hydroponically (Hamli et al., 2015). Therefore hydroponic cultivation must obtain nutrients through the nutrient solution given (Silvina et al., 2008). Cow urine is a liquid manure containing nutrients N, P, K and organic matter (Sutanto, 2002). Besides cow urine contains a type of auxin hormone Indole Butyric Acid (IBA) which can stimulate plant roots, affect the process of cell extension, cell wall plasticity and cell division (Suparman et al., 1990).

Bokashi is an organic material that is fermented using EM-4 technology, can be used as organic fertilizer and its manufacture only lasts a few days (Subadiyasa, 1997). Effective microorganism (EM-4) is a mixed culture of various types of microbes that function as bioactivators including *Lactobacillus sp*, *Saccharomyces sp*, *Actinomycetes* and fungi cellulose fungi. These microorganisms function in maintaining carbon and nitrogen balance which is a critical factor in the success of making bokashi (Djuarnani, Kristian, Setiawan, 2005 and Yuwono, 2005).

ABmix contains essential nutrients needed by plants, out of these 16 elements 6 of them are needed in large quantities (macro) namely N, P, K, Ca, Mg, S, and 10 elements are needed in small amounts (micro) namely Fe, Mn, Bo, Cu, Zn, Mo, Cl, Si, Na, Co (Agustina, 2004). Pakcoy plants are very popular among the people, especially in Indonesia, because these plants have many benefits, including vitamins and minerals. The content of vitamins K, A, C, E and folic acid is very high. While the mineral content of mustard plants including vitamins and minerals are also very high (Rizal 2017).

The choice of media type is determined by the type of hydroponics to be used and the type of plants to be planted. The composition of the selected substrate or media can have a positive influence on the cultivation process (Susanto, 2002).

METHODS

The research starts with preparation of tools and materials using the DFT (Deep Flow Technique) hydroponic system, plant roots in the inland water layer ranged from 4-6 cm, circulating plant nutrient solutions continuously for 24 hours in a closed flow series. Plant nutrient solution in the tank is pumped by a water pump to the planting basin through a pipe irrigation network, then the plant nutrient solution in the planting tub is flowed back to the tank (Chadirin, 2007).

Cow urine organic fertilizer is made, through a fermentation process in which as much as 3 liters of cow urine is poured in a bucket then added with 500 g of sugar and slowly poured EM 4 as much as 150 ml, then stirred until the sugar has dissolved and all ingredients are mixed evenly, after that the bucket will be tightly closed and it is left for 7 days and the fermentation results are successful if the liquid fertilizer no longer smells of urine (Affandi. 2008) and the organic fertilizer of cow urine is ready to be put in the shelter and ready to flow.

For making leaf bokashi, in this research using 10 kg of chopped broccoli leaf waste and then combined with 4 kg of manure, 5 liters of water for mixing and 50 ml EM4 diluted with 5 liters of water, then drained until getting pure leaf bokashi through fermentation process for 4 weeks.

The dilution of ABmix fertilizer is done by dissolving ABmix A and B as much as 83g each into 2 liters of water, then the two solutions are separated into 5 liters of water then stirred until evenly mixed, then these nutrients are stored separately in a closed plastic bucket.

Measurement of the concentration of hydroponic solutions is needed to maintain a healthy and good plant according to the type of plant by using TDS (*Total Dissolved Solid*) to see the amount of dissolved solids in water and in this study for pakcoy plants 1050-1400 PPM (*Part per Million*).

RESULTS

The results on pakcoy growth using the DFT system for measurements of plant height, leaf width and root length were recorded every week for 5 weeks.

Table 1. Growth of plant height, leaf width and root length by type of fertilizer.

Types of Fertilizers	High Plant (cm)	Leaf Width (cm)	Root Length (cm)
AB mix	22.71	9.22	49.76
Bokashi leaves	18.74	8.03	21.33
Cow urine	16.38	7.00	21.21

Table 2. ANOVA Statistical Test Results on Pakcoy Plant Height (*Brassica rapa L. var. Chinensis*)

Height	Number of Squares	Df	Mean	F	Significant
Between group	613,523	2	306,761	96,036	0,000
In the group	277,898	87	3,194		
A total	891,421	89			

Table 3. Duncan Results Measurement on Pakcoy Plant Height (*Brassica rapa L. var. Chinensis*)

Nutrition	N	Subset for Alpha = 0.05		
		1	2	3
Cow urin	30	16.3833		
Bokhasi leaves	30		18.7367	
AB mix	30			22.7100
Significan		1.000	1.000	1.000

Table 4. ANOVA Statistical Test Results on Pakcoy Leaf Width (*Brassica rapa L. var. Chinensis*)

Leaf Width	Number of Squares	Df	Mean	F	Sig.
Between group	74.065	2	37.032	47.445	0.000
In the group	67.906	87	.781		
A total	141.971	89			

Tabel 5. Duncan Results Measurement on Pakcoy Leaf Width (*Brassica rapa L. var. Chinensis*)

Nutrition	N	Subset for alpha = 0.05		
		1	2	3
Cow urin	30	7.0033		
Bokhasi leaves	30		8.0300	
AB mix	30			9.2233
Significan		1.000	1.000	1.000

Tabel 6. ANOVA Statistical Test Results on Pakcoy root length (*Brassica rapa L. var. Chinensis*)

Root length	Number of Squares	Df	Mean	F	Sig.
Between group	16235.706	2	8117.853	183.159	0.000
In the group	3855.958	87	44.321		
A total	20091.663	89			

Tabel 7. Duncan Results Measurement on Pakcoy root length (*Brassica rapa L. var. Chinensis*)

Nutrition	N	Subset for alpha = 0.05	
		1	2
Cow urin	30	21.2100	
Bokhasi leaves	30	21.3267	
AB mix	30		49.7600
Significan		.946	1.000

CONCLUSION

Appropriate fertilizer application will cause increased yields and plants will grow well if the nutrients supplied are in a balanced amount and in accordance with plant needs (Mappanganro N, et al, 2011). In this study bokashi leaves and cow urine can be used as an alternative fertilizer in the hydroponic system even though ABmix still accounts for the highest value.

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