

EVALUATION OF TEA HERBAL BASED INGREDIENTS CLOVE LEAVES (*Syzygium aromaticum*) OF MALUKU INDONESIA

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ABSTRACT

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Clove (*Syzygium aromaticum*) is one of the famous ancient spices and was used before christ. This plant belongs to the Myrtaceae family which is believed to be able to treat a variety of diseases. Cloves grow in tropical areas and range in height from 10-20 meters and are native plants that originated in Maluku. Clove that can be processed into a drink such as one is to make herbal tea from clove leaves. The type of research used is the experimental type, which is a study conducted to determine the results of organoleptic tests and compounds on clove leaf herbal tea. This research was conducted from July 29 to August 9, 2024 at the Basic Biology laboratory of Pattimura University. The results of the study showed that clove leaf herbal tea has a unique color, aroma and taste and meets quality standards because it has been tested at the level of color, aroma and taste preference. In the color of clove leaf herbal tea, it can be seen that the one (very like) consists of 7 panelists, the result (like) consists of 3 panelists. Aroma it can be seen that for those who answered (very liked) consisting of 5 panelists, the result of the score (like) consisted of 1 panelist and the result (moderately) consisted of 4 panelists. For the results of the taste score, it can be seen that (very liked) consisted of 1 panelist, the result of the score (liked) consisted of 4 panelists, and the result of the score (moderate) consisted of 4 panelists and for the result of the score (disliked) consisted of 1 panelist.

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INTRODUCTION

Herbal tea is made from various types of plants and their organs vary from leaves, agar, twigs, flowers, and fruits (Ramadan, 2022). In addition to having a variety of unique characteristics, herbal tea products are known to have medical properties, making them potential to be developed as health drinks (Nusaly et al, 2023). Herbal tea raw materials are generally still natural and free of chemicals. Indonesian people's tea consumption compared to the world is quite low, namely 0.35 kg/capita: 1.02 kg/capita, so the tea industries in Indonesia often make several innovations so that tea products are more popular, one of which is by producing herbal tea commercially (Anggraini Putri, 2021). Herbal tea is included in functional drinks, namely in addition to being consumed, herbal tea has health benefits for the body. Herbal tea is a brew of leaves, stems, flowers, fruits or roots from various types of plants. Uniquely, herbal tea is not made from tea plants (*Camelia sinensis*) like conventional products in general. Herbal tea has advantages in terms of product variety compared to conventional tea, besides herbal tea has various medical properties that are beneficial in maintaining body health. This is what causes herbal tea products to have the potential to be developed in the national market (Wael S, 2018). The development of herbal tea products is influenced by the technology used in its production. Tea is one type of drink that is widely favored by the Indonesian people who make tea drinks as refreshing as well as having benefits for the body (Astuty et al, 2024). the benefits of tea drinks are that they provide a fresh taste, can restore body health and are proven not to cause negative impacts if consumed in reasonable doses. tea can be made from other leaves such as clove leaves. *Syzygium aromaticum* are one of the ancient spices known and used thousands of years before Christ. This plant belongs to the Myrtaceae family which is believed to be able to cure various diseases (Wael S et al, 2018).

Cloves grow in tropical areas and altitudes ranging from 10-20 M and are native plants originating from Maluku (Marasabessy et al, 2024). Maluku people is know there are 5 variants of cloves including white cloves or siputik, tunih cloves or sikotok, zansibar cloves, or forest cloves. The main part that is often used as a medicine or spice is the flower part due to the content of attrition oil of 10% -20%, while the stalk is as large as 5-10% and 1-4% in the leaves (Alrasdy et al, 2023). Indonesia itself also has several types of cloves, namely siputik, sikotok, zansibar and raja. Clove leaves contain flavonoids, tritepenoids, phenolides and tannins as antibacterials, not only that, clove leaves also contain eucalyptus compounds, cardinal caryophyllene and limonene (Idowu et al, 2021). Cloves are used by the wider community not only as a food flavoring but also as a traditional medicine for asthma, digestive system disorders, toothaches, respiratory disorders. Headaches, throats, are antimicrobial, immunomodulatory, anti-cancer, anti-inflammatory, improve reproductive organs and are aphrodisiacs (Wael S et al, 2018).

Bioactive compounds are eugenol, caryophyllene, volatile compounds and are known to have pharmacological functions such as anesthetic, antimicrobial, antiseptic, stimulant, antioxidant, immunomodulator, anti-inflammatory and toothache (Otunola et al, 2022). Parts of the clove plant contain different compounds ranging from flowers, leaves, stems and roots with the highest content in flowers. Contains phenolic compounds such as simple phenols, phenolic acids, phenyl acetic acid, cinnamic acid, coumarin, lignan, flavonoids, lignin, tannins, benzophenones, stilbenes, quinones and betacyanins (Husen et al, 2024). These compounds act as antioxidants, the potential for free radical resistance activity is higher than vitamin, inhibits lipid peroxide, maintains the activity of superoxide dismutase, catalase, and glutathione peroxidase enzymes (Wael S et al, 2023).

The anti-cancer compounds of cloves in Maluku are not widely known, even though they are taxonomic characters that can be used as markers to determine species or populations. Meanwhile, environmental factors can cause differences in morphological characters (Surya et al, 2024). Chemotaxonomic studies can involve anti-cancer compounds such as flavonoids (phenols), terpenes, alkaloids, lignans, sterols, fats and tannins. Gas chromatography analysis of cloves leaf compounds found 23 compounds dominated by eugenol, caryophyllene, humulene, eugenol acetate, limonene, methyl salicylate, methylchavicol, chavicol, famesen, caryophyllene alcohol, caryophyllene oxide, humulene epoxide, cis-limonene oxide, trans-limonene oxide, methyleugenol, cis-isoeugenol, cis-methylisoeugenol, cis acetate and trans-isoeugenyl acetate. The potential of clove metabolites is not widely known by the public and to increase their utility, several studies on the search for active anti-cancer compounds have been carried out by the government and institutions. The importance of research on the search for active substances in anti-cancer compounds from Cloves are caused as a source of raw materials for drugs that can be used for industrial and medical purposes. Previous research on anti-cancer compounds of cloves was limited to one variety of clove, namely zanzibar, while other varieties such as siputik, sikotok and raja have never been done (Wael S et al, 2018).

MATERIALS AND METHOD

Materials

This research was conducted in July-August 2024 with the research location located in Negeri Lima, Leihittu District, Central Maluku Regency, Maluku Province. The tools and materials used in this study were cross-sections, analytical scales, ovens, kettles, measuring cups, blenders and tea bags. The method used in this study is (1) separating the clove leaves from their stems, (2) washing the clove leaves until clean, (3) wilting them in the room for 3 days, (4) after wilting the clove leaves are cut into small pieces and then drying them in the oven for 60 minutes or 1 hour at a temperature of 100°C, (5) then the dried leaves are blended into powder and weighed as much as 5 grams using an analytical scale and the powder that has been weighed is put into a tea bag, (6) putting the tea bag into a teapot containing 200ml of water for 2 minutes then pouring 2ml of tea into a glass and letting it sit for 5 minutes, (7) after letting it sit for 5 minutes the tea is ready to be drunk.

RESULTS AND DISCUSSION

Cloves leaf tea is a traditional drink that is unique and has many benefits because it is different from tea drinks in general, this tea drink comes from clove plant leaves that are ripe or have a yellowish color which are then boiled with boiling water so that they produce a fragrant aroma, a distinctive color and can be drunk. The many clove plants that are usually found in the yard and in the garden make it easy for people to obtain the main raw materials for making clove tea drinks without spending money (Surya, 2024). For the community, clove tea drinks have many health benefits such as being able to provide warmth to the body, avoiding various diseases (Dong, 2024). Based on research on the processing of herbal tea made from clove leaves and organoleptic tests, this was done to see the level of preference for color, aroma and taste from very much liked to disliked. The hedonic scale results can be seen in the following.

Table 1. Results of the organoleptic hedonic scale of clove leaf

No	Testing	Scale hedonic					Total
		1	2	3	4	5	
1	Color				3	7	10
2	Aroma			4	1	5	10
3	flavor			4	4	2	10

Inform:

1. Don't like it
2. Dislike
3. Enough
4. Like
5. Really like it

Organoleptic test is also known as sensory testing or sensory testing, which is a testing method using human senses as the main tool for measuring product acceptance. The senses used in organoleptic testing are the sense of sight/eyes, the sense of smell/nose, the sense of taste/tongue, and the sense of touch/hands. The ability of the senses to assess includes the ability to detect, recognize, differentiate, compare, and the ability to assess likes or dislikes (Rahmawati, 2024). Based on the table above, it can be seen that the results of organoleptic testing show that there is a comparison between several panelists regarding the color, aroma and taste of herbal tea made from clove leaves.

Color

The color of herbal tea made from clove leaves can be seen that for those who answered (really like) consisted of 7 panelists, and for the results that (like) consisted of 3 panelists, these results indicate that the panelists really like the color of herbal tea made from clove leaves because it has a good color, and the color is like the previous tea. Because it has a determination of the quality of beverage ingredients that generally depend on the color it has, a color that does not deviate from the color it should have will give the impression of its own assessment by the panelists. Color assessment of cloves leaf herbal tea can be seen that the panelists really like the color of cloves leaf herbal tea because it has a good color, and the color is like the previous tea. These results indicate that the value of the color of herbal tea is very much liked by researchers, because it has a determination of the quality of beverage ingredients that generally depend on the color it has, a color that does not deviate from the color it should have will give the impression of its own assessment by the researcher.

Aroma

The aroma of herbal tea made from clove leaves can be seen that for those who answered (really like) consisted of 5 panelists, and the results of the value (like) consisted of 1 panelist, and for the results that were sufficient consisted of 4 panelists. These results indicate that the aroma value has a fragrant aroma and has a distinctive clove scent because it has a fragrant aroma. Several other panelists also have different opinions. Aroma assessment of cloves leaf herbal tea can be seen that the panelists really like the aroma of clove leaf herbal tea, because it has a very fragrant aroma and has a distinctive clove scent because it has a fragrant aroma. These results indicate that the aroma of herbal tea made from clove leaves has an aroma that is very much liked by the panelists and also has an aroma that is sufficient for several other panelists, because it has an aroma that is difficult to measure so that it often causes different assessments or opinions (Rahawaati, 2024).

flavor

The results of the flavor value of herbal tea made from clove leaves can be seen that (very much like) consists of 2 panelists, for the value results (like) consists of 4 panelists and the value results (enough) consists of 4 panelists. These results indicate that the taste value of herbal tea made from clove leaves has a mint taste and a distinctive taste of herbal tea made from clove leaves. Assessment flavor of cloves leaf herbal tea can be seen that the panelists assessed the taste of cloves leaf herbal tea, because it has a mint taste and a distinctive taste of clove leaf herbal tea. These results indicate that the taste value of herbal tea made from clove leaves is a taste that is liked by some panelists, and also has a taste that is not liked by some panelists. because the taste also has a combination of flavors that are created to meet the tastes of the panelists

Identification of cloves leaf

The four cloves leaf extracts of the sikotok, siputik, zanzibar and raja varieties were tested for chemical compounds at the UGM FMIPA Organic Chemistry Laboratory. The extracts were injected into the GC-MS QP2010S SHIMADZU as much as 0.5 μ L in a syringe, the column temperature was programmed at 120-310^oC with an increase of about 10^oC per minute, with the carrier gas being helium, pressure 13.7 kPa, EI (electron impact) ionization detector. The compound levels were determined based on the standard peak area compared to the sample peak area. The results of the GC-MS analysis of the extracts of the four cloves leaf varieties can be seen below.

Table 2. GC-MS results of cloves

Varieties of clove	Compounds %					
	Eugenol	β -caryophyllen	α -humulene	caryophyllene oxide	β -isopropylidene-glycerol	Tetratetraconten
Siputik	80,15	13,44	1,50	4,90		
Sikotok	48,33	28,80	2,97	3,40	16,50	
Zanzibar	70,43	16,79	3,03	2,07		3,12
Raja	77,24	16,15	1,52	5,08		

The results showed that there were differences in the compound content of the four clove varieties with different compositions. Eugenol was highest in var.siputik 80.15% followed by var.raja 77.24%, var.zanzibar 70.43%, var.sikotok 48.33%. The highest β -caryophyllene was found in var.sikotok 28.80%, followed by var.zanzibar 16.79%, var.raja 16.15%, var.siputik 13.44%. The highest α -humulene compound was found in var.zanzibar 3.05%, followed by var.sikotok 2.97%, var.raja 1.52%, and var.siputik 1.50%. The highest caryophyllene oxide compound was found in var.raja 5.08%, followed by var.siputik 4.90%, var.sikotok 3.40%, and var.zanzibar 2.07%, while the β -isopropylidene-glycerol compound 16.50% was only found in var.sikotok, and the tetratetraconten compound 3.12% was found in var.zanzibar.

The GC-MS results showed that the compound content of these four clove varieties was not much different from cloves from several other countries. GC-MS test on cloves from India using acetone solvent showed that eugenol compound 80.19%, eugenyl acetate 7.91%, caryophyllene 3.79%, from Madagascar found eugenol 91.81-96.65%, β -caryophyllene 1.66-4.48%, α -humulene 0.22-0.79%, eugenyl acetate 0.37-2.53%, caryophyllene oxide 0.14-0.6%, from Zanzibar islands found eugenol 87.52 -89.47%, β -caryophyllene 7.19-9.70%, α -humulene 0.75-1.08%, eugenyl acetate 0.55-0.88%, caryophyllene oxide 0.25-0.68%, from Bangladesh found 74.28% eugenol, 5.78% eucalyptol, 3.85% caryophyllene, 2.43% α -cardinol (Barakat, 2014). Research by Sudarma et al., (2009) on clove flowers from Lombok, West Nusa Tenggara using the GC-MS method obtained 67.27% eugenol with a molecular weight of 164, 9.43% β -karyophyllene with a molecular weight of 204, 1.24% α -humulene with a molecular weight of 204, eugenol acetate 13.96% molecular weight of 206, and caryophyllene oxide 2.92% molecular weight of 187.

Study by Bhuiyan et al., (2010) on clove leaves from Bangladesh using the GC-MS method obtained cloves leaf compounds consisting of 74.28% eugenol, 18.9% β -karyophyllene, eucalyptol 5.78%, 3.85% karyophyllene oxide, 2.43% α -cardinol, and limonene. 2.08%. Research by Sulistyoningrum et al., (2017) stated that the compounds in clove oil from Toli-Toli are eugenol 66.37%, β -caryophyllene 15.38%, α -humulene 1.97%, eugenol acetate 12.99%, chavicol 0.18%, and caryophyllene oxide 0.47%, while from Bali it consists of eugenol 72.34%, β -caryophyllene 12.51%, α -humulene 2.34%, eugenol acetate 5.33%, chavicol 0.25%, and caryophyllene oxide 0.18%. Differences in the composition of clove compound content in each different location and/or plant organ are due to the main function of secondary metabolites in environmental changes, defense, temperature, predators and the survival of the plant or organ. Eugenol has been reported to be used as an antiseptic, pesticide, antioxidant, anti-inflammatory, analgesic, and antibacterial (Ali et al., 2014). Eugenol is most biologically active in blocking nerve impulse transmission to reduce pain, so it is widely used as a medicinal agent (Sudarma et al., 2009).

AUTHORS CONTRIBUTION

Letlora, M.E., Baharudin, A.A designed and conducted the study, analyzed and interpreted the data, Wael, S., Jaber, Z.M designed the research, analyzed and interpreted the data. Rehena, J.F reviewed the draft manuscript, and supervised the entire process.

CONCLUSION

The results of the study can be concluded that in the processing of herbal tea made from clove leaves and organoleptic tests, in terms of overall acceptance, panelists prefer the color of herbal tea made from clove leaves. While the overall acceptance of the aroma and taste of the panelists has a sufficient value.

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