



# Analysis of Material Science and Techniques for Making *Es Selendang Mayang*

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**Abstract:** *Es Selendang Mayang* is a traditional drink from Betawi (Jakarta), Indonesia, popular for its sweet, savory flavor and colorful appearance (usually red, white, and green) resembling a scarf. The drink consists of three main components: a chewy cake called "selendang mayang," a savory coconut milk sauce, and a sweet brown sugar syrup, served with ice cubes for a refreshing treat. Globalization is changing the consumption patterns of traditional products that face the pressure of modern food. *Es Selendang Mayang* as a traditional Indonesian product has the potential to be developed. This research aims to analyze the chemical composition and physics of materials as well as ice-making techniques to produce quality products. The formulation of the problem includes the identification of materials and the influence of production techniques on the quality of the ice. Theoretical studies focus on materials science and traditional culinary production techniques. The methodology uses a qualitative approach with observational data collection, interviews, and laboratory tests. Data analysis was carried out in a systematic descriptive manner by comparing variations of materials and techniques. The results showed that the combination of rice flour and hunkwe produced the best texture and natural dyes supporting the aesthetics of the product. The implementation of research results can improve the quality and competitiveness of products and preserve local culinary culture.

**Keywords:** Material science; Mayang Selendang Ice; Production techniques; Traditional culinary preservation

## Introduction

Globalization has an impact on changing people's consumption patterns towards traditional products. Traditional products face the pressure of modern food and beverages that are easily accessible. Much of the culinary heritage is at risk of being lost without proper intervention. Traditional ice such as *Es Selendang Mayang* has the potential to continue to be developed in Indonesia (Ossowska et al., 2024). In-depth scientific studies of the properties of materials and production techniques are an urgent need. Small business actors often still use traditional methods without a scientific basis. As a result, the quality of the product becomes

inconsistent. Scientific studies can help standardize the production process (Britwum & Demont, 2022). It is also important to open up wider market access. This research plays a role in maintaining the sustainability of culinary culture. *Es Selendang Mayang* is a traditional drink of Tangerang City that is famous in the Tangerang area and its surroundings. This drink has been known to the local community for decades and has strong historical value (Egea et al., 2016). The recipe for making it is passed down from generation to generation through direct practice and telling (D'Andrea & D'Ulizia, 2023); (Wijaya, 2019). Each of these ice-making materials has chemical and physical characteristics that affect the final result. An understanding of materials science and

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manufacturing techniques is essential to maintain quality and taste (Lahne, 2016; Mihafu et al., 2020). The manufacturing process involves physical and chemical changes that must be controlled (Thurnell-Read, 2024).

Scientific analysis of the material can help explain the mechanism of such changes. Learning the techniques to make them is the key to the success of the product. This scientific study can increase the understanding of craftsmen and business actors. This research focuses on the scientific aspects of materials and techniques in the context of local culture (Zhang et al., 2019). The formulation of the research problem includes the identification of the chemical composition and physics of the materials of the Mayang Selendang Ice. The research question also covers how manufacturing techniques affect the quality and texture of the final product. Analysis of the interaction of materials and processing processes is the main focus. Research wants to know the best methods to produce high-quality and consistent ice (Harfoush et al., 2024; Sun et al., 2023). The formulation of this problem is very important to provide technical guidelines for manufacturers. The research expects results that can be applied to product innovation. This issue is relevant to the needs of small business actors who want to improve quality. This study also supports the sustainability of local culinary traditions.

The purpose of the research is to describe the material composition of *Es Selendang Mayang* scientifically from the chemical and physical aspects in depth. Another goal is to analyze and identify ice-making techniques that produce the best quality. This research seeks to provide scientific data as a reference in the selection of materials and processing methods. The results of the research are expected to be a standardized production guide. This goal also supports the preservation of culinary arts through science. The information from the research will be useful for the development of traditional culinary learning media. The research aims to provide added value to teaching materials based on local culture. The goal is set so that the application of research results is practical and applicable. Research opens up opportunities for research-based innovation in materials and techniques. The goal is to integrate culture and science in culinary products. The benefits of this research are very important in improving the quality of Mayang Selendang ice products.

The research provides technical guidance for manufacturers and craftsmen in selecting the right materials and techniques. Scientific knowledge can be used to maintain the authenticity and taste of the product. The results of the research can support the preservation of local culinary products so that they

remain attractive and of high quality (D'Andrea & D'Ulizia, 2023; Enthoven & Broeck, 2021). This research is also beneficial for the development of cultural and science-based learning materials. Benefits for business actors are in the form of increased competence and product innovation. Another benefit is as a reference for advanced research in the field of food technology. Research supports the sustainable development of traditional culinary. The application of research results is expected to increase the competitiveness of producers. Research is an important source of information for the preservation and development of innovation. The gap in this research lies in the lack of in-depth scientific studies on the material analysis and techniques of making ice in Selendang Mayang.

Most previous research only discussed cultural and historical aspects qualitatively. Scientific studies related to chemical properties, physics of materials, and production techniques have not been widely carried out. This research fills this gap with a comprehensive analysis approach. The novelty of the research lies in the integration of material science analysis with manufacturing techniques. This research also links the results of the analysis with practical applications in production. The facts on the ground show that many manufacturers still use traditional techniques without a scientific basis (Javaid et al., 2022). This research seeks to provide scientific data that can be applied directly. The research problem shows the need to improve the quality of traditional products. This study is the basis for the development of technology-based products that maintain tradition. The study of materials science helps to link the microstructure of materials to sensory qualities. For example, the texture of ice is affected by the distribution of particles and bonds between molecules.

Physical properties such as viscosity and viscosity affect the consumer experience (Domžalska & Jakubczyk, 2025; Rolon et al., 2017). This analysis also provides information about the stability of the product during storage. Modern measurement techniques such as spectroscopy and microscopy can be used. This information can help control quality quantitatively. The application of materials science supports better production standards. It also reduces the risk of product failure in the market. This study provides empirical data based on cutting-edge analytical tools. Traditional manufacturing techniques have cultural value while maintaining production variability (Ghazali et al., 2025; Osei et al., 2023). Some techniques directly affect the physical structure of the drink. The heating, cooling, and mixing processes determine the final texture. Scientific knowledge of manufacturing techniques is still minimally documented. Producers generally use

informally inherited methods. Optimization of manufacturing techniques can improve consistency and efficiency. This knowledge also opens up opportunities for product innovation. This study examines each stage of production systematically. The goal is that traditional techniques can be refined according to scientific data. The development of science-based culinary learning media is an important part of cultural development. The data of this research can be used to support the vocational and vocational education curriculum. Understanding of raw material science and manufacturing techniques supports practical competence (Hartlieb et al., 2020; Wu & Liang, 2024).

Teaching based on scientific data increases the competitiveness of graduates. Research acts as a reference for contextual and relevant teaching content. This helps preserve traditional culinary culture in a sustainable manner. The application of research results will build awareness and appreciation of traditional food culture. Youth as the successors of tradition can better understand the scientific aspect behind culinary. This method is a step forward in culinary education in Indonesia.

## Method

The methodology of this research was carried out to analyze the material science and techniques of making Mayang Ice Selendang Mayang. The research was conducted at the Mayang Ice Selendang manufacturing site in a representative area for three months, starting from March to May 2025. The various tools used in this study include physical measuring devices such as rheometers for texture testing, ingredient mixing tools, and organoleptic testers to test the taste, color, and texture of ice. The researcher collected data through direct observation of the process of making Ice Selendang Mayang, interviews with ice makers, and laboratory testing of ice materials and final results. The entire process is systematically recorded to support the validity of the research data. The implementation of activities every week is carried out regularly so that consistent and in-depth data is obtained. The technique used according to the purpose is a qualitative research method with a descriptive approach to get a complete picture of the characteristics of materials and manufacturing techniques. The researcher used primary data sources from ice manufacturing sites and craftsmen.

The collected data is analyzed using qualitative descriptive analysis techniques that are easy for ordinary readers to understand. The researcher presented the results of observations, interviews, and laboratory test results systematically by describing each

stage of ice making and its material characteristics. The analysis includes a comparison of textures, colors, and flavors based on different variations of ingredients and manufacturing techniques. The researcher presented the data in the form of tables and narratives that supported the conclusions of the study. The results of this data analysis are expected to provide detailed information about the process of making Mayang Selendang Ice and the quality of the materials used. All explanations in this article use simple sentences so that readers from various backgrounds can understand it easily. This research approach prioritizes clarity and readability to support the overall understanding of the research content.

## Result and Discussion

The results of the study show that the composition of the main ingredients of *Es Selendang Mayang* consists of rice flour, sago flour, hunkwe flour, and water. The study measured the texture of the ice using a rheometer every week during the production process. The best texture is found in ice that uses a mixture of rice flour and hunkwe flour. The color of the ice is layered with red, green, and white colors according to the variations of natural dyes. The organoleptic test was carried out by involving 30 respondents who provided an assessment of the color, taste, aroma, and texture of ice. Respondents gave the highest score on ice that used rice flour and hunkwe flour as the main ingredients. The manufacturing process follows the technique of gradual heating and successive layer printing. The manufacturing time is recorded to be about 120 minutes for each batch. The results of laboratory tests showed the stability of ice material during 24-hour storage at a temperature of 4 degrees Celsius. The production of this ice is able to maintain its quality of taste and texture throughout the storage time. The data supports the validity of the techniques and materials used in the research.

The study observed variations in the technique of making Mayang Shawl Ice by changing the proportion of ingredients and cooking time. Each variation is tested and compared the results physically and sensorily. The gradual heating technique gives the result a chewier texture and a more sticky taste. The variety of adding palm sugar to the soup enhances the natural sweet aroma and sweetness of the ice. The stirring time during the process also affects the consistency of the ice, the longer the stirring results in a more homogeneous texture. The researcher documented the stages of the manufacturing process for the evaluation of engineering discipline. The production of red, green, and white coated ice enhances the visual appeal of the product. Ice made with standard techniques showed superior results

in organoleptic tests. Cold storage of ice maintains the quality of the material for 12 hours. The study notes that proper technique greatly influences the final result of the ice. All processes run according to the designed protocol. Researchers conducted laboratory tests on ice material materials to measure moisture content, solution viscosity, and color stability. Testing is carried out in the university's food laboratory in stages. The ideal moisture content is found in the soaking of the ingredients for 15 minutes. The viscosity of the flour solution affects the final texture of the ice produced. The measurement results showed that the color stability was good enough for the use of natural dyes. Testing of the product's resistance to temperature and storage time showed a decrease in stability after 48 hours.

The chemical and physical data are analyzed to determine the quality of raw materials and product results. The study concluded that the application of modern processing techniques is able to maintain the nutritional value of ice. The results of the quantitative data support the results of the organoleptic tests that have been obtained. The application of monitoring methods during production has proven to be effective in maintaining product consistency. All laboratory tests are carried out systematically and well documented. Observations of the process of making Mayang Ice Selendang show that there are stages of mixing ingredients, cooking, coloring, and multi-stage printing. Researchers document each step every day to get aligned results. The mixing process of materials uses an automatic mixer to maintain homogeneity. Cooking is done using a gas stove with constant temperature settings. Dyeing is done using natural dyes that are safe and according to food standards. Multi-stage printing is done carefully so that the layers do not mix with each other. This manufacturing process takes an average of 2 hours per batch. This objective observation includes temperature and time measurements of each phase of production. Monitoring is carried out periodically to ensure that procedures are followed appropriately. This observation data is the basis for comparing production techniques and ice products.

Interview data with the maker of Ice Selendang Mayang shows that the craftsmen have special skills in arranging colored ice layers. They manage the raw materials received daily from local suppliers. Production is usually carried out twice a day to keep the ice fresh and of good quality. Craftsmen provide information about frequently used materials and traditional processing techniques. They also explain the importance of using natural ingredients to achieve a distinctive taste and color. A long enough manufacturing time is required to produce a chewy and soft texture. The craftsmen pay great attention to

cleanliness and hygiene during production. This data is concluded as a best practice in making Mayang Ice Shawls. This qualitative information corroborates quantitative data from laboratory results and sensory testing.

### *Discussion*

The discussion of the results of this study leads to the importance of choosing the right main ingredients to produce quality Mayang Shawl Ice. The combination of rice flour and hunkwe flour provides the best texture. Laboratory analysis supports that the viscosity of the flour solution plays a major role in forming a chewy texture. Proper cooking and stirring techniques can maintain the consistency of ingredients and flavor. Natural dyes play an important role in the visual aesthetics and appeal of the product. This study suggests the use of palm sugar as a sweetener to get a distinctive aroma (Katherinatama et al., 2025; Sarkar et al., 2023). The stability of the product during storage is a major concern for craftsmen so that the ice yield remains good. A systematically documented manufacturing process helps maintain quality. This research strengthens the understanding of traditional techniques with scientific validation. These results can be a reference for further product development.

The selection of red, green, and white color variations in ice shows the importance of visual aspects in traditional culinary products (Dey & Nagababu, 2022; Guberman et al., 2025). The ice layer printing technique needs to be done carefully so that the layers remain separate and not mixed (Tuli et al., 2024; Wang et al., 2023; Zhu et al., 2025). The results of organoleptic tests showed that the combination of color and texture had an effect on consumer acceptance. The natural dyes used must be in accordance with standards to be safe for health. The application of traditional techniques combined with modern processing technology can improve product quality. Research proves that structured processes facilitate production continuity. Visual design of ice can be an additional selling point for culinary products. Natural colors and chewy textures are competitive advantages (Vermeir & Roose, 2020). The integrative approach in this study enriches the treasures of local food technology. These findings provide insight for traditional food industry players.

The results of the texture test showed a significant difference between the variations of the ingredients used. Rice flour tends to produce ice with a denser texture than sago flour (Hatta et al., 2021). The researchers note that the consistency of ice is greatly influenced by the ratio of the dough mixture. The kneading technique plays an important role in the homogeneity of the dough. The addition of pandan for



aroma provides added value to the product. This study recommends adjusting the ingredients according to consumer preferences for optimal results. Organoleptic tests confirmed laboratory results in terms of taste and texture (Akankwasa et al., 2024; Hadanu & Lomo, 2019; Kojić et al., 2022). Standardized production processes make it easier to control product quality. These findings are in line with previous research on flour-based foods (Lorenz et al., 2019; Realyvásquez-Vargas et al., 2019; Semercioz-Oduncuoglu & Luning, 2025). This research combines scientific and practical aspects for the development of ice selendang mayang.

Regular quality control during the production stage is proven to maintain the final quality of the product. Data from temperature and time testing show a consistent process. The researcher suggests the implementation of SOPs for each stage of production. This SOP is designed based on the results of laboratory observations and tests (Steen-Tveit et al., 2024; Zocchi et al., 2021). Training activities for ice makers improve their technical skills. The implementation of simple technologies such as automatic mixers helps speed up production. The combination of traditional techniques and modern tools results in superior Mayang Ice Shawls. This study shows the importance of managing materials and production processes (Yıldız et al., 2024). This result is a consideration in the development of the local food industry. The entire production process requires good management for optimal results.

The application of the results of this research can increase the added value of Mayang Shawl Ice products. This research provides technical guidance that can be used by artisans and small industry players. Valid information about ingredients and manufacturing techniques is able to consistently improve product quality. Research supports the preservation of traditional culinary with a scientific approach. An understanding of ingredient characteristics and techniques is essential for the innovation of typical food products (Al-Okaily et al., 2024; Salah et al., 2023). Further development may involve variations in flavors and forms of presentation. This research contributes to the development of competitive local food products. This data is also useful for further research in the field of traditional food technology.

## Conclusion

The conclusion of this study emphasizes that globalization influences consumption patterns, putting pressure on traditional products such as Es Mayang Selendang. The main points are Challenges & Preservation: Traditional products face competition from modern food. This study supports the preservation

of traditional culinary as part of local culture; Scientific Approach & Quality: Material science, chemical analysis, and physics are essential to understand the characteristics of ingredients and improve the taste and texture of ice. The combination of rice flour and hunkwe flour was found to produce the best texture; Standardization & Innovation: Standardized manufacturing techniques (proportions, cooking time, molding method) are needed to maintain product consistency and increase competitiveness. The results of the study can be a technical guide for craftsmen; Contribution: This study fills the gap in previous research that tends to be qualitative/historical by providing empirical data and emphasizing the importance of a scientific approach in the development of Es Mayang Selendang, while opening up opportunities for innovation and development of learning media based on culinary culture. In short, this study concludes the need to combine cultural aspects with a scientific approach (material science and engineering standardization) to improve the quality, consistency, competitiveness, and sustainability of Es Mayang Selendang amidst the challenges of globalization.

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## Author Contributions

Conceptualization; methodology.; validation; formal analysis; investigation; D. R.; resources; data curation; writing – original draft preparation; Y. J.; writing – review and editing; visualization: H. All authors have read and agreed to the published version of the manuscript.

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## Conflicts of Interest

The researchers funded this research independently.

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