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Characterization of Gum from Durian Seed and Application in Ice Cream

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The objectives of the research were to characterize gum from durian seed and application in icecream. The gum extraction from durian seed was carried out using acetic acid and dried by hot air oven. The yield of durian seed gum extraction was 8.24%. Gum from durian seed contained moisture content of 8.29%, ash 5.86%, water absorption index 1.26% and water solubility index 68.78%. The color value L*(lightness) a*(redness) b*(yellowness) was investigated. The results show that L* a* b* was 54.01, 8.70 and 22.35, respectively. The effect of durian seed gum in sherbet icecream on total soluble solid, overrun and meltdown were studied. The results indicated that the durian seed gum was added the total soluble solid and overrun were increased but meltdown was decreased. Gum from durian seed can be used in food product and value-added utilization of waste.

Keywords: gum, durian seed, ice cream

Introduction

Durian is one of the main economic fruit crop in Thailand, were popular fruit comsumption in both domestic and foreign. At present, farmers can develop to produced almost all the year round and it can be consumed fresh fruit or processed into many product such as preserved durian, chips dried durian and frozen durian. The wastes generate after human consumption or processing were durian peels (about 75%) and seeds (20-25%). In previous studies revealed that durian seed has a high nutritional and dietary fiber content, and can production of flour for produced many products such as cake, cookies, soup, and sauce by replacement of wheat flour or used as thickening agents. In addition, durian seed contains gum which has thickener, gelling agent, improving the texture and stabilizer, and improve several aspects of food quality such as stability, texture and appearance. For icecream, stabilizer which helps keep ice cream smooth and decreased or slow the growth of ice crystals during storage for sale, and consequently, homogeneous products and increased

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melting resistance of ice cream. The substances used to stabilize ice cream such as gelatin, gum arabic, pectin, locust bean gum and guar gum etc., often these imported from abroad. Therefore, the used gum from durian seed for application in icecream by used as stabilizer, consequently, an alternative to take advantage of their waste, reduced environment problem and help reduction imported other stabilizer used in icrecream.

Objectives: to studies characterize gum from durian seed and application in icecream.

Materials and methods

Preparation of durian seeds

The durian seed was preparated according to the method described by Noo-sing and Sompongse (2015), with the minor modifications. Briefly, durian seeds were washed, peeled and chopped white flesh into small pieces. Then drying by hot air oven at 50 °C for 18 h. After drying, cooling, milling through 35 mesh sieve. To obtained powder for extraction.

Extraction of durian seed gum

The durian seed gum was performed according to the method described by Mirhosseini *et al.* (2013). Cold extraction was used to extract the hydrophobic lipid fraction from durian seed flour in order to avoid thermal degradation of the gum structure. The process was carried out successively using hexane and isopropanol (60:40) at ambient temperature, and the solvent residue was removed by using centrifuge at 3,000 rpm for 15 min. The seed flour was soaked in 1% aqueous acetic acid for 1.5 h at ambient temperature. Subsequently, the slurry was filterd by using a cloth filter and the filtrate was precipitated with 95% ethanol. The precipitated slurry was washed three times using absolute ethanol. Soaking, washing and precipitation processes using acetic acid and ethanol led to achieve light brown amorphous crude gum. The crude gum was collects and oven dried at 40°C.

Characterization of durian seed gum

The extraction yield of gum from durian seed was measured by weighing powder from durian seed, then calculated percentage yield of gum following equation:

$$\%\text{Yield} = \frac{\text{durian seed gum (g)}}{\text{durian seed powder (g)}} \times 100$$

The moisture and ash content were performed according to AOAC (2000)

Water absorption index was determined by prepration of 2.5% of gum solution (w/v). The resulting solution is stirred for 2 min and centrifugation of a solution at 5,000 rpm at 25 °C for 30 min. Then, collect supernatant and weighing. The water absorption index was expressed of proportion of water absorbed per durian seed gum.

Water solubility index was determined by prepration of 0.5% of gum solution (w/v). The resulting solution is stirred for 30 min and centrifugation of a solution at 7,000 rpm at 25 °C for 30 min for remove insoluble. Then, collect supernatant and drying at 150 °C for 24 h and calculated final concentration in total soluble solid form by following equation:

$$\text{Water solubility index} = \frac{\text{concentrations of supernatant}}{\text{initial concentrations of a solution}} \times 100$$

Color of durian seed gum was measured by Colorimeter and expressed of L* a* and b*. The L* value represent the lightness of the color, (-a*) indicate green, (+a*) indicate red, (+b*) indicate yellow and (–b*) indicate blue.

Application of durian seed gum in icecream

The manufacture of sherbet icecream with varies durian seed gum were 0.0, 0.1, 0.2 and 0.3% w/w. The process sherbet icecream following: weighing separation between dry ingredients. (e.g., sugar, skim milk, durian seed gum) and liquid (e.g., water, whipping cream, glucose syrup and fruit juice). Then, mixing dry ingredients, while warm liquid ingredients performed on hotplate until to 50 °C, added dry ingredients, well-stirred until temperature reach 60 °C. After that, mixture blended to ensure complete mixing by blender at highest speed for 1 min for homogenization. Then, Ice cream mix is pasteurized at 80 ℃ for 2 min and cooling. Ice cream mix is aged at 4 ℃ for 24 h before freezing. Fill ice cream mix into Plastic container with lid. Freezing at -25 ℃ for 24 h. The various quality of icecream such as total soluble solid, overrun and meltdown were studied. For overrun value was calculated following:

$$\text{Overrun (\%)} = \frac{\text{weight of icecream mix} - \text{weight of icecream}}{\text{weight of icecream}} \times 100$$

For the meltdown rate was performed according to the method described by Nakjirungkura (1998) with the minor modifications. By freezed icecream at -25 ℃ for 24 h and know the exact weight put on 250 mesh sieve and have container underlie. Timer of meltdown of icecream at control room temperature of 25 ± 1 ℃ and weighing melted icecream every 5 min. The result ploting between weight of liquid (melted icecream) per time (min).

Results and Discussion

Characterization of durian seed gum

The studies of durian seed gum extraction with acetic acid found that yield of gum was 8.24±1.01%, according to Klinsukon *et al*. (2009) that studies of gum extraction from malva nut with acetic acid found that yield of gum was 6.48%. As also reported by Noo-sing and Sompongse (2015), gum extraction from tamarind seed with various contidion such as hydrochloric acid, sodium hydroxide and hot water found that yield of gum were 17.74, 7.73 and 6.73%, respectively. The gum from acid extraction has higher yield than sodium hydroxide and hot water, due to acid strong destroy of cell structure and mechanism were random action and can hydrolyzed glycosidic linkage. In addition to drying method effecting on yield, by optimal condition was drying with hot air oven at 40 ℃, to achive higher yild than freez drying (Amin *et al*., 2007).

The moisture content of durian seed gum was 8.29±0.91%, indicate low moisture, also dried food group that can storage under room temperature. The ash content of durian seed gum was 5.86±0.43%. Amin *et al*. (2007) reported that ash content of commercial gum arabic, guar gum and xanthan gum were 1.2, 11.9 and 1.5% which ash content are indicator of food quality. The foods should have least ash content because ash can not dissolve in water.

Water absorption capacity value of gum from plants have gelling and viscosity properties. The water absorption capacity depend on molecule structure. The gum from plants seed was soluble polysacharide and gelling properties, but not dissolve in lipid (Mirhosseini and Amid, 2012). At the present study found that durian seed gum has Water absorption capacity of 1.26±0.10%. The water absorption of durian seed gum was low because xyloglucans from durian seed that extraction with acid, it looks like a short polymer. Therefore, less water absorption capacity, according to value that reported by gum extraction from tamarind seed with various contidion such as

hydrochloric acid, sodium hydroxide and hot water were 3.86, 9.14 and 8.75%, respectively (Noo-sing and Sompongse , 2015), which these gum has less than water absorption capacity compare to durian seed gum.

Water solubility capacity of durian seed gum was 68.78±1.31%. The extraction gum from durian seed, depite acid ability destroy various structure, but can break glycosidic linkage it is a bond between the monosaccharide of xyloglucans. Also, xyloglucans from durian seed that acid extraction therefore, small polymer, it can relatively reaction with water because molecular structure is smaller and show more hydrophilic resulting good water soluble capacity (Noo-sing and Sompongse, 2015) .

The color of durian seed gum were 54.01±2.56, 8.70±1.43 and 22.35±0.66 for L*, a* and b*, respectively. According to gum from tamarind seed, L* a* and b* were 52.36±0.06, 8.72±0.02 and 22.19±0.05, respectively (Noo-sing and Sompongse, 2015). The color of gum from durian seed was dark brown. According to studies by Noiduang and Phochai (2010), mucilage extraction from okra, by using drying at 60 ℃. At high temperature cause polysaccharide breakdown given monosaccharide that can reaction with amino acid from protein breakdown at low temperature, that cause dark green of mucilage okra. The gum from durian seed have characterized to brown sheet and sticky as shown in figure 1.

Figure 1. Durian seed gum

Effect of gum from durian seed on icecream characterization

As show in table 1, found that increasing gum from 0.0 to 0.3% increased the total soluble solid from 33.00% to 35.00%. This is due to the increasing gums increased the total soluble solids of the icecream.

Overrun indicating that air addition to icecream during mixing icecream mix. The overrun analysis, found that increasing gum leading to an increase in overrum (table 1). The sample addition 0.3% of gum was significantly overrun

higher than other sample ($P \leqslant 0.05$). As according to Nakjirungkura (1998), found that addition increasing gum into Fruit sherbet icecream mix leading to significantly increased overrun.

Table 1. Effect of durian seed gum on total soluble solid and overrun of sherbet icecream

Durian seed gum content (wt%)	***Total soluble solid (°Brix)***	***Overrun (%)***
0.0	33.00 ± 1.38^{b}	25.36 ± 3.45^{c}
0.1	33.50 ± 0.78^{b}	30.26 ± 4.67^{b}
0.2	33.75 ± 0.21^{a}	33.33 ± 7.51^{b}
0.3	35.00 ± 0.15^{a}	50.48 ± 8.12^{a}

Means within column followed by different superscripts, are significantly different at $P \leqslant 0.05$ by Duncan's test.

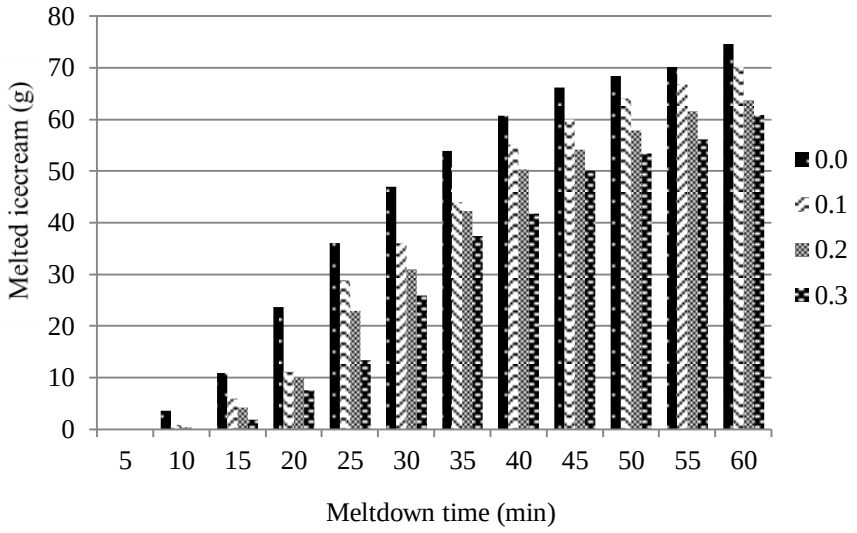

Figure 2. Effect of durian seed gum on meltdown rate of sherbet icecream

The effect of durian seed gum on sherbet ice cream was studied, found that increasing gum decreased melted ice cream, indicates that more stability of the icecream. The addition of gum leading to an increase stability. The viscosity of the ice cream related to meltdown rate. Increasing viscosity decreased the meltdown rate compare to control (Hongchai and Bunchoo, 2015).

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