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Utilization of Coconut Water Waste for Nutrition Microgreen Kailan (*Brassica Oleraceae*)

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Abstract. Microgreens is a diversified fresh and nutritious vegetable product with a relatively short harvest time. Microgreens are healthy vegetables, and organic and easily cultivated. Coconut water waste can be used as nutrition for your microgreens (*Brassica Oleraceae*). This study aims to determine fresh weight, water quality, chlorophyll content, fiber, and ascorbic acid microgreens of kailan plants (*Brassica oleraceae*) by providing coconut water as a nutrient. The research was conducted at the Green House, the Faculty of Agriculture Laboratory, and the Food Processing Technology Laboratory of the UPN "Veteran" East Java. The topic being tested is about the concentration and intervals of giving coconut water as a microgreen nutrient. Fresh weight parameters were measured by scales, total chlorophyll analysis using spectrophotometry method, fiber analysis by enzymatic method, and ascorbic acid analysis using DCPIP method. . Data were analyzed using a Completely Randomized Design. The best microgreen weight in the treatment of coconut water with a concentration of 25% and watered three times a day. Fresh weight of 5.92gr / 100 microgreens, chlorophyll content of 0.34 mg / gr, fiber content of 4.67% and 4.0rb% ascorbic acid content.

Keywords: production technology, kailan microgreen plants, environment friendly

1. Introduction

Microgreen is still rarely found in Indonesia today, both in traditional markets and in supermarkets. Microgreens is a diversification of fresh vegetable products. Microgreen is in the form of a small plant with two leaves. The harvest time for microgreens is relatively very fast, when two original leaves have grown and opened completely (around 7-14 days). Microgreens are widely used as fresh vegetables, salad mixes, juice mixes and garnishes in various types of contemporary foods.

There are 3 reasons why microgreens are so popular. First, the visual appearance of microgreens is so tempting, petite and rich in color. Second, microgreens provide a new and more intense taste sensation with a preferred crispy texture. Third, microgreens have 30 percent more nutritional value than ordinary vegetables, including vitamins C, E, K, and carotenoids (precursors of vitamin A).

Microgreens cultivation technology is environmentally friendly because it is organic and supports urban farming and supports agribusiness activities. Microgreen cultivation can be carried out on



narrow land and vertically. Increasing the production and quality of microgreens can be innovated through the use of various media and nutrition technologies.

The media for microgreens can be soil or from junk material such as cocopeat, rock paper, rockwool or hydrotone. The nutrients used must be organic and can supply nutrients such as coconut water, rice washing water, tea water or other liquid nutrients that are organic. Media and nutrient solutions to be tested are media derived from cocopeat by watering nutrients from coconut water.

The problem is that it is not yet known how much nutrient solution needs to be given to microgreens to produce good quality and production. It is necessary to test the provision of nutrient solutions in the production of microgreens both in quantity and quality. So the purpose of this study was to determine the concentration of coconut water and the frequency of administration that is appropriate for microgreen production both in quantity and quality.

2. Methods

The study was conducted at the Green House of the Faculty of Agriculture of the UPN "Veteran" East Java. Microgreens analysis was carried out in the Production Laboratory and the Food Processing Technology Laboratory. The ingredients used are water, coconut water, and kailan seeds (*Brassica oleraceae*) and cocopeat growing media.

Complete Random Design (CRD) with factor I: Coconut water concentration and factor II: Frequency of coconut water administration. Where factor I is coconut water concentration (K) has 4 treatment levels: K0 = coconut water concentration 0%, K1 = coconut water concentration 15%, K2 = coconut water concentration 25%, K3 = coconut water concentration 35%. Factor II, the frequency of coconut water (P) has 3 levels of treatment: P1 = Giving coconut water once a day (morning) P2 = Giving coconut water twice a day (morning and afternoon) P3 = Giving coconut water three times a day (morning, afternoon, and evening).

Parameters observed included fresh weight of microgreens and qualitative analysis of kailan plant microgreens (*Brassica oleraceae*) including water content, total chlorophyll of microgreens leaves, fiber content, and ascorbic acid.

3. Results and Discussions

3.1. Result

3.1.1. Fresh Weight of Microgreens. There is an interaction between coconut water concentration and coconut water supply to fresh weight microgreens (*Brassica oleracea*). The average fresh weight of microgreens due to the provision of coconut water can be seen in table 1.

Table 1. The average fresh weight of 100 microgreens (g) due to the provision of coconut water

Treatment Concentration	The average fresh weight of 100 microgreens (g)		
	Interval		
	P1(1 time a day)	P2(2 times a day)	P3(times a day)
K0 (0 %)	3,68 a	3,79 a	3,81 a
K1 (15%)	3,89 a	4,69 ab	4,82 ab
K2 (25%)	5,92 b	5,28 b	5,92 b
K3 (35%)	3,81 a	3,85 a	3,87 a
RDH 5%		1,24	

Note: The numbers accompanied by the same letter mean that they are not significantly different in the test of the real honest difference of level $p = 0.05$

The provision of coconut water has a very significant effect on the fresh weight of microgreens. Giving coconut water with a concentration of 25% and splashed 3 times gives the best results but is not significantly different from giving once or twice

3.1.2. Total Chlorophyll Content. Provision of coconut water has a very significant effect on the chlorophyll content of kailan (*Brassica oleracea*) plants. The average chlorophyll content in microgreen can be seen in Table 2.

Table 2. Average chlorophyll content in microgreens (mg / g) due to the provision of coconut water

Treatment Concentration	Average chlorophyll content in microgreens (mg / g)		
	Interval		
	P1(1 time a day)	P2(2 times a day)	P3(times a day)
K0 (0 %)	0,09 a	0,11 ab	0,14 bc
K1 (15%)	0,15 cd	0,18 d	0,18 d
K2 (25%)	0,33 f	0,33 f	0,34 f
K3 (35%)	0,27 e	0,29 e	0,33 f
RDH 5%		0,03	

Note: The numbers accompanied by the same letter mean that they are not significantly different in the test of the real honest difference of level $p = 0.05$

The provision of coconut water with a concentration of 25% and sprayed either one, two or three times gives results that are not significantly different and the best.

3.1.3. Fiber Content. Provision of coconut water has a very significant effect on the fiber content of kailan (*Brassica oleracea*) microgreens. The average value of microgreens fiber content due to concentration and intervals of coconut water can be seen in Table 3.

Table 3. Average microgreens fiber content (%) due to the provision of coconut water

Treatment Concentration	Average microgreens fiber content (%)		
	Interval		
	P1(1 time a day)	P2(2 times a day)	P3(3 times a day)
K0 (0 %)	2,57 a	2,68 a	2,69 a
K1 (15%)	2,76 a	2,83 a	3,55 bc
K2 (25%)	3,88 cd	4,53 de	4,67 e
K3 (35%)	2,84 a	3,10 ab	3,85 c
RDH 5%		0,66	

Note: The numbers accompanied by the same letter mean that they are not significantly different in the test of the real honest difference of level $p = 0.05$

Fiber content in microgreens can be increased with increasing concentration of coconut water up to 25% with three times watering and not significantly different from twice watering. An increase in the concentration of coconut water can cause decreased fiber content in microgreens.

3.1.4. Ascorbic Acid Content. Provision of coconut water significantly affect the ascorbic acid content in kailan plant microgreens (*Brassica oleracea*). Average ascorbic acid content in microgreens due to the provision of coconut water can be seen in Table 4.

Table 4. Average ascorbic acid content in microgreens (%) due to the provision of coconut water.

Treatment Concentration	Average ascorbic acid content in microgreens (%)		
	Interval		
	P1(1 time a day)	P2(2 times a day)	P3(3 times a day)
K0 (0 %)	1,62 a	1,97 a	1,68 a
K1 (15%)	1,99 ab	2,61 abcd	3,64 cde
K2 (25%)	3,79 de	3,86 de	4,18 e
K3 (35%)	2,19 abc	3,53 bcde	2,66 abcde
RDH 5%		1,54	

Note: The numbers accompanied by the same letter mean that they are not significantly different in the test of the real honest difference of level $p = 0.05$

3.2. Discussions

Provision of coconut water with the right concentration and frequency of administration can make effective the growth of kailan microgreens (*Brassica oleraceae*). The provision of coconut water is an effort to provide organic nutrition for microgreens. The nutrients contained in coconut water support cell division and elongation so that the size of microgreens quickly increases. This can be seen in the fresh weight of microgreens. Increasing the concentration of coconut water to 25% at all levels of watering frequency causes the fresh weight of microgreens to increase compared to controls. The effectiveness of organic nutrition in microgreens is influenced by the right concentration and intervals and will have different effects on the growth activities of microgreens [1]. Coconut water can help increase water levels in microgreens [2] but the effect of coconut water and the watering interval are not significantly different in the microgreens water content which can reach 80% -90% [3]. The amount of water content will affect the freshness of microgreens as fresh vegetables. Vegetables usually have a high water content which is around 70 - 95%, but low in fat and protein [3]. The presence of LED illumination treatment can also affect the quality of microgreens.

Improved quality of microgreens is also influenced by the provision of coconut water. Increasing the concentration of coconut water to 25% provides the highest quality at all levels of watering frequency. A higher concentration of coconut water which is 35% decreases yield. Provision of high concentrations of coconut water is thought to inhibit the growth of microgreens. Microgreens growth, especially elongation of microgreens stems, does not require high concentrations of cytokinins [4]. Microgreens require exogenous cytokinin in low concentrations, because the endogenous cytokinin content is sufficient. As a result, the addition of exogenous cytokinins no longer has an effect and can even inhibit growth because the concentration of cytokinins becomes excessive (supra optimal) and the nature of the hormone will be toxic microgreens when in excessive amounts.

The results of this study indicate that the provision of coconut water with a certain level of watering frequency can affect production both in quantity and quality. The quality of microgreens can be measured by the amount of content of important elements in microgreens such as chlorophyll, fiber, and ascorbic acid. Increasing the concentration of coconut water to a level of 25% at all levels of watering frequency gives the best quality results. Provision of coconut water in kailan microgreens can accelerate growth and affect the amount of fiber, chlorophyll, and vitamin C [5].

Important content in broccoli plants such as chlorophyll, fiber, and ascorbic acid shows better results when harvested as microgreens than harvested in sprouts and mature plants. Differences in nutrient content between mature plants, microgreens and sprouts of spinach (*Amaranthus*) are found in chlorophyll content, vitamin content and growth substances [6]. The content of substances contained in broccoli microgreens is better than mature plants and this affects the nutritional value [7]. The content of important substances in microgreens by giving coconut water is also better than microgreens by giving water. Microgreens also contain sulphorapen which acts as an antioxidant and is useful as an antidote to free radicals [8].

The frequency of watering one, two or three times did not give significantly different results at the level of 25% coconut water. This shows that the moisture of the growing media in each treatment was maintained even though only watered once, so that the nutritional needs of microgreens were still met.

The concentration of coconut water needed by microgreens in the frequency of watering three times a day will keep organic nutrition needs better so that it gives good results [9]. The effectiveness of giving coconut water to microgreens is influenced by the right concentration and frequency so that it can give a different effect on the microgreens activity [3]. Concentration and frequency of giving coconut water to microgreens illustrates the growth conditions that are affected by the environment [10].

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