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Modification of Sourdough Using Snake Fruit Starter

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Abstract
This research investigated the use of snake fruit (Salacca zalacca) as a sourdough starter, aimed at promoting the utilization of snake fruit in culinary products and understanding feedback from respondents based on the resulting product. With the rising popularity of sourdough bread and the growing demand for locally sourced ingredients, exploring unconventional starter cultures has become essential. The study is conducted through research and development by evaluating the properties of 3 types of snake fruit namely" Pondoh, Gading, and Gula Pasir". Acidity, carbohydrate content, and sugar levels are used to determine its compatibility through sourdough fermentation. A comprehensive comparison is conducted between the resulting product and the widespread yeast-based sourdough bread. Interviews and questionnaires were distributed to the public and culinary professionals to extract information. A total of 25 individuals has generally positive feedback with the results of the "Pondoh and Gading" variety, showing likeness towards texture and crust. The remaining subject "Gula Pasir" was deemed to be incompatible for sourdough production due to its low acidity. The findings of this study hold promise to the Indonesian culinary industry by capitalizing on the diverse range of tropical fruits to expand and incorporate sustainable local ingredients. Embracing snake fruit as a sourdough starter presents a lucrative prospect for promoting local gastronomic diversity.

Keywords: Sourdough, Snake fruit, Culinary, Local ingredients

Abstrak
Penelitian ini menyelidiki penggunaan buah salak (Salacca zalacca) sebagai starter sourdough, bertujuan untuk mempromosikan pemanfaatan buah salak dalam produk kuliner dan memahami umpan balik dari responden berdasarkan produk yang dihasilkan. Dengan meningkatnya popularitas roti sourdough dan permintaan yang semakin besar akan bahan-bahan lokal, mengeksplorasi kultur starter yang tidak konvensional menjadi penting. Penelitian ini dilakukan melalui penelitian dan pengembangan dengan mengevaluasi sifat dari 3 jenis buah salak yaitu "Pondoh, Gading, dan Gula Pasir". Keasaman, kandungan karbohidrat, dan kadar gula digunakan untuk menentukan kompatibilitasnya melalui fermentasi sourdough. Perbandingan komprehensif dilakukan antara produk yang dihasilkan dan roti sourdough berbasis ragi yang luas. Wawancara dan kuesioner didistribusikan kepada

masyarakat dan profesional kuliner untuk mendapatkan informasi. Sebanyak 25 individu umumnya memberikan umpan balik positif dengan hasil dari varietas "Pondoh dan Gading", menunjukkan kesukaan terhadap tekstur dan kerak. Subjek yang tersisa "Gula Pasir" dianggap tidak kompatibel untuk produksi sourdough karena keasamannya yang rendah. Temuan penelitian ini menjanjikan bagi industri kuliner Indonesia dengan memanfaatkan berbagai macam buah tropis untuk memperluas dan menggabungkan bahan-bahan lokal yang berkelanjutan. Menggunakan buah salak sebagai starter sourdough menghadirkan prospek menguntungkan untuk mempromosikan keragaman gastronomi lokal.

Kata kunci: *Sourdough; Buah salak; Kuliner; Bahan lokal*

1. BACKGROUND

Bread is a popular food in Indonesian society. Bread, a wheat-based food product, serves as a source of carbohydrates whose consumption is increasing annually (Wijayati and Prasmita Dian, 2020). According to the Indonesian National Standard (SNI) bread is a product made from dough of wheat flour evenly mixed with bread yeast and baked, with or without the addition of other permitted food ingredients and additives. This applies to all types of bread, with variations based on the quantity of basic ingredients and the type of yeast used.

It is widely known that there are many bakeries, hotels, and restaurants in Indonesia that offer bread. In some regions, these businesses naturally attract more international guests. International visitors have different food preferences compared to Indonesians, and bread falls into that category of food.

Indonesia is a country that is very rich in diversity in various fields. Whether in terms of culture, human resources, or natural resources, Indonesia always has something unique. Basic food ingredients such as spices and local fruits can be easily and quickly found. Melisnawati H. (2019) stated that local Indonesian fruits are types of fruits that grow naturally and originate from Indonesian regions. The ideal type of local fruit for this research is salak. According to the Faculty of Agriculture at Universitas Medan Area (2021), salak is a type of palm fruit that is commonly consumed. Salak is one of the most frequently consumed fruits by Indonesian people primarily because it is economical, easy to harvest, and available in every season. Salak also has the potential to be used as an immune system booster (Haryo Limanseto 2022 and Ika 2016). The availability of this fruit is also backed by the annual fruit production report listed by BPS Indonesia.

Table 1. Indonesian local fruit production, BPS Indonesia (2021-2023)

Fruit type	Snake fruit (Ton)	Star fruit (Ton)	Rambutan (Ton)	Durian (Ton)	Mangosteen (Ton)
2021	1 120 242	137 450	884 702	1 353 037	303 934
2022	1 147 473	128 632	885 162	1 159 172	343 663
2023	-	-	-	-	-
Total	2 267 715	226 082	1 769 864	2 512 209	647 597

This research will involve the modification of sourdough starter using snake fruit, a local fruit, to enhance the diversity of sourdough bread types and to gather opinions

or feedback on modifying traditional Western bread with local fruit. The choice of snake fruit is drawn due to several reasons. Amongst many, snake fruit is economical due to its cheap prices and can be found in almost every market and supermarket. The author has also decided on the use of snake fruit due to there being little prior experiments and research using the said fruit.

Research done by Universitas Gajah Mada (2016) revealed that snake fruit, a fruit rich in carbohydrates, sugars, acids, and fiber, offers various health benefits. These include boosting the immune system. Snake fruit is particularly abundant in polyphenols and flavonoids, compounds known for their anticancer effects and their ability to activate immune responses, as stated by Nurwachid Arbangi, from the Faculty of Medicine at UGM. It is known that in sourdough production, the yeast emerges from the fermentation of fruit mixed with sugar and bread flour over a week. This process generates CO2 gas from the reaction between acids and carbohydrates along with sugar, which sustains the yeast. The fermented yeast, also known as a starter, imparts a distinctively sour and fragrant aroma (Sandra, 2018). This supports the decision of using snake fruit as it is a fruit with adequate acidity and sugar level.

This research aims to enhance and expand knowledge on the potential of snake fruit to facilitate the Indonesian culinary industry. Incorporating snake fruit into bread making can also increase the fruit's gastronomic appeal. Therefore, it is crucial to establish that snake fruit can be used as a sourdough starter and that sourdough bread made from a snake fruit starter is favored by both the public and culinary professionals. Based on the background, the author has chosen the title "Modification of Sourdough Using Snake Fruit Starter" with the intention of enhancing and expanding knowledge on the potential of snake fruit to facilitate the Indonesian culinary industry. The incorporation of snake fruit into bread making can also elevate the gastronomic experience associated with local fruits.

2. LITERATURE REVIEW

The primary focus of this research is on sourdough bread, one of the oldest types of bread globally, highly favored by international tourists. According to the Bandung Culinary Arts Academy (2017), sourdough dates back approximately 4000 years BCE. The bread is made through a two-stage process: the creation of a starter followed by the mixing and kneading of other ingredients. Sourdough bread is unique due to the naturally occurring yeast formed through the fermentation process.

In sourdough production, the yeast emerges from the fermentation of fruit mixed with sugar and bread flour over a week. This process generates CO2 gas from the reaction between acids and carbohydrates along with sugar, which sustains the yeast. The fermented yeast, also known as a starter, imparts a distinctively sour and fragrant aroma (Sandra, 2018). This supports the decision of using snake fruit as it is a fruit with adequate acidity and sugar level.

In the study titled "*Penggunaan air fermentasi strawberry sebagai natural starter dalam pembuatan soft roll*" by Sandra Sanggramasari (2018), the author aimed to contribute to the development of substituting commercial yeast with natural starters in soft roll production. The objective was to assess public preference for soft rolls made using a natural starter derived from strawberries. The research method employed was experimental with a quantitative approach.

The findings indicated that using strawberry fermentation water as a natural starter for soft roll production did not significantly differ from using instant yeast in terms of overall taste, texture, and appearance. However, the experimental soft rolls using strawberry fermentation water were generally preferred in terms of texture and appearance compared to those made with instant yeast. Both methods used fruit fermentation water as a starter. The main difference was that the initial study used strawberries as the base for the starter, while the author intended to conduct research using snake fruit.

The study titled "Physiochemical Properties of Sourdough Bread Made from Local Variety Sweet Potato and Pineapple Juice" by Zaidiyah, Y.M. Lubis, C.A.R.G. Putri, and S. Rohaya (2019) explores the production of sweet potato sourdough using pineapple juice. The research aims to examine the characteristics of sourdough bread made from local sweet potatoes and a starter derived from pineapple juice. The objective is to enhance the quality of local sweet potato and pineapple products.

This experimental study employed a quantitative research method. It utilized local sweet potatoes and pineapple juice as the base ingredients and starter for sourdough bread. The results indicated that different varieties of sweet potatoes influenced the size, density, and porosity of the experimental sourdough bread.

Like the previous study, both research efforts used fruit fermentation water as a starter in bread production. The key difference lies in the second study's use of pineapple as the base for the starter, whereas the intention of the authors was to investigate using snake fruit in their research.

3. METHOD

This study employed the Research and Development (R&D) methodology along with hedonic testing. The research analyzed the use of three types of snake fruit (Pondoh, Gading, and Gula Pasir) as the base ingredient for making sourdough starter. The study was conducted through these steps as follows:

1. Planning: developing the research instruments that will be used by the researcher.
2. Implementation: conducting trials, analyzing, and establishing the instruments.
3. Evaluation: at this stage, the researcher will analyze and manage the data according to the research methods that have been collected.
4. Report Writing: the stage where the author will compile the report based on the research findings obtained (Sugiyono, 2010).

Recipe modifications, brainstorming and seeking out similar research were conducted during the “Planning” stage. Modifications using snake fruit were then incorporated into the subject, namely the sourdough starter in the “Implementation” stage. the design phase. During the “Evaluation” stage, validation processes and further trials were conducted with feedback from experts and common panelists. The final stage involves “Report Writing” to display all the data and experiments involved, along with records of all broader scale trials with more respondents. This research and development effort aimed to identify suitable processing techniques to produce sourdough bread using the local snake fruit.

Furthermore, this research employes the use of hedonic testing as a method used in analysis, commonly employed in research to determine the extent of quality differences among various product innovations and modifications. This is achieved by

collecting personal responses from panelists regarding their likes or dislikes of a specific innovation or product, by assigning values or scores to certain attributes of the product. The hedonic test is typically used in product marketing to obtain consumer opinions on a product or innovation, allowing the tester or author to identify the most favored product by the panelists or consumers. This enables the tester to identify elements that need improvement before the product is marketed. The analysis of the hedonic scale is transformed into a numerical scale based on the level of preference. In the hedonic test, the evaluation includes aspects such as color, taste, aroma, and texture.

a. Color
   In this research, the visual appearance of color determines the level of product acceptance by consumers. Appearance is a significant parameter because it is sensory in nature. Color is one of the key elements in a dish that attracts consumer acceptance, making it an essential organoleptic attribute. Furthermore, any changes in a product or food ingredient can be indicative of chemical changes.
b. Taste
   One of the factors that determines whether a food product is acceptable to consumers, or the public, is taste. Taste arises from chemical compounds, temperature, and concentration. It can be described as a sensation originating from substances in the mouth, triggered by the senses of taste and smell. Generally, taste is assessed using the sense of taste or the tongue, and there are four basic taste perceptions: sweet, bitter, sour, and salty.
c. Aroma
   The aroma of food generally serves as an attraction and a determining factor in the taste assessment of a food product. Both the taste and the appeal of a food product can be enhanced through its aroma. Aroma is influenced by the sense of smell.
d. Texture
   When bitten, chewed, swallowed, or touched, there is a sensation of pressure that can be observed, known as texture. Texture is a physical property of food materials. It can be formed or arise through the combination of two physical properties, including size and shape. Similarly, the texture within a dish can be described using terms such as solid, chewy, crispy, thick, and many others.

Name:					
Gender:					
Occupation:					
Date:					
INSTRUCTIONS	Taste the food product and then state your level of liking based on the characteristic using the appropriate number.				
HEDONIC SCALE	Clear Dislike (1)	Mild Dislike (2)	Neutral (3)	Like (4)	Love (5)
SCORE	PARAMETERS				
	COLOR	TASTE	AROMA	TEXTURE	OVERALL
COMMENTS	Respondent Signature				

Image 1. Hedonic test grading slip. Source: Author (2023)

4. RESULTS & DISCUSSION

This study employed natural fermentation as the primary method for creating a starter for sourdough bread. The snake fruit was cut into small pieces, placed in a glass jar with sugar and water, stirred thoroughly, and left to ferment for 7 days. The following is a photographic documentation of the salak sourdough production process, accompanied by the results:

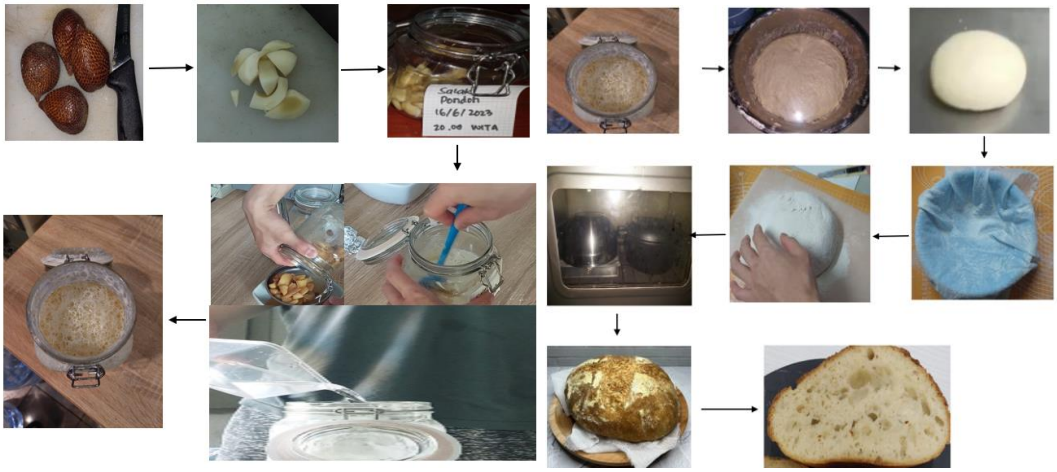

Image 2: Sourdough from Pondoh Snake fruit.
Source: Author (2023)

Image 3: Sourdough from Gading Snake fruit.
Source: Author (2023)

The results are then distributed to several respondents for a following hedonic testing. A hedonic test can be defined as a powerful tool in food research, offering deep insights into consumer preferences and product acceptability. By adhering to a rigorous methodology and robust data analysis, researchers can ensure the reliability and validity of their findings, ultimately aiding in the successful development of food products. The application of hedonic testing in this study provides a comprehensive understanding of consumer responses, guiding product development. Data is collected through a small

questionnaire, allowing respondents to express their opinions on the referred snake fruit sourdough bread.

Image 4: Sourdough from Gula Pasir Snake fruit.
Source: Author (2023)

The hedonic test was done on both professional chefs and the public. The properties tested from the snake fruit sourdough are its color, taste, aroma, and texture. The outcome of the test reveals the representation of their opinions. A summary of the results has been listed in the table below.

Table 2: Professional Chef's grading sheet on Pondoh Snake fruit sourdough. (2023)

Num.	Grading Parameter	Panellist Name				Average Score
		Chef Billy	Chef Heru	Chef Dewa	Chef Kadek	
1	Color	4	5	4	5	4.5
2	Taste	2	5	3	5	3.75
3	Aroma	3	4	3	5	3.75
4	Texture	3	4	3	5	3.75
Total Average Score						3.93
The overall average score is 3.93 out of 5. Pondoh Snake Fruit Sourdough was well received by panellists with the common remark of: 1. Good Texture.						

Table 3: General public's grading sheet on Pondoh Snake fruit sourdough. (2023)

Num	Name	Occupation	Grading Parameters				
			Color	Taste	Aroma	Texture	Overall
1	Kenneth Fiorellino	University Student	4	3	4	5	4
2	Ira Kwok	Baker	5	5	5	5	5
3	Kusniadi	General Manager	3	3	4	4	4
4	Kimberly K.	Student	5	5	5	5	5

5	Hendra Purna	Architect	4	4	3	3	3
6	Gerry Morell	University Student	4	5	4	4	4
7	Sheila	Freelancer	4	4	3	4	4
8	James Wijaya	University Student	3	4	3	4	4
9	Nicholas Budiman	University Student	5	4	5	5	5
10	Felix A.	University Student	5	4	5	4	5
11	Wayan Adi	Barista	5	4	4	5	5
12	Makeyla	Student	3	4	3	5	4
13	Jason	University Student	5	5	4	5	5
14	Rafi Canon	University Student	4	4	5	5	5
15	Evan Wang	University Student	4	4	4	4	4
16	Alvin	Personal Trainer	4	4	4	5	5
17	Celine Kurniawan	University Student	4	3	3	4	4
18	Evelynn	University Student	4	3	4	4	4
19	Rian	University Student	5	5	4	4	4
20	Davin	IT Specialist	4	3	3	3	3
Total			84	78	79	87	86
Average Score			4.2	3.9	3.95	4.35	4.3
Total Average			4.14				

Conclusion:
Product average score is 4.14 dari 5. Pondoh Snake Fruit Sourdough is well received by panellists with the common remark of:
1. Good Texture.
2. Perfect Crust.

Table 4: Professional Chef's grading sheet on Gading Snake fruit sourdough. (2023)

Num.	Grading Parameter	Panellist Name				Average Score
		Chef Billy	Chef Heru	Chef Dewa	Chef Kadek	
1	Color	4	5	4	5	4.5
2	Taste	3	5	4	5	4.25
3	Aroma	3	4	4	5	4
4	Texture	4	4	3	5	4
Total Average Score						4.18

The overall average score is 3.93 out of 5. Gading Snake Fruit Sourdough was well received by panellists with the common remark of:
1. Suitable choice.

Table 5: General public's grading sheet on Gading Snake fruit sourdough. (2023)

Num.	Name	Occupation	Grading Parameters				
			Color	Taste	Aroma	Texture	Overall
1	Kenneth Fiorellino	University Student	4	4	4	5	4
2	Ira Kwok	Baker	5	5	5	5	5
3	Kusniadi	General Manager	4	3	4	4	4
4	Kimberly K.	Student	5	5	5	5	5
5	Hendra Purna	Architect	4	3	3	4	4
6	Gerry Morell	University Student	4	5	4	4	4
7	Sheila	Freelancer	3	4	5	4	4
8	James Wijaya	University Student	4	4	4	4	4
9	Nicholas Budiman	University Student	5	5	5	5	5
10	Felix A.	University Student	5	4	5	5	5
11	Wayan Adi	Barista	5	4	4	5	5
12	Makeyla	Student	3	4	3	5	4
13	Jason	University Student	5	5	4	5	5
14	Rafi Canon	University Student	5	4	5	5	5
15	Evan Wang	University Student	4	4	4	5	4
16	Alvin	Personal Trainer	5	4	4	5	5
17	Celine Kurniawan	University Student	4	3	4	4	4
18	Evelynn	University Student	4	3	5	4	4
19	Rian	University Student	5	5	3	4	4
20	Davin	IT Specialist	4	4	4	3	4
Total			87	82	84	90	88
Average Score			4.35	4.1	4.2	4.5	4.4
Total Average			4.31				

Table 6: Professional Chef's grading sheet on Gula Pasir Snake fruit sourdough. (2023)

Num.	Grading Parameter	Panellist Name				Average Score
		Chef Billy	Chef Heru	Chef Dewa	Chef Kadek	
1	Color	3	3	3	5	3.5
2	Taste	2	5	3	5	3.75
3	Aroma	4	5	4	5	4.5
4	Texture	2	2	3	5	3
Total Average Score						3.68
The overall average score is 3.93 out of 5. Gula Pasir Snake Fruit Sourdough was well received by panellists with the common remark of: 1. Tough texture. 2. Lack of pores.						

Table 7: General Public's grading sheet on Gula Pasir Snake fruit Sourdough. (2023)

Num	Name	Occupation	Grading Parameters				
			Color	Taste	Aroma	Texture	Overall
1	Kenneth Fiorellino	University Student	3	3	4	3	3
2	Ira Kwok	Baker	4	4	4	4	4
3	Kusniadi	General Manager	3	3	3	3	3
4	Kimberly K.	Student	4	4	4	4	4
5	Hendra Purna	Architect	3	2	4	2	3
6	Gerry Morell	University Student	4	4	4	3	4
7	Sheila	Freelancer	4	4	3	2	4
8	James Wijaya	University Student	3	4	4	3	4
9	Nicholas Budiman	University Student	4	4	5	4	4
10	Felix A.	University Student	4	4	4	4	4
11	Wayan Adi	Barista	3	4	4	3	5
12	Makeyla	Student	3	4	3	3	4
13	Jason	University Student	4	5	4	3	4
14	Rafi Canon	University Student	4	4	5	4	4
15	Evan Wang	University Student	4	4	4	4	4
16	Alvin	Personal Trainer	3	4	4	3	3
17	Celine Kurniawan	University Student	4	3	3	3	4
18	Evelynn	University Student	4	3	4	4	4
19	Rian	University Student	3	5	5	2	4
20	Davin	IT Specialist	3	3	4	3	3
Total			71	75	79	64	76
Average Score			3.55	3.75	3.95	3.2	3.8
Total Average			3.65				

Conclusion:
Product average score is 3.65 dari 5. Gula Pasir Snake Fruit Sourdough is well received by panellists with the common remark of:
3. Flaky Texture.
4. Dense Bread.

Based on the presented results, it was gathered that both expert and general respondents share similar opinions regarding the modified sourdough bread using snake fruit-based starter. Gading snake fruit sourdough received the highest scores from the total respondents, with average ratings of 4.18 and 4.31, followed by Pondoh snake fruit sourdough with average ratings of 3.93 and 4.14, while the lowest scores were given to Gula Pasir snake fruit sourdough with average ratings of 3.68 and 3.65.

5. CONCLUSION

Based on the research findings, the three types of sourdough modifications using snake fruit starters have undergone hedonic testing by panelists, and the results indicate that snake fruit is feasible and suitable for use as a sourdough starter. The findings show

that the products are approximately similar but reveal that not all types of snake fruit are ideal for use as a sourdough starter. The community's response to sourdough bread made with snake fruit starter is generally positive. Various comments were received regarding the unique flavor and its suitability, both from general panelists and professional chefs. These positive results should be accompanied by a shift in the culinary world and industry, which is expected to be more open to creativity with local products.

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