

PHYSICAL, CHEMICAL AND ORGANOLEPTIC CHARACTERISTICS OF CELERY LEAF (*APIUM GRAVEOLENS*) HERBAL TEA

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ABSTRACT: Celery (*Apium Graveolens* L.) is one type of herbal plant that is known to have many properties for human health. Despite its abundant availability, it has a relatively short shelf life, which is around 2-3 at room temperature. Celery can be used for the treatment of hypertension, rheumatism, gout, inflammation, appendicitis, typhoid, poisoning, insect bite wounds, cough, prostate, hair fertilizer, oily face, asthma and xerophthalmia. Given the many uses of celery leaves and the relatively short shelf life, this celery will be processed into a form of herbal drink that is ready for consumption. Therefore, this herbal tea will be a solution to extend the shelf life of celery leaves. In this study, celery will be dried using three different techniques: the sunlight method, an oven, and a dehydrator, which also serves as the study's variable. Sunlight drying takes 12 hours, 24 hours, and 48 hours, while oven drying takes 5 hours at 50°C and dehydrator drying takes 1 hour at 50°C. The 14 hours celery withering process is applied for all drying methods. The results of the study will be tested for water content, ash content, antioxidant activity test, flavanoid test and hedonic test. Only 2 methods were found to be in accordance with the INS, namely sun drying for 12 hours and using a dehydrator for 1 hour.

Keywords: Celery, drying, herbal tea

1. INTRODUCTION

Indonesia is known as one of the agrarian countries that is rich in natural resources, especially agricultural products. One type of agricultural product that plays an important role is vegetables. Celery plant is one type of vegetable that is included in medicinal plants which are commonly used as seasonings. One of the abundant producers of celery plants is in East Java, especially in Sumberejo Village.

Apium graveolens L., known as celery, is a plant of the Apiaceae or Umbelliferae tribe that grows at an altitude of 1000 – 1500 meters above sea level. The leaves of this plant, apart from being used as a flavoring vegetable, have been used for generations as a traditional medicine for hypertension, gout, and to increase appetite [1]. The chemical contents that have been reported

include essential oils, flavonoids, coumarins, carbohydrates.

One of the flavonoid compounds which also plays a role as an active antihypertensive ingredient is apigenin, a flavon with free hydroxy groups on carbon atom numbers 5.7 and 4'. In the framework of the standardization program for phytopharmaceutical preparations containing celery leaves, capsule preparations have been standardized with apigenin as a concentration parameter and determined using TLC-densitometry, in accordance with the provisions of the Ministry of Health regarding general standard parameters for medicinal plant extracts [2]. These standard parameters have been applied to various medicinal plants.

The flavonoids in celery leaves are responsible for the effect of lowering blood pressure, not only

apigenin and in celery leaves there are other flavonoids such as apiin, luteolin, isoquersitrin and so on which in the literature are also said to have blood pressure effects. Therefore, it is recommended to standardize celery preparations in relation to blood pressure lowering effects, complemented by determining total flavonoid levels spectrophotometrically. Apigenin can be used as a standardization parameter for celery leaf preparations using TLC-densitometricity, good precision and accuracy, with a detection limit of 3 µg. It is recommended to complement the standardization method by determining the total content of flavonoids in the preparation [3].

The use of traditional medicinal plants is currently increasing along with the increasing price of marketed drugs and the side effects of using marketed drugs as well as the belief in the benefits of traditional medicine. Nowadays, people are starting to look at traditional medicine because traditional medicine does not require expensive costs and can be concocted by themselves. Besides, traditional medicine has relatively small side effects compared to drugs on the market.

Many types of medicinal plants have the effect of lowering high blood pressure and one of which is celery. Celery has a good effect on lowering blood pressure in patients with high blood pressure (hypertension). Blood pressure generally begins to fall the day after treatment followed by subjective improvements such as sleeping with comfortable feeling, and increasing the amount of excreted urine.

Some research on celery leaves as herbal tea proves that celery plants contain flavonoid compounds and serves as anti-oxidants [4]. In a previous study entitled "Making Herbal Tea Mix Of Rosella Flowerpals (Hibiscus Sabdariffa) And Celedri Herb (Apium Graveolen) using rosella flower petal additives. The petal part of Hibiscus sabdariffa, family Malvaceae, is one of the plants that is currently and popularly used by the public. Rosella red tea has been proven to have properties for the treatment of various types of diseases, one of which is hypertension or high blood pressure. Giving rosella petal extract that has been standardized so that it contains 9.6 mg of anthocyanins and it can reduce high blood pressure. With the best formulation of 1:1/4 (rosella flower petals: celery leaves) and the resulting water

content was 18.29%, ash content was 5.60% and antioxidants and flavonoids were 4.22 mg/mL [5]. In research conducted by Wenny et al, there are similarities between theory and fact, as evidenced by the research results which showed that the majority of respondents suffering from hypertension were 27 women. This could be because 22 people out of 27 of them were > 50 years old and progesterone levels in the body had decreased when they entered a vulnerable age, which could cause stiffness in the blood vessels and decreased flexibility of the arteries. Meanwhile, the majority of respondents who suffered from hypertension were 24 respondents aged more than 41 - 50 years. This is because as you get older you will lose the flexibility of your arteries, causing your arteries to become stiff. So the arteries cannot expand when the heart pumps blood through the arteries, therefore each heart beat is forced to pass through blood vessels that are narrower than usual, causing an increase in blood pressure [6].

Ecoction of celery leaves can reduce the general effect of celery in controlling blood pressure, among other things, providing a dilating effect on blood vessels and inhibiting angiotensin converting enzyme (ACE). Renin-angiotensin system inhibitors can reduce the kidney's ability to increase blood pressure. Blood pressure began to fall the day after treatment, followed by improvements in comfortable sleep, and the amount of urine excreted increased. Celery contains flavonoids, saponins, tannins 1% essential oil 0.033%, flavuglucoside (apiin), apigenin, phytosterols, choline, lipase, pthalides, asparagine, bitter substances, vitamins (A, B and C), volatile oil apiin, apigenin and alkaloids [6].

Overall chemical content of celery leaves. Apigenin in celery leaves functions as a beta blocker which can slow the heart rate and reduce the strength of heart contractions so that less blood flow is pumped and blood pressure is reduced

Table 1. Panelists' Blood Pressure Readings before and after drinking boiled celery leaves [6]

Pressure	Time	Reading
Sistol	before	142
	after	136
Diastol	before	94
	after	87

Mannitol and apiin are diuretics, meaning they help the kidneys remove excess fluid from the body, so

that reduced fluid in the blood will lower blood pressure. The potassium (potassium) contained in celery will be useful in increasing intercellular fluid by attracting extracellular fluid, resulting in changes in the balance of the sodium-potassium pump which will cause a decrease in blood pressure. One strategy in treating hypertension is changing the Na⁺ balance. Changes in Na⁺ balance are usually achieved by administering oral diuretics [6].

Celery leaves also have natural content in the form of phytosterols. Phytosterol is a phytochemical component that has the opposite function to cholesterol when consumed by humans. Phytosterols are known to have the function of reducing cholesterol levels in the blood and preventing heart disease, so they are very beneficial for human health. In plants there are more than 40 sterol compounds, dominated by three main forms of phytosterol, namely beta sitosterol. Sitosterol is an antihypercholesterol agent and prevents cholesterol deposition on the walls of blood vessels which is important for treating cases of atherosclerosis. The efficacy of phytosterols to reduce cholesterol levels has been clinically recognized. This property has been exploited in the medical world, namely phytosterol extract has been given to sufferers of hypercholesterolemia (excessive levels of cholesterol in blood plasma) in an effort to reduce cholesterol absorption [6].

In this study, bay leaves were also added with the aim of reducing the celery flavor which was too dominant considering that not all people like the taste and aroma of celery leaves. The mixture with bay leaves will give a distinctive herbal aroma and not too strong. In addition, bay leaves also have properties as a remedy for stomach pain/diarrhea. The bay leaves are used for medicine because there is a content of 0.17% essential oil with eugenol and methyl cavitcol components in dry leaves. The 3x250mg of bay leaf extract per day has additional properties that can lower fasting blood sugar levels.

2. RESEARCH METHOD

This research was conducted experimentally and carried out at the Food Ingredient Technology Laboratory at the National Institute of Technology Malang.

3. MATERIAL

The materials used in this study were celery leaves (*Apium Graveolens*) from Sumberejo

Village, (East Java) and bay leaves (*Syzygium polyanthum*).

4. EQUIPMENT

The equipment used in this study include a dehydrator, oven, knife, chopping board, baking sheet, blender, tea bags and other laboratory equipment for parameter testing.

5. PROCEDURE

The steps for making herbal tea from celery leaves are as follows:

5.1. Stage of Raw Material Preparation

- Preparation of raw materials for celery leaves and bay leaves
- Shotting celery leaves and bay leaves from leaves that are deformed and yellow in color
- Washing of celery leaf raw materials and bay leaves directly in running water taps
- Drainage of celery leaf raw materials
- The process of withering bay leaves with the aim of reducing the water content in celery leaves by aerating for 14 hours.

5.2. Stage of Drying

- In the drying stage celery leaves were dried using 3 methods with sunlight for 12 hours, 24 hours and 48 hours then using an oven for 5 hours at 50°C and using a dehydrator for 1 hour at 50°C (temperature benchmarks for ovens and dehydrators based on journals).

5.3. Stage of Making Herbal Teabag

- Pulverization of dried celery leaves and dried bay leaves using a blender
- Packaging in tea bags with a ratio of 1: 3 (0.25gram celery simplisia: 0.75 bay leaf simplisia)
- The powder that had been packed into the tea bag was then brewed using 80-90°C hot water.
- Celery leaf tea could be mixed with sugar or palm sugar according to personal taste.
- Moisture content, ash content, antioxidant activity test, flavanoid test and hedonic test were analyzed.

5.4. Testing the quality of the best Celery leaf tea produced

Quantitative testing of the quality of the best breadfruit leaf tea produced was carried out quantitatively on the water content and ash content of breadfruit leaves. The stage for testing the water content of breadfruit leaves is to take 1-2 gram samples, put them in a cup and dry them in an oven at a temperature of $103^{\circ} \pm 2^{\circ}\text{C}$ for 3 hours, then cool and weigh them. This is done repeatedly until a fixed weight is obtained. Water content is calculated based on the formula:

$$\text{Water content (\%)} = \frac{\text{Initial weight} - \text{Finally weight}}{\text{Initial weight}} \times 100\% \quad [7]$$

Meanwhile, the ash content can be determined by heating an empty porcelain cup in the oven, then cooling it in a desiccator for 30 minutes and weighing it. Then the sample was weighed to ± 5 g and placed in a porcelain cup, then burned on an electric stove until it did not smoke. The porcelain cup is then placed in the muffle furnace. Ashing is carried out at a temperature of 550°C for ± 2 -3 hours until whitish ash is formed. The porcelain cup is then cooled in a desiccator, after cooling the porcelain cup is then weighed. After the weighing results are obtained, the percentage of ash content can be calculated using the following formula:

$$\text{Ash content (\%)} = \frac{\text{Ash weight}}{\text{Sample weight}} \times 100\% \quad [7]$$

Quantitative Analysis

Calculation of Flavonoid Levels

A sample of 5 mg of celery leaf simplicia was weighed, then 0.3 ml of 5% sodium nitrite was added. After 5 minutes add 0.6 ml of 10% aluminum chloride. After waiting for 5

minutes, 2 ml of 1M sodium hydroxide was added to the solution. then add up to 10 ml of distilled water to the measuring flask. The solution was transferred into a cuvette and the absorbance was read using a spectrophotometer with a wavelength of 510 nm [8].

Antioxidant Activity Test

10 mg of celery leaf simplicia extract was weighed, then dissolved in 10 mL of methanol p.a (1000 $\mu\text{g/mL}$), this solution was the stock solution. A total of 500, 1000, 2000, 3000, and 4000 μL of the stock solution was put into a 5 mL reaction tube to obtain concentrations of 100, 200, 300, 400, and 500 $\mu\text{g/mL}$. Each tube was added with 1 mL of DPPH and methanol (p.a) up to 5 mL. The mixture was homogenized and incubated for 30 minutes. Then the absorbance was measured with a spectrophotometer with a wavelength of 516 nm[8].

The level of public acceptance of celery tea

From the three drying treatments, namely drying in the sun for 12 hours, 24 hours and 48 hours, samples of celery tea were obtained, which the panelists will carry out organoleptic tests on hedonic quality by filling in the organoleptic test form. Panelists use the five senses and the results are a scale of 1-5 levels of liking, namely: 1 = really don't like it; 2 = don't like; 3 = moderate; 4 = like, and 5 = like very much. Panelists will test brewed celery tea for taste, color and aroma. [7]

6. RESULT AND DISCUSSION

The dry yield of celery herb and bay leaf were calculated based on dry weight compared to wet basis. Drying celery leaves and bay leaves for 1 hour at 50°C . Celery yield was about 8%.

Table 2 Summary of the data of Chemical analysis and sensory input

Chemical Analysis Indicator	INS	TEST RESULT
Water content (%)	Max. 8%	0.2%
Ash content (%)	Max. 8%	0.048%
Antioxidant Activity ($\mu\text{g/ml}$)	-	24.5 $\mu\text{g/ml}$
Flavonoid (ppm)	-	91.01 ppm
Color Preference Test	Typical Tea Product	70%
Aroma	Typical Tea Product	70%
Flavour	Typical Tea Product	70%

7. WATER CONTENT

PERCENTAGE

From table 1, the percentage of water content in accordance the standard is obtained, where the maximum water content value is 8% and the results of the water content analysis for celery tea show 0.2%. This shows that the process of drying celery leaves using the sun method for 12 hours and drying using a dehydration device for 1 hour at a temperature of 50°C has produced a tea of celery leaves product that meets the standards for water content.

8. TOTAL ASH CONTENT

An organic material left in high temperatures will be depleted and will only leave ash. This ash can be used to determine the purity of a mineral in the material and as a sign of cleanliness of the raw material to be used. Dried celery herb was obtained with a total ash content of 0.048% and is in accordance with SNI- 01-3836-2000 [9]

9. FLAVONOID AND

ANTIOXIDANT CONTENT TEST

Determination of total flavonoid content was determined using the spectrophotometric method by adding AlCl₃. The principle of adding AlCl₃ is the formation of a stable complex with C-4 ketone groups and at C-3 and C-5 hydroxyl groups. The results obtained in this study showed flavonoid levels of 91.01 ppm. Flavonoids are money compounds that act as anti-oxidants. The higher the total phenol and flavonoid values, the higher the antioxidant ability to donate electrons in terms of suppressing the development of free radicals [10].

10. HEDONIC TEST

Each herbal tea formula was brewed with 150 mL of hot water and left to stand for about 5 minutes. Furthermore, it was tested on 25 panelists to provide organoleptic assessments, which included color, aroma and taste. The panelists used included panelists who were trained and taken randomly with the criteria of men or women 17-50 years old and willing to conduct organoleptic preference tests with the conditions that have been given. The study used the five senses and the results were in the form of a scale of 1-5 levels of favorability, namely: 1 = strongly dislike; 2 = dislike; 3 = moderate; 4 = like, and 5 = strongly

like. The result was 70% of the survey data for preference for flavor, color, and aroma. The trial results showed that a 1: 3 ratios for celery herbal tea was the most popular one (1 part celery leaves and 3 parts bay leaves).

11. CONCLUSION

The bay leaf blended herbal tea recipe was created using standardized ingredients, with the most popular recipe being sun-dried for 12 hours and dehydrated for 1 hour at 50°C.

REFERENCE

- [1] Perry L.M, 1980, *Medicinal Plants of East and Southeast Asia*, The Mitch Press, Massachusetts, 413.
- [2] Anonim, 2000, *Parameter Standar Umum Ekstrak Tumbuhan Obat*, Dep.Kes. RI, Jakarta, 37-38.
- [3] Djatmiko M., Pramono S., Standarisasi Sediaan Daun Seledri (*Apium Graveolens* L.) Secara Klt- Densitometri Menggunakan Apigenin Sebagai Parameter, Fakultas Farmasi Universitas Gadjah Mada, Yogyakarta, Majalah Farmasi Indonesia 12 (2), 59-64, 2001 .
- [4] Smeltzer, Bare. Medical surgical nursing Philadelphia: Lippincott Williams& Wilkins;2008.
- [5] Abdul Mun'im. Pembuatan teh herbal campuran kelopak bunga rosella (*Hibiscus Sabdariffa*) dan Herba Seledri (*Apium Gravenolens*). 2008
- [6] Wenny L.,Widia A. Rahma, Anggi Sakinah Lubis,Tuti Sulastri, Pengaruh Rebusan Daun Seledri Untuk Menurunkan Tekanan Darah Pada Penderita Hipertensi, Zilmu Kesehatan Masyarakat, Empowering Society Journal, Volume 1;No.1 (April, 2020): 26-32
- [7] M. Zainuddinnur, Meldayanoor, Nuryati, Proses Pembuatan Teh Herbal Daun Sukun Dengan Optimasi Proses Pengeringan Dan Penambahan Bubuk Kayu Manis Dan Cengkeh : Jurusan Teknologi Industri Pertanian, Politeknik Negeri Tanah Laut, Kalimantan Selatan, Jurnal Teknologi Agro-Industri, Vol. 3 No.1 ; Juni 2016

- [8] Naovi Nur Fadia Hanin, Rarastoeti Pratiwi, Kandungan Fenolik, Flavonoid Dan Aktivitas Antioksidan Ekstrak Daun Paku Laut (*Acrostichum Aureum* L.) Fertil Dan Steril, Universitas Gadjah Mada, Journal of Tropical Biodiversity and Biotechnology, Vol. 2, 51-56, 2017.
- [9] Kristiandi. Analisa kadar air, abu, serat dan lemak pada minuman sirop jeruk siam (*Citrus nobilis var. micropa*) : Politeknik Negeri Sambas; 2021.
- [10] Dwi Susilpningrum. Uji Aktivitas Antioksidan Dan Penetapan Kadar Flavonoid Total Ekstrak Temu Mangga (*Curcuma Manga Valetton & Zijp*) dengan variasi konsentrasi pelarut: STIKES Cendikia Utama Kudus; 2021.