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Processing of Milkfish and Moringa Flour as Alternative Superfoods for Handling Stunting in Bone Regency

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Abstract

Stunting has a big influence on children's growth and development, both motoric and verbal development. Stunting can be prevented by fulfilling quality energy intake. Modification of additional food for toddlers by using local food through a touch of technology is the strategy offered in this research. This study aims to evaluate the effect of fortification of Moringa leaf flour in milkfish crackers on organoleptic characteristics, including color, aroma, texture and taste. The cracker samples were fortified with Moringa leaf flour at concentrations of 0%, 2.5%, 5% and 7.5%. The assessment is carried out by panelists who provide scores for each parameter. The results showed that fortification up to 2.5% did not affect color and aroma, and improved texture, but reduced taste acceptability. Fortification at levels of 5% and 7.5% reduced the acceptability of taste and color although the texture remained good.

Introduction

Stunting in children under five shows poor linear growth during the critical period and is diagnosed as height for age less than -2 standard deviations from the median child growth standard according to the World Health Organization ('WHO Child Growth Standards', no date). This is caused by insufficient long-term nutritional intake (Ilmani & Fikawati, 2023). The consequences of stunting in children are short-term and long-term, including increased morbidity and mortality, poor child development and learning capacity, increased risk of infection and non-communicable diseases in adulthood, and reduced productivity and economic capacity (Stewart et al., 2013). Long-term conditions that are not addressed with various massive strategies will cause Indonesia to lose generations and even decline in civilization.

The problem of stunting begins with a lack of specific nutrients, inadequate intake and the incorrect composition of the proportion of food consumed. so it is necessary to provide additional food (PMT) that is rich in nutrients to meet the energy needs of toddlers (Basri et al., 2021). One source of high protein is milkfish (Chanos chanos Forsk.) which contains high protein, especially the essential amino acid lysine, and contains PUFA (Polyunsaturated Fatty Acid (Rosyidah et al., 2021; Nopiyanti et al., 2023; Abdullah et al., 2020).

Bone Regency is one of the milkfish production centers in South Sulawesi (Asriany et al., 2018) but Bone district is also a stunting locus. Bone Regency once ranked second in terms of the highest prevalence of stunted toddlers in South Sulawesi. In 2019, the prevalence of stunting was 37.3%, in 2021 it was 341% and in 2022 it was 27.8% (Kesumasari et al., 2020;

Mutmainnah & Musni, 2022). Although it has decreased, it is still above the national stunting prevalence and the stunting prevalence of South Sulawesi.

Milkfish is the main commodity for brackish water fish cultivation which has high nutritional content and is popular because of its affordable price, delicious and savory taste (Abriana et al., 2020). Milkfish (Chanos chanos Forsk.) contains high protein, especially acid. the essential amino lysine, and contains PUFA (Polyunsaturated Fatty Acid) which is good for children's growth (Dewi et al., 2019; Sayuti et al., 2022; Munawaroh et al., 2024).

Crackers are a popular snack in Indonesia. Milkfish as a basic ingredient for crackers has a high protein content, but its nutritional value can still be increased through fortification. Moringa leaf flour (Moringa oleifera) is known to have high nutritional content, including vitamins, minerals and protein, as well as potential as a fortification ingredient. This study aims to evaluate the effect of adding Moringa leaf flour to milkfish crackers on their organoleptic properties.

Methods

The method in this study used a single factor Complete Randomized Block Design with the addition of Moringa leaf flour to make milkfish crackers. This research was carried out at the nutrition and chemistry laboratory, Department of Fisheries Cultivation, Pangkep State Agricultural Polytechnic. This research began by collecting data and information on the processing of milkfish to be made into milkfish crackers

Materials and tools: 1) Fresh milkfish; 2) Moringa leaf flour; 3) Other additional ingredients (tapioca flour, spices); 4) Standard kitchen equipment; 5) Organoleptic assessment form

Procedure; 1) Preparation of Ingredients: Clean the milkfish, take out the meat and grind it. Moringa leaf flour was prepared in concentrations of 0%, 2.5%, 5% and 7.5%. 2) Making Crackers: Cracker dough is made by mixing fish meat, moringa leaf flour, tapioca flour, and spices. The dough is molded and dried. 3) Frying: Dry crackers are fried until cooked. 4) Organoleptic Assessment: Ripe crackers are assessed by panelists based on color, aroma, texture and taste parameters. Each parameter is scored from 1 (dislike very much) to 5 (like very much).

Data analysis

Organoleptic testing includes color, taste, aroma, teture of the milkfish cracker products produced. The products studied in all treatments were presented together, to test color, taste, aroma and crispness, a liking test was carried out, namely the panelists were asked to give a value to each product according to the criteria

Result and Discussion

This research provides indepth insight into the effect of moringa flour fortification on milkfish crackers, especially in terms of organoleptic acceptability.

Based on the organoleptic test results, there was a decrease in color acceptance at 5% and 7.5% fortification shows that Moringa flour at high concentrations has a color changing effect that is not liked by the panelists. This may be caused by significant color changes at high concentrations.

For aroma, there was no significant change in aroma acceptance, indicating that Moringa leaf flour did not significantly affect the aroma of crackers up to a concentration of 7.5%.

In terms of texture, there was an increase in the texture score at 2.5% to 7.5% fortification, indicating that Moringa leaf flour had a positive effect on the texture of the crackers, making them crunchier and liked by the panelists.

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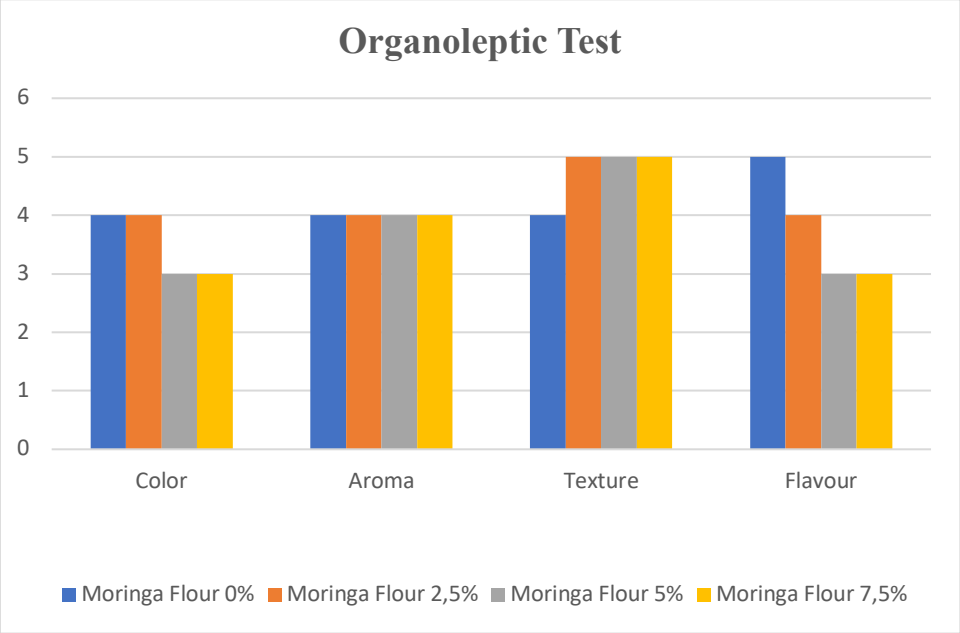

Figure 1. Organoleptic Test

In terms of taste, there was a decrease in taste acceptance at 5% and 7.5% fortification, indicating that Moringa leaf flour gave a less favorable taste at high concentrations. This may be caused by the distinctive taste of Moringa leaves which becomes more dominant at high concentrations.

Color is one of the important parameters in organoleptic assessment of food because it is the first visual perception that can influence consumers' initial impressions. In this study, the color of milkfish crackers with fortified Moringa leaf flour at concentrations of 0% and 2.5% did not show a significant difference, with an average score of 4.00. However, at concentrations of 5% and 7.5%, the color score decreased to 3.00.

This decrease can be caused by natural pigments contained in Moringa leaves, such as chlorophyll, which gives them a green color. When the concentration of Moringa leaf flour increases, the green color becomes more dominant, which may not match the expectations of consumers who are accustomed to the paler or white color of fish crackers. According to the literature, the addition of ingredients with strong pigments in food products often changes color perception and can reduce acceptability if they do not match consumers' visual expectations (Shetty et al., 2017; Sipos et al., 2021).

Aroma is another crucial factor in organoleptic assessment because it is directly related to the perception of taste and enjoyment of food. In this study, there was no significant difference in aroma acceptability between control samples and those fortified with various concentrations of Moringa leaf flour, with all average scores being 4.00.

This lack of change in aroma scores indicates that Moringa leaf flour, although having a distinctive aroma, is not strong enough to change the overall aroma of milkfish crackers. The strong fish aroma may be more dominant, so the additional aroma from Moringa leaf flour was not detected significantly by the panelists. This is in accordance with previous findings showing that aroma components in fish-based foods can often mask additional aromas from other ingredients (Ormanci & Colakoglu, 2015; Fu et al., 2024).

Texture is an important sensory attribute that influences consumers' overall impression and satisfaction with food products. In this study, fortification of Moringa leaf flour showed an increase in texture scores from 4.00 in the control to 5.00 at concentrations of 2.5%, 5% and 7.5%.

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This increase indicates that Moringa leaf flour may make a positive contribution to the elasticity and crunchiness of the crackers. Moringa leaves have a high fiber content, which can play a role in improving the structure and texture of products. The addition of fiber in food products is known to improve textural characteristics such as chewiness and crunchiness, which are often desired in cracker products (Delgado-Nieblas et al., 2015; Adawiyah et al., 2024).

Taste is the most critical parameter in determining the success of food products on the market. In this study, fortification of Moringa leaf flour up to 2.5% was still well received, with an average score of 4.00, but taste acceptance decreased significantly at concentrations of 5% and 7.5%, with a score of 3.00 respectively.

This decrease in taste acceptance may be caused by the distinctive taste of Moringa leaves which becomes more dominant at high concentrations. Moringa leaves have a slightly bitter and spicy taste, which can interfere with the original taste of milkfish crackers that consumers expect. In this context, it is important to understand that taste is a highly subjective perception and can be influenced by consumer expectations and habits (Wang et al., 2019; Bowen & Grygorczyk, 2022).

The results of this study are consistent with findings from other studies exploring the fortification of Moringa flour in various food products. For example, the study by Islam et al. (2021) showed that the addition of Moringa flour to bread increased the nutritional value but affected sensory acceptability, especially in terms of taste and color. Another study by Famakinwa et al. (2024) found that the addition of Moringa leaves to processed food products is often well received up to a certain concentration, after which sensory acceptance begins to decline (Islam et al., 2021; Famakinwa et al., 2024).

This research shows that Moringa flour has the potential as a good fortification ingredient to increase the nutritional value of milkfish crackers, but there are challenges in terms of organoleptic acceptability at higher concentrations. The practical implication of these findings is that manufacturers can consider fortifying moringa flour up to 2.5% without significantly compromising organoleptic acceptability. For higher concentrations, more innovative approaches are needed to mask or balance the strong taste and color of moringa leaves.

Conclusion

The organoleptic test results showed that fortification of Moringa leaf flour up to 2.5% in milkfish crackers was acceptable without significantly sacrificing color, aroma and texture parameters, although there was a slight decrease in taste. Fortification at levels of 5% and 7.5% showed a more significant reduction in taste and color acceptability. Further research is needed to explore modification methods that can improve organoleptic acceptability at higher fortification concentrations. These findings provide a basis for the development of functional food products that not only increase nutritional value but also maintain or improve sensory acceptability.

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