

## **EFFECT OF SALT CONCENTRATION ON THE ORGANOLEPTIC AND NUTRIENTS CONTENT OF MANDAI (TRADITIONAL FERMENTED JACKFRUIT)**

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### **Abstract**

Mandai (fermented jackfruit) is traditional food from South Borneo. It was salted fermentation from rind part of *Artocarpus champeden*. Salt is contributing on the selection of microbial growth during fermentation processes of mandai, and potentially influence it's nutrientsal content. Objective: To identify the effect of salt concentrations on the organoleptic and nutrientsal content (protein, fat, carbohydrates, and dietary fiber) of mandai. Methods : It was true experimental study with four treatment groups consists of 0%,2%,6% and 10% of salt concentrations. This study was done by completely randomized design with two times of each treatment. Orgnoleptic properties were examined by 30 panelis by using Hedonic scale test method. Data were analyzed using Kruskal Wallis continued with post hoc Duncan Multiple Range Test. Nutrientsal content were examined by using proximate method and data were analyzed using Anova and continued using Duncan multiple range test. Results : This study found that variation of salt on the fermentation processed of mandai was significantly influence the organoleptic properties including in colour ( $p < 0.0001$ ), flavour ( $p = 0.003$ ), taste ( $p < 0.0001$ ), and texture ( $p = 0.0043$ ). The best of nutrientsal content of mandai were found in 10% of salt concentration which consist of 1,47% of protein, 16,22% of fat, 2,28% carbohydrates and 23,78% of dietary fiber. Conclusion : Concentrations of salt in the process of mandai fermentation were influence the organoleptic and nutrientsal properties of mandai.

**Keywords: mandai, fermentation, jackfruit, salt**

### **1. INTRODUCTION**

Indonesia is rich in biodiversity as well as in food comodities aspect. Therefore food diversification is very potential to be developed in this country. Food diversification gives many advantage not only to decrease dependency of homogeneity in food variation but also to support diversity of nutrient intake to increase the health and well being [1].

Cempedak (*Artocarpus champeden*) is one of Indonesian local fruit that potential as one of alternative fruits to promote food diversification in Indonesia. It is an abundant fruits that consumed by Indonesian people. However it was only consumed in the pulp part of this fruit. The rind of this fruit was only become as garbage.

Hovewer in some region of Indonesia, mainly in South Borneo, people can utilize rind of cempedak to be processed as salted fermented food called Mandai. This fermented food usually then consumed as side dish. This fermentation processed also give many advantages such as new food product with unike flavour and taste, reduce garbage if its rind, as well as preservation of food. Mandai is durable food that can be saved until 1 year [2].

Processing in fermentation of Mandai was still traditionally, therefore there were not standard process including in the concentration of salt in this process. Previous study found that variation of salt concentration was significantly had effect on pH, total of lactid acid bacteria, crude fiber, ash and water content level [3]. However the effect on protein, lipid, carbohydrates, and dietary fiber have not been studied yet. Therefore this study will evaluate the effect of variation on salt concentration on the proximate content and organoleptic properties of Mandai. This study also be

expected to get the appropriate of salt concentration to produce Mandai which have appropriate organoleptic and nutrients content.

## 2. MATERIALS AND METHODS

It was experimental study with completely randomized design by using four treatment consists of 0%,2%,6% and 10% in salt concentration with twice batch of duplication. Cempedak (*Artocarpus champeden*) were bought from traditional market from South Borneo. The rind of its fruits were separated then used for fermentation.

Processing of fermentations were done in Culinary Laboratorium of UNRIYO. Fermentation were done traditionally using glass jar for 7 days of fermentation in the room temperature.

Nutrientsal content of mandai was analyzed in CV. Chem-Mix Pratama Laboratory by using proximate (protein, lipid, carbohydrate) and dietary fiber analysis. Organoleptic properties of mandai were analysis by using hedonic scale test on 30 panelis by student in Boarding house of West and South Borneo with criteria of panelis were 20-25th of age.

Datas of organoleptic properties were statistically analyzed by using Kruskal-Wallis and post hoc Duncan Multiple Range Test. While, datas of nutrients content (protein, lipid, carbohydrates, and dietary fibers) were statistically analyzed by using oneway Anova and uji post hoc Duncan Multiple Range Test.

## 3. RESULTS AND DISCUSSIONS

### Organoleptic Properties of Mandai

Results of organoleptic properties analysis were served in table 1. Mandai have brown in colour. Colour change of mandai was suspected from the mailard reaction and oxidation of nutrients content, also pigment degradation because of salt inhibition into the ingredient. High concentration of salt increase the pigment inhibition and resulting on the more brown colour of mandai (5). In this research colour of mandai also influenced by friying process. However, based on hedonic scale test, 10% concentration of salt was the best consentration based on the colour properties ( $p < 0,001$ ).

Different flavour of mandai may be influenced by ripeness of fruit. Strong flavour of mandai was found on the most ripe fruit. However flavour and taste of mandai in this research mostly influenced by salt concentration and duration of fermentation. As well as in previus study which found that score of flavour influenced by duration of fermentation and salt concentration (6). Salt in fermentation process was contribute as selective media to support growth of lactid acid bacteria. Increasing of lactid acid bacteria will increase pH and inhibit other microorganism (pathogen). This fermentation process also produce organic acid such as lactid acid and acetaldehyd. These organic acid contributed on flafour and taste (7). However, based on hedonic scale test, 10% concentration of salt was the best consentration based on the flavour ( $p = 0,003$ ) and taste ( $p < 0,001$ ) properties.

Table 1. Organoleptic properties of Mandai based on Kruskal-Wallis and post hoc Duncan Multiple Range Test

Concentration of salt	Average (%)			
	Colour	Flavour	Taste	Texture
0%	93,69 <sup>a</sup>	144,12 <sup>b</sup>	120,02 <sup>b</sup>	116,36 <sup>ab</sup>
2%	145,52 <sup>c</sup>	108,46 <sup>a</sup>	89,99 <sup>a</sup>	102,90 <sup>a</sup>
6%	114,62 <sup>b</sup>	102,95 <sup>a</sup>	121,58 <sup>b</sup>	126,16 <sup>ab</sup>
10%	128,18 <sup>bc</sup>	126,48 <sup>ab</sup>	148,89 <sup>c</sup>	136,58 <sup>b</sup>
<i>p</i>	0,000	0,003	0,000	0,043

note: different superscript note (a, b, c) on the same coloum means significantly differences based post hoc Duncan Multiple Range Test superscript note (a) was the lowest value.

Texture of mandai in this research was expected by salt concentration and duration of fermentation. As well as previous study that found that there were significantly differences on texture of jambal roti (fermented fish) on the different salt concentration and duration of fermentation [6]. In this study found that the most preference texture of mandai was found in 10% of salt concentration. This group produce more hard starched. Salt in this fermentation contribute on the osmosis process, resulting water flow rate of from intracell intoextracelluler (8). Based on hedonic scale test, 10% concentration of salt was the best concentration based on the texture properties ( $p < 0,043$ ).

**Nutrients content of Mandai**

Nutrients content of Mandai were served on table 2. Protein content were increase in accordance with increasing of salt concentration. This study was similar with previous study on the fermentation of terasi (fish fermentation) [9]. The highest protein content were found in 10% of salt concentration bot not significantly differences with 6% of salt concentration. The higher content of lipid was found in 10% of salt concentration.

This study found that there were decrease of lipid content in accordance with decrease of salt concentration. Decrease of lipid content suspected by lipase enzyme activity of microbia which cleave lipid content into simple component as well as faty acid. This result was similar with previous study which found that high salt concentration influenced lipid content in rusip [10].

Table 2. Nutrients content of Mandai based on Oneway Anova dan post hoc Duncan Multiple

Salt concentration	Average (%)			
	Protein	Lipid	Carbohydrate	Dietary Fiber
0%	0,99 <sup>a</sup>	23,63 <sup>d</sup>	5,22 <sup>d</sup>	16,20 <sup>a</sup>
2%	1,28 <sup>b</sup>	19,87 <sup>c</sup>	1,73 <sup>a</sup>	21,08 <sup>b</sup>
6%	1,44 <sup>c</sup>	17,96 <sup>b</sup>	1,77 <sup>b</sup>	22,13 <sup>c</sup>
10%	1,47 <sup>c</sup>	16,22 <sup>a</sup>	2,28 <sup>c</sup>	23,78 <sup>d</sup>
<i>P</i>	0,001	0,000	0,000	0,000

note: different superscript note (a, b, c) on the same coloum means significantly differences based post hoc Duncan Multiple Range Test superscript note (a) was the lowest value.

This study found that increasing of salt concentration in accordance with decrease of carbohydrate content. Decrease of carbohydrate content might be caused by energy metabolism of carbohydrate by microorganism. Carbohydrate is digested and converted into simple compound such as lactid acid, acetic acid, propionic acid as well as etyl alcohol [11]. Carbohydrate also can be cleaved into simple sugar such as dextrose, manose, and sucrose than utilize as source of energy by lactid acid bacteria [12].

This study found that increasing of salt concentration in accordance with increasing of dietary fiber content. It was similar with previous study which found that increasing of salt concentration was increase crude fiber of mandai [3]. Crude fiber were consist of digestible and undigestible fiber, but can not describe as fiber parameter in food.

#### 4. CONCLUSION

This study found that concentrations of salt in the fermentation process of mandai were influence the organoleptic and nutrients properties (lipid, protein, carbohydrate, and dietary fiber) of mandai. Ten percent (10%) of salt concentration was the best recommendation formula to get the appropriate organoleptic and nutrients content of mandai.

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