The quality analysis of "JOSS" (Jatisarono Organik Sehat Sejahtera) organic rice

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Abstract. Consumption of organic rice continues to increase accompanied by the increasing number of organic rice products in the market. This results in increasingly tight competition for organic rice product. One of the efforts for a new product to be accepted by consumers is by paying attention to its quality. In addition, it is also necessary to know the level of consumer acceptance on the product. The main subject of this research is JOSS Organic Rice, a local product from Yogyakarta Special Region that is currently in the phase of introduction to the market. The purpose of this study is to conduct an analysis of the quality profile of JOSS Organic Rice and its level of consumer acceptance. The rice samples used in this study are white organic aromatic rice from JOSS Organic Rice (Menor), Brand X (Mentik Susu), and Brand Y (Pandan Wangi). The samples have the same limitations in terms of location, price, and production period. The physical quality testing includes attributes such as rice color, rice dimensions, and rice hardness. Meanwhile, the chemical quality testing includes moisture content, whiteness, and cooked rice shelf life. Rice dimensions are calculated using ImageJ, hardness is tested using a Universal Testing Machine, moisture content is measured using an moisture analyzer, rice color is assessed using a chromameter, rice stickiness is measured using a spektrofotometer. JOSS Organic Rice has the characteristic of having a dull white color, medium rice grain shape, but it tends to break easily. The texture of the cooked rice from JOSS Organic Rice is not too sticky nor too loose. Based on consumer acceptance tests, JOSS Organic Rice scored highest in rice stickiness, while the attribute related to rice appearance had the lowest consumer acceptance score. These results proved that the most disliked of JOSS Organic Rice's appearance surprisingly resulted in the most preferred cooked rice by consumers.

1 Introduction

The consumer interest in a product becomes more focused and diverse over a time. This has a positive impact, leading to the emergence of various brands of organic rice products in the market. The abundance of organic rice products in the market creates intense competition for new products to be accepted by consumers. One of the efforts for a new product to be accepted by consumers is by paying attention to its quality attributes to align with consumer expectations. Hence, there is a need to conduct an quality analysis of JOSS Organic Rice based on its quality attributes. In addition, it is also necessary to anlyze the level of consumer acceptance on the product.

Jatisarono Organik Sehat Sejahtera Organic Rice, referred as JOSS Organic Rice, is an organic rice productfrom the Rice Farmers Group in Kulon Progo Regency, specifically located in Jati Ngarang Lor Village. JOSS Organic Rice first introduced its rice products to the market in 2013 and began promoting organic rice in 2020. They produce two types of rice: white rice and red rice, using various rice varieties. The rice varieties that commonly used are Ciherang, Menor, Rojolele, Nutrizinc, and Pandan Wangi. JOSS Organic Rice also has a division known as the Internal Control System (ICS) to monitor and oversee theproduct quality throughout the production process, both inthe fields and post-harvest. For the JOSS Organic Rice company, product quality is a top priority.

One of the existing problems based on the researcher's interview with the company is related to the wholeness of the rice grains. The company was dissatisfied with the final shape especially rice wholeness after the post-harvest handling process. Based on manual visual observation, JOSS organic rice grains have prominent characteristics. Rice grains tend not to be intact or cracked. These problems can undoubtedly impact sales, where consumers wonder and assume the product is not fresh and has poor quality.

According to the expert, Heizer & Rander (2001), quality is defined as the entirety of the form and characteristics of goods or services that demonstrate theirability to satisfy both evident and hidden needs. The quality of rice is regulated by the SNI 6128-2020, which applies to both organic and non-organic rice, consisting general requirements and quality specifications. For organic rice is also requiring to adhere to SNI 6729:2016 (Organic Farming System). [6]

2 Research Method

In this study, the quality of rice will be assessed through few physicochemical testing. The physical quality testing includes attributes such as rice color, rice dimensions, and rice hardness. Meanwhile, the chemical quality testing includes moisture content and rice stickiness. Rice color testing is conducted using a

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chromameter and employs color parameters such as L*, a*, b* values. Rice shape measurement is identified through dimention test and hardness test. Rice dimension measurement involves measuring the length and width of the rice. Length and width are calculated using the ImageJ software with ten repetitions for each organic rice sample. Hardness testing is conducted using texture analysis with a Universal Testing Machine (UTM) and repeated twice. To determine the stickiness level of cooked organic rice can be found from amylose and amylopectin content and tested using spectrophotometer an instrument for measuring sample absorbance at specific wavelengths. The moisture content of rice is measured using the Ohaus Moisture Analyzer through the thermogravimetric method. Consumer acceptance is determined through hedonic testing. The sensory testing method that used in this research is consumer acceptance test that refers to SNI 01-2346- 2006.

Tabel 1. Data Collecting and Processing Methods

Data	Data Collecting	Data Processing
Rice Dimension	Length and width measurements using ImageJ Software	- Normality Test - Kruskall-Wallis Test - Mann-Whitney Test
Rice Hardness	Hardness test using Universal Testing Machine (UTM)	
Rice Color	Color test using chromameter	
Rice Moisture Content	Moisture test using Ohaus Moisture Analyzer	
Rice Stickiness	Amylose content test	
Consumer Acceptance	Hedonic Test	
Quality Attributes	Literature	Descriptive

3 Sample

The sample is determined based on the market survey by selecting 1 sample at different market positions. Based on market surveys that have been conducted, Brand Y (Pandan Wangi) rice samples are included as the market leader, Brand X (Mentik Susu) is included as the market challenger, and JOSS organic rice is a market follower. Based on a preliminary survey, the classification is determined by looking at market data, sales, and product distribution in the Yogyakarta Special Region. Market surveys were conducted before the start of the study, and data was generated in the form of the availability of organic rice products in traditional retail in each city/district in Yogyakarta.

3.1 Brand X (Mentik Susu)

Mentik Susu variety is one of the main varieties used in selling Brand X aromatic white organic rice products. Brand X organic rice produces organic rice together with partner farmer groups based on mutual trust. Brand X organic rice is from rice grown in the DIY and Magelang regions. The Mentik Susu variety is selected because Mentik Susu is the mainstay local variety of organic rice farming in the area where the farmer group is located. Mentik Susu variety is included in aromatic rice, whose shape is closer to the shape of white sticky rice. The Mentik Susu variety has a fluffier texture and whiter color (Handayani et al., 2018).

3.2 Brand Y (Pandan Wangi)

Brand Y Organic Rice uses the pandan wangi variety, also included in the aromatic rice type. The pandan wangi variety was chosen as the main variety in selling Brand Y organic white rice because it is one of the local superior varieties. Similar to Brand X, Brand Y organic rice is taken from rice grown in the DIY and Magelang areas. The production system is also the same as Brand X, namely by partnering with several farmer groups. According to Syamsiah et al. (2020), the Pandan Wangi rice variety has a characteristic according to its name, namely producing pandanus-scented rice with a fluffy texture.

3.3 JOSS (Menor)

Organic is Unlike the other two samples, JOSS Organic Rice is produced by the farmers themselves. JOSS Organic Rice is produced from rice grown in the Nanggulan area using the Menor variety, a superior local rice variety from the Menoreh Mountains region. Menor rice is a local rice that is developing in Kulon Progo Regency.

4 Result and Discussion

4.1 Rice Shape

4.1.1 Rice Dimension

The measurement of rice dimensions was conducted with ten repetitions for each sample of organic rice. Rice dimensions include length and width, from which the elongation value (length/width) was derived. The steps involved in measuring the dimensions included capturing images of rice grains placed on a millimeter-block base next to a ruler. These images were then processed using ImageJ software to calculate the length and width of the rice grains. The results of the length and width measurements using ImageJ software can be seen in Table 2.

Table 2. Dimensions of organic rice

Sample	Length (cm)	Widht (cm)	Ratio (L/W)	Length category	Shape
Brand X (Mentik Susu)	0,560[a]	0,230[a]	2,433	sedang	medium
Brand Y (Pandan Wangi)	0,579[a]	0,264[b]	2,197	sedang	medium
"JOSS" (Menor)	0,625[b]	0,234[a]	2,674	sedang	medium

*different letter notations in the same column indicate significant differences with a significance level of 5%.

Based on the measurements of length and width from the three samples of organic rice, it can be observed that there are significant differences among some samples. In terms of length measurements, JOSS Organic Rice exhibits a significant difference from the other two samples. The length of JOSS Organic Rice using the Menor variety is the longest and tends to be longer, measuring 0.625 cm. According to the Department of Agriculture (2003), based on length measurements, rice can be classified into several groups, including Short (<5.51 mm), Medium (5.51-6.60 mm), Long (6.61-7.50 mm), and Very Long (>7.50 mm). Consequently, the length measurements of these three samples fall within the Medium rice category, which is 5.51-6.6 mm in length.

In terms of width measurements, JOSS Organic Rice doesn't show a significant difference compared to Organic Rice Brand X (Mentik Susu), while Rice Brand Y (Pandan Wangi) exhibits a significant difference, tending to be wider with a value of 0.264. The elongation values of the three samples don't present significant differences; all of them fall into the classification of rice with a medium shape size, which corresponds to a ratio value between 2.1-3.0.

4.1.2 Rice Hardness

In a package of organic rice, the initial visual perception for consumers is rice dimensions and also rice wholeness. To assess the level of rice wholeness in each organic rice sample, this can be done by calculating the percentage of broken rice or by conducting a hardness test on the rice grains. The hardness test is carried out using a Universal Testing Machine (UTM) by measuring Fmax, which represents the maximum force required to compress the product until it breaks for the first time. The results of the rice hardness test can be seen in Table 3.

Table 3. Hardness test of organic rice

Sample	Unit	Average
Brand X (Mentik Susu)	Fmax (N)	405,43 ± 1,60[a]
Brand Y (Pandan Wangi)	Fmax (N)	405,55 ± 1,15[a]
Rice "JOSS" (Menor)	Fmax (N)	403,83 ± 1,90[a]

*different letter notations in the same column indicate significant differences with a significance level of 5%.

From the results of the hardness test, it can be observed that the three samples do not exhibit significant differences. The Fmax values for Rice Brand X (Mentik Susu) are not substantially different from the Fmax values for Rice Brand Y (Pandan Wangi), measuring 405.43 N and 405.55 N respectively. JOSS Organic Rice has the lowest Fmax value among the three samples, measuring 403.83 N. The relatively lower value can potentially contribute to the susceptibility of JOSS Organic Rice grains to breakage. According to research conducted by Widiatmoko (Hernawan & Meylani, 2016), the hardness value of rice is influenced by factors such as moisture content and the duration of rice storage. Broken rice can also result from the milling process. The use of a new milling stone can lead to more broken rice, while a worn milling stone tends to produce fewer broken rice grains (Handayani et al., 2018). [4,5]

The hardness value of rice affects the level of rice wholeness in each sample. The greater the hardness value of the rice, the more resistant it is to breaking or fracturing. This aligns with the calculation of broken and chalky rice in each sample. JOSS Organic Rice is a sample with the highest percentage of chalky and broken rice in a single package. The percentage of chalky and broken rice in a package of JOSS Organic Rice reaches 60%, surpassing the percentage of intact rice. This can be attributed to overly harsh milling, resulting in a higher amount of broken and chalky grains (BSN, 2015).

4.2 Rice Moisture Content

Rice moisture content is the amount of water content present in rice, expressed as a percentage. The hardness level of rice is greatly influenced by its moisture content. Moisture content is also a crucial quality attribute as it can impact the appearance, texture, and taste of food products. The rice moisture content measurements for the three samples can be seen in Table 4.

Table 4. Moisture test of organic rice

Sample	Unit	Average
Brand X (Mentik Susu)	(% Wb)	10,40 ± 0,54[a]
Brand Y (Pandan Wangi)	(% Wb)	11,18 ± 0,040[a]
Rice "JOSS" (Menor)	(% Wb)	13,49 ± 0,060[b]

*different letter notations in the same column indicate significant differences with a significance level of 5%.

The analysis results indicate that only the moisture content of JOSS Organic Rice shows a significant difference compared to the other two samples. JOSS Organic Rice has the highest moisture content at 13.49%. The moisture content of Organic Rice Brand X (Mentik Susu) is at 10.40%, while Organic Rice Brand Y (Pandan Wangi) has the lowest moisture content at 11.18%. According to the quality requirements for organic and non-organic rice, all three samples still meet the SNI criteria, which state a maximum moisture content value of 14%.

Stated by Arsyad & Saud (2020), excessively high moisture content (over 14%) can affect the rice milling process; the rice grains become too soft or mushy, leading to broken rice. Excessively low moisture content can also make the rice too dry and prone to breakage. Aside from moisture content, rice breakage can also be caused by inadequate drying processes. According to research by Prasetyo et al. (2008), using excessively high drying temperatures can lead to rapid drying rates, inducing stress within the material, creating moisture content variations, resulting in cracks, and lowering rice quality, characterized by a decrease in the percentage of head rice.

4.3 Rice Color

Rice color is greatly influenced by the rice variety used. There are rice varieties with bright white color, while others have a dull white appearance. Based on the color test conducted using a chromameter, the L*, a*, and b* values of the three rice samples can be seen in Table 5.

Table 5. The value of brightness, redness and yellowness of organic rice color

Sample	Lightness (L*)	Redness (a*)	Yellowness (b*)
Brand X (Mentik Susu)	67,81[b]	-1,42[a]	7,71[a]
Brand Y (Pandan Wangi)	57,20[a]	-1,84[a]	8,13[a]
Rice "JOSS" (Menor)	59,82[a]	-1,68[a]	7,51[a]

*different letter notations in the same column indicate significant differences with a significance level of 5%.

The rice types in the three samples are white rice, so the color test results can be observed in the L* parameter, which represents the brightness level of color, with a value of 0 for black and 100 for white. The a* value indicates the level of redness for positive values, while the b* value indicates the level of yellowness for positive values. Based on the testing results using the chromameter, JOSS Organic Rice has a brightness level (L*) of 59.82. JOSS Organic Rice and Rice Brand Y (Pandan Wangi) have similar values, while Rice Brand X (Mentik Susu) has a higher value, measuring 67.81.

Based on the color test results, it is evident that Rice Brand X (Mentik Susu) has the highest level of brightness, measuring 67.81. This aligns with the theory that variety of Mentik Susu tends to have a whiter color, resembling the color of milk. Mentik Susu rice is a variety with a milky white color due to genetic factors that result in a higher calcium content in the organic rice grains of the Mentik Susu variety (Handayani et al., 2018). The color test results for JOSS Organic Rice and Rice Brand Y (Pandan Wangi) are not significantly different. Both samples have a similar color, falling within the category of dull white.

4.4 Rice Stickiness

The testing of rice stickiness level is conducted by examining the amylose content of the rice using a spectrophotometer, which is a testing instrument used to measure the absorbance of a sample at a specific wavelength. The amylose content results for the three samples can be observed in Table 6.

Table 6. The amylose levels of organic rice

Sample	Unit	Average
Brand X (Mentik Susu)	(% Wb)	14,48 ± 0,05[a]
Brand Y (Pandan Wangi)	(% Wb)	17,99 ± 0,06[b]
Rice "JOSS" (Menor)	(% Wb)	15,46 ± 0,06[c]

*different letter notations in the same column indicate significant differences with a significance level of 5%.

In terms of statistical analysis, the amylose content values of the three samples do not show significant differences, but there are notable differences in the values. Among the three samples, the amylose content of JOSS Organic Rice falls in the middle range when compared to the other two samples. The amylose content value of JOSS Organic Rice is 15.46%, which classifies it as medium amylose rice, resulting in rice that is neither overly sticky nor too loose. Organic Rice Brand Y has the highest amylose content at 17.99%, while Organic Rice Brand X has the lowest amylose content at 14.48%.

According to the classification by Kumar and Kush as cited in Sari et al. (2020), JOSS Organic Rice and Organic Rice Brand Y (Pandan Wangi) fall under the medium amylose rice classification, while Organic Rice Brand X (Mentik Susu) is categorized as low amylose rice. Based on the Indonesian National Standard (SNI) Number 6128 of 2015 regarding rice, one of the factors determining the rice texture, whether sticky or loose, is the amylose content. A content of amylose > 25% results in a sticky texture, amylose content between 20-25% leads to a loose texture, amylose content between 15-20% results in a very loose texture, and amylose content < 15% is associated with a sticky (glutinous) texture (BSN, 2015). [7]

4.5 Consumer Acceptance

The Consumer acceptance test determines consumer assessment of a product's properties or quality. The acceptance test used in this study is the hedonic test, a sensory (organoleptic) test used to determine the preference level for a food or beverage product. A hedonic test assessment was conducted on 47 panelists with different age ranges and domiciles. In the consumer acceptance test, mathematical data processing was carried out using the Kruskal-Wallis method to determine whether the results of the three samples were significantly different. The results showed that rice color, wholeness, and texture attributes were significantly different. There is no significant difference in the rice aroma attribute and overall results.

Table 7. Average score of hedonic test

Attributes	Average Score of Hedonic Test		
	Brand X (Mentik Susu)	Brand Y (Pandan Wangi)	JOSS (Menor)
Rice color	5,85 ± 0,932[a]	4,85 ± 1,489[b]	4,66 ± 1,109[b]
Rice wholeness	5,19 ± 1,345[a]	5,77 ± 1,047[b]	3,91 ± 1,265[c]
Cooked rice stickiness	4,83 ± 1,372[a]	4,57 ± 1,379[a]	5,43 ± 1,137[b]
Cooked rice aroma	4,72 ± 1,136[a]	5,28 ± 1,246[a]	5,00 ± 1,319[a]
Overall	4,74 ± 1,276[a]	5,30 ± 1,30[a]	5,19 ± 0,947[a]

*different letter notations in the same column indicate significant differences with a significance level of 5%.
1 = Dislike very much 2 = Dislike moderately 3 = Dislike slightly 4 = Neutral 5 = Like slightly 6 = Like moderately 7 = Like very much

The acceptance value of Brand X (Mentik Susu) in rice color attributes has a significant difference

with the two samples, while Brand Y (Pandan Wangi) and JOSS Organic Rice (Menor) have similar or not significantly different values. In the rice wholeness attribute, each sample has a significantly different value. Based on general assessments, consumers will give a low acceptance value to rice with a dull color (Mardiah et al., 2016) At the rice texture attribute, Brand X (Mentik Susu) has a consumer acceptance value that is not significantly different from Brand Y (Pandan Wangi), while JOSS Organic Rice has a significant difference compared to the other two samples. The rice aroma attribute has no significant difference in the results of all samples, and this can be caused because all organic rice samples used are included in fragrant rice varieties. In addition, the aroma of rice that is easily lost or faded can also be a factor causing the value of consumer acceptance of the rice aroma attribute is not significantly different.

The overall attribute does not have a significant difference in value, and this can be due to consumer preferences that balance the quality of rice and rice and are not too affected by the differences in each sample as a whole. Overall, JOSS Organic Rice is only limited to a score of 5 or Somewhat Like. This result can be due to consideration of the physical quality of rice, which has a low level of wholeness.

Based on the table, it can be seen that JOSS Organic Rice received a relatively low score on the rice wholeness attribute. This proves that the results of the quality characteristics show that JOSS Organic Rice breaks easily have a significant impact on consumer acceptance. Consumers tend to like rice with a high wholeness level and do not break easily. Based on the level of liking, JOSS Organic Rice is most significant in the attribute of rice stickiness, with an average score of 5,4. That score proves that the test results for the amylose content of JOSS Organic Rice, which is in the middle range, produce rice with the stickiness/fluffiness most liked by consumers.

5 Conclusion

JOSS Organic Rice, currently positioned as a market follower, exhibits quality characteristics that enable it to compete with the other two samples. JOSS Organic Rice has a brightness value (L*) of 59.82, with a characteristic dull white color. Its rice shape is medium and tends to be breakable. The resulting moisture content value is 13.49%, and the rice hardness is measured at 403.83 N. The rice texture from this rice is neither too sticky nor too loose, with an amylose content of 15.46%.

Based on the consumer acceptance test, JOSS Organic Rice has the highest acceptance value on the rice texture attribute, while the quality attribute with the lowest acceptance value is the rice wholeness attribute. These results prove that the least favorable level of wholeness of JOSS Organic Rice produces the most favorable rice texture for consumers.

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