Paper 1

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EXTENDED ABSTRACT

Antioxidant Activity in Ready-to-Drink Beverage Made from Snake Fruit (*Salacca edulis Reinw*) Enriched with Butterfly Pea (*Clitoria ternatea*) and Roselle (*Hibiscus sabdariffa*) Flower Extracts

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SUMMARY

This research aimed to develop an antioxidant-rich ready-to-drink beverage made from snake fruit and to observe the effect of addition of butterfly pea and roselle flower extracts on the antioxidant activity of snake fruit juice. Snake fruit juice was prepared by boiling sliced snake fruit in water for 15 minutes. Dried flowers were added to snake fruit extract at 90oC then the extract was cooled and filtered. The addition of butterfly pea flowers did not increase pH, the amount of vitamin C, phenolic compounds and antioxidant activity of snake fruit juice, while roselle flowers decreased pH and increased vitamin C, phenolic compounds and antioxidant activity.

Keywords: Antioxidant activity, *Clitoria ternatea*, Healthy drink, Hibiscus sabdarifa, Snake fruit

INTRODUCTION

Snake fruit is rich in vitamins, minerals, dietary fiber, and bioactive compounds with antioxidant activities. Snake fruit also has high dissolved solids so it can be extracted and processed into a ready-to-drink beverage. Nevertheless, the snake fruit juice's color looks less attractive. On the other hand, butterfly pea and roselle flowers are potential sources of natural colorant. Butterfly pea flower had blue gradation color and roselle flower had red gradation color. Both butterfly pea and roselle flower are also rich in antioxidant. Bioactive compounds that have been extracted from butterfly pea flowers were triterpenoids, phenolic acids, flavonoids, anthocyanins and steroids (1). Bioactive compounds in roselle flower were phenolic acids, flavonoids, and anthocyanidin (2). This study aimed to develop an antioxidant-rich ready-to-drink beverage made from snake fruit and to observe the effect of addition of butterfly pea and roselle flowers on the antioxidant activity of snake fruit juice.

MATERIALS AND METHODS

Snake fruit var "pondoh" was obtained from Sleman, Yogyakarta; table sugar, dried butterfly pea flower (BPF) and roselle flower (RF) were obtained from local market. Snake fruit juice was prepared by boiling sliced snake fruit in boiling water (30% w/v). Boiling process lasted for 15 minutes. The additions of BPF were 0.25% and 0.50% and RF were 0.75% and 1.00% w/v, as it is the most attractive color according to consumers' preferences in the preliminary study. Dried flowers were added to snake fruit extract while it was still hot (± 90oC), then it was cooled and filtered to separate the flowers residue and obtained clear snake fruit juice. Vitamin C was measured by 2.6 dichlorophenol titration method. Total phenolic compound was measured by Folin-Ciocalteu method using gallic acid as a standard. Antioxidant activity (AA) was measured by DPPH (2,2'-Diphenyl-1-Picrylhydrazyl) radical scavenging activity. pH was measured using pH meter. The data were analyzed by analysis of variance (ANOVA), followed by the LSD test at $p < 0.05$.

RESULTS AND DISCUSSION

Vitamin C acted as a cofactor and reducing agent of various enzymatic reactions. Because of its low oxidation-reduction potential, vitamin C can react with almost all oxidized free radicals. Vitamin C in fresh roselle flowers was 14 mg/100 g, while in dried roselle it was 60-280 mg/100 g (3). Thus, it was reasonable that there was an increase in vitamin C with the addition of dry roselle flowers. To the best of our knowledge, there is no data reported on the quantity of vitamin C in butterfly pea flowers (Figure 1).

Bioactive compounds with antioxidant activity that have been extracted from BPF were triterpenoids, phenolic acids, flavonoids, anthocyanins and steroids

Figure 1: Vitamin C of ready-to-drink beverage from snake fruit with or without addition of BPF and RF. Values are means ± SD (n=3). Bars with the same letters are not significantly different (p>0.05)

(1). RF extract contained phenolic compounds, caffeine, quercetin, hesperidin and hesperetin (4). This study showed that addition of 1% roselle flower increased phenolic compounds effectively in snake fruit juice (Figure 2).

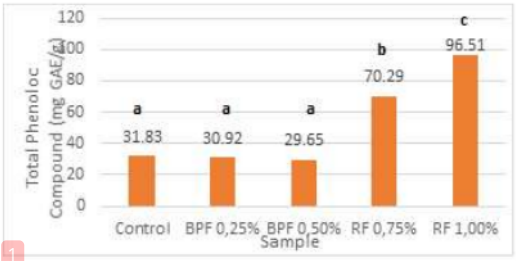

Figure 2: Total phenolic compounds of ready-to-drink beverage from snake fruit with or without addition of BPF and RF. Values are means ± SD (n=3). Bars with the same letters are not significantly different (p>0.05)

The addition of 0.5% butterfly pea flowers and 0.75% roselle flowers resulted in an antioxidant activity similar to BHT (butylated hydroxy Toluene), a synthetic antioxidant compound that was widely used in processed foods to prevent oxidation. The addition of 1% roselle flowers resulted in 33% higher antioxidant activity than BHT. The increase in antioxidant activity was possibly due to an increase in vitamin C and phenolic compounds from roselle flower (Figure 3).

The pH of control snake fruit juice and those added with butterfly pea flowers ranged from 5.5 to 5.6, while those added with roselle flower decreased to 3.8-3.9 (significantly different, p<0.05). Snake fruit juice with roselle flower met the pH standard as stipulated in Indonesian National Standard on fruit juice which was 2.9-4. pH adjustment was required for control and fruit juice with BP flowers to comply with the standard. The high acidity of snake fruit juice with roselle flowers addition might be caused by the large number of organic acid compounds contained in rosella flowers (5). Sensory evaluation by 44 panelists showed that

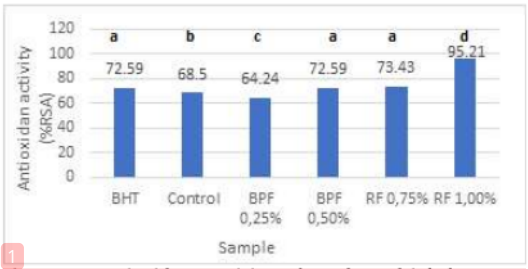

Figure 3: Antioxidant activity of ready-to-drink beverage from snake fruit with or without addition of BPF and RF. Values are means ± SD (n=3). Bars with the same letters are not significantly different (p>0.05)

snake fruit juice with 0.25% butterfly pea and roselle flower had higher preference scores for appearance than the control sample, due to more attractive color (significantly different, p<0.05).

CONCLUSION

The antioxidant-rich ready-to-drink beverage from snake fruit has been successfully developed. Addition of butterfly pea flowers did not increase pH, the amount of vitamin C, phenolic compounds and antioxidant activity of snake fruit juice, while roselle flowers decreased pH and increased vitamin C, phenolic compounds and antioxidant activity.

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