Screening of Phytochemical, Antioxidant and Fiber Levels of Sweet Potato (Ipomoea batatas), Cassava (Manihot esculenta), and Binahong (Anredera cordifolia (Ten) Steenis) Leaves Extract

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ABSTRACT

Generally, vegetables contain various vitamins, minerals, and pigments that have antioxidant activity and can neutralise free radicals before causing damage to body cells. The research aimed to analyse phytochemical, antioxidant contents, and fibre levels of leaves extract of sweet potato, cassava, and binahong. The study was experimental research utilising leaves of sweet potato, cassava, and binahong. The leaves were removed and analysed for contents of phytochemicals, antioxidant and fibre levels. Flavonoid compounds were obtained positively on the 5-blades leaves extract of Cassavas. Polyphenol and tannin were undoubtedly discovered on the single, and 3-blades leaves extract of Sweet Potatoes and also on the five, and 7-blades leaves extract of Cassavas. Interestingly, alkaloids and steroids were identified on leaves extract of binahong, the single and 3-blades leaves extract of Sweet Potatoes and also on the five and 7-blades leaves extract of Cassavas. Consequently, 7-blades leaves extract of Cassavas contains the highest level of antioxidants (IC50), which was 44.46% (90 ppm). Nonetheless, 3-blades leaves extract of Sweet Potatoes contains the lowest. The leaves extract of binahong had an average fibre content of 28.45%, followed by 5-blades cassava leaves at 26.59%, and cassava leaves at 25%. The extract of sweet potato leaves was able to be developed as a source of antioxidants. Moreover, it contained high fibres.

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INTRODUCTION

Indonesia is a country that has various types of plants used as traditional medicine. Binahong or Anredera cordifolia (Ten) Steenis is a plant that is widely used as traditional medicine (Sakti et al., 2019). The community used Binahong leaves as medicine for wounds on the skin and also injuries because of surgery (a/p Gurcharan Singh et al., 2014). A sweet potato is a group of tubers that are often found in the form of processed foods. However, sweet potato can also be used as medicinal plants (Mohanraj and Sivasankar, 2014). Besides, cassava is the main carbohydrate commodity after rice, corn and sweet potato, and has a vital role in the supplying food, industrial raw materials and animal feed. Judging from its chemical composition, cassava is potential as carbohydrates, minerals, and vitamins source (Mahmudatussa’adah, 2014). One part of the cassava plant is the leaves which are supposed to have antioxidant activity.

During this time, sweet potato leaves and cassava leaves are used as a source of vegetables not as antioxidant food source. The importance of analysing antioxidant content, especially food that is rich in antioxidants is due to the role of antioxi-
dants in maintaining health because it can capture free radical molecules and reactive oxygen species, thus inhibiting oxidative reactions that cause degenerative diseases like heart disease, cancer, cataracts, brain dysfunction and arthritis, and diabetes mellitus (Asmat et al., 2016). This research was aimed to identify phytochemical substance; antioxidant power and Binahong leaf extract fibre content, cassava and sweet potato.

**MATERIALS AND METHODS**

This research was an experimental study in the Chemistry Laboratory of the Faculty of Mathematics and Natural Sciences, Tadulako University. The main ingredients of the study were binahong leaves, cassava leaves, and sweet potato leaves.

**Research Stages**

Phytochemical screening (Alkaloids, Flavonoids, Saponins, Tannins, Triterpenoids, Steroids) in binahong leaf extract, cassava leaves, and sweet potato leaves. The hydrolysis and extraction process of binahong leaf, cassava leaves and sweet potato leaves were carried out using a solution of 2 M sulfuric acid (to hydrolyse) and chloroform (to extract). Five grams of binahong leaf powder, cassava leaves and sweet potato leaves were hydrolysed with 25 mL of 2 M sulfuric acid solution with two hydrolysis processes.

Antioxidant test activity. The parameters for interpreting the results of testing the DPPH method was IC50 (inhibition concentration). IC50 is the concentration of Sample solution, which will cause a reduction of DPPH activity by 50%. The smaller the IC50 value means, the higher the antioxidant activity. IC50 values were obtained from several stages. Before calculating the IC50 value, first, calculate the log concentration value and the probit value for each percentage of free radical capture activity. Then connect the two calculation data obtained in 1 graph, where the concentration log value was used as the X-axis, and the probit value was used as the Y-axis.

Fibre content test. It is analysed by using the AOAC method. Total food fiber = dissolved food fiber + insoluble food fiber (Cunniff, 1995).

**RESULT**

Table 1 shows that Binahong leaf extract samples, sweet potato leaves (1, 2 and 3 fins) and cassava leaves did not contain flavonoids and saponins. However, qualitatively it contained polyphenol & tannin phytochemicals (except binahong leaves), and steroids. High steroid content includes top categories, namely binahong leaves, sweet potato leaves (3 blades), and cassava leaves.

Table 2 shows that Binahong Leaf had the highest IC50 of 144.35 ppm compared to the other samples, and the lowest was the Sweet Potato Leaves 7 Blades with an IC50 value of 107.93 ppm. These results also indicate that the antioxidant content of the study sample is in the medium category, range IC50 101-150 ppm.

Table 3 shows that the binahong leaf extract on average had a more significant fibre content of 28.45%, followed by cassava leaves (5 blades) by 26.59%, and cassava leaves at 25%.

**DISCUSSION**

The results showed that sweet potato and cassava leaves contained polyphenol & tannin phytochemicals, alkaloids, and steroids. High steroid content included top categories, namely binahong leaves, three blades sweet potato leaves, and cassava leaves. These results were not in line with several studies that showed that binahong leaf extract contains phytochemicals of flavonoids and saponins. Binahong leaf extract using the TLC-Spectrophotodensitometry method used the mobile phase that corresponds to the class of compounds contained therein indicating that binahong leaf extract contains flavonoids, saponins, triterpenoids and tannins (Dwitiyanti et al., 2019). Binahong [Anredera cordifolia (Ten.) Steenis] is a plant with medicinal compounds (Dono et al., 2018). The stems, leaves, flowers and roots contain several active chemicals, such as phenol, flavonoids, alkaloids, terpenoids, saponins and steroids, that play essential roles as antimicrobials (Astuti et al., 2011).

A flavonoid in the human body function as an antioxidant, so it is magnificent for cancer prevention. The benefits of flavonoids include protecting cell structures, increasing the effectiveness of vitamin C, anti-inflammation, preventing bone loss and as an antibiotic. The use of saponin is to increase the permeability of lipid bilayers to regulate the access of antibodies to the cell cytoplasmic surface so that the transmembrane protein is aggregated. Saponin is proven to have a strong influence in inducing blood platelet aggregation so that they have a role in hemostasis (Kang et al., 2014).

The results of the study on the content of polyphenols and tannins showed that sweet potato and cassava leaves were positively containing these phytochemicals. Some compounds from polyphenols have antihypertensive activity. Research has also
Table 1: Phytochemical Screening

| Phytochemical | Binahong Leaf | Sweet Potato Leaves (3 blades) | Sweet Potato Leaf (1 blade) | Sweet Potato Leaves (7 blades) | Cassava Leaves (5 blades) |
|---------------|---------------|-------------------------------|----------------------------|--------------------------------|--------------------------|
| Flavonoid     | -             | -                             | -                          | -                              | +                        |
| Saponin       | -             | -                             | -                          | -                              | -                        |
| Polifenol     | -             | ++                            | ++                         | ++                             | ++                       |
| & Tanin       |               |                               |                            |                                |                          |
| Alkaloid      | +             | +                             | +                          | +                              | +                        |
| Steroid       | ++            | ++                            | +                          | ++                             | +                        |

Table 2: Antioxidant Activity Analysis

| Sample         | cons (ppm) | A 517.00 nm | % Inhibition | Average Inhibition | IC50 (ppm) |
|----------------|------------|-------------|--------------|--------------------|------------|
| Binahong Leaf  | 10         | 0.46        | 0.46         | 14.07              | 14.26      | 14.17      | 144.35    |
|                | 30         | 0.42        | 0.43         | 20.64              | 20.26      | 20.45      |           |
|                | 50         | 0.40        | 0.40         | 25.52              | 25.33      | 25.42      |           |
|                | 70         | 0.37        | 0.37         | 30.39              | 30.21      | 30.30      |           |
| Sweet Potato   | 90         | 0.35        | 0.34         | 35.27              | 35.84      | 35.55      |           |
| Leaf 1 Blade   | 10         | 0.46        | 0.46         | 14.07              | 13.70      | 13.88      | 120.66    |
|                | 30         | 0.43        | 0.43         | 19.89              | 19.51      | 19.70      |           |
|                | 50         | 0.39        | 0.39         | 26.45              | 26.83      | 26.64      |           |
| Sweet Potato   | 70         | 0.35        | 0.35         | 34.71              | 34.90      | 34.80      |           |
| Leaves 7 Blades| 90         | 0.33        | 0.32         | 38.84              | 39.40      | 39.12      |           |
|                | 10         | 0.44        | 0.44         | 17.82              | 18.20      | 18.01      | 107.93    |
|                | 30         | 0.41        | 0.40         | 24.02              | 24.39      | 24.20      |           |
| Sweet Potato   | 50         | 0.37        | 0.37         | 30.58              | 30.58      | 30.58      |           |
| Leaves 7 Blades| 70         | 0.33        | 0.34         | 37.34              | 37.15      | 37.24      |           |
| Sweet          | 90         | 0.30        | 0.30         | 44.28              | 44.65      | 44.47      |           |
| Potato         | 10         | 0.51        | 0.51         | 5.92               | 6.10       | 6.01       | 132.30    |
| Leaves 3 Blades| 30         | 0.46        | 0.46         | 14.79              | 14.60      | 14.70      |           |
|                | 50         | 0.43        | 0.42         | 21.07              | 22.00      | 21.53      |           |
| Cassava Leaves | 70         | 0.38        | 0.39         | 29.21              | 28.84      | 29.02      |           |
| Leaves 5 Blades| 90         | 0.36        | 0.36         | 33.83              | 34.20      | 34.01      |           |
|                | 10         | 0.47        | 0.47         | 12.38              | 12.57      | 12.48      | 138.06    |
|                | 30         | 0.44        | 0.45         | 18.67              | 17.75      | 18.21      |           |
|                | 50         | 0.41        | 0.40         | 25.14              | 25.51      | 25.32      |           |
|                | 70         | 0.37        | 0.38         | 30.87              | 30.50      | 30.68      |           |
|                | 90         | 0.35        | 0.35         | 35.31              | 35.31      | 35.31      |           |
Table 3: Analysis of fiber content

| Sample               | Repetition | Weight of filter paper (g) | Sample weight (g) | Final Weight (g) | Fiber Content (%) | Average content (%) |
|----------------------|------------|---------------------------|-------------------|------------------|------------------|---------------------|
| Binahong Leaf        | R1         | 0.64                      | 1.83              | 1.15             | 28.22            | 28.46               |
|                      | R2         | 0.63                      | 1.22              | 0.98             | 28.70            |                     |
| Sweet Potato Leaf    | R1         | 0.60                      | 1.03              | 0.85             | 25.20            | 25.27               |
| Leaf (1 Blade)       | R2         | 0.60                      | 1.00              | 0.86             | 25.35            |                     |
| Sweet Potato Leaves  | R1         | 0.62                      | 1.02              | 0.89             | 25.88            | 25.85               |
| (3 Blades)           | R2         | 0.65                      | 1.02              | 0.91             | 25.81            |                     |
| Sweet Potato Leaves  | R1         | 0.68                      | 1.01              | 0.93             | 24.48            | 24.52               |
| (7 Blades)           | R2         | 0.64                      | 1.01              | 0.88             | 24.55            |                     |
| Cassava Leaves       | R1         | 0.60                      | 1.03              | 0.87             | 26.63            | 26.60               |
| (5 blades)           | R2         | 0.62                      | 1.02              | 0.89             | 26.56            |                     |

Phytochemical alkaloids showed that all samples contained positive alkaloids. Other studies also showed that the binahong plant contains phenol compounds, flavonoids, saponins, triterpenoids, steroids and alkaloids (Astuti et al., 2011). Phytochemical steroids were found to be positive in binahong leaf extracts, sweet potato and cassava leaves. The results showed that Binahong leaf extract had higher antioxidant activity compared to other samples which amounted to 144.35. Different results showed that the IC50 values obtained for Binahong leaf extracts and vitamin C were 40.27 ppm and 49.20 ppm. Binahong leaf extracts were more potent antioxidant than vitamin C 15. The antioxidant activity of cassava leaves showed 138.06 (IC50) (Tsumbu et al., 2011) succeeded in identifying routine compounds in cassava leaves that was thought to be compounds that play a role in inhibiting free radical activity. Differences in antioxidant activity can be caused by several factors, such as differences in the ability to transfer hydrogen atoms to free radicals, chemical structures of antioxidant compounds, and pH reaction mixture (Santos-Sánchez et al., 2019).

The fibre content showed that the binahong leaf extract sample had a high percentage of fibre compared to other samples that were 28.45%. This research also showed that sweet potato and cassava leaves also contained high fibre, namely cellulose fibre. Food fibre is a remnant of plant cell walls that are not hydrolysed or digested by human digestive enzymes which include hemicellulose, cellulose, lignin, oligosaccharides, pectin, gum and wax coating. Vegetables and fruits are the sources of dietary fibre that is most easily found in the community menu. As a fibre source, vegetables can be consumed in raw or processed by boiling.

CONCLUSION

7-blades leaves extract of Cassavas contains the highest level of antioxidants (IC50), which was 44.46% (90 ppm) and the highest fibre content is found in leaves extract of binahong. Cassava and Binahong leaf extracts have high levels of antioxidants and fibre so that they have the potential to be anti-hyperglycemic and hypercholesterolemia.

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Conflict of Interest

Authors declared no conflict of interest.

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