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Research Article

Phytochemical Profile and Sensory Evaluation of Natural Vinegar from Mixed Fruits and Flowers of Melastoma malabathricum L. with Variations of Starter Concentration and Fermentation Time

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Abstract.

Melastoma malabathricum L. is a wild plant in Aceh that can be used as a traditional medicine. This research aimes to determine the phytochemical profile and sensory evaluation of the fruit and flower vinegar of *Melastoma malabathricum* L. This research used a completely randomized design (CRD) consisting of two main groups, *Saccharomyces cerevisae* 5 days and 10 days with six treatments. Both the groups were added with *Acetobacter aceti* concentrations of 5%, 10%, and 15% which were fermented for 28 days. This study conducted phytochemical screening, total phenol and flavonoid test, and sensory evaluation. The results showed that the phytochemical test of the vinegar contained flavonoids, saponins, tannins, polyphenols, and terpenoids. The results of the sensory evaluation or organoleptic test showed that there was no significant difference in the color, acceptability, and Aroma of vinegar in all treatments but there was a significant difference in the taste of vinegar ($p<0.05$). The preferred vinegar was in the P5 treatment with a neutral taste. This natural vinegar product can be used as a beneficial beverage for public health.

Keywords: phytochemical, sensory evaluation, vinegar, melastoma malabathricum L, mixed fruits and flowers, starter concentration, fermentation time

1. INTRODUCTION

Indonesia has various types of plants that are used as food and medicine. One of the plants that can be used as traditional medicinal ingredients is the senggani plant (*Melastoma malabathricum*)[1]. *M. malabathricum* L is a plant with white or pink-purple

flowers, belonging to the Melastomataceae family, which is spread in Asia, especially in Southeast Asia. Its distribution or distribution is throughout Indonesia, especially in lowland forest, shrubs, and cliff edges [2].

The pharmacological activities of *M. malabathricum* have been reported, including antibacterial, antidiarrheal, antioxidant, gastroprotective, wound healing, anticoagulant, anti-inflammatory, antivirus, anticancer [3] activity, anticoagulant, and platelet-activating factor inhibitor [4]. Ethanol extract from *M. malabathricum* is reported to act as antidiabetic and antihyperlipidemic because it contains active ingredients such as glycosides, alkaloids, terpenoids, flavonoids, and carotenoids [5]. Leaf extract of *M. malabathricum* was reported to have hepatoprotective activity [6] and gastroprotective activity [5].

Many pharmacological of *M. malabathricum* activities can be used in the pharmaceutical and culinary world. The fruit and flowers of *M. malabathricum* also can be used as a ingredient for making vinegar. Vinegar is produced from ethanol fermentation by acetic acid bacteria. Vinegar has a long shelf life due to its acetate content. As much as 0.1% acetic acid can inhibit the growth of spore-forming bacteria that cause food poisoning and 0.3% acetic acid can prevent methoxine-producing molds [7].

The aim of this study was to determine the phytochemical profile and sensory evaluation of the mixed vinegar from fruit and flower of *M. malabathricum* L. The research expected as a basis information about the benefits of mixed vinegar from the fruit and flowers of *M. malabathricum.*

2. RESEARCH METHOD

The research was conducted at the Chemistry and Biology Laboratory, Faculty of Teacher Training and Education, Syiah Kuala University in February- April 2022. This research used a completely randomized design (CRD) consisted of 2 main groups, *Saccharomyces cerevisae* 5 days and 10 days with 6 treatments. P1 was the filtrate added with 1% *Saccharomyces* on day 5 and 5% *Acetobacter.* P2 was the filtrate added with 1% *Saccharomyces* on day 5 and 10% *Acetobacter.* P3 was the filtrate added with 1% *Saccharomyces* on day 5 and 15% *Acetobacter.* P4 was the filtrate added with 1% *Saccharomyces* on day 10 and 5% *Acetobacter.* P5 was the filtrate added with 1% *Saccharomyces* on day 10 and 10% *Acetobacter.* P6 was the filtrate added with 1% *Saccharomyces* on day 10 and 15% *Acetobacter.* P1 to P6 vinegar were stored for 28 days.

2.1. Vinegar Making

M. malabactricum L obtained from Aceh Tengah, Aceh, Indonesia. A total of 250 grams of the fruit and flower mixture of *M. malabactricum* L. were cleaned, then 750 ml of water and 50 grams of sugar were added. Mix in a blender, then filtered to get the filtrate. The filtrate was pasteurized at 65^0C for 15 minutes, then 1% of the total sample weight was added with *Saccharomycess cavisiae*. The filtrate was fermented at room temperature for 5 and 10 days under anaerobic conditions. On the 5th and 10th days, 5%, 10%, 15% *Acetobacter aceti* (v/v) were added to the filtrate. The filtrate was fermented again for 14 days and 28 days under aerobic conditions. For the phytochemical test and the organoleptic test, 6 formulas were made which were labeled as P1, P2, P3, P4, P5, P6,

2.2. Phytochemical Test

The method for phytochemical tests was following Septiani [8] with the modifications.

1. Identification of Tannins

   A total of 50 mg of the sample was added to 5 mL of distilled water and then boiled for 5 minutes and then filtered. Then 3 drops of the filtrate were added with 3 drops of 1% $FeCl_3$. The presence of tannins is indicated by the formation of a dark blue or greenish black color.

2. Identification of Alkaloids

   A total of 50 mg of sample was added with 10 mL of chloroform and 3 drops of ammonia. The chloroform fraction was separated and acidified with 10 drops of 2M H_2SO_4. The acid fraction formed was taken and divided into 3 parts, then each was added with 1 drop of Dragendorf reagent, 1 drop of Meyer's reagent, and 1 drop of Wagner's reagent. The presence of alkaloids was indicated by the formation of a red precipitate on Dragendorf's reagent, a white precipitate on Meyer's reagent and a brown precipitate on Wagner's reagent.

3. Identification of Flavonoids

4. A total of 50 mg of the sample was added to 10 mL of distilled water and then heated for 5 minutes. Then filtered and the filtrate was taken. The filtrate obtained was added with Mg powder, 1 mL concentrated HCl and 1 mL amyl alcohol and then shaken. The presence of flavonoids is indicated by the appearance of a red, yellow or orange color on the amyl alcohol layer. Identification of Saponins

A total of 50 mg of the sample was added with 5 mL of distilled water and then boiled for 5 minutes. Then the solution was filtered and the filtrate was shaken vigorously. The presence of saponins was indicated by the appearance of a stable foam for 10 minutes after shaking.

5. Identification of Triterpenoids and Steroids

   A total of 50 mg of the sample was added with 2 mL of 30% ethanol and then heated for 5 minutes and filtered. The filtrate formed was evaporated and then 1 mL of ether was added. Furthermore, Liberman Buchard reagent was added which contained 3 drops of acetic anhydride and 1 drop of H_2SO_4. The presence of triterpenoids is indicated by the formation of a red or purple color, while the presence of steroids is indicated by the formation of a green color.

2.3. Organoleptic Test

An organoleptic test is a test carried out with human senses on food ingredients. This test was carried out by taking into account 4 parameters, namely Aroma, acceptance, taste, and color. The level of appropriateness of vinegar was observed with the level of preference of the panelists at the time of the assessment. The questionnaire used a hedonic scale and an organoleptic test table according to SNI 2729:2013 issued by the National Standardization Agency (BSN) [9].

TABLE 1: Organoleptic test results on colour, aroma, taste and acceptance.

Numerical Scale	Hedonic Scale			
	Colour	**Aroma**	**Taste**	**Acceptance**
1	Clear	Strongly uncharacteristic of acetic acid	strongly not sour	Absolutely don't like it
2	Yellowish-brown	Very uncharacteristic of acetic acid	Not very sour	Very dislike
3	Brownish Yellow	Not typical of acetic acid	Not sour	dislike
4	Pale Brownish Purple	Slightly uncharacteristic of acetic acid	slightly not sour	Kinda dislike
5	Medium Brownish Purple	Neutral	Neutral	Neutral
6	Brownish purple	Slightly typical of acetic acid	Slightly Sour	Kinda like
7	pale purple	Typical acetic acid	Sour	Like
8	Medium Purple	Very characteristic of acetic acid	Very Acid	Really like
9	Purple	Very much characteristic of acetic acid	Very much sour	Very much like

2.4. Data Analysis

Phytochemical tests were presented qualitatively. The results of the organoleptic test were analyzed by nonparametric test (distribution free statistics) using the SPSS.22 application. If the treatment gives a significant effect ($p < 0.05$), then further testing is carried out.

3. RESULTS AND DISCUSSION

The results of the identification of the phytochemical components contained in the mixed vinegar from *M. malabatrticum* can be seen in Table 2.

TABLE 2: The phytochemical components.

Uji Fitokimia	Ekstrak Vinegar
Flavonoid	+
Saponin	+
Tanin	+
Kuinon	-
Polifenol	+
Steroid	-
Terpenoid	+

The results of the phytochemical examination in the P1 to P6 treatments showed that the presence of flavonoids, saponins, tannins, polyphenols and terpenoids in *M. malabathricum* vinegar but tested negative for the presence of quinone and steroid. The examination of the phytochemical profile is intended to provide an overview or determine the general class of compounds contained in *M. malabathricum* vinegar

Organoleptic test results showed that the average value of the level of panelists' preference for the colour of vinegar in the P1 to P6 treatments was same (Figure 1). The score was 6 with the meaning of brownish purple. Color becomes very important because of visual factors in making decisions before buying and consuming food [10]. The results showed that the treatment did not have a significant effect of panelist ratings based on the smell of vinegar ($p > 0.05$).

Organoleptic test results showed that the average value of the level of panelists' preference for the acceptance of vinegar in the P1 to P6 treatments was same (Figure 1). The results obtained showed that the treatment did not have a significant effect on panelist ratings on the acceptance of vinegar ($p > 0.05$). This indicates that all vinegar are acceptable.

The taste of the beverage can be translated when the panelists taste it [11]. Taste can also explain the content of food nutrients [12]. Organoleptic test results showed that the average value of the level of panelists' preference for the taste of vinegar was varied from 5.68-6.88 (Figure 1). The highest value showed by P1 and the lowest value showed by P5. The higher score indicates that the more sour of vinegar taste, while the lower score indicates the less sour of vinegar taste. The results showed that the treatment have a significant effect on panelist ratings on the Aroma of vinegar ($p < 0.05$). Vinegar that has slightly sour is vinegar from group P1 and vinegar that has a neutral taste is from group P5.

Aroma has a key role in the delicacy of food [13] and quickly provides an assessment of the result of likes or dislikes [14]. Food Aroma occurs when panelists capture volatiles in food by smelling food [15]. The results of the organoleptic test showed that the average value of the panelists' preference for the Aroma of vinegar in the P1 to P6 treatments was the same (Figure 1). All panelists chose 9 which are the most characteristic of acetic acid. The results obtained showed that the treatment did not have a significant effect on panelist ratings on the Aroma of vinegar ($p > 0.05$).

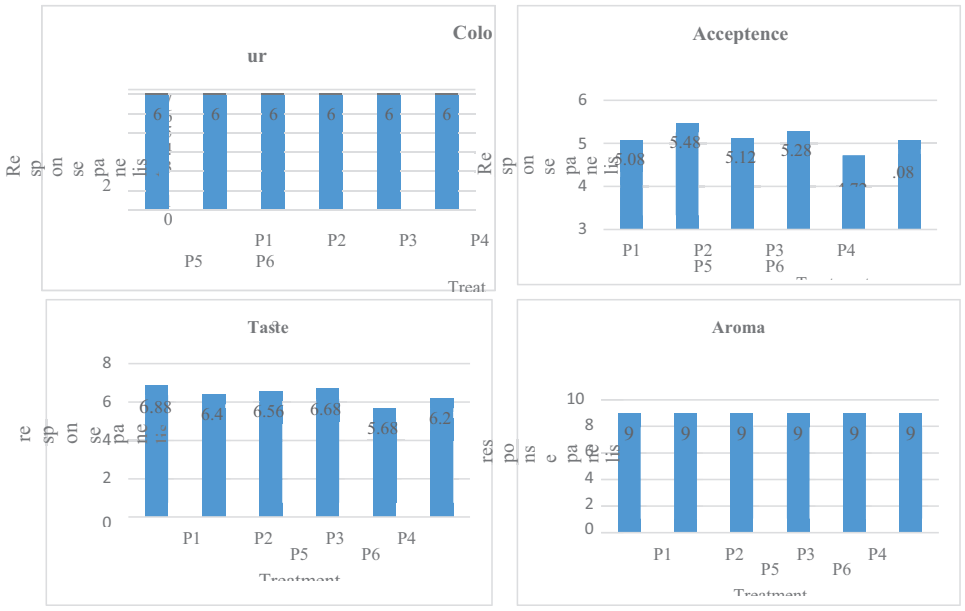

Figure 1: Graph of organoleptic values of vinegar.

4. CONCLUSION

The phytochemicals of fruit and flower vinegar contained flavonoids, saponins, tannins, polyphenols, and terpenoids. Based on the organoleptic test all vinegar were acceptable.

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