Conference Paper

Characterization of Physical and Chemical Quality of Selected Indonesian Rice based on Geographical Origin

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Abstract

Local rice with typical quality characteristics that linked strongly with its geographical origin needs to be promoted as geographical indication products for marketing and legal protection purposes. Characterization of both physical and chemical quality parameters, therefore, need to be studied. A local rice variety called 'Rojolele' and the other rice variety for comparison purposes was collected from different regions in Central Java province and determined their quality parameters. The results then were tested with ANOVA. Rice quality characteristic differences among various geographical origins were observed and discussed in this paper.

Keywords: Geographical Indication; Quality; Rice; Rojolele

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INTRODUCTION

Rice is the staple food in Indonesia, which was reached 46.67% of total calorie daily intake consumption in the country. Being the staple food of the country, rice consumer has considered several buying decision factors such as flavor, nutrition content, and price. Besides, Indrasari [6] reported that consumer from different regions in Indonesia has their own preference, including shape, taste as well as hardness of the cooked rice. Furthermore, Haryadi [5] mentioned that rice quality could be divided based on several aspects such as geographical origin, varieties, and processing techniques.

For marketing purposes and easiness to be identified by its consumer, rice has been sold in labeled packaging, especially for the premium variety such as 'Rojolele' and 'Pandanwangi,' which consist information about rice variety, geographical origin, and quality grade. Although has good purposes, there is a possibility of information misuse.

Table 1: Geographical information of the sample's location.

Region	Sub-region	Coordinate	Altitude (m a.s.l.)	Rainfall* (mm.month-1)
Klaten	Karanganom	-7°37'S 110°37'E	276	188
	Polanharjo	7°39'S 110°40'E	172	183
Boyolali	Banyudono	7°33'S 110°42'E	175	159
* modified from Meteorology and Geophysics of Indonesia				

For instance, rice originated from other region has been labeled with Delanggu, a well-known sub rice producer area within Klaten, in order to increase the selling price of the products [9]. An effort has been made by the Government through releasing of

Government Regulation about Geographical Indication Protection, including for rice originated from Delanggu. Based on the Indonesian Government Regulation No. 51 issued in the year 2007, Geographical Indications has been defined as a sign indicating the origin of goods that correspond to geographical environment factors, either natural, human or both factors, providing the particular quality characteristic of the products. To obtain certification of protected geographical indications, the information about the profile and the quality characteristics of rice produced in Delanggu area, therefore, are required. The research aimed to profile quality characteristics of selected rice varieties based on their geographical origins.

MATERIAL AND METHODS

Rice samples

Variety 'Rojolele,' a premium rice in Indonesia, was chosen as sample. Samples were obtained from two regions, namely Klaten and Boyolali. From each region, one to two sub-regions were selected based on their rice production levels and the availability of the selected rice varieties. Location coordinates and altitudes were deduced from "Google Maps" (Table 1), while rainfall data were obtained from Meteorology and Geophysics of Indonesia.

Samples were harvested at their physiological maturity and were collected directly to assure their authenticity.

To confirm the effect of geographical location factors on the observed quality characteristics, 'IR-64' that widely grown in the area were chosen.

Quality parameter analysis

Both chemical and physical quality parameters, such as length, elongation, lightness (L) value, and the content of total ash, total fat, protein, carbohydrate as well as amylose of the samples were determined. Length and width were measured with micrometer screw on 20 rice samples, where the comparison of length to width was used to define rice elongation. A certain amount of rice was put into the granular material attachment of Konica Minolta Chroma meter CR-400 and measured its L value.

Chemical quality parameters were measured according to Rohman, et al. [8]. A method, described by AOAC, was applied to determine total ash by furnace incineration. Determination of total fat content was done using Soxhlet extraction. The extraction was accomplished by Soxhlet apparatus for a minimum five hours refluxing period, using petroleum ether as solvent.

The second studied chemical parameter, crude protein content, was determined using the AOAC Kjeldahl method, involving protein digestion and distillation. The carbohydrate content of the sample was measured as a percentage value by the difference method as reported by Onyeike, E. N] in Oko, A.O. [3]. The value was calculated by subtracting 100 with the sum of total ash, crude protein value, lipid, moisture and crude fiber contents. The amylose content of the samples was determined by UV-Vis spectrophotometry according to the method developed by Yuan et al [10].

Statistical analysis

Analysis of variance (ANOVA) was applied to find out whether the significant difference of the quality parameters between one geographical origin to the others existed.

RESULT AND DISCUSSION

Physical quality characteristics

Physical quality parameters of rice, such as size, shape, and lightness (L) values have been analyzed in the study. The data were then analyzed statistically to determine the difference between rice quality parameters of each region (Table 2).

For 'Rojolele,' no significant differences had been observed on size and shape of the samples from the three regions, whereas significant difference had been observed on

Table 2: Physical quality characteristics of rice.

Variety	Origin		Physical quality characteristics		
	Region	Sub-region	Length (mm)	Elongation	L value
'Rojolele'	Klaten	Karanganom	6.658 ± 0.029^{a}	2.506 ± 0.015^{a}	72.016 ± 0.363^{a}
		Polanharjo	6.696 ± 0.039^{a}	2.527 ± 0.018^{a}	74.885 ± 0.320^{b}
	Boyolali	Banyudono	6.728 ± 0.031^{a}	2.514 ± 0.019^{a}	72.819 ± 0.537^{ab}
'IR-64'	Klaten	Karanganom	6.713 ± 0.037^{a}	3.037 ± 0.019^{b}	74.688 ± 0.661^{b}
		Polanharjo	7.003 ± 0.029^{b}	3.186 ± 0.018^{c}	71.930 ± 0.730^{a}
	Boyolali	Banyudono	7.049 ± 0.032^{b}	3.367 ± 0.017^{d}	74.448 ± 0.491^{b}

Mean ± standard deviation (SD) are used to express the data. Different letters within a column indicate significant difference within the corresponding group ($p<0.05$).

lightness value of the sample from Polanharjo. For 'IR-64,' significant differences had also been seen on the lightness value of the sample from Polanharjo.

Although samples obtained from Polanharjo had significant lightness value differences when compared with the two other sub-regions, the differences were not consistent for both varieties, higher lightness value for 'Rojolele' but lower for 'IR-64.' Although the effect of geographical origin on the rice quality parameters can be dissimilar for different varieties, however, showed the non-significant influence of the geographical origin on the observed physical quality characteristics of the samples.

Chemical quality characteristics

In general, no significant difference were observed in total ash and fat contents in all three sub-regions for both varieties, whereas significant difference were found in protein, carbohydrate and amylose contents (Table 3).

Similar to the physical quality parameters, the influence of the geographical origin on the chemical quality parameters was only observed in carbohydrate content of Polanharjo samples, which had a higher content. Due to the different influence of geographic origin on the quality characteristics of the different varieties, the authentication of the rice origin should consider a variety of rice.

Table 3: Chemical quality characteristics of rice.

Variety	Origin		Chemical quality characteristics (DW)				
	Region	Sub-region	Ash (%)	Total Fat (%)	Protein (%)	Carbohydrate (%)	Amylose (%)
'Rojolele'	Klaten	Karanganom	$0,37 \pm 0,02^{a}$	$0,92 \pm 0,17^{a}$	$6,06 \pm 0,16^{a}$	$92,61 \pm 0,05^{bc}$	$30,18 \pm 0,12^{d}$
		Polanharjo	$0,42 \pm 0,02^{ab}$	$0,75 \pm 0,07^{a}$	$5,85 \pm 0,10^{a}$	$92,99 \pm 0,14^{c}$	$28,55 \pm 0,32^{c}$
	Boyolali	Banyudono	$0,41 \pm 0,01^{ab}$	$0,86 \pm 0,08^{a}$	$6,63 \pm 0,08^{b}$	$92,18 \pm 0,15^{ab}$	$27,94 \pm 0,23^{bc}$
'IR-64'	Klaten	Karanganom	$0,44 \pm 0,01^{ab}$	$0,90 \pm 0,06^{a}$	$6,16 \pm 0,07^{a}$	$92,50 \pm 0,15^{bc}$	$27,54 \pm 0,24^{b}$
		Polanharjo	$0,44 \pm 0,02^{ab}$	$0,54 \pm 0,11^{a}$	$7,45 \pm 0,26^{c}$	$91,97 \pm 0,26^{ab}$	$24,72 \pm 0,21^{a}$
	Boyolali	Banyudono	$0,47 \pm 0,02^{b}$	$0,67 \pm 0,16^{a}$	$7,31 \pm 0,08^{c}$	$91,55 \pm 0,25^{a}$	$26,02 \pm 0,66^{b}$

Mean ± standard deviation (SD) are used to show the data. Different letters within a column indicate significant difference within the corresponding group ($p<0.05$).

CONCLUSION

Variety 'Rojolele' from Karanganom was characterized with highest total fat and amylose contents, whereas the variety from Polanharjo was described with highest L-value, total ash, and carbohydrate contents. We also observed that 'Rojolele' from Banyudono was marked with longest but the most slender shape with higher protein content compared with other two sub-regions of the same variety. However, significant differences in quality characteristics parameters were only observed for L-value, protein, carbohydrate and amylose contents of 'Rojolele' samples

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