Characteristics of tea bags from keji beling (Strobilanthes crispus Bi) and lemongrass (Cymbopogon nardus. L) leaves

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Abstract. Drinking tea is one thing that to do when visiting a place. The antioxidant content of the keji beling and lemon grass has the potential to be developed into a tea drink in the form of a practical bag. The purpose of this study was to know the characteristics of tea bags product from the formulation of keji beling leaves and lemongrass, as well as to increase the antioxidant levels of tea bags commonly consumed by the public. This study consisted of 2 step, namely drying the raw materials and making tea bags. Using 2 factors with factorial Completely Randomized Design (CRD). The results of steeping tea bags were then analysed for antioxidant levels and colour (*Hue). The data obtained shows that the addition of lemongrass can increase antioxidant levels in tea. The more lemongrass that is added, the higher the value of the resulting Ic50. And has a colour scale with the yellow red group. The best way to brew tea bag from a mixture of vile leaf and lemon grass based on antioxidant content and colour value *Hue is brewed. Based on this research, a quality standard is needed to be a reference for further research.

1. Introduction

Drinking tea is considered as one of the things to do especially when visiting a place. Tea is a popular drink because of its fresh taste. Tea is divided into 2 groups, namely herbal teas and non-herbal teas. Non-herbal tea is a type of drink that comes from tea leaves, while herbal tea is tea that comes from fruit, spices or other plant parts. Tea is a type of beverage that is often drunk hot, warm or cold. Tea is classified as a functional drink. This is because tea contains antioxidants that are nutritious for health [1]. Currently more and more diseases are caused by the presence of free radicals, and antioxidants are compounds that can inhibit free radicals. Therefore, it is very necessary a functional tea formulation from ingredients rich in antioxidants. Bag tea is a very practical form of tea. Tea bags are packaged in bags and have been widely circulating in the market. This tea bag is also a form of tea preparation that is very popular with the community compared to the solid form of tea for brewing and tea that is packaged in bottles [2].

Herbal tea as a drink that comes from herbal plants and is considered to treat various diseases and gives a fresh taste when consumed. One of the herbal plants that can be used as tea is keji beling (Strobilanthes crispus BI) [3]. Keji beling (Strobilanthes crispus BI) has a weak odour and a slightly chelish taste, contains compounds such as sodium, potassium, calcium, silicic acid, saponins, alkaloids, flavonoids and polyphenols which have potential as antioxidants. So that this plant is also considered to be a drug to inhibit the growth of cancer cells [4]. Keji beling with its benefits is suitable as a raw
material for making tea bags. According to (the MGMP team) in the book Pharmacognosy Volume II, the vile leaf has a weak odour, and tastes a bit tart and bitter [5].

Lemongrass (Cymbopogon nardus) is a traditional plant that is easy to obtain, cheap and generally can be made by yourself for consumption. These plants generally have medicinal properties because of their high antioxidant content [6]. Lemongrass contains essential oils so it has a strong aroma. The smell of fragrant lemongrass is due to the content of geraniol, citronellal and citronellol compounds which are the value of lemongrass oil when compared to other essential oils [7]. The use of lemongrass into a new product is important for food diversification. The content of substances in lemongrass is useful in treating infections of the stomach, intestines, urinary tract, wounds and various other diseases [8].

The purpose of this study was to know the characteristics of tea bags produced from the formulation of keji beling leaves with fragrant lemongrass, as well as to increase the antioxidant levels of tea bags commonly consumed by the public.

2. Materials and methods

The materials used in this research are keji beling leaves and lemon grass. This study consisted of 2 stages, namely drying the raw materials and making tea bags. The first stage is the keji beling and lemon grass leaves sorted and washed, then dried in the keji beling at 60°C for 12 hours and lemongrass at 80°C for 6 hours. The second stage of making tea bags with the ratio of keji beling and lemon grass P1 (100%: 0%), P2 (90%: 10%), P3 (80%: 20%), P4 (70%: 30%), P5 (60%: 40%), P6 (50%: 50%) into a tea bag weighing 2.5 g per bag. This study used a factorial Completely Randomized Design (CRD) consisting of 2 factors. The results of steeping tea bags were then analysed for antioxidant levels and colour (Hue).

The first factor is the ratio (P) of the keji beling and lemongrass which is divided into 6 levels P1 (100%: 0%), P2 (90%: 10%), P3 (80%: 20%), P4 (70%: 30%), P5 (60%: 40%) and P6 (50%: 50%). The second factor is the serving method (G) of the formulation of keji beling leaves and lemongrass which consists of 2 levels of G1 (brewed) and G2 (boiled). For accuracy, it was repeated 3 times, so that the total sample size was 36.

2.1. Antioxidants

Antioxidant content was analysed with DPPH solution, namely prepared five test tubes containing 1 ml of extract in methanol with varying concentrations (tube A), five tubes containing 1 ml of extract in methanol with varying concentrations (tube B). The variation of the extract concentration in tubes A and B was 50; 100; 150; 200 and 250 ppm for crude extract and ethyl acetate fraction, while the concentration was 100; 250; 500; 750 and 1000 ppm for the n-hexane fraction. Then the fifth tube A was added with 1 ml of methanol and tube B was added with 1 ml of DPPH [9].

Then all tube A and tube B were vortexed and incubated in an incubator at 37oC for 30 minutes and measured using a spectrophotometer but previously performed an optimization of the tool to find the wavelength (λ) with the maximum absorbance. Repeat the above procedure by replacing the extract with vitamin c, where the concentration of vitamin c was 1.5; 2; 2.5; 3 and 3.5 ppm. Prepared a tube containing 1 ml of methanol as negative control (tube C) and measured immediately after adding 1 ml of DPPH. Repeat the above steps three times and the percentage of DPPH reduction is calculated using the formula:

\[
\% AA = \frac{100 - (AB - AA)}{AKN} \times 100
\]

Information:

% AA = Percentage of antioxidant activity
AA = Absorbance blank (contains 1 ml of extract in methanol + 1 ml of methanol)
AB = Absorbance of sample (contains 1 ml extract in methanol + 1 ml DPPH)
AKN = Absorbance of negative control (contains 1 ml methanol + 1 ml DPPH)
2.2. Colour

Colour analysis is done by taking a picture of a tea sample and then applying it to the Adobe Photoshop computer software. The value and colour can be seen through the hue (L, a, b values) that are stored in the software. Determination by moving the eyedropper tool to determine the point, and the hue value will come out on the foreground colour set [10].

\[
\text{Hue} = \tan \frac{b}{a}
\]

If the results are obtained [11]

- 18° - 54° then the product is red (R)
- 54° - 90°, the product is yellow red (YR)
- 90° - 126°, the product is yellow (Y)
- 126° - 162°, the product is yellow green (YG)
- 162° - 198° then the product is green (G)
- 198° - 234°, the product is blue green (BG)
- 234° - 270° then the product is blue (B)
- 270° - 306°, the product is blue purple (BP)
- 306° - 342° then the product is purple (P)
- 342° - 18°, the product is red purple (RP)

3. Results and discussion

3.1 Antioxidants

From the analysis, it was found that the comparison of the keji beling and lemon grass had a very significant effect (P <0.01) on the antioxidant content of tea bags. The comparison of the vicious interaction of glass and lemongrass and the way of serving it can be seen in Figure 1.

![Figure 1](image_url)

**Figure 1.** The relationship between the comparison of the viciousness of keji beling and lemon grass
Figure 2. The relationship between the serving method with the antioxidant content of tea bags

In the diagram above, it can be seen that the addition of lemongrass can increase antioxidant levels in tea. The more lemongrass that is added, the higher the value of the resulting Ic50. This is due to the high content of antioxidants in lemongrass. According to previous research, it was found that the keji beling extract had moderate antioxidants [12]. Meanwhile, according to previous studies, lemongrass has a strong antioxidant content [13]. It can also be seen that the way it is served by boiled reduces the antioxidant content in the tea bag. This is due to the high temperature heating process. Antioxidants are sensitive to thermal processes and high temperature cooking can reduce their antioxidative properties and damage the chemical structure of the compounds that compose them [14].

3.2. Colour

From the analysis, it was found that the ruthless comparison of keji beling and lemongrass serving method had a very significant effect (P < 0.01) on the colour value of tea bags. The interaction between the two has a very significant effect on the colour of tea bags. The comparison of the vicious interaction of glass and lemongrass and the way of serving it can be seen in Figure 2.

Figure 3. The relationship between the vicious comparison of keji beling and lemon grass
Figure 4. The relationship between the serving method with the colour value of tea bags

Based on the data above, it can be seen that lemongrass has an effect on the colour of the tea produced and the way it is served by boiling has a lower "Hue value than brewed. The data above shows the numbers in the range 55-80 which means it is included in the yellow red colour group. The "Hue value is the dominant wavelength in determining the colour direction of a material or product. Previous research explained that the smaller the hue value indicated that the colour of the lotus flower tea was getting red [13]. Due to the high temperature heating process of tea products, the steeping results are more concentrated. The longer the heating process, the more brownish the colour will be. These changes are due to the degradation of chlorophyll [14].

4. Conclusions and suggestions
Based on the research conducted, it can be concluded that the addition of lemongrass fragrance has an effect on increasing antioxidant levels and colour value in tea products. The best way to serve it based on antioxidant content and "Hue value is brewed.

After conducting this research, the authors suggest the need to establish quality standards for herbal teas in general. So that the tests carried out can refer to these quality standards.

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