ANTIOXIDANT ACTIVITY OF HARD CANDY PRODUCED USING GARCINIA MANGOSTANA PERICARP

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Abstract: Most hard candy are empty-calories with nearly 100% sugar by weight. Consumed too much of it can be bad for health. One of the fruits that rich in antioxidant is *Garcinia mangostana*. Looking to its health potential, a study was conducted to produce a nutritive hard candy by using waste of *Garcinia mangostana* pericarp and honey to replace the function of sugar in making hard candy. The objective of this study is to determine the antioxidant activity in hard candy made of *Garcinia mangostana* pericarp using DPPH Radical Scavenging Activity following International Food Research Journal test method. Result indicated presence of antioxidant activity value at 14.31% in one solid sample of the hard candy. In conclusion, hard candy made from *Garcinia Mangostana* pericarp contains antioxidant and can be a nutritive snacking choice for consumer.

Keywords: *antioxidant activity, empty-calorie, nutritive*

1. Introduction

The majority of hard candies contain over 100 percent sugar. Syrups of sucrose, glucose, fructose, or other sugars may be used in recipes for hard candy (Advameg, 2007). So researchers came up with the notion to make a healthier, more nutritional hard candy. By combining it with the hard candy, we fully utilize the nutrients included in the pericarp of *Garcinia mangostana*. Lollipops were selected by researchers as the hard candy category because they are among the most well-liked by consumers. Southeast Asia is the home of the *Garcinia mangostana*, also referred to as mangosteen. *Garcinia mangostana* has been produced in numerous nations since the dawn of time because of its juiciness, delicate texture, and somewhat sweet and sour flavour (Ho Dinh Hai, 2016). While the durian has been referred to as the "King of Fruits," *Garcinia mangostana* is not merely an ordinary fruit. When rumours circulated in the 1890s that Queen Victoria would knight anyone who brought her fruits, the phrase "Queen of fruits" was coined (Stone, 2016). The *Garcinia mangostana* fruit is highly prized for its strong antioxidant contents, in addition to its royal heritage. *Garcinia mangostana* juice is quite popular, and the fruit's much-touted health advantages are due to the type of antioxidant present, particularly in the pericarp. These anti-oxidants are classified as biologically active and abundant xanthones (Chester, 2018).

According to phytochemical studies, the pericarp of the mangosteen has the most potent amounts of xanthones, flavonoids, saponins, and tannin. Pharmacological actions of xanthones, such as antibacterial, antifungal, and anti-inflammatory ones, have been identified. Mice have been shown to be unaffected by xanthones from the mangosteen pericarp when given 100 mg/kg of body weight orally every day for seven days. However, Kaomongkolgit also discovered throughout his investigation that alpha-mangostin was not harmful to human gingival fibroblasts for 480 minutes at certain concentrations (Puteri et. al., 2019). Foods that are abundant in calories but lacking in nutrients are considered junk food (Merriam, 2015). If ingested in excess, it can lead to a variety of diseases. For instance, eating foods devoid of fibre and nutrients required to effectively digest carbohydrates, such as white flour and processed sugars found in soft drinks, will raise your insulin levels (Roizman, 2015). Typically, junk food vendors focus mostly on children. Children's food preferences, purchasing behaviour, and general dietary behaviour have all been found to be influenced by food advertising and other forms of marketing (WHO, 2014). Because of this, researchers developed this hard candy with healthy natural ingredients.

As is common knowledge, eating foods high in antioxidants is beneficial to our health. *Garcinia mangostana* is one of the fruits that is high in antioxidants. Most of the time, people merely consume the fruit and discard the pericarps. Fruit peels are the primary production waste in the food business when using fruits as a raw material for products such fruit juices, concentrated jams, and dried fruits (Ibrahim, 2017). Not only do we waste food, but we also waste natural sources of nutrients like antioxidants that are good for our health. In order to fully utilize the nutrition in the *Garcinia mangostana* pericarp, researchers decided to produce hard candy utilizing the pericarp. Additionally, researchers intend to create nutritive hard candy as an alternative for kids or adults who ate unhealthy food with good nutritional value.

2. Materials and Methods

2.1 Plant material

The main material used in this study was the pericarp of *Garcinia mangostana* which was obtained from the local market area in Merlimau, Malacca Malaysia. The pericarp was extracted by using slow extraction method.

2.2 Formulation of lip balm

The mangosteen fruit needs to be removed and washed first. A slow extraction procedure was used to obtain the extract of the mangosteen pericarp. The lollipop mould was made of silicone. Stevia, pure honey, and water were mixed in a saucepan according to the recipe in Table 1. Butter vanilla was then added after all ingredients had been thoroughly combined. The mixture was brought to a double boiled for 5–7 minutes until the thermometer read 375°F/200°C (hard-crack stage). Turn off the heat when the mixture reaches the hard crack stage and the mangosteen pericarp extract was added. The liquid mixture was poured immediately into the silicone lollipop mould. The lollipop sticks was inserted right away. The lollipops were let to cool completely and firm before carefully removing them from the mould. Figure 1 showed

processing steps in making the hard candy while Figure 2 showed the final product of hard candy made from *Garcinia mangostana* pericarp.

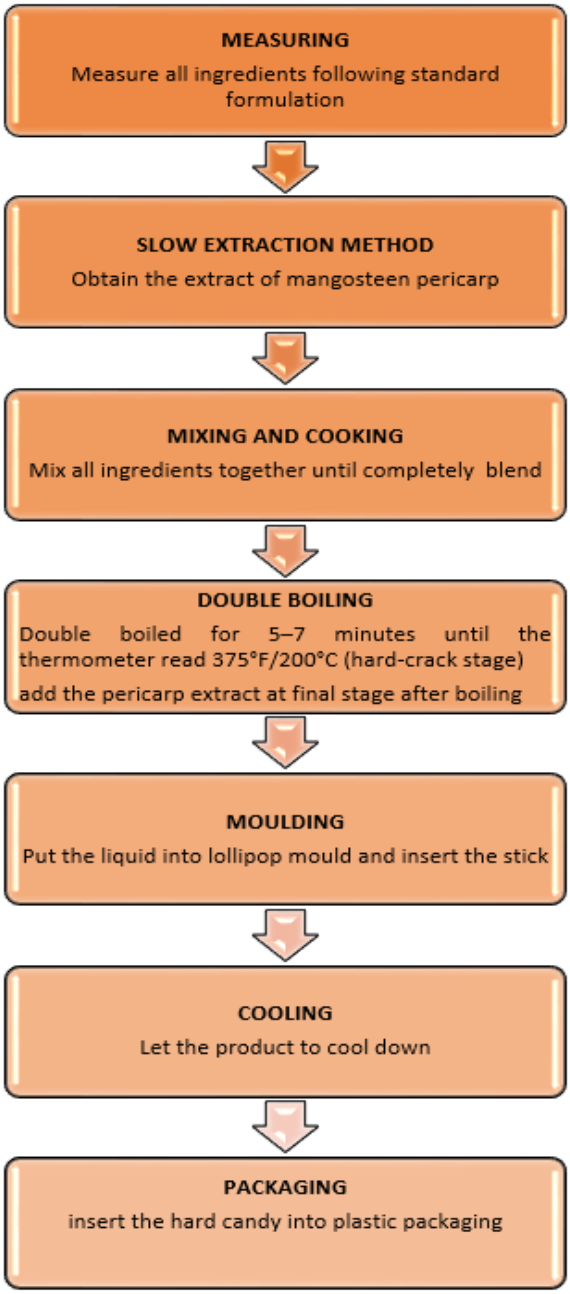

Figure 1: Process flowchart for making hard candy made of *Garcinia mangostana*

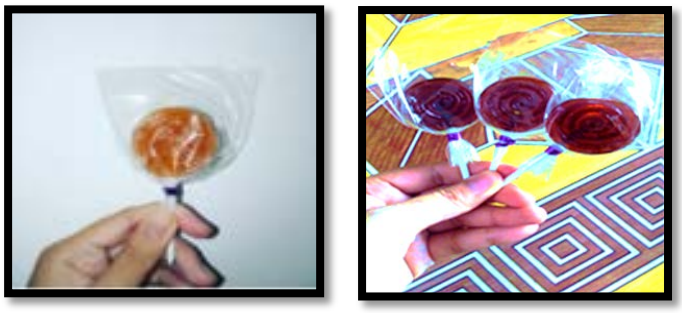

Figure 2: Final look of hard candy made of *Garcinia mangostana*

Table 1: Standard formulation of hard candy made of *Garcinia mangostana*

Ingredients	Quantity (gram)
Mangosteen pericarp extract	10 g
Stevia	31 g
Water	57 g
Pure honey	100 g
Butter vanilla	2 g
Total (g)	200 g

2.3 Evaluation of hard candy

Antioxidant properties were determined through an in-house method based on International Food Research Journal.

3. Results

Antioxidant properties of the hard candy made of *Garcinia mangostan* were determined through an in-house method based on International Food Research Journal. This method refers to the determination of antioxidant activity in foods and beverages by reaction with 2,2' – diphenyl-1-picrylhydrazyl (DPPH Radical Scavenging Activity): collaborative study first action 2012.04 (Plank et al., 2012). Result indicated presence of antioxidant activity value at 14.31% in one solid sample of the hard candy.

Table 2: Result of antioxidant activity

Test Parameter	Unit	Test Method	Result	Limit
Antioxidant activity (DPPH Radical Scavenging Activity)	%	International Food Research Journal	14.31	N/A

4. Discussion

The special antioxidant profile of mangosteen is arguably one of its most important qualities. Compounds known as antioxidants can counteract the negative effects of potentially dangerous molecules known as free radicals, which are associated with a number of chronic disorders (Pham-Huy et al., 2008). Vitamin C and folate are two minerals found in mangosteen that have antioxidant properties. Though their clinical anticancer potential has not yet been tested, mangosteen products seem safe and have been well tolerated in human clinical trials where they exhibit antioxidant activity (Nauman et al., 2022). Therefore, researchers think that this hard candy made from *Garcinia mangostana* pericarp has a great potential to be marketed as nutritive hard candy because the test results for the sample showed presence of antioxidant activity of 14.31 percent. Other than that, the pleasant aroma of butter vanilla and distinctive flavour of the *Garcinia mangostana* pericarp extract, together with the goal of appealing to the kid's market, make this lollipop primarily appropriate for those who prefer hard candy that is not overly sweet. Moreover, it has been found that *Garcinia mangostana* pericarp extract, either alone or in combination with other leave extract, have the potential to be utilized as antibacterial and antifungal agents (Pasaribu et al., 2021). An antibacterial agent is a substance that has the ability to either kill or inhibit the growth of bacteria (Parham et al.,2020). As a result, using the pericarp of mangosteen as the major ingredient can serve as a natural preservative for the hard candy. This innovation will also assist to prevent environmental pollution, thereby fully using the antioxidant compound existence, given that these residues of mangosteen pericarp are one of the ideal sources of antioxidants and dietary fiber.

5. Conclusion

A remarkable consistency of product is produced by combining ingredients like pure honey, stevia, and butter vanilla. Due to the enhanced antioxidant capabilities from the mangosteen pericarp, this formulation would increase consumer acceptance because it would give the candy improved characteristics in term of nutrient.

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