Effect of sodium metabisulphite concentration and salt concentration on the physicochemical properties of durian seed flour (Durio zibethinus Murr)

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Abstract. This research aimed to determine the physicochemical characteristics of durian seed flour and to develop the utilization of durian seeds. The analysis was performed using a factorial complete randomized design consisting of two factors, namely the concentration of sodium metabisulphite (N) and the salt concentration (G). The concentration of sodium metabisulphite (N) gave a very significant effect on moisture content, ash content, and the value of L; and no significant effect on fat content and protein content. Furthermore, salt concentration (G) had a very significant effect on ash content, fat content and the value of L; a significant effect on the moisture content and protein content. The interaction between the two factors had a highly significant effect on ash content and the value of L; and no significant effect on moisture content, fat content and protein content. Durian seed flour with a concentration of 3000 ppm sodium metabisulphite and a salt concentration of 4% yield produced by best durian seed flour.

1. Introduction
Durian is the fruit of Indonesia who the 4th national fruit of much-loved by the community. Durian seeds can be obtained in several areas that have the potential to be the durian fruit durian seed which has become one of the wastes abandoned or not used, which contains a lot of added value [1]. Generally, the durian fruit flesh consumed is around 20-35%, so that the 60-75% of the skin and 5-15% of the seed are not fully utilized. Durian seeds have good nutritional content such as 43.6 g carbohydrates, 2.6 g protein, 0.4 g fat, 68 mg phosphorus, calcium 17 mg, and 1.0 mg iron per 100 g of material and has a high food fibre content [2]. Therefore, durian seed flour processing is expected to improve the nutritional intake of more varied in society, reducing the amount of waste, prolong shelf life, increase economic value, facilitate the use of product applications, and can reduce the amount of use of wheat flour. It encourages people to process durian seeds into durian flour, so that it can facilitate food diversification and to develop the utilization of durian seed. [3]. Durian seed flour with different preliminary treatments will then be tested for its physicochemical properties and obtain the best durian seed flour.
2. Methods

This research was conducted at the Laboratory of Chemical Analysis Laboratory of Food Ingredients and Food Technology Study Program Food Science and Technology, Faculty of Agriculture, University of North Sumatra, Medan. Seeds were obtained from Sibolang Durian Durian, Medan, Indonesia.

Durian seeds were sorted, cleaned and blanched. At a temperature of 85°C for 15 minutes. Furthermore, durian seeds were peeled and sliced thin with a thickness of 2-3 mm, and then soaked for 30 minutes in a solution of sodium metabisulphite (Na₂S₂O₅) according to the treatments in one litre of water. Followed by immersion using salt in a litre of water by the treatment for 3 hours. Durian seeds were washed, drained and drawn into the pan and then put in the oven with a temperature of 60°C for 20 hours. Next, flouring by softening seed durian seeds in a blender and sieved to 80 mesh sieve and packed in polyethylene plastic-covered and stored at a temperature of 28°C.

Analysis of moisture content is done with the oven method [4], the ash content was conducted by drying the ash [5], fat content was conducted by boiling flask [4], the protein content was conducted using K-Jeldahl [4], and colour (brightness) with using a Minolta chromameter (type CR 200, Japan), de-Garmo method was used to determine the best treatment [6].

3. Result

3.1. Moisture content

The increase of sodium metabisulphite concentration cause the decrease in the moisture content of durian seed flour produced. The lower moisture content due to the process sulphites on immersion sodium metabisulphite which can damage tissue durian seeds resulting in tissue cells in the material be perforated so that it will speed up the drying process and rapid drying the moisture content of the material would be quickly vaporized [7]. Sodium metabisulphite binds water and forms a bond with a sodium bisulfide reaction [8] of Na₂S₂O₅ + H₂O → 2 NaHSO₃.

Similarly, higher salt concentration in the solution osmosis decreased the moisture content of flour. The higher amount of salt. Cause more water is tied up leading to the reduction in water levels. Osmodehidrasi was able to eliminate some of the water in the food with the help of osmotic agents, such as sugar and salt. Moisture reduction is related to the process of osmosis and drying processes that affect the discharge of the material due to the heat effect [9].

3.2. Ash content

That higher concentration of sodium metabisulphite increased the ash content. This is caused by sodium metabisulphite into the pores of the larger there by increasing the ash content in durian seed flour [10]. Sodium metabisulphite salt and ash, including one of the minerals that immersion using sodium metabisulphite will increase the ash content of flour [11]. Minerals contained in the sodium metabisulphite is Na and S [12]. Similarly, the higher the concentration of salt used, the higher the ash content of the flour, because salt contains minerals such as Na, Ca, Mg, Fe resulting in the accumulation of mineral material. These minerals are not burned in the combustion process so that the ash content in durian seed flour increased [13]. Interaction between concentration of sodium metabisulphite and concentration of salt caused ash content increase. Because sodium metabisulphite and salt are minerals.
3.3. Fat content
Sodium metabisulphite immersion had no significant effect on the fat content of durian seed flour. Previous study reported that the increase of sodium metabisulphite, caused the decrease in fat content, because high sodium metabisulphite concentration can speed up the drying so that the fat will be damaged due to heat. Soaking sodium metabisulphite process causes the breakdown of fat into fatty acids so that more and more fatty acids that evaporate into the air during the drying [14]. In contrast, soaking salt causes a decrease in fat content. This is due to the higher concentration of salt compound to be diffused into the material. In addition to materials that have a high moisture content during the drying, takes a long time so that material loss water becomes slower cause the levels of nutrients such as carbohydrates, fats, and proteins inside the mass that remains becomes less [15].

3.4. Protein content
Concentration of sodium metabisulphite gave no significant effect on protein levels of durian seed flour produced. However, the process of sulphites by sodium metabisulphite might be able to inhibit protein reduction. The decrease in the protein can be prevented because the sulphites can prevent the breakdown of proteins into amino acids [7]. However, different salt concentrations affect protein structure. Low salt concentrations cause the protein to undergo salting in, in which the protein will be more easily soluble. In contrast, higher salt results in salting out protein, where the protein will precipitate and insoluble [16]. A different salt concentration is inversely proportional to the protein content and the effect of saline solution that diffuses into the material also causes decreased protein [17]. Salt is a powerful electrolyte that can dissolve the protein, so that the water can break molecular bonds in water and could alter the nature of the protein [18].

3.5. Value L
That higher sodium metabisulphite concentrations increase the value of L flour. Therefore, the increase in L value shows that amount of SO$_2$ in metabisulphite is able to maintain the colour of the material [19]. Sulphite group binds to the carbonyl group of compounds that prevent the formation of melanoidin which causes the colour to become brown durian seeds [7].

In addition, soaking in salt increased the L value. The higher L value indicated that the salt was able to prevent colour destruction. As phenol compound is not contact with oxygen, polyphenol oxidase (phenolate) which can cause browning enzymatic formed. The addition of sodium chloride can protect the phenolic compounds contained in the seeds of durian, so that the process of browning
can be prevented [20]. Interaction between concentration of sodium metabisulphite and concentration of salt caused the L value increase. Because the material can prevent colour destruction.

![Figure 2. Interaction between of sodium metabisulphite concentration and salt concentration with colour (L value) of durian seed flour](image)

**Figure 2.** Interaction between of sodium metabisulphite concentration and salt concentration with colour (L value) of durian seed flour

### 4. Conclusion

Immersion 3000 ppm sodium metabisulphite and soaking salt 4% produce the best durian seed flour and qualified.

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