



Response of Liquid Organic Fertilizer and Type of Media on Pakcoy (*Brassica Rapa*.) Production by Wick Hydroponics

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ABSTRACT

A Green mustard or Pakcoy (*Brassica rapa* L.) is a type of vegetable that has high economic value and has the potential to contain bioactive compounds and nutrients that are useful for increasing immunity in the body. The formulation of the problem obtained is whether there is an interaction between giving POC and types of media on the development and production of pakcoy. The purpose of the experiment was to study and evaluate the response of POC and media types to pakcoy production using hydroponics. The research methodology used a completely randomized design, two factors, namely the concentration of POC (K) and the type of growing media (M). Parameters measured included plant height, leaf area, fresh weight, root length. The data were tested with ANOVA consisting of F Count and LSD Test or Duncen's test if there was a significant effect. The results of the study proved that there was no interaction between the two treatments. However, there was a single effect on media use and the best one was M2 (husk charcoal) which had the highest number of leaves, leaf area, fresh weight and root length. The addition of POC concentration of 12 ml/L had a very significant effect on the variation in leaf area observed at 30 days after planting.

INTRODUCTION

Mustard greens are quite well known in Indonesia, classified as vegetables of high economic value, growing in highlands to lowlands (Anggraini, 2020). The advantages of pakcoy include fast harvesting, high adaptability, it can last for 10 days with a temperature of 0-5 °C and 95% RH (Utomo, 2014). Pakcoy plants need water in the right amount to grow and develop in order to achieve optimal production. In plant physiology, water is very important and is the main consideration in plant cultivation, pakcoy plants that lack water tend to produce lower yields than pakcoy plants with sufficient water intake. This is an obstacle in the cultivation of pakcoy, so that the community's need for pakcoy is not met (Widiyani and Ariffin, 2017). Along with population growth in Indonesia, hydroponics is a technique of growing vegetables without using soil. One of the techniques for growing hydroponic

vegetables is the simplest hydroponic system. Operation is passive because it does not require a water pump or water flow. The nutrient solution is taken from the container into the pot media using a wick. Can be used in narrow areas such as yards and urban areas (Masduki, 2017). According to (Manurung, 2016), explaining that the planting medium is a place for plants to grow, it is very important to strive to function properly in providing nutrients, water and air circulation as well as pores for the entry and exit of substances needed in the plant development process. The problem is how to increase the production of green mustard without the need for large land and fast harvesting. The purpose of this experiment is to solve existing problems, namely to study the response to the use of organic liquid fertilizer that is easily absorbed by plants and the use of various growing media to increase pakcoy production with the Wick hydroponic system. The benefit is land efficiency, and increased production in a short time can be harvested is also easy to do in various locations. The results of this research are new innovations that are easy to apply and can be carried out in a narrow field.

METHODS

Time and Location

The study started from March to April 2022, in the Greenhouse near the Jombok Village house, Pule District, Trenggalek with an altitude of about ± 720 m above sea level, a temperature of around 26°C. Tools and supporting materials are rulers, stationery, styrofoam boxes, net pots, flannel, plastic, pH meters, measuring cups and scales, pakcoy seeds, cocopeat, husk charcoal, sponges, water and Phonska POC fertilizer.

Method of Collecting Data

The method used is a factorial completely randomized design with two factors,

Factor I Phosnka concentration (K)

K1 : Fertilizer Concentration 6 mL/L Water

K2 : Fertilizer Concentration 9 mL/L Water

K3 : Fertilizer Concentration 12 mL/ L Water

Factor II type of planting media (M)

M1 : Cocopeat

M2 : Husk Charcoal

M3 : Sponge

Pakcoy seeds are sown in trays filled with up to 85% substrate. First, soak the seeds in warm water for about 3-5 minutes. The seeds that float are thrown away while the seeds that sink are planted. Water the seeds with a sprayer depending on the conditions of the growing media. Wick hydroponic system, made 27 units of used styrofoam boxes. Planting media was used cocopeat, rice husk, and sponge then put into the net pot. Seedlings are planted after 2 weeks in seedlings, transferred to permanent planting media. Seedlings are planted evenly, strong seeds, straight stems, green leaves, not attacked by pests. Embroidery is carried out a maximum of 7 days after planting if any die. Plant maintenance is done manually, disease control is only carried out if it is at the economic threshold. For treatment, phonska fertilizer and water were applied at the same time, namely 7, 14, and 21 DAP with doses according to treatment. Pakcoy can be harvested 35 days after planting

Observation Variables

Vegetative observations were carried out three times at 9, 16, 23 and 30 days after planting on plant height, Number of leaves, leaf area, and fresh weight. Plant height was measured with a ruler from the base of the plant to the growing point. The number of leaves was counted on plants whose leaves had fully opened. Leaf area is calculated by calculating length x width x k. Generative observations were made at the time of harvest, namely the age of 35 DAP. Fresh weight was calculated using a scale, by weighing the pakcoy plant samples. The root length of the mustard plant was obtained by measuring after harvesting at the age of 35 DAP. Root length was measured from the base of the root to the tip of the root.

Data Analysis

The data obtained were entered into the table for F-test using the variance method (ANOVA). If there is a real or very real interaction from each treatment, the comparison test is carried out using the Least Significant Difference (LSD) with a 5% confidence degree on the average treatment results have an effect on the observed variables. If it does not have an effect on the observed variable, no further test is carried out.

RESULTS AND DISCUSSIONS

Plant Height

Based on Table 1. 5% LSD test, it is known that the POC concentration treatment has no effect on plant height. However, the planting media treatment had an effect on plant height, at 9 DAP M3 was higher than M2 and M1, and at 16, 23 and 30 DAP, M3 was higher than the other treatments but not significantly different from M2. In the growing media, sponges have better porosity and aeration, so that the movement of air and water in the media is more flexible. This is in accordance with Tati's (2021) study. The best growth of kale and pakcoy was found in porous media. This is because the sponge has a much higher porosity.

Table 1. Average of Plant Height

Treatment	Average Plant Height (cm)			
	9 HSPT	16 HSPT	23 HSPT	30 HSPT
K1	3,96	4	8,82	10,5
K2	4,43	3,99	8,59	10,8
K3	4,52	4,23	8,84	11,5
LSD 5 %	ns	ns	ns	ns
M1	3,16a	0a	0a	0a
M2	3,70a	6,76b	10,45b	14,51b
M3	6,05b	11,44b	15,25b	18,29b
LSD 5 %	0,56	4,03	0,90	0,97

Description : ns : non significant effects. Numbers followed by the same letter in the same column are not significantly different at the Least Significant Difference level at the 5% level (LSD Test 0.05)

Planting media is declared good, which contains balanced nutrients for growth, can bind water and nutrients, good aeration and drainage, can maintain moisture around the roots, free from pests and

diseases, not susceptible (Syafrinal, 2008). One of the external factors that influence is nutrition and the type or texture of the media used (Wasonowati, 2011). Opinions (Perwitasari et.al., 2012) that different types of media affect the growth of hydroponic pakcoy. A good planting medium has a porous or perforated hole in the middle of the material that allows water to seep in so it doesn't get stuck in pots or polybags. This is because the sponge has a better porosity, the porosity of the media is the proportion of empty space (pores) that is sufficient for the movement of air and water circulation around the plant root system.

Number of Leaves

Table 2. Average Number of Leaves

Preatment	Average Number of Leaves (strands)			
	9 HSPT	16 HSPT	23 HSPT	30 HSPT
K1	13,03	13,70	20,90	17,80
K2	15,08	14,10	21,70	17,47
K3	13,93	14,60	14,27	17,53
LSD 5 %	ns	ns	ns	ns
M1	12,10a	0a	0a	0a
M2	13,30a	19,90b	31,00b	27,40b
M3	16,63b	22,50b	33,00b	25,40b
LSD 5 %	1,33	1,03	1,23	2,44

Description : ns : non significant effects. Numbers followed by the same letter in the same column are not significantly different at the Least Significant Difference level at the 5% level (LSD Test 0.05)

Based on Table 2. The results of the 5% LSD test explained that the planting medium affected the increase in the number of leaves, the 9th day observation turned out to be M3 higher than M2 but significantly different from M1, but at 16.23 and 30 DAP observations M2 and M3 were not significantly different because the husk charcoal media has nutrients, good water capacity facilitates root penetration, so that the increase in the number of leaves is maximized. Prihmantoro (2003), explained that straw charcoal has good characteristics, including easy attachment to water, light weight, sterile, good porosity. The content of husk charcoal: nitrogen 0.32%, phosphate 0.15%, potassium 0.31%, calcium 0.96%, Fe 180 ppm, Mn 80.4 ppm, Zn 14.10 ppm and Ph 8.5 – 9.0. Supported by Lakitan (2007), that nitrogen affects the growth and development of the number and area of leaves because chlorophyll is quite optimal in photosynthesis, the results are used by plants for growth and development.

This is supported by Furoidah and Wahyuni (2017), nitrogen nutrition is the main component for leaf formation. . The statement above can be said that applying too much fertilizer can affect the growth of the number of leaves which has an impact on reducing the number of leaves in the vegetative phase. Other sources state that leaf growth also has a balance in the availability of nutrients N, P and K (Yusuf, 2017). This proves that the growth of the number of leaves of mustard plants requires optimization of fertilization, not fertilization as much as possible. Other sources also argue that plant growth and production will be optimal if these growth supporting factors are in optimal conditions, balanced elements, and appropriate fertilization doses, and essential nutrients are available to plants (Bustami, et al. 2012). The leaves of the mustard plant grow on the internodes, so the length of the stem

affects the number of leaves that grow on the internodes. Zenita and Eko (2019), explained that the growth in the number of leaves is directly proportional to the growth of plant height.

Leaf Area

Based on the 5% LSD test in Table 3, it was concluded that there was no interaction between treatments and M3 was higher than M2 and M1, but at the age of 30 DAP M2 was higher than M1 and M3, because husk charcoal media had ideal porosity and aeration. for plant growth so that nutrients are easily absorbed by pakcoy plants.

Table 3. average of leaf area

Treatment	Average of Leaf Area (cm ²)			
	9 HSPT	16 HSPT	23 HSPT	30 HSPT
K1	6,16	22,94	59,50	84,60a
K2	8,00	23,78	61,65	85,22a
K3	7,77	23,94	67,94	97,82b
LSD 5 %	ns	ns	ns	8,89
M1	5,81a	0a	0a	0a
M2	4,43a	25,56b	94,51b	147,02b
M3	11,69b	45,10b	94,59b	120,63b
LSD 5 %	2,41	6,46	13,08	8,89

Description : ns : non significant effects. Numbers followed by the same letter in the same column are not significantly different at the Least Significant Difference level at the 5% level (LSD Test 0.05)

Yuliantika (2017) husk charcoal is an ideal growing medium for hydroponic systems, it is porous and has good water storage capacity and is ideal for plant growth and development. The treatment of increasing POC at the age of 9, 16, 23 days after was not significantly different but at the age of 30 days showed a very significant effect. With the highest mean of 97.82 cm in the K3 treatment (POC concentration 12 ML/L). POC is a source of organic matter to increase the photosynthesis process of plants. Murdianto (2016) said that the right application of organic fertilizer will stimulate plant growth because the function of organic fertilizer is to increase water storage and water absorption. Setyanti (2013) photosynthesis produces energy used by plants to develop and growth is expressed as the addition of plant height, number of leaves and leaf area.

Wet Weight

Based on the results of the 5% LSD test in Table 4, it shows that there is no interaction between treatments. However, the planting media treatment had a very significant effect on the wet weight observations in the M2 (husk charcoal) treatment which was higher than M1 and M3. The ability to store water or nutrient solution from coal rice will affect the availability of nutrients. Plants need to carry out optimal metabolic processes to encourage better plant growth and development and to optimize plant weight. Fitriana et al. (2012), the more nutrients a plant can absorb, the more basic materials it has for photosynthesis.

Table 4. Average of wet weight

Treatment	Average Wet Weight (gr)
K1	63,27
K2	64,40
K3	79,93
LSD 5%	tn
M1	0a
M2	123,33c
M3	84,27b
LSD 5%	16,94

Description : ns : non significant effects. Numbers followed by the same letter in the same column are not significantly different at the Least Significant Difference level at the 5% level (LSD Test 0.05)

Good photosynthesis stimulates the accumulation of carbohydrates and proteins in plant organs. According to Elisabeth (2013) the addition of plant size and new leaves on plants can appear optimally if the plant growth factor requirements are met. Pruning leaves, stems, and branches on mustard plants will increase the fresh weight of mustard plants because mustard plants are basically vegetable plants which mostly consist of leaves. Solutions that contain nutrients in hydroponics are macronutrients and micronutrients in balanced amounts (Hartus, 2010).

Primary Root Length

Table 5. Average of root length

Treatment	Average Root Length (cm)
K1	34,15
K2	34,70
K3	33,73
LSD 5%	tn
M1	0a
M2	55,71c
M3	46,87b
LSD 5%	8,44

Description : ns : non significant effects. Numbers followed by the same letter in the same column are not significantly different at the Least Significant Difference level at the 5% level (LSD Test 0.05)

Based on the 5% LSD test, it was known that the two treatments did not interact with the observation of root length. POC concentration treatment had no effect on root length observations. In the treatment of planting media showed that M2 was higher than M1 and M3. Prihmantoro (2003), excess husk charcoal can bind water, not easy to clot, light, sterile and has good porosity. Rice husk charcoal has many pores which can increase aeration and high porosity so that the planting medium is more porous. This property is expected to make it easier for roots to penetrate the media, and a larger root elongation area, and can accelerate root growth. But the less porous space, the less plant roots will develop.

CONCLUSIONS

There was no interaction between POC concentration treatment and type of planting media on pakcoy production, but there was a very significant effect of 12 ml/L POC concentration on leaf area observation variables at 30 days after planting. There was a single effect of planting media, which showed a very significant effect on all parameters observed from 9 to 30 days of age. For plant height, it is best to use sponge planting media (M3) while for the number of leaves, leaf area, wet weight and the highest average root length, using husk charcoal (M2) planting medium.

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