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Effect of Honey Type on Chemical and Sensory Quality of Kratom Herbal Tea (Mitragyna speciosa)

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ABSTRACT

Indonesia has a lot of large forests with a diversity of plant species. That diversity of plants can potentially be used as medicinal plants. Indonesians have long identified many plants with medicinal benefits as an effort to overcome various health problems, one of the plant is the kratom (Mitragyna speciosa). Kratom leaves are consumed as tea by brewing it with hot water. Some Kapuas Hulu people use sweeteners such as honey, to reduce the bitterness of kratom. The mixture of kratom herbal tea added with sweet honey is expected to produce sensory and functional attribute which will affect consumers in choosing products. This experiment used a Randomized Block Design (RBD). Statistical analysis of research data using ANOVA (Analysis of Variance) test with a rate of 5%. The results of the sensory research of kratom herbal tea showed a significant effect on taste, but no significant effect on aroma and color, namely the color value of 2.08, aroma 2.28 and taste 2.25. The addition of honey variations to kratom herbal tea included vitamin C, flavonoids, alkaloids, and antioxidants, which was vitamin C content ranges from 8.9-13.5 mg/100 g, flavonoids 15.2-27.56 mg QE/ml, alkaloids 53.1-55.4% and antioxidant activity 39.1-80.1%.

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- The study was conducted to evaluate how different types of honey affect the chemical and sensory quality of kratom herbal tea, aiming to provide a better understanding of the factors influencing kratom herbal tea quality and offer valuable insights for the herbal tea industry and consumers

Introduction

Kratom is one of the plants in the Rubiaceae family originating from Southeast Asia, which grows in tropical regions. The leaves of the kratom plant are commonly utilized by farmers and laborers as a stimulant to increase work productivity and are used by communities in southern Muang Thai as herbal tea to enhance productivity (2). Kratom tea is often used in traditional communities as a form of medicine. Dayak and Malay ethnic communities highly value and respect kratom leaves in their cultural philosophy. Kratom leaves are utilized by the community in the form of fresh leaves or powder consumed as a beverage by steeping them in hot water as tea. Some communities in Kapuas Hulu use sweeteners to reduce the bitter taste of kratom, such as honey (2).

Honey is a liquid produced from flower nectar collected by bees, generally having a sweet taste, but there are also types of honey with sour or bitter tastes. Honey ranges in color from golden to dark brown-black, and sweet-tasting honey has high sugar content and low fat. Components in honey include vitamins, amino acids, minerals, organic acids, and various phytochemicals. The phytochemical compounds in honey vary depending on each region, caused by variations in vegetation types (10). Good quality honey contains around 17-21% water. If the water content exceeds 19%, honey will ferment quickly. As the altitude increases, the temperature decreases, making it easier for honey to absorb water (7). Water absorption affects acidity because the higher the water content, the easier it is for yeast to ferment and reduce the reducing value (16). Important indicators for consumers in assessing honey are color, aroma, and taste. The color, aroma, and taste of honey are influenced by the types of plants that are the source of nectar. Honey color, for example, is influenced by the mineral content it contains, which can come from the soil where the plants grow and contaminants from the surrounding environment(10).

The addition of honey to kratom herbal tea is suspected to produce sensory and functional properties that will influence consumers in choosing the product. However, regional differences and plant vegetation that produce honey can affect the quality of honey produced, which in turn will affect the overall quality of kratom herbal tea holistically. The differences in the content of different functional compounds in honey due to differences in regional and plant vegetation will determine the quality of honey, especially the functional characteristics produced (vitamin C, flavonoid, alkaloid, antioxidant activity, and sensory character). This research is conducted to determine the types of honey that can produce the best chemical and sensory quality of kratom herbal tea.

Methods

The main ingredients in this research are kratom leaf powder obtained from PEKRINDO, West Kalimantan. Kapuas Hulu honey is obtained from honey farmers in Nanga Lauk Village, Embaloh Hilir Sub-district, Kapuas Hulu Regency, West Kalimantan Province. Honey from West Nusa Tenggara is obtained from honey farmers in Tambora District, Dompu Regency, and honey from Bangka Belitung is obtained from the market in West Bangka Regency. Lime is obtained from Flamboyan Market in Pontianak City. The materials used for analysis are ethanol, distilled water, acetate, NH4OH, NaNO2, AlCl3, NaOH, quercetin, DPPH reagent, aluminum foil, zip-lock plastic, plastic cups, filter paper, and plastic wrap. The tools used are baking sheets, thermometers, test tubes, measuring cups, beakers, micropipettes, droppers, volumetric pipettes, digital scales, analytical balances, ovens, magnetic stirrers, water baths, vortex, cuvettes, and UV-Vis spectrophotometers.

The research design uses a Randomized Complete Block Design (RCBD) with one factor, namely the type of honey. Each treatment is repeated in 5 blocks. The research data is analyzed using Analysis of Variance (ANOVA) at the 5% significance level, and the best treatment is determined using the Effective Index Test.

Results

Figure 1 shows that the highest vitamin C content is found in kratom herbal tea with added honey from Kapuas Hulu, with a value of 13.5 mg/100g, followed by honey from West Nusa Tenggara with a vitamin C content of 10.9 mg/100g, and the addition of honey from Bangka Belitung showing a dissolved vitamin C content of 8.9 mg/100 g.

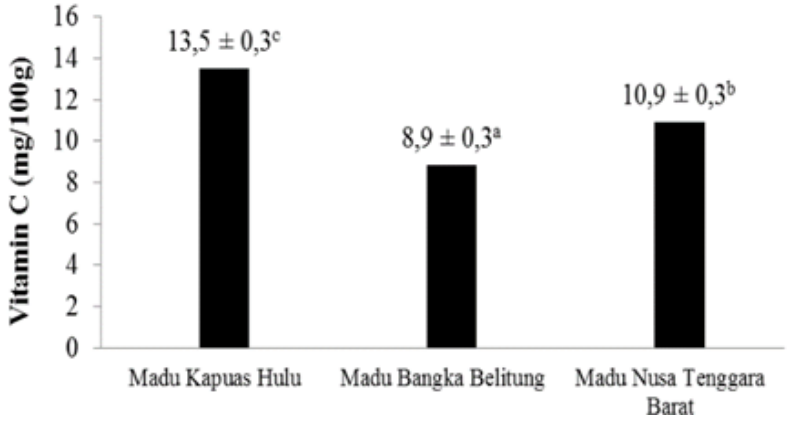

Figure 1. Vitamin C of Kratom Herbal Tea

Based on the data analysis Figure 2, the difference in honey types shows a significant effect ($p < 0.05$) on the flavonoid content of kratom herbal tea. The highest flavonoid content is shown in Kapuas Hulu honey with a value of 27.56 mg QE/ml, followed by honey from West Nusa Tenggara with a value of 20.2 mg QE/ml, while the lowest flavonoid content is shown in Bangka Belitung honey with a value of 15.2 mg QE/ml. Based on the data analysis in Figure 3, the difference in honey types shows a significant effect ($p < 0.05$) on the antioxidant activity of kratom herbal tea. The antioxidant activity values range from 39-80.1%, with the highest value observed in Kapuas Hulu honey treatment at 80.1%, and the lowest value observed in the addition of Bangka Belitung honey at 39%.

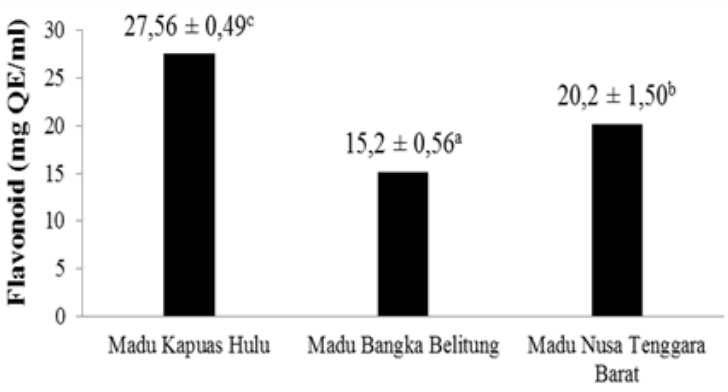

Figure 2. Kratom Herbal Tea Flavonoids

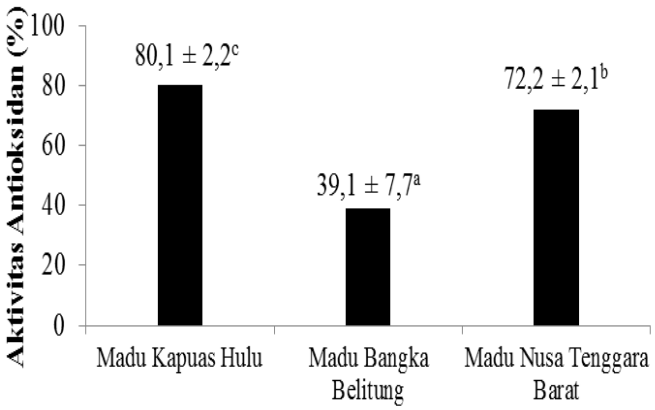

Figure 3. Antioxidant Activity of Kratom Herbal Tea

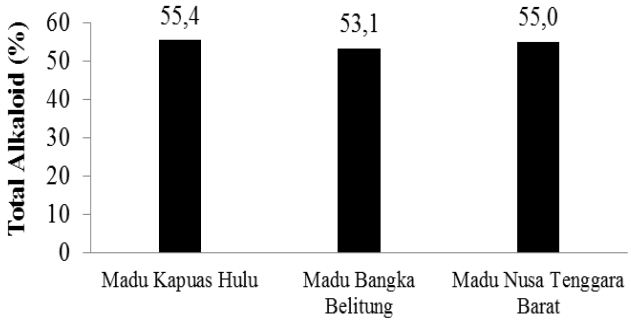

Figure 4. Kratom Herbal Tea Alkaloids

The total alkaloid content of kratom herbal tea can be seen in the following Figure 4, sequentially showing the treatment of adding Kapuas Hulu honey at 55.4%, Bangka Belitung honey at 53.1%, and West Nusa Tenggara honey at 55.0%.

Discussion

Vitamin C Content in Kratom Herbal Tea

Honey plays a role as an antioxidant. Vitamin C is a nutrient that is highly susceptible to damage during storage or because of processing (11). The results of measuring the vitamin C content in kratom herbal tea with various additions of honey can be seen in Figure 1. Based on the data analysis, the different types of honey showed a significant effect ($p<0.05$) on the vitamin C content of kratom herbal tea. It is suspected that honey from different regions will affect the types of nectar-producing plants brought by bees to produce honey, and the vitamin C content in honey also depends on the type of bee

producing it (multiflora or monoflora). Vitamin C in honey acts as the main antioxidant in plasma and cells by reacting with anions, superperoxides, hydroxyls, and hydroperoxides, thereby interrupting free radical chain reactions (ROS) (20). Vitamin C in each honey has a different amount depending on the source or location of honey production, climate, topography, etc., as it will affect the nectar produced by surrounding plants. The highest vitamin C content was found in kratom herbal tea with the addition of Kapuas Hulu honey, with a value of 13.5 mg/100g, followed by West Nusa Tenggara honey with a vitamin C content of 10.9 mg/100g, and the addition of Bangka Belitung honey showed the lowest vitamin C content at 8.9 mg/100 g. These results are consistent with measurements of antioxidant activity. According to Santos et al. (2021), vitamin C in honey acts as an antioxidant by preventing oxidation reactions through the donation of 2 electron bonds in C number 2 and 3 (14).

Flavonoid Content in Kratom Herbal Tea

Flavonoids compounds in honey are phenolic compounds with low molecular weight, which play a role in aroma and antioxidants in honey (3). The flavonoid content of kratom herbal tea with variations in the addition of different types of honey can be seen in Figure 2. Based on the data analysis, the different types of honey showed a significant effect ($p<0.05$) on the flavonoid content of kratom herbal tea. The highest flavonoid content was shown in Kapuas Hulu honey with a value of 27.56 mg QE/ml, followed by West Nusa Tenggara honey with a value of 20.2 mg QE/ml, while the lowest flavonoid content was shown in Bangka Belitung honey with a value of 15.2 mg QE/ml. Flavonoid compounds are the most dominant phenolic compounds in flower nectar, produced by bees to produce honey. Flavonoid compounds are associated with good antioxidant activity in honey (5). The physical, chemical, and biochemical characteristics, including flavonoids, are influenced by the geographical environment, source of flower nectar, and the honey-making process (4).

Antioxidant Activity of Kratom Herbal Tea

Antioxidant activity is assessed by reacting with stable DPPH (2,2 Diphenyl-1-picrylhydrazyl) radical compounds at room temperature. The antioxidant capability of honey inhibits oxidation reactions caused by free radicals by donating hydrogen atoms to the unpaired DPPH radicals (7). The antioxidant activity of kratom herbal tea with the addition of various types of honey can be seen in Figure 3. Based on the data analysis, the different types of honey showed a significant effect ($p<0.05$) on the antioxidant activity of kratom herbal tea. The antioxidant activity values ranged from 17.9% to 80.1%, with the highest value in the Kapuas Hulu honey treatment at 80.1% and the lowest value without the addition of honey at 17.9%. The research results indicate that the variation in honey addition to kratom herbal tea significantly affects its ability to neutralize DPPH free radicals. Honey is a substance high in antioxidants, with flavonoid compounds playing a significant role in its antioxidant activity. Additionally, honey contains vitamin C compounds, which also contribute to its antioxidant activity.

Alkaloid Content of Kratom Herbal Tea

The total alkaloid content of herbal kratom tea can be seen in Figure 4, with the treatment without honey at 51.6%, honey from Kapuas Hulu at 55.4%, honey from Bangka Belitung at 53.1%, and honey from West Nusa Tenggara at 55.0%

The addition of various types of honey did not significantly affect the alkaloid content produced, as the total alkaloid content was likely consistent due to the kratom extract ratio in the formula, thus the effect of honey and lime did not influence the total alkaloid content produced. The phytochemical analysis of monofloral honey or forest honey from Apis dorsata bees, after testing the honey sample, showed no alkaloid content (20).

Sensory Characteristics of Herbal Kratom Tea

Color

The mean values of the panelists' preference for color show an average preference for the color of herbal kratom tea with the addition of Kapuas Hulu honey at 1.88, Bangka Belitung honey at 2.03, and West Nusa Tenggara honey at 2.08. The color value had no significant effect on herbal kratom tea. It is suspected that the panelists perceive all colors of herbal tea produced to be the same, despite having different honey treatments, compared to the initial honey ingredient, even though the honey variations have different colors. However, the production of herbal kratom tea does not result in different colors. The color compounds of kratom leaves come from alkaloid compounds that provide orange visual color, steroid compounds that show green or bluish color, and red color derived from quinone compound groups (14).

Aroma

The mean values of the panelists' preference for the aroma of herbal kratom tea can be seen in Table 6, showing the highest average preference for the aroma of West Nusa Tenggara honey at 2.28. The aroma value of honey significantly influences the resulting herbal kratom tea, as the aroma is caused by volatile organic compounds found in honey (15).

Taste

The mean values of the panelists' preference for the taste of herbal kratom tea show an average preference for the taste of Kapuas Hulu honey at 1.92, Bangka Belitung honey at 1.83, and West Nusa Tenggara honey at 2.25. (11) stated that the taste of a material or food product is influenced by several factors such as the interaction of various taste components, temperature, duration, and type of cooking. It is suspected that the sweet taste produced by the addition of various types of honey can neutralize the bitter taste of kratom.

Overall Preference

The mean values of the panelists' overall preference for herbal kratom tea show an average overall preference for herbal kratom tea with Kapuas Hulu honey at 1.88, Bangka Belitung honey at 1.93, and West Nusa Tenggara honey at 2.18. Overall preference results are also influenced by the panelists' assessment of the color, aroma, and taste of herbal kratom tea. Wardhani et al. (2020) stated that the level of consumer preference will affect the sensory evaluation of a sample. Overall, herbal kratom tea is acceptable to the panelists. This is in line with the opinion of (Kusumastuti et al., 2022) that the assessment of overall preference from panelists is used to determine the overall liking of each product or sample.

Determination of the Best Treatment with Effectiveness Index Test

Based on the physicochemical and sensory characteristics of kratom discussed above, the determination of the best treatment was done with the effectiveness index test, which showed the highest treatment value for herbal kratom tea with West Nusa Tenggara honey. The calculation results of the best treatment value (NP) in that treatment resulted in an average physicochemical test of 72.2% antioxidant, 10.9 mg/100g vitamin C, 20.2 mg QE/ml flavonoids, and 55.0% alkaloids. The best sensory test results are color 2.08, aroma 2.28, taste 2.25, and overall preference 2.18. Therefore, based on the hypothesis, the best treatment of West Nusa Tenggara Honey is accepted.

Conclusion

Herbal Kratom with various types of honey shows a significant effect on physicochemical and sensory properties. The best type of honey for herbal kratom tea is using West Nusa Tenggara Honey.

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Conflicts of Interest: The authors declare no conflict of interest.

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