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Comparison of Nutritional Content of Water Spinach (*Ipomoea aquatica*) Cultivated Hydroponically and Non-Hydroponically

Comparison of Nutritional Content of Water Spinach (*Ipomoea aquatica*) Cultivated Hydroponically and Non-Hydroponically

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Abstract. Abstract Water spinach is well known by our society as a green vegetable that has a high vitamin mineral content at a low price and is easy to obtain and its cultivation is also relatively easy. This character supports the development as a potential horticultural crop commodity to be developed. The main source of vitamins is leafy green vegetables. Leaf green vegetables can be cultivated non-hydroponically and hydroponically. In vegetables there is beta-carotene which is the initial form of vitamin A so it is called pro vitamin A or provit A. Provit A is found in leafy green vegetables such as water spinach. The objectives of this study were: To compare the nutritional content of water spinach cultivated hydroponically and non-hydroponically. This research was conducted at the Wire House Biology Laboratory, Padang State University in May - July 2020. This research is a descriptive study. The analysis that will be carried out in this study are: Nutritional content of kale. The research steps that will be carried out are: preparation of hydroponic kale samples obtained from the West Sumatra hydroponic community in Alai and non-hydroponic kale obtained from the Padang Raya market, analysis of nutrient content using spectrophotometric methods and data analysis. From the research that has been done, it is found that the nutritional content of water spinach cultivated non-hydroponically is higher than that of water spinach cultivated hydroponically.

1. Introduction

Water spinach is well known by our people as a green vegetable that has a high content of mineral vitamins at a low price and is easy to obtain and its cultivation is also relatively easy. This character supports the development as a potential horticultural crop commodity to be developed. The main source of vitamins is leafy green vegetables. Leaf green vegetables can be cultivated non-hydroponically and hydroponically. In vegetables there is beta-carotene which is the initial form of vitamin A so it is called pro vitamin A or provit A. Provit A is found in leafy vegetables such as kale. Vegetables are believed to be nutritious and vital for human health (especially vegetables that are fresh and free of pollution). Several types of vitamins and minerals in vegetables are easily damaged or lost when cooked or washed [7].

Water spinach has important nutrients and is quite high in vitamins A and C and beta-carotene. These nutrients can help reduce free radicals in the body (as antioxidants) so that they can help prevent

oxidized cholesterol. Cholesterol is oxidized on the walls of blood vessels, causing clogged arteries, heart attack or stroke. In addition, the folate in kale can help to convert a potentially dangerous chemical called homocysteine, which at high levels can lead to heart attack or stroke. Magnesium is a mineral that lowers blood pressure and provides protection against heart disease.

Vegetable production in Indonesia increases every year and consumption is recorded at 44kg / capita / year, the growth rate of vegetable production in Indonesia ranges from 7.7-24.2% / year. Archipelago tropical horticultural agribusiness products consisting of fruits, vegetables, ornamental plants and medicinal plants are one of Indonesia's mainstays in both the domestic, regional and international markets. The subsector includes four commodity groups of vegetables, fruits, ornamental plants and biopharmaceuticals. In 1980 - 2000 the export value of vegetables and fruit contributed around 12% - 17% of the export value of foodstuffs produced by the agricultural and fisheries sectors [3].

Nutrients are elements needed for bodily processes and functions. Energy needs are obtained from various nutrients, such as: carbohydrates, protein, fat, water, vitamins, and minerals.

The purpose of this study was to compare the nutritional content of water spinach cultivated hydroponically and non-hydroponically.

2. Materials and Methods

2.1. Vitamin C Measurement

The materials used in this study were hydroponic water spinach obtained from the West Sumatra hydroponic community in Alai, while non-hydroponic kale was obtained from Pasar Raya Padang.

The tools needed when the study measured the vitamin C content were: Erlenmeyer 100 ml, 10 ml measuring pipette, 100 ml measuring flask, glass funnel, 50 ml burette, spray bottle, analytical scale, feeder, filter paper and cotton. Materials needed Hydroponic spinach and non-hydroponic spinach samples, 1% starch solution, 0.01 N iodine solution and Aquades.

The material is crushed until a slury is obtained. Weigh 10 grams of slury, put it in a 100 mL measuring flask, and dilute it to the mark. Filter it using a cotton ball, then put 10 mL of the filtrate obtained into the Erlenmeyer. Add 1% starch solution to titration rapidly using 0.01 N iodine solution until a color change occurs (blue-black color).

Calculation:

$$A = \text{mL Iod } 0{,}01 \text{ N} \times 0{,}88 \times p \text{ gram sample} \quad (1)$$

Note:

A = mg vitamin C per gram of material

p = amount of dilution

Note: Use IPI vitamin C as a comparison

2.2. Vitamin A Measurement

Water Spinach weighs 100 g. Grind each ingredient then squeeze it with a filter cloth and take 25 mL. Add distilled water to mark the limit on the 100 mL flask. Then filtered with filter paper. The 10 ml filtrate was heated at 40-60oC and 1 mL KOH was added. The solution was extracted using petroleum ether and 92% methanol in a ratio of 1: 1, then shaken. The resulting solution was re-extracted with 10 ml of methanol to separate the bottom layer; monohydroxy-carotene soluble in methanol and topcoat; carotene is soluble in petroleum ether [2], for measurement of light absorption. Separation is carried out with a separating funnel, and in the top layer with petroleum ether as a solution; measured absorbance at a wavelength of 450 nm.

Determination of β-carotene levels, using a standard solution of pure β-carotene (5 mg / ml): 10 mg β-carotene standard was dissolved in 2 ml of the petroleum ether-acetone (1: 1) mixture. The solution is diluted with a petroleum ether-acetone (10: 1) mixture to 25 ml. Each volume variation is 0, namely without extract, 0.2 mL, 0.4 mL, 0.6 mL, 1.0 mL of extract into a 25 ml volumetric flask. Each was diluted with petroleum ether-acetone (10: 1) mixture to mark the limit. Determined the level of

vitamin A in the sample based on the standard curve obtained. The absorbance obtained from the sample and the concentration / concentration in the sample is [7].

% Carotene = [(mg / 100) / sample weight / 100] x fp1 x fp2 x 100 (2)

2.3. Vitamin B Measurement

The tools needed are; test tube, dropper pipette, bunsen, test tube rack, 500 ml glas beaker, stirring rod. Materials for vitamin B testing, 1% Thiamin solution (50 ml), 6 N NaOH solution (50 ml), Pb - acetate solution 10% (50 ml).

Prepare the tools and materials to be used, put 10 drops of 1% thiamin solution into the reaction tube, add 10 drops of pb - acetate solution 10% and 1 ml NaOH 6 N, mix well, then pay attention to the yellow color occurs, then, heat, so that a black brown color deposits will appear which indicates a positive B vitamin.

3. Results and Discussion

The results showed that the vitamin C content of water spinach cultivated hydroponically was 0.049 mg, while the other nutritional content can be seen in table 1.In hydroponics, nutrition is the main factor that determines the success of hydroponic plant cultivation. The solution in the media must be rich in nutrients for growth. According to Lingga [6] that in plant vegetative growth, which is indicated by the increase in length, height, nutrient that plays a role is nitrogen (N) which functions to spur growth in the vegetative phase, especially leaves and stems. An important aspect that needs to be considered in determining the success of hydroponic cultivation is plant management which includes the preparation of media materials, nutrient solutions, maintenance, application of nutrient solutions, harvest and post-harvest [5].

Table 1. Nutritional content of hydroponic water spinach

Nutritional Content	Total	Nutritional Contenti	Total
Energy	28 kkal	Iron	2,3 mg
Protein	3,4 g	Natrium	7 mg
Fat	0,7 g	Phosfor	54 mg
Charbohydrate	3,9 g	Vitamin B1	0,07 mg
Fiber	2 g	Vitamin B2	0,36 mg
Calsium	67 mg	Vitamin B6	2 mg

As for the content of vitamin C, water spinach cultivated non-hydroponically is 0.061 mg, and for other nutritional values can be seen in Table 2. Non-hydroponic water spinach grows on the ground and can usually grow on its own. For nutrients from non-hydroponic water spinach, it is obtained from soil nutrients that are around the growth of water spinach. The caterpillars of water spinach usually make kale leaves perforated and the quality of kale is reduced.

Table 2. Nutritional content of non hydroponic water spinach

Nutritional content	Ttotal	Nutritional content	Total
Energy	29 kkal	Fosfor	50 mg
Protein	3 g	Iron	2,5 mg
Fat	0,3 g	Vitamin A	6300 mg
Charbohydrate	5,4 g	Vitamin B1	0,07 mg
Fiber	1,0 g		
Calsium	73 mg	Water	89,7 g

The advantages of organic / non-hydroponic vegetables: Environmentally friendly: because they all come from organic and natural materials, of course they are environmentally friendly, using nutrient sources from organic fertilizers (manure, compost, etc.) which tend to be cheaper, planting is done in the soil: soil micro organisms and The nutrients in the soil help plant growth so they tend to be cheaper and tend to be more beautiful to look at because they are natural.

Weaknesses of organic / non-hydroponic vegetables: it is still difficult to obtain large yields because of the limited need for nutrients from organic fertilizers which contain small nutrients (unless the soil is healthy and carried out continuously and for a long time), because it is planted On the ground, the contamination tends to be higher and the attack of pests and diseases is greater, because using organic pesticides, the effectiveness of the pesticides is relatively low (except in sterile environments such as green houses or land that is healthy so that pests and diseases run in balance).

4. Conclusion

The results showed that the vitamin C content of kale cultivated hydroponically was lower than the Vitamin C content of kale cultivated non-hydroponically. Water spinach contains substances such as vitamin A, vitamin B1, vitamin C, protein, calcium, phosphorus, iron, iron is very important for our bodies, its role in forming red blood cells is vital Limpness, dizziness and blurred vision are the initial characteristics of anemia due to deficiency iron. In kale there are 2.5 mg / 100g, so it is very good for overcoming anemia / lack of blood

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