



Difference in organoleptic test results and antioxidant activity in variations of the method of making Emprit Ginger and Secang Wood powdered drink

Perbedaan hasil uji organoleptik dan aktivitas antioksidan pada variasi metode pembuatan serbuk minuman Jahe Emprit dan Kayu Secang

Mia Srimati^{1*}, Sandra Hakim Afrizal², Sartika Mahardika³

¹ Department of Nutrition, Faculty of Health Sciences and Technology, Binawan University, East Jakarta, Indonesia.

E-mail: mia@binawan.ac.id

² Department of Nutrition, Faculty of Health Sciences and Technology, Binawan University, East Jakarta, Indonesia.

E-mail: sandra.hakiem@binawan.ac.id

³ Department of Nutrition, Faculty of Health Sciences and Technology, Binawan University, East Jakarta, Indonesia.

E-mail:

sartika.mahardikasyahrial@student.binawan.ac.id

*Correspondence Author:

Department of Nutrition, Faculty of Health Sciences and Technology, Binawan University, Dewi Sartika Roadway, No. 25-30, Keramat Jati District, East Jakarta, Indonesia.

E-mail: mia@binawan.ac.id

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Abstract

Antioxidants in ginger (*Zingiber officinale*) and sappan wood play roles in health benefits, including dilating blood vessels and inhibiting cancer cells. The study analyzes the differences in organoleptic characteristics and antioxidant activity of powdered ginger and sappan wood, comparing Crystallization (MK) and conventional drying (MP) methods. In the crystallization method, 100 grams of Emprit Ginger and 5 grams of sappan wood sticks were blended, followed by adding 500 ml of water and 50 grams of sugar, then stirred in a hot pan for 2 hours until crystals formed. In the conventional drying method, an equal amount of ginger was dried for 5 days, and then, together with sappan wood and sugar, it was ground using a food processor. The data from the organoleptic test were normal, and the T-test result showed that powdered drinks from the drying method significantly exhibited better hedonic quality ($p < 0,05$). For every 100 grams, this powder contains 386 kcal of energy, 1,62% ash content, 2,18% moisture content, 91,88% carbohydrates, 1,0% fat, 2,32% protein, and 2040,86 mg/kg of antioxidant activity (IC50 method). In conclusion, different methods affect the characteristics of ginger powder, which has implications for product development and medicinal uses.

Keywords: Antioxidant, crystallization, ginger, powdered drink, sappan wood

Abstrak

Antioksidan dalam jahe (*Zingiber officinale*) dan kayu secang memainkan peran dalam manfaat kesehatan, termasuk melebarkan pembuluh darah dan menghambat sel kanker. Penelitian ini menganalisis perbedaan karakteristik organoleptik dan aktivitas antioksidan pada serbuk jahe dan kayu secang, membandingkan dua metode: kristalisasi (MK) dan pengeringan konvensional (MP). Dalam metode kristalisasi, 100 gram jahe emprit dan 5 gram batang kayu secang dihaluskan untuk mengekstrak esensinya, diikuti dengan penambahan 500 ml air dan 50 gram gula. Campuran tersebut kemudian diaduk dalam wajan panas selama 2 jam hingga membentuk kristal. Pada metode pengeringan konvensional, jumlah jahe yang sama dikeringkan selama 5 hari, lalu, bersama dengan kayu secang dan gula, dihaluskan menggunakan food processor. Data dari uji organoleptik normal (diuji oleh Kolmogorov Smirnov), dan hasil uji T menunjukkan bahwa serbuk dari metode pengeringan secara signifikan menunjukkan kualitas hedonik yang lebih baik ($p < 0,05$). Untuk setiap 100 gram, serbuk ini mengandung 386 kcal energi, 1,62% kandungan abu, 2,18% kandungan air, 91,88% karbohidrat, 1,0% lemak, 2,32% protein, dan 2040,86 mg/kg aktivitas antioksidan (metode IC50). Kesimpulan, metode yang berbeda memiliki pengaruh terhadap karakteristik serbuk jahe, yang memiliki implikasi untuk pengembangan produk dan penggunaan medis.

Kata Kunci: Antioksidan, jahe, kayu secang, kristalisasi, minuman serbuk

Introduction

Antioxidants are compounds recognized for their protective role in safeguarding cells against damage from free radicals, thereby preventing oxidative stress (Zuraida et al., 2017). In addition to their protective properties, antioxidants also have various physiological effects. These include inhibiting blood cell clotting and stimulating nitric oxide (NO) production, which plays a crucial role in vasorelaxation. This process leads to dilation of blood vessels. Through these mechanisms, antioxidants actively contribute to blood pressure reduction and inhibit the growth and proliferation of cancer cells (Adinda et al., 2015). These effects further underline the importance of antioxidants in maintaining overall health and well-being.

Ginger (*Zingiber officinale*) is a natural ingredient rich in active phenolic compounds. Compounds such as shogaol, gingerol, and gingerone have antioxidant effects on Vitamin E and anticancer properties (Ali et al., 2018; Wiendarlina & Sukaesih, 2019). A separate study by Firdausni & Kamsina (2018) further highlighted ginger's phenolic compound content is higher than red ginger's. Ginger is widely used as a traditional medicinal ingredient, making it suitable for use in medicine, especially for the treatment of hypertension (Torabi et al., 2017). Additionally, ginger has been widely developed as a traditional beverage. Ginger beverages have long been considered traditional drinks with health benefits.

One of the factors affecting the quality of ginger beverages is the ingredients used, including Sappan Wood. Sappan Wood has been used in traditional medicine to enhance the immune system and to combat infections. It also has high antioxidant content, which is beneficial for preventing cell damage caused by free radicals (Utari, 2017; Nurullita & Irawati, 2022). Despite much research on Sappan Wood and its health benefits, studies on the influence of Sappan Wood on ginger beverages are still very limited.

This study combined ginger and Sappan Wood into a powdered beverage. The powdered beverage was chosen because it is affordable, can be stored for a long time, and is easy to prepare. The community needs healthy powdered beverages, such as ginger and Sappan Wood drinks. Therefore, through this research, new information is expected to be found regarding using Sappan Wood as an additive in ginger

beverages. This study also aimed to evaluate the influence of Sappan Wood substitution on organoleptic characteristics, a term referring to the aspects of food experienced by the senses, and antioxidant content in powdered ginger beverages. Finally, the influence of the method on the organoleptic and antioxidant activities of powdered ginger and sappan beverages was determined.

Methods

The study was conducted from April to July 2023 at the Culinary and Dietetic Laboratory of Binawan University for Organoleptic Tests and PT Saraswati Indo Genetech for antioxidant and proximate tests. This study compared crystallization and conventional drying methods. This experimental study compared crystallization and conventional drying methods to produce powdered ginger and Sappan wood drinks. In the crystallization method, 100 g of Emprit Ginger and 5 g of sappan wood were blended to extract their essence, followed by the addition of 500 ml of water and 50 g of sugar. The mixture was stirred in a hot pan for 2 h until crystals formed. In the conventional drying method, an equal amount of ginger was dried for five days, and then, together with sappan wood and sugar, it was ground using a food processor.

The equipment required for powdered drinks included food scales, baking pans, power mixes, tablespoons, and spatulae. For the antioxidant activity analysis (IC50), the essential equipment and reagents included a spectrophotometer, microplate reader, pipettes, vortex mixer, centrifuge, pH meter, water bath, standard laboratory glassware, DPPH (2,2-diphenyl-1-picrylhydrazyl) or (2,2'-azino-bis (3-ethylbenzothiazoline-6-sulfonic acid)), solvents such as methanol or ethanol, and appropriate buffers.

In the proximate analysis of protein, moisture, fat, and ash content, the required apparatus and reagents included a Kjeldahl apparatus, distillation unit, oven, Soxhlet extractor, rotary evaporator, muffle furnace, crucibles, sulfuric acid, sodium hydroxide, boric acid, methyl red, bromocresol green (BCG), petroleum ether, and anhydrous sodium sulfate. Common instruments such as an analytical balance, grinder, and desiccators were used across the analyses, and samples were handled in

compliance with standard laboratory protocols to ensure the precision and reliability of the results.

An organoleptic test evaluated the four main attributes: taste, color, aroma, and texture. The assessment used a seven-point scale for hedonic and quality hedonic evaluations. On the hedonic scale, attributes ranged from 1 (Strongly Dislike) to 7 (Strongly Like). Specific scales for hedonic quality assessment were defined as follows: color ranged from 1 (brown) to 7 (cornsilk); aroma extended from 1 (Strongly Unfragrant) to 7 (Strongly Fragrant); taste varied from 1 (Strongly Bitter) to 7 (Strongly Spicy), and texture moved from one (Strongly Coarse) to seven (Strongly Smooth).

Organoleptic data were derived from the products obtained using crystallization and drying methods. This test was performed to observe the differences in organoleptic characteristics and to select the best product from an organoleptic perspective. The organoleptic test involved 75 pre-elderly participants in the target age group for the product. Before completing the questionnaire, the subjects were given instructions on how to complete it. The attributes assessed included taste, color, aroma, and texture, each rated on a scale of 1–7 for specific qualities. The results of the organoleptic test were initially evaluated for normality using the Kolmogorov-Smirnov test and subsequently analyzed using a t-test to discern the differences. This study was approved by the Health Research Ethics Commission of Universitas Muhammadiyah, Prof. Dr. Hamka Jakarta (No: 03/23.04/02475). This methodological approach facilitated a comprehensive assessment of the organoleptic properties, aiding the selection of the most favorable product based on sensory evaluation. All procedures performed in this study involving human participants followed the ethical standards of the institutional and national research committee and the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Result and Discussion

An organoleptic test was conducted after creating a powdered drink by using different methods. A hedonic scale was used to evaluate the organoleptic attributes of the products

derived from both crystallization and conventional drying methods. This scale encompasses various attributes, such as color, aroma, taste, texture, and overall quality, with ratings ranging from 1 (Strongly Dislike) to 7 (Strongly Like). An independent samples t-test was conducted to ascertain significant differences between the two methods, with statistical differences indicated by different letters in the table. The summarized results of the assessment, with the mean values and standard deviations, are presented in Table 1.

Table 1. Comparison of organoleptic attributes between crystallization and conventional drying methods evaluated on a hedonic scale

Attribute	Crystallization	Conventional drying
Color	4,05±0,723 ^a	4,90±0,573 ^b
Aroma	4,02±0,770 ^a	5,03±1,008 ^b
Taste	3,55±0,746 ^a	4,58±0,696 ^b
Texture	2,83±0,740 ^a	4,63±0,581 ^b
Overall	4,25±0,628 ^a	4,73±0,446 ^b

Attributes range from 1 (Strongly Dislike) to 7 (Strongly Like). Independent sample t-test, significant at $p < 0,05$. The letters "a" and "b" in the table signify a statistical difference between the two methods for each attribute.

Table 1 presents a comparative analysis of the organoleptic attributes of the two drying methods, crystallization, and conventional drying, evaluated on a hedonic scale from 1 (Strongly dislike) to 7 (Strongly like). Significant differences were observed in the color. Crystallization scored 4,05±0,723, while conventional drying achieved 4,90±0,573, indicating a preference for conventional drying products. The underlying scientific phenomena explaining this difference could be attributed to variations in the processing parameters, such as temperature, time, and treatment method, which must be further explored.

The evaluation was extended to aroma, taste, and texture, with a consistent preference for conventional drying across all tested organoleptic qualities. This preference might be understood in food products, particularly powdered ginger and sappan wood drinks, where conventional drying appears superior in maintaining the desired sensory characteristics. Sun drying is the most desirable method for preserving and enhancing ginger quality

because of its cost-effectiveness and bioactive compound efficacy (Atmadja & Yunianto, 2019; Mustafa & Chin, 2023).

Comparatively, Andre et al. (2022) conducted an organoleptic evaluation of crystallized ginger products in Daerah Istimewa Yogyakarta using Hedonic Scale Scoring. They found differences in organoleptic results across several samples, including taste, aroma, color, and texture. Yanis et al. (2019) studied the formulation of rosella dips using various combinations of instant ginger, ginger powder, and rosella. This study revealed that adding instant ginger acts as a catalyst to facilitate solubility, with the best formulation consisting of 5 g instant ginger, 2 g ginger powder, and 2 g dried rosella.

Table 2. Comparison of organoleptic attributes between crystallization and conventional drying methods evaluated on a quality hedonic scale

Attribute	Crystallization	Conventional drying
Color	3,15±0,723 ^a	5,66±0,573 ^b
Aroma	4,23±0,770 ^a	4,83±1,008 ^b
Taste	3,21±0,746 ^a	4,26±0,696 ^b
Texture	3,06±0,740 ^a	5,53±0,581 ^b

Specific scales for the quality hedonic assessment were defined as follows: color ranged from 1 (brown) to 7 (cornsilk); aroma extended from 1 (Strongly Unfragrant) to 7 (Strongly Fragrant); taste varied from 1 (Strongly Bitter) to 7 (Strongly Spicy); and texture moved from 1 (Strongly Coarse) to 7 (Strongly Smooth). Independent sample T-test, significant at $p < 0,05$. The letters "a" and "b" in the table signify a statistical difference between the two methods for each attribute.

The evaluation continues to the quality of the hedonic scale, beginning with aroma, valued at 4,23±0,770 for crystallization and 4,83±1,008 for Conventional drying, extending from 1 (Strongly Unfragrant) to 7 (Strongly Fragrant). A higher score for conventional drying could imply better retention of the volatile compounds responsible for aroma during the drying process. This observation may lead to an exploration of how the drying temperature and time affect the preservation of these compounds. A higher score for conventional drying indicates that this method may be more effective in retaining volatile compounds responsible for aroma, possibly related to the more optimal drying temperatures and times in the conventional method (Hu et al., 2023).

Taste varies from 3,21±0,746 in crystallization to 4,26±0,696 in conventional drying, ranging from 1 (Strongly Bitter) to 7 (Strongly Spicy). The effect of this method on the chemical composition and interaction of various compounds within food products can influence taste. This observation is supported by a study of ginger essential oils, in which different drying treatments significantly affected the yield and chemical composition of the essential oils. These results highlight the importance of drying methods in retaining the volatile compounds responsible for flavor, with variations in drying methods leading to differences in taste and aroma characteristics (Kamal et al., 2023).

The texture was evaluated at 3,06±0,740 for crystallization and 5,53±0,581 for Conventional drying, moving from 1 (Strongly Coarse) to 7 (Strongly Smooth). The discrepancy in texture scores can be explained by the fundamental differences in drying techniques, potentially affecting the product's physical properties. The Conventional drying method results in a more desirable texture, which may correspond to the overall appeal of the food products and consumer satisfaction. A study of the effects of microwave vacuum drying and conventional drying methods on squid shreds supports this observation, highlighting how different drying methods can significantly influence food's physicochemical and microstructural properties, thereby affecting its texture (Pankyamma et al. 2019).

Table 3. Nutritional composition and antioxidant activity of powdered ginger and sappan wood dried using conventional method

Component	Powdered ginger and Sappan wood (conventional drying)
Total energy (kcal)	386
Ash content	1,62
Moisture content (%)	3,18
Carbohydrate (%)	91,88
Fat (%)	1,00
Protein (%)	2,32
Antioxidant activity (mg/kg)	2040,86

Table 3 provides information on the composition of powdered ginger, and Sappan wood prepared using conventional drying methods, with specific attention paid to the

proximate analysis results. The total energy content was 386 kilocalories, reflecting its calorific value and suitability for replenishing energy. The ash content, measured at 1,62, revealed the mineral content within the mixture, signifying the presence of essential minerals in the food product. The moisture content, quantified as 3,18%, indicated the mixture's water content.

According to research conducted by Widiyana et al. (2021), adding ginger powder significantly influences the moisture content of herbal drink powder. This connection supports the broader context, where high moisture content can affect the shelf life of a product, as it may make the product more susceptible to microbial attack during storage.

Carbohydrates comprised a significant portion (91,88%), with a high content resulting from adding sugar during processing. The fat content was minimal at 1,00%, reflecting the low lipid content of the mixture, and the protein content (2,32%) was slightly lower than that of the other powdered beverages. The antioxidant activity, measured at 2040,86 mg/kg using the DPPH method, indicated potential health benefits and protective properties. Widiyana et al. (2021) and Ajila (2022) also highlighted the impact of ginger powder on antioxidant activity, total phenol, total flavonoid, IC50, and sensory characteristics, such as color, aroma, and taste. These findings provide valuable insights for producers to optimize processing methods to align with consumer preferences and regulatory standards, thereby advancing traditional herbal drink powder production.

Conclusion

Powdered beverages containing ginger and sappan wood have the potential to be health drinks because of their antioxidant content and other beneficial effects. Conventional drying was superior in organoleptic aspects, such as color, aroma, taste, and texture, compared with crystallization. Thus, conventional drying can be considered a more effective choice for developing powdered beverage products.

Nevertheless, further research is needed to understand the factors influencing these preferences and the potential application of sappan wood as an additive in ginger beverages.

This conclusion emphasizes that combining these natural ingredients offers exciting potential for further development in the food and pharmaceutical industries.

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MS and SM contributed to the design and implementation of the research, SM contributed to the analysis of the results, and MS contributed to the writing and publishing of the manuscript.

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