Comparison and characteristics of antioxidant components of traditional herbal medicine hygienically produced

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Abstract. Antioxidants in traditional herbal medicine are proven to have health benefits. The purpose of this study were to compare and characterize the antioxidant components of traditional herbal medicines serbat secang, keras kencur, kunyit asam and zingiber curcuma (zicurma). The total antioxidants of phenols, flavonoids, tannins, alkaloids and saponins were determined with a spectrophotometry, viscosity with a viscometry, and coloform with coliform test. Total phenols, flavonoids, tannins, alkaloids and saponins as well as viscosity on T: 67.25; 19.36; 114.52; not detected; 0.06; and 3.45. BK: 16.19; 30.07; 21.90; 0.03; 0.09; and 5.85. KA: 41.06; 27.31; 39.58; not detected; 0.13 and 5.10. Zicurma is made from Curcuma xanthorrhiza, Curcuma longa, and Zingiber officinale contain the highest antioxidants, namely: total phenol 91.62 mg; flavonoids 127.50; tannin 119.70 mg; alkaloid 0.003%; and 0.58% saponins. Viscosity 15.30 cP. Coliform on all herbs were not detected. In conclusion, antioxidants content on Sc, BK, KA, and zicurma are varies. Viscosity is ideal asa a drink and hygienically produced. Zicurma is a potential traditional herbal medicine that has higher antioxidant component than others. Traditional herbal medicine is very potential, hygienic and suitable for consumption every day.

1. Introduction

Research Institute and Community Service (LPPM) Universitas Negeri Semarang (UNNES) on September 4, 2019 has launched three pilot Science and Technology Excellence Centers (PUI) on three different fields, which are Functional Food, Child Friendly, and Hybrid Energy. Functional food PUI is specifically design to accommodate research in UNNES related to food and health. The UNNES Chancellor hopes that research outcomes can be beneficial for scientific development and must be practiced in order to benefit the public[1].

One of the topic research in functional food center is herbal medicine. Currently there are four types of product traditional herbal medicine: wedang secang, beras kencur, kunyit asam, dan zicurma. Various processing and packaging process innovations have been carried out. Antioxidant characteristics of traditional herbal medicine components and hygienic production need to be conveyed to consumers.

Consumption of adequate amounts of antioxidants can reduce the incidence of degenerative diseases and improve one's immune status. Various herbal plants which are a source of natural antioxidants [2]. Plant derived antimicrobial compounds have massive remedial potential. These are useful against infectious ailments with minimal side reactions that are associated with synthetic antimicrobial agents. The antimicrobial properties of plant extracts usually arise from secondary plant metabolites such as steroids, tannins, alkaloids, flavonoids, resins, gums and phenolic compounds [3]. Total phenolic compounds is very important because the amount of phenolic compounds is usually positively correlated with antioxidant properties [4].

Various studies on phytochemical simplicia/basic ingredients of herbal medicine/traditional herbal medicine have been carried out to support the quality of herbal medicine products produced. Curcuminoid is a group of phenolic compounds contained in the rhiizomes of the family
Zingiberaceae, among others: *Curcuma longa* syn. *Curcuma domestica* (turmeric) and *Curcuma xanthorrhiza* (temulawak) [5]. The phenol compound in *Curcuma xanthorrhiza* is a compound that contains antioxidants [6]. Flavonoid compounds are thought to have a mechanism of action to denature bacterial cell proteins and damage cell membranes beyond repair [7].

Clove flower (*Syzygium aromaticum* L.) reported to contain 30.08% tannin in the form of the rest saponin, alkaloid, glikosida, dan flavonoid [8]. Eugenol in clove flowers as an antibacterial [9]. Methanol extract of *Syzygium aromaticum* (L.) Merry & Perry of Tuni Buru Selatan Varieties as antimalarial [10]. Secang wood extract (*Caesalpinia sappan* L.) has a total flavonoid of 6.02% and a total anthocyanin of 2.43% [11].

*Zingiber officinale* (jahe), *Curcuma xanthorrhiza* (temulawak), *Curcuma domestica* (kunir) and *Cymbopogon citratus* (serai). Herbs actually have high value because they contain antioxidants that can be used to treat cancer and degenerative diseases [12]. The active compound in curcumin is polyphenols. Curcumin is known recently to have antioxidant, anti-inflammatory, anticancer effects and, thanks to these effects, to have an important role in prevention and treatment of various illnesses ranging notably from cancer to autoimmune, neurological, cardiovascular diseases, and diabetic [13]. Curcumin found in *Zingiber officinalis*, *Curcuma longa*, *Cymbopogon citratus* and *Curcuma xanthorrhiza* which are commonly made cooking spices and public drinks as an possible antidote to the corona virus [14].

Stability tests of traditional medicines and health supplements include physical, chemical and microbiological tests, which can undergo changes during storage and tend to affect product quality. There are five physical parameters in the product form of the solution, namely organoleptic, determination of content, viscosity, pH, and microbial content[15].

All processed food products traditional herbal medicine are required to meet the food safety, quality and nutrition requirements. This is regulated in this Agency Regulation in the form of a maximum limit of Microbial Contamination in Processed Food. The maximum limit of Microbial Contamination as referred to in the form of Microbiological Criteria. The maximum and minimum ALT limit for traditional drinks is $10^5$ colonies/g - $10^6$ colonies/g based on ISO 4833-1[16].

High levels of sanitation and hygiene should be applied to every aspect of making traditional medicine. The scope of sanitation and hygiene includes personnel, buildings, equipment and supplies, production materials and containers, and everything that can be a source of product pollution. Potential sources of pollution should be eliminated through a comprehensive and integrated sanitation and hygiene program. Because of its source, traditional medicinal ingredients can contain microbiological contamination; in addition, the process of harvesting/gathering and the production process of traditional medicines is very easily contaminated by microbes. To avoid changes in quality and reduce contamination, it is necessary to apply high standard sanitation and hygiene [17].

The purpose of this study was to compare and characterize the antioxidant components of traditional herbal medicine. The traditional herbal medicine under study were wedang secang, beras kencur, kunyit asam, and zicurma. Antioxidants observed included total phenols, flavonoids, tannins, alkaloids, and saponins. Viscosity and total *E.coli* were also tested.

2. Methods

This research is divided into four stages. First, the making of drinks, the second is antioxidant test, the third is a physicochemical test, the fourth is a viscosity and microbiological test.

**Serbat secang production process.** Stem Secang (*Caesalpinia*), cinnamon flower 3 sticks, 2 ounces of grilled ginger, and kapulgo cloves were boiled using 750 ml of water on a pan until it boils. Simmer until the water remains ±500 ml. Add 250 grams of sugar cubes and filter the liquid. Serbat secang is ready to be packaged using a sterilized bottle.

**Beras Kencur production process.** One ounce of rice is washed with boiled water, and soaked in boiled water for 2 hours. Two ounces of kencur (*Kaempferia galanga* L) peeled, washed using warm water and blended using boiling water. Kencur and rice are added to a blender, plus 500 ml sugar water, blend until smooth. Filtered and squeezed. The pulp is put into the blender again, plus 500 ml of
sugar water added with salt and a little tamarind water and then blended and squeezed on a sieve. The kencur rice is ready to be packaged using a sterilized bottle.

**Kunyit asam production process.** Two ounces of turmeric (*Curcuma longa* Lin.) peeled, washed, and thinly sliced. Boil with 250 ml of brown sugar water/brown sugar in a pan until it boils. Boiled turmeric is cooled and blended until smooth and filtered. The remaining pulp in the filter plus 500 ml of sugar water and a little salt then filtered and squeezed again. Two ounces of tamarind (*Tamarind indica*) boiled with 250 ml of sugar water, filtered. Tamarind water and turmeric juice are mixed together and filtered again using a fine cloth filter. Tamarind turmeric is ready to be packaged using a sterilized bottle.

**Zicurma production process.** Two ounces of turmeric (*Curcuma longa* Lin.) and two ounces of temulawak (*Curcuma longa* Lin.), peeled, cleaned and cut thinly. Two ounces of Ginger (*Zingiber officinale*) is burned, peeled and crushed. All three ingredients are boiled using 2 liters of water in a pan until boiling. Simmer and boil until the water volume remains 1 liter. Add rock sugar to taste and a little salt then filtered. Zicurma is ready to be packed using bottles that have been sterilized.

Total phenols, flavonoids, tannins, alkaloids, and saponins were determined by UV-Vis Spectrophotometry, viscosity with a viscometry, and coloform with coliform test.

### 3. Results and Discussion

This descriptive study describes the comparison of laboratory results of antioxidant content which is focused on total phenols, flavonoids, tannins, alkaloids, saponins; viscosity and coliform test of Serbat Secang, Beras Kencur, Kunyit Asam, and Zicurma. Display of traditional herbal medicinal products is presented in Figure 1. Total phenols, flavonoids, and tannins of traditional herbal medicine expressed in Table 1; total alkaloids, and saponins expressed in Table 2; and the viscosity and coliform test expressed in Table 3.

![Figure 1. Traditional herbal medicine: Zicurma, Serbat secang, Beras kencur, and Kunyit asam](image)

### Table 1. Total Phenols, Flavonoids, and Tannins of Traditional Herbal Medicine

| No | Traditional Herbal Medicine | Total Phenols (mg/100 gram) | Total Flavonoids (mg/100 gram) | Total Tannins (mg/100 gram) |
|----|-----------------------------|----------------------------|-----------------|-----------------|
| 1  | Wedang secang               | 67.250                     | 19.357          | 114.524         |
| 2  | Beras kencur                | 16.188                     | 30.071          | 21.905          |
| 3  | Kunyit asam                 | 41.063                     | 27.314          | 39.583          |
| 4  | Zicurma                     | 91.620                     | 127.500         | 119.702         |

### Table 2. Total Alkaloids, and Saponins of Traditional Herbal Medicine

| No | Traditional Herbal Medicine | Total Alkaloids (%) | Total Saponins (%) |
|----|-----------------------------|--------------------|--------------------|
| 1  | Wedang secang               | Not detected       | 0.064              |
| 2  | Beras kencur                | 0.028              | 0.091              |
| 3  | Kunyit asam                 | Not detected       | 0.127              |
| 4  | Zicurma                     | 0.003              | 0.580              |
Based on the analysis results it is known that herbal Serbat secang contains more tannins than phenols, flavonoids, and saponins. *Caesalpinia sappan* is one of the plant material that is commonly used as a natural dye for food, drinks and a potential source of natural antioxidants. Antioxidant activity in secang wood, due brazilln compounds, flavonoids and phenolic contains. High tannin content in Serbat secang is very possible derived from clove flowers. Of the various basic ingredients caesalpinia sherbet, only clove flowers contain tannins. This is supported by the results of the that the tannin content in Cloves (Syzygium aromaticum L.) is 30.08%. [8]. Phenol comes from *Zingiber officinalis* and not from *Amomum compactum* seeds. *Amomum cardamomum* contains terpineol, terpineolasetat, cineol, borneol, and camphor which has the efficacy of thinning phlegm, easing the expulsion of water from the stomach, warming, cleansing blood, relieving pain, scent, stimulant and scent [18].

Beras Kencur contains more flavanoids than phenol, tannin, alkaloids, and saponins. The antioxidant content mainly comes from the *Kampferia galanga* L. rhizome. Conclusions of the study [19] that *Kampferia galanga* L. contains flavonoid compounds, saponins, polyphenols and essential oils that are believed to have the ability as an antibacterial. Inhibiting the growth of bacteria Bacillus subtilis and *Escherichia coli*.

Kunyit Asam contains more tannins than phenols, flavonoids, and saponins. The content of tannins in tamarind turmeric herbs comes from the contribution of the two basic ingredients, namely *Curcuma longa*, and *Tamarindus indica* L. . This refers to the results of research [20], that C. Longa infusion extract contains tannin. Alkaloids, flavonoids and extracts of tamarind (*Tamarindus indica*) contain alkaloids, flavonoids, saponins and tannins.

Zicurma contains more flavanoids than phenol, tannin, alkaloids, and saponins. In accordance with the results of the study [21]. That the results of the *Curcuma xanthorrhiza* analysis are reported to contain major phytochemicals such as flavonoids, tannins, saponins, terpenoids and potential as anti-hypercholesterolemic.

There are five physical parameters in the product form of the solution, namely organoleptic, determination of content, viscosity, pH, and microbial content [15]. The Viscosity and Coliform Test of Traditional Herbal Medicine in this study are presented in Table 3.

| No | Traditional Herbal Medicine | Viscosity Cp | Coliform Test |
|----|----------------------------|-------------|--------------|
| 1  | Wedang secang              | 3.45        | Not detected |
| 2  | Beras kencur               | 5.85        | Not detected |
| 3  | Kunyit asam                | 5.10        | Not detected |
| 4  | Zicurma                    | 15.30       | Not detected |

Table 3 shows that the viscosity of traditional herbal medicine varies. from 3.45 cP to 15.30 cP. This is very much determined by the basic ingredients of each type of herbal medicine. Viscosity of zicurma is higher than the other. Viscosity describes the thickness and determines the color of the herbal medicine. This can be an attraction to consumers.

Based on the results of the coliform test it can be seen that the four products of traditional herbal medicine are free from coli bacteria which is one of the hygienic indicators of whether or not beverage products (Table 3). This means that the processing procedure of the four traditional medical herbs has been carried out by maintaining the cleanliness of the processing site, all tools used are sterilized using hot water, selected quality ingredients are peeled, and washed thoroughly; packaging bottles are also washed and washed with hot water can maintain product hygiene. This means that all the herbs in this study, namely serbat secang, beras kencur, kunyit asam, and zicurma are in hygienic conditions and are very suitable for consumption by consumers. Fhitryani *et al* state that microbes could be as one of the parameters of herbal medicinal herbs. Higienity is very important in medicinal herbs. Furthermore,
if the medicinal herbs is contaminated with microbes, this drug can cause health problems if consumed by humans [23]. Beside that, herbal medicine from temulawak (Curcuma xanthorrhiza) and kunyit (Curcuma longa) has been proven to relieve clinical symptoms due to impaired liver function [24].

Table 1, 2, and 3 show that zicurma traditional herbal medicine with the main composition of turmeric, ginger and ginger is a traditional herbal medicine that has the highest antioxidant components, in the form of total phenols 91.62 mg, flavonoids 127.50 mg, tannins 119.70 mg, alkaloids 0.003%, and saponins 0.58%. Viscosity number also looks the highest, which is 15.30 cP. Coliform test not detected. Besides the antioxidant content is proven to be higher than the others except alkaloids. The stability test of traditional medicines especially the viscosity is also the highest. Viscosity is one of the important elements in the physical test of herbal medicines in solution. Coliform tests were not detected, meaning zicurma was made hygienically. Curcuma xanthorrhiza is believed to have enormous benefits including increasing appetite, anti-cholesterol, anti-inflammation, anemia, antioxidants, cancer prevention, and anti-microbial [25]. Zingiber officinale inhibits the enzymes that regulate carbohydrate metabolism and ultimately hyperglycemia in diabetic conditions [26]. Prof Dr drh Chairul Anwar Nidom explained that curcumin found in Zingiber officinale, kunyit Curcuma longa, Cymbopagon citratus and Curcuma xanthorrhiza which are commonly made cooking spices and public drinks is a possible antidote to the corona virus [14].

Thus, zicurma has passed the stability test set by BPOM. This can provide confidence to consumers not to hesitate to consume it. The other three traditional medicines namely serbat secang, beras kencur, kunyit asam have also passed the stability test set by BPOM. The consumer has the full right to determine which choice of traditional herbal medicine he will choose after knowing the antioxidant content. No doubt that in determining the choice of course depends on the interests and preferences.

4. Conclusion
Antioxidants of traditional herbs of serbat secang, beras kencur, kunyit asam, and zicurma were varies. Viscosity is ideal and hygienic as proven from the E.coli detection. Zicurma is a potential traditional herbal medicine that has a higher antioxidant component than others.

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