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Antioxidant Activity In Pineapple Kombucha Tea (*Ananas comosus L. Merr.*)

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Abstract

Background of study: Pineapple (Ananas comosus L. Merr) is known for being rich in vitamin C, B1, B6, and folic acid, and it possesses strong antioxidant properties effective against free radicals, which can cause cellular damage and lead to degenerative diseases.
Aims and scope of paper: This study focuses on testing the antioxidant activity of made from pineapple kombucha extract
Methods: The research scope includes preparing pineapple samples and producing kombucha through a 14-day fermentation process. The antioxidant activity of the kombucha is then tested using the DPPH method, with the IC_{50} value serving as an indicator of antioxidant capacity
Result: A lower IC_{50} value corresponds to higher antioxidant activity, and it was found that pineapple kombucha exhibits stronger antioxidant activity (IC50 7.51 µg/ml) compared to regular kombucha (IC_{50} 39.46 µg/ml). This enhancement is due to the increased phenolic content and vitamin C during fermentation. The process of making pineapple kombucha involves boiling 2 liters of mineral water, adding 6 tea bags (10 grams) and 500 grams of sugar, then pouring the mixture into a growth jar. After cooling, 2 pieces of SCOBY are added, and the mixture is fermented for 14 days. Previous studies have demonstrated that regular kombucha tea has strong antioxidant activity with an IC_{50} value of 39.46 µg/ml. However, pineapple kombucha shows even higher antioxidant activity, with an IC_{50} value of 7.51 µg/ml.
Conclusion: This suggests that adding pineapple to kombucha not only enhances its flavor but also significantly increases its health benefits by boosting its antioxidant activity.

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INTRODUCTION

Fruits are food elements that must be available. Fruits make a significant contribution to humans, in the form of proteins, vitamins, and minerals. Fruits, such as guava, star fruit, papaya, pineapple, watermelon have large amounts of vitamins A and C. Pineapple is a popular fruit in Indonesia because it has characteristics in terms of aroma, taste, and color that are preferred by the public to consume (Bait et al., 2022).

The nutritional content contained in pineapple includes, vitamins B6, B1 and vit C as well as folic acid, the sugar content is quite high and has the ability to be the highest free radical anti-oxidant antioxidant. Free radicals are compounds or molecules with unpaired electrons consisting of at least one or more and as a result the molecule becomes very reactive in finding a partner, free radicals find a partner by binding electrons to the surrounding molecules. Free radicals can come from inside the body and outside the body. Free radicals in the body are the result of metabolic processes, while those from outside the body can be in the form of environmental factors, including pollution, smoking, radiation and the use of pesticides in food. Free radicals are involved in the aging process and the appearance of degenerative diseases such as diabetes mellitus, stroke, cardiovascular disease, cancer and blood vessels. Free radicals work by damaging important cells in the body, so

they need to be treated with the use of antioxidants (Rusli et al., 2023). Antioxidants function as an inhibitor of oxidation reactions and cannot completely stop the oxidation process in fats so that at the end of the process of serenity will always occur. The mechanism of action of antioxidants in general is to inhibit the oxidation of fats.

Pineapple fruit belongs to the genus Ananas and has the Latin name Ananas comosus (L) Merr. The types of pineapples that are widely grown in Indonesia are Queen and Cayene pineapples. Honey pineapple is a type of Queen pineapple because of its small fruit, sweet taste, fragrant aroma, and has a reddish-brown yellow skin. Pineapple has a unique and fresh sweet taste, so it is widely consumed in the form of fresh fruit, fruit juice, and canned fruits. The main aroma components of pineapple fruit are terpenes, ketones, aldehydes, and esters. 10 grams of pineapple contains 52.0 kcal; 13.7 grams of carbohydrates; 0.54 grams of protein; 130 I.U vitamin A; 24 mg vitamin C; and 150 mg of potassium. 100 grams of pineapple can meet 16.2% of vitamin C needs. Vitamin C as an antioxidant helps prevent atherosclerosis through the mechanism of preventing LDL oxidation and ROS production. This mechanism is derived from the ability of vitamin C to protect the endothelium by increasing NO synthase (Chauliyah & Murbawani, 2015).

METHOD

This research will be carried out in May – August in 2024. This research is experimental with the aim of testing antioxidants in pineapples. Starting from the preparation of tools and materials, sample preparation, and antioxidant activity tests using the DPPH (2,2-Diphenyl-1-picrylhydrazyl method).

Tools and Materials

The tools that will be used in this study are UV-Vis spectrophotometer (Shimadzu UV-1800®), stoves, stainless steel pans, digital scales, cover cloths, glass jars, bottles, measuring cups, measuring flasks, volume pipettes, vials, adhesive rubber. The ingredients used include: black tea (sariwangi), pineapple, scoby, aquades, sugar, DPPH (2,2-Diphenyl-1picrylhydrazyl), vitamin c.

Sample Collection and Preparation

Sampling was carried out in the Tangkit Muaro Jambi area, the sample taken was fresh pineapple. The pineapple is peeled by separating the skin from the contents, then washed with running water, which is clean, 500 gr is taken and then cut into small pieces. Then cooled. Then put it in a jar containing kombucha tea and fermented for 3-5 days (Afgani et al., 2022).

Kombucha Tea Making

Boil 2 liters of mineral water, then after the fire is turned off, 6 bags of tea bags (10 grams) are added, and 500 grams of sugar. Then put in a growth jar. Once cooled, 2 pieces of SCOBY. Then fermentation is carried out for 14 days. After that, antioxidant activity was analyzed. The antioxidant test procedure (IC_{50}) uses the DPPH method . Antioxidant activity testing a manufacture of pineapple fruit kombucha test solution a total of 2 ml of pineapple kombucha is put in a measuring gourd and then added with 3.8 ml of DPPH (2,2-diphenyl-1-1 pykrilhydryl) (Yuningtyas et al., 2021).

Antioxidant Activity

The test was carried out by pipetting 0.5 ml of ascorbic acid solution from various concentrations (2ppm, 4 ppm, 6 ppm, 8 ppm and 10 ppm). Then each of them is added 3.5 ml of DPPH in a vial and then shaken. Let it sit for 30 minutes in a dark room. Then the absorbance was measured at a wavelength of 517 nm using a UV-Vis spectrophotometer (Handayani et al., 2014). A 100 ppm solution of vitamin C raw solution was sprayed into a 100 mL measuring flask that had been wrapped in aluminum foil of 2 mL, 4 mL, 6 mL, 8 mL, and 10 mL, respectively. A total of 5 grams of pineapple kombucha are put into a pumpkin and then diluted with aqueducts up to 100 ml. The diluted kombucha sample is then taken as much as 25 mL and put into the erlenmeyer. Next, the sample was added to 2 mL of 1% amylum indicator and then titrated with iodine 0.01 N until it was blue. The calculation of vitamin C content uses the following formula (Dewi, 2018).

A 100 ppm DPPH solution is made by weighing 10 mg of DPPH dissolved with 100 ml of 96% ethanol in a measuring flask to the limit mark (Sibarani et al., 2020). The test was carried out by mipetating 0.5 ml of sample solution from various concentrations (10 ppm, 20 ppm, 30 ppm, 40 ppm, and 50 ppm). Then 3.5 ml of DPPH was added to each vial and then shaken, then its absorbance was measured at a wavelength of 517 nm using a UV-Vis spectrophotometer (Handayani et al., 2014). A total of 3.8 ml of DPPH solution 20µg/ml and added with 0.2 ml of ethanol in a test tube. After that, leave it for 30 minutes in a dark place. The absorption of the solution is measured with a UVVis spectrophotometer at a wavelength of 400-600 nm. Determine the maximum (Kusuma & Yolanda, 2022). The test was carried out by pipetting 0.5 ml of sample solution from various concentrations (2 ppm, 4 ppm, 6 ppm, 8 ppm, and 10 ppm). Then 3.8 ml of DPPH was added to each vial and then shaked, then its absorbance was measured at a wavelength of 517 nm using a UV-Vis spectrophotometer (Handayani et al., 2014).

RESULTS AND DISCUSSION

In research that has been carried out on the fermentation process, kombucha tea produces products with distinctive characteristics, such as brownish color, kombucha's distinctive aroma, and slightly sour taste. This is in accordance with previous research where the characteristics of khombucha are that they have a color that ranges from golden yellow to dark brown, then have a distinctive and slightly sharp aroma, with a slightly sour and fresh taste (Lestari & Sa'diyah, 2020). The acidity level of fermented kombucha tea can be derived from acetic acid and lactic acid produced during fermentation (Wang et al., 2025).

Table 1. IC50 value

Sample	**IC50 value (µg/ml)**	**Intensity**
Ascorbic Acid	6,83	Very Powerful
Kombucha Tea	39,46	Very Powerful
Pineapple Fruit Kombucha Tea	7,51	Very Powerful

Meanwhile, the modification of kombucha tea is by adding pineapple to the fermentation process. As a result, pineapple fruit kombucha tea has different characteristics, with a yellowish color, pineapple aroma, and a more acidic taste. The more dominant sour taste in pineapple kombucha tea is due to the high levels of organic acids, such as citric acid, which are contained in pineapple and produced during the fermentation process. The addition of fruit in the fermentation process has also been studied before, where other fruits such as mangosteen peel experience a change in color to brownish-red but after the fermentation process changes color to a slightly yellow color, and has a real influence on the sweet and sour taste (Mukti, 2023). This shows that the addition of fruit in kombucha fermentation is an effective method to produce a variety of products with unique and distinct characteristics. Antioxidant activity can be seen from the IC50 value. The value of IC50 is a number that indicates the ability to inhibit the oxidation process by 50%. The smaller the IC50 value, the higher the antioxidant activity. The fermentation time will affect the IC50 value. The longer the fermentation, the higher the IC50 value, which means that the ability of antioxidant activity decreases (Firdaus et al., 2020).

Meanwhile, in the research that has been carried out, it is known that bawhea in kombucha tea also shows strong antioxidant activity with an IC50 value of 39.46 µg/ml. However, pineapple fruit kombucha tea showed higher antioxidant activity than regular kombucha tea, with an IC50 value of 7.51 µg/ml. This suggests that the addition of pineapple fruit to kombucha tea may increase the antioxidant activity of the drink. This is due to the higher content of phenolic compounds and vitamin C in pineapples. During the fermentation process, these compounds may increase or undergo changes that increase the antioxidant activity of pineapple fruit kombucha tea. Phenolic compounds work as antioxidants by preventing the formation of new free radicals, namely they can convert existing free radicals into molecules that do not have a negative impact, act as free radical catchers, and prevent chain reactions (Indriyah et al., 2023).

Studies that have been conducted show that kombucha tea, especially with the addition of pineapple, has the potential to be a drink with strong antioxidant activity, so it is beneficial to fight free radicals in the body. By utilizing a natural fermentation process that involves the symbiosis of bacteria and yeast. Kombucha tea can enrich the content of beneficial active compounds, including organic acids, enzymes, polyphenols, and probiotics (Selvaraj & Gurumurthy, 2023). So that the addition of pineapple not only provides a variety of flavors and aromas to kombucha tea but also increases the functional value of the drink.

CONCLUSION

Making kombucha tea combined with pineapple can be done by putting the cut pineapple in the finished kombucha tea, then fermented again for 7 days. Pineapple fruit kombucha tea shows very high antioxidant activity, with a higher IC value of 50 than kombucha tea not combined with pineapple fruit. This suggests that the addition of pineapple fruit to kombucha tea may increase antioxidant activity.

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AUTHOR CONTRIBUTION STATEMENT

Mukhlis Sanuddin conducted a research design and calculation of antioxidant activity. Okie Febrian Syahviqra conducts fermentation treatment on samples and makes kombucha.

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