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Effect of Cooking Methods on The Physicochemical and Organoleptic Properties of Inpari IR Nutrizinc and Inpari 45 Rice Varieties

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Abstract. People usually cook rice in various methods, such as using steamer, rice pot and rice cooker. The Inpari IR Nutrizinc variety is claimed to be Zn-rich rice. The quality needs to be traced after it is cooked into steamed rice. This research aim was to study the effect of cooking methods on physicochemical and organoleptic properties of Inpari IR Nutrizinc and Inpari 45 rice varieties. The research design used was factorial randomized block design with 2 treatments i.e., cooking methods (steamer, rice pot and rice cooker) and rice varieties (Inpari IR Nutrizinc and Inpari 45), repeated three times. Results showed that the cooking method by using rice cooker was able to maintain the nutrition better than other treatments. Steamed rice from Inpari IR Nutrizinc has higher nutritional value than steamed rice from Inpari 45 variety, it contained of 54.88% moisture, 0.19% ash, 0.07% fat, 6.03% protein, 38.83% carbohydrate and 14.89 ppm zinc. Consumption of rice with high protein and Zinc content can support government programs in reducing stunting prevalence in Indonesia

1. Introduction

The role of nutrition in human's body is to increase and to maintain a normal body weight, prevent any disease and increase immunity. Nutrient needs are obtained from the food consumed, if not fulfilled it will cause nutritional problems such as stunting. Rice is widely consumed as staple food in Asia [1]. In Indonesia, rice is the staple food consumed by more than 90% of the population. Rice contains macro and micro nutrients consisting of protein, vitamins, minerals and carbohydrates that are needed for human life. According to the Food Standards Agency and Institute of Food Research (2002), rice generally contains 78% carbohydrates, 6.7% protein, 3.6% fat, 0.4% fiber, 0.41% vitamin B1, 0.02 mg vitamin, and 5.8 mg of niacin per 100g. Currently, rice is consumed by the population not only to meet the nutritional needs, taste and satiety, but also because it has functional properties [2].

Rice processing technology is continuously developed to improve its quality and added value, one of which is through fortification technology. The nutritional content of food crops can be improved and even increased through plant breeding, both conventionally and biotechnology [3]. Plant breeding with biological fortification or known as biofortification has the potential to be widely developed to increase the adaptability of varieties to the growing environment, and is profitable from an economic and agronomic perspective. In addition, biofortification is a way to increase the nutritional content of food

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crops, especially micronutrients which play an important role in overcoming the problem of malnutrition and consumer health. The population, including toddlers with low economic levels and those who are affected by natural disasters, have difficulty getting natural food sources rich in zinc.

Zinc is one of the micronutrients that play an important role in the process of growth and development of motor and hormone development [4]. Zinc deficiency as risk factor for stunting among children aged 2-5 years. Biofortification of food crops such as rice and wheat has a significant impact on overcoming the problem of zinc deficiency in developing countries [5]. Zinc biofortification in Inpari IR Nutrizinc rice variety is expected to help increase nutritional value as well as be a solution in dealing with stunting cases. The Inpari IR Nutrizinc variety has high productivity, pest resistance, high Zn content (34.51 ppm), and low amylose (16.6%) so that steamed rice tastes good and is quite sticky [6].

Rice is generally consumed as steamed rice, which is cooked both traditional and modern. Traditionally, rice is made by adding rice with sufficient water and then cooking it by boiling or steaming it until it is cooked. Meanwhile, in a modern way, rice is made by cooking rice with some water using an electric rice cooker. Indonesian people cook rice in several ways, including using rice pot, steamers and electric rice cookers. Cooking rice using a rice pot, which is a special vessel made of metal and can be tightly closed, and using a traditional steamer is still commonly found in Indonesia. However, in today's modern household cooking rice generally uses an electric rice cooker. This equipment is not cheap, but it is very helpful because it is practical, efficient, and the rice is always available warm.

Treatment of washing, heating, light, and oxygen in the food processing process will cause loss or reduce the nutritional content of food [7]. It is necessary to study the effect of treatment or cooking method of rice on the quality and composition of its nutrients. This study aims to determine the effect of rice cooking methods on physicochemical and organoleptic characteristics of Inpari IR Nutrizinc and Inpari 45.

2.Materials and methods

This research was conducted in Laboratory of Indonesia Center for Agricultural Postharvest Research and Development from November 2020 to April 2021. The equipment used in this research were electric rice cooker, rice pot, steamer, scales, rice drainer, basin, box plastic container, steaming cloth, spoon or spoon rice, measuring cup, pan, gas stove, and equipment for nutritional analysis. The main materials used in this study were varieties Inpari IR Nutrizinc and Inpari 45 rice. The chemicals used were chemicals for laboratory analysis, namely filter paper, HCl 25%, distilled water, N-hexan, selenium, Concentrated H2SO4, NaOH 30%, H_3BO_3 4%, BCG-MM, and HCl 0.1N.

2.1. Research implementation

The research implementation was conducted in 3 stages. The raw materials used consist of 2 type of rice varieties, which were Inpari IR Nutrizinc and Inpari 45. The first stage was conducting the laboratory test on 2 raw materials rice varieties as proximate parameter and Zn. The second stage was washing process of 2 rice varieties, washed one time using water as much as 400 ml on 200 grams of rice sample for each rice varieties. The third stage was cooking process of 2 rice varieties as steamed rice with 3 cooking treatments using electric rice cooker, *rice pot* and steamer for 3 times replication. Then laboratory testing was carried out on rice samples from 2 rice varieties with 3 different cooking treatments with 3 replications for proximate, Zn, and organoleptic.

The experimental design used was Factorial Randomized Block Design with cooking method treatments (electric rice cooker, *rice pot* and steamer) and rice varieties (Inpari IR Nutrizinc and Inpari 45) with three replication.

2.2 Raw material characterization

Inpari IR Nutrizinc and Inpari 45 rice varieties used as raw material were characterized their organoleptic properties, including proximate analysis (SNI (national standard) for Food and Beverage Test Method), and Zn (Modification SNI (national standard) for Heavy Metal Test Method).

2.3. Steamed rice production

The process of steamed rice cooked using steamer, *rice pot* and electric rice cooker. Each of 200 grams of Inpari IR Nutrizinc and Inpari 45 rice varieties were washed once using 400 ml of water for 30 seconds. After the rice was washed, they were steamed until well cooked. Each repeated three times for three cooking treatments, namely cooking using rice pot *l* and rice cooker with the addition of 250 ml of water and cooking using a steamer with the addition of 400 ml of water until the rice were cooked.

2.4. Steam rice characterization

Steamed rice was characterized its physicochemical and organoleptic properties, such as proximate analysis (SNI for Food and Beverage Test Method), Zn (Modification of SNI for Heavy Metal Test Method), appearance, color, aroma, flavor, and texture were conducted on 25 respondents. Based on physicochemical characterization data, it would be determined the best treatment on rice cooking process.

2.5. Statistical analysis

The study design used was Factorial Randomized Block Design by cooking method treatment (electric rice cooker,rice pot and steamer) and rice varieties (Inpari IR Nutrizinc and Inpari 45) with three times replication. The data obtained was processed using SAS package programme with Tukey test at a significant difference level of 5% ($\alpha = 0.05\%$).

2.6. Experimental design

The experimental design in this study used two-factorial randomized block design. Those factors were rice varieties and rice cooking treatments. Rice varieties factors consist of 2 variable (A1= Nutrizinc, A2 = Inpari 45) and cooking treatments factors consist of 3 variable (B1= using electric rice cooker, B2 = using rice pot, B3= using steamer).

3. Result and Discussion

3.1. Raw material characterization

Quality of raw materials affects the characteristics of processed products. Raw materials used in this study were Inpari IR Nutrizinc and Inpari 45 varieties. In general, 100 g of rice contains 8.4 g of protein, 1.7 g of fat, 77.1 g of carbohydrates and 357 kcal of energy [8]. The chemical composition of Inpari IR Nutrizinc and Inpari 45 rice varieties is presented in Table 1.

Table 1. Chemical composition of Inpari IR Nutrizinc and Inpari 45 rice varieties

Component	Rice Varieties	
	Inpari IR Nutrizinc	Inpari 45
Moisture (%)	10.53	9.82
Ash (%)	0.28	0.25
Fat (%)	0.22	0.19
Protein (%)	11.01	9.02
Carbohydrate (%)	77.96	80.72
Zinc (ppm)	22.35	21.80

Table 1 shows that Inpari IR Nutrizinc rice has water content of 10.53%, ash 0.28%, fat 0.22%, protein 11.01%, carbohydrates 77.96%, and zinc 22.35%. Meanwhile, Inpari 45 rice has 9.82% water content, 0.25% ash, 0.19% fat, 9.02% protein, 80.72% carbohydrates, and 21.80% zinc. The nutritional and zinc content of Inpari IR Nutrizinc and Inpari 45 rice have met the standard raw materials, where the water content of rice for domestic food is maximum 12%, maximum ash content 0.8%, maximum fat content 1.7%, protein content >8.4%, carbohydrate content >77.1%, and zinc content >5 ppm [9]. The Inpari IR Nutrizinc and Inpari 45 varieties are new superior varieties released by the Ministry of Agriculture in 2019. The Inpari IR Nutrizinc variety is claimed to be rich in Zn mineral content through a biofortification program developed by the Indonesian Center for Rice Research. The zinc content in Inpari IR Nutrizinc is quite high (22.35 ppm), confirming this claim.

3.2. Cooked rice characterization

Characterization of cooked rice was carried out to determine the effect of the method of cooking rice using castor, cork, and rice cooker on physicochemical and organoleptic characteristics. The composition of proximate and zinc in cooked rice, both from the Inpari IR Nutrizinc and Inpari 45 varieties with 3 cooking methods have met the standards [9]. Cooked rice quality standards include rice water content 56.7%, ash <0.2%, protein >3%, fat <0.3%, carbohydrates 39.8%, and zinc content >6 ppm [9].

3.2.1. Moisture content. Moisture content is one of the important components in food product. The water content directly affects the stability and quality of food [7]. Moisture content of the rice samples can be seen in Table 1. While moisture content of cooked rice processed by 3 cooking methods is presented in Table 2. The results showed that moisture content of rice after being processed into cooked rice using a rice cooker, rice pot and steamer, showed an increase of 5-6 times compared to the moisture content of raw materials. The cooking method has a significant effect on the moisture content of cooked rice [10]. The cooking process by using steamer resulted in largest increase in the value of moisture content compared to the other treatments. This is because the cooking process uses a larger ratio of water added, namely 1:2, while the ratio of water added for other treatments is 1: 1.25. The greater ratio of water added to the cooking process, the greater increase in moisture content. Based on the results of statistical tests for the moisture content of rice as on Table 2, it shows that rice varieties have no significant effect on the moisture content of rice, while the cooking method has a significant effect on the moisture content of rice. The biggest moisture content is the cooking method using a boiler.

Table 2. Statistical test results for moisture content

Rice Varieties	Cooking Method			Average
	Electric Rice cooker	Rice pot	Steamer	
Inpari 45	56.923 $^{B(a)}$	54.823 $^{B(a)}$	66.423 $^{A(a)}$	59.390 ^{a}
Nutrizinc	54.877 $^{B(a)}$	55.590 $^{B(a)}$	66.463 $^{A(a)}$	58.977 ^{a}
Average	55.900 ^{B}	55.207 ^{B}	66.443 ^{A}	

Remark : Number followed by different capital letters in the same column and lowercase letters in the same row showed significant different (P<0.05)

3.2.2. Ash content. The type of food material and the method of ashing used will determine the composition and measured ash content. Mineral content in a food material is related to the ash content. Ash content in foodstuffs indicates the presence of inorganic mineral content in these foodstuffs. Ash content is the material left when food is burned at a temperature of around 500^{o}-800^{o} C. Ash content of the rice samples can be seen in Table 1. While ash content of cooked rice processed by 3 cooking methods is presented in Table 3.

Ash content indicates that the processed food products through the cooking process have decreased ash content compared to the raw materials. The reduced ash content of rice into cooked rice is caused by the process of soaking with water before cooking which can dissolve inorganic substances [11]. Cooked rice derived from Inpari IR Nutrizinc and Inpari 45 cooked by steaming showed the highest reduction in ash content of raw material, compared to the other two cooking methods. This is probably caused by some of the mineral content that is easily soluble in water coming out with the water through the hole in steamer during cooking process using a steamer. Based on the results of statistical tests for rice's ash content as shown on Table 3, it shows that both rice varieties and cooking methods have a significant effect on rice's ash content. The biggest ash content is the cooking method using *rice pot*.

Table 3. Statistical test results for ash content

Rice Varieties	Cooking Method			Average
	Electric Rice cooker	*Rice pot*	Steamer	
Inpari 45	0.09000 $^{AB(b)}$	0.17333 $^{A(a)}$	0.09333 $^{B(a)}$	0.11889 ^{b}
Nutrizinc	0.18667 $^{AB(a)}$	0.20000 $^{A(a)}$	0.12000 $^{B(a)}$	0.16889 ^{a}
Average	0.13833 ^{AB}	0.18667 ^{A}	0.10667 ^{B}	

Remark : Number followed by different capital letters in the same column and lowercase letters in the same row showed significant different (P<0.05)

3.2.3. Fat content. Fat in food is a source of energy and is important for the health of the human body. Fat content is found in almost all foods consumed. These macronutrients act as solvents and carriers of fat-soluble vitamins, namely vitamins A, D, E, and K. Fat also plays an important role in increasing palatability [12]. Fat content of the rice samples can be seen in Table 1. While fat content of cooked rice processed by 3 cooking methods is presented in Table 4.

Fat content as a macronutrient in rice is quite small. Results showed that fat content of cooked rice, whether using a rice cooker, rice pot and steamer showed a decrease compared to the fat content of raw material. This is probably caused by the breakdown of fat components that may occur in food processing. Degree of fat breakdown in foodstuffs varies depending on the temperature used and the length of processing time. The higher the temperature used, the higher the fat damage [11]. Based on the results of statistical tests for rice`s fat content as shown on Table 4, it shows that neither rice variety nor cooking method has a significant effect on rice`s fat content. The largest fat content is the cooking method using *rice potl*.

Table 4. Statistical test results for fat content

Rice Varieties	Cooking Method			Average
	Electric Rice cooker	Rice pot	Steamer	
Inpari 45	0.10667 $^{A(a)}$	0.11667 $^{A(a)}$	0.09000 $^{A(a)}$	0.10444 ^{a}
Nutrizinc	0.07000 $^{A(b)}$	0.12333 $^{A(a)}$	0.14000 $^{A(a)}$	0.11111 ^{a}
Average	0.08833 ^{A}	0.12000 ^{A}	0.11500 ^{A}	

Remark : Number followed by different capital letters in the same column and lowercase letters in the same row showed significant different (P<0.05)

3.2.4. Protein content. This nutritional component also functions as an immunological. Protein is important because it is a source of amino acids containing the elements oxygen, hydrogen, carbon, and nitrogen [12]. Degree of polish and condition of the soil where rice is grown affect the protein content of milled rice. Slightly higher protein content was shown in rice grown on N-rich soil [13]. Rice with a high protein content will require more water and a longer cooking time [10]. Protein from food consumed by humans, will then be absorbed by the intestines as amino acids. The use of heat in processing rice into cooked rice can affect its nutritional value. This is shown in Tables 1 and 5.

The results showed a slight decrease in protein content as a result of processing, both cooking using a rice cooker, rice pot and steamer. Heating at a temperature of 55-75^{o}C will causes protein denaturation [12]. Cooking rice using a steamer showed a greater decrease in protein content compared to other treatments. This is probably caused by some proteins that are easily soluble in water coming out with the water through the steam boundary holes of the tool during the cooking process using a steamer. Based on the results of statistical tests for rice's protein content as shown on Table 5, it shows that both rice varieties and cooking methods have a significant effect on rice's protein content. The greatest protein content is the way of cooking using a rice cooker.

Table 5. Statistical test results for protein content

Rice Varieties	Cooking Method			Average
	Electric Rice cooker	*Rice pot*	Steamer	
Inpari 45	4.78333 A(b)	4.3367 A(b)	3.5667 B(b)	4.2289 b
Nutrizinc	6.03333 A(a)	5.7133 A(a)	5.2700 B(a)	5.6722 a
Average	5.4083 A	5.0250 A	4.4183 B	

Remark : Number followed by different capital letters in the same column and lowercase letters in the same row showed significant different (P<0.05)

3.2.5. Carbohydrate content. The main macronutrient component in rice is carbohydrates, which serve as a source of energy for the human body. Glucose is a carbohydrate constituent compound obtained from the starch hydrolysis. Glucose plays a role in producing energy through the glycolysis process. Rice starch is formed by two types of polysaccharide molecules, each of which is a polymer of glucose, namely amylose and amylopectin [14]. Carbohydrate content of the rice samples can be seen in Table 1. While fat content of cooked rice processed by 3 cooking methods is presented in Table 6.

Cooking rice using a rice cooker, rice pot and steamer showed a decrease in carbohydrate content compared to the raw materials. Carbohydrate content of cooked rice using a steamer was lower than the other treatments. This is due to the relatively high water content for rice cooked using a steamer.
In addition, cooking using a steamer consists of two stages, namely boiling the rice first and then steaming it. This two - stage cooking process has an impact on reducing carbohydrate and glucose levels. The heating process will result in leaching or damage of starch molecules [15]. Different cooking methods will affect the hydrolysis of rice starch. Based on the results of statistical tests for the carbohydrate content of rice as shown on table 6, it shows that the rice variety has no significant effect on the carbohydrate content of the rice, while the cooking method has a significant effect on the carbohydrate content of the rice. The largest carbohydrate content is the cooking method using *rice pot*

Table 6. Statistical test results for carbohydrate content

Rice Varieties	Cooking Method			Average
	Electric Rice cooker	*Rice pot*	Steamer	
Inpari 45	38.097 A(a)	40.550 A(a)	29.827 B(a)	36.158 a
Nutrizinc	38.833 A(a)	38.373 A(a)	28.007 B(a)	35.071 a
Average	38.465 A	39.462 A	28.917 B	

Remark : Number followed by different capital letters in the same column and lowercase letters in the same row showed significant different (P<0.05)

3.2.6 Zinc content. Zinc is an important micronutrient in the body's metabolic reactions. Zinc has a function in taste perception, increasing enzyme activity, wound healing. This mineral also plays an important role in growth and development processes such as normal fetal development, normal growth and maturation, the digestive system, nutrients absorption, and the immune system because it helps boost the immune system [12]. Zinc is part of many enzymes, and is needed to make proteins and genetic material.

Improving micronutrients in foodstuffs that play an important role in overcoming malnutrition and health problems can be done through biofortification or biological fortification [3]. Zinc biofortification in Inpari IR Nutrizinc rice variety was carried out to overcome stunting problems in Indonesia caused by malnutrition, especially zinc. The mineral composition is related to the ash content. In the combustion process, organic substances can be burned out but inorganic substances are not burned [11]. Zinc levels from rice samples can be seen in Table 1. While Table 7 presents zinc levels in cooked rice.

In Table 7 it can be seen that the rice cooked using a rice cooker, castor and steamer showed a decrease compared to the zinc content of the raw material. The rate of decrease in the mineral content of rice from milled rice to cooked rice occurs due to the presence of minerals that dissolve during the

rice washing process and are lost due to heating during the cooking process. The use of water in the washing, soaking and boiling processes can reduce the availability of minerals because minerals will be dissolved by the water used. Zinc mineral damage is mostly caused by the heating process [12]. The results showed that zinc content of cooked rice using a steamer resulted in the highest reduction in zinc levels compared to the raw material. The rice washing process will reduce the availability of zinc because zinc is easily soluble by the water used. Steaming causes the dissolved zinc content to come out with the water through the holes of the steamer, causing the zinc nutrient content to be lower than other treatments. Based on the results of statistical tests for rice's zinc levels as on Table 7, it shows that both rice varieties and cooking methods have a significant effect on rice zinc content. The greatest zinc content is the way of cooking using a rice cooker.

Table 7. Statistical test results for zinc content

Rice Varieties	Cooking Method			Average
	Electric Rice cooker	*Rice pot*	Steamer	
Inpari 45	7.4467 $^{A(b)}$	7.3933 $^{A(b)}$	5.3600 $^{B(b)}$	6.7333 ^{b}
Nutrizinc	14.8867 $^{A(a)}$	13.7733 $^{A(a)}$	10.5800 $^{B(a)}$	13.0800 ^{a}
Average	11.1667 ^{A}	10.5833 ^{A}	7.9700 ^{B}	

Remark : Number followed by different capital letters in the same column and lowercase letters in the same row showed significant different ($P<0.05$)

3.2.7. Effect Treatment on Rice Cooking Method. The results showed that the cooking method had a significant effect on the chemical characteristics of cooked rice. Washing, cooking and heating processes can affect the biological function and stability of fortified products. In addition, temperature, time, oxygen and food composition also affect the nutritional quality of the product [16]. Table 2 shows that cooking with a rice cooker can maintain nutritional content better than other treatments, especially for protein and zinc.

Cooked rice from Inpari IR Nutrizinc which is processed by using a rice cooker has a higher nutritional value than rice from Inpari 45 rice. Cooked rice from Inpari IR Nutrizinc which is processed by using a rice cooker contains 54.88% water, 0.19% ash, 0.07% fat, 6.03% protein, 38.83% carbohydrates and 14.89 ppm zinc. Meanwhile, cooked rice from Inpari 45 rice contains 56.92% water, 0.09% ash, 0.11% fat, 4.78% protein, 39.10% carbohydrates and 7.45 ppm zinc.

3.2.8. Organoleptic characteristic. Organoleptic test aims to determine consumer acceptance of cooked rice products. Consumers can accept the appearance, color, aroma, taste, and texture of rice, cooked by using a rice cooker, rice pot*l* and steamer. Amylose is the main parameter that determines rice quality [17]. Based on its amylose content, rice is categorized into three groups, namely low amylose (<20%), medium amylose (20-24%), and high amylose (>25%) [18]. Rice with a high amylose content will produce cooked rice that is hard and less sticky after cooling, while low-amylose rice will produce cooked rice that is lower in hardness and more sticky [19]. Based on their amylose content, Inpari 45 and Inpari IR Nutrizinc varieties are classified as low amylose rice with sticky rice texture. The amylose content in Inpari 45 variety was 12.40% and Inpari IR Nutrizinc was 16.60%.

Table 8, shows that the Inpari IR Nutrizinc cooked rice by using a steamer, was more favored by the panelists in terms of appearance, color, aroma, taste, and texture (score 4) compared to cooked rice using *rice pot* and rice cooker (score 3). Cooked rice from the Inpari 45 variety which was processed using a steamer was preferred by panelists in terms of appearance, color, aroma, taste, and texture parameters (score 4) compared to cooked rice processed by using *rice pot* and rice cooker (score 3-4). Panelists prefer rice cooked by using a steamer. This is probably due to the fact that steamed rice has a higher ratio of water to rice and water content compared to the method of cooking by using rice pot and rice cookers.

Among the factors that affect the level of rice stickiness is the method of cooking rice by using the steam method. This method is carried out in two stages, namely the boiling stage and the steaming stage.

In the first stage, the rice is boiled using a certain amount of water, boiled until half cooked, then cooking is continued with the second stage of steaming until it is perfectly cooked. The use of water during boiling before steaming requires more water so that the rice is perfectly cooked during the steaming stage [20]. It should be noted that the more water used when cooking rice, the more nutrients will be lost [21]. In the rice pot and rice cooker methods, only one step is carried out where rice and water are in a certain ratio. Using too much water in the rice pot and rice cooker method will result in cooked rice that is too soft and sticky. The water requirement to produce perfectly cooked rice is adjusted where the amount of water added is less than the method of cooking by using a steamer. Result of statistical analysis shows that the panelists can accept all quality attributes, the Inpari 45 and and Inpari IR Nutrizinc rice varieties did not provide significant differences in the panelist's preference of the appearance, color, aroma, taste, and texture. However, the panelists prefer cooked rice processed by using steamer compared to other treatments.

Table 8. Statistical test results for organoleptic properties

Parameter	Cooking Method					
	Inpari IR Nutrizinc			Inpari 45		
	Electric Rice cooker	Rice pot	Steamer	ElectricRice cooker	Rice pot	Steamer
Appearance	3,24 $^{B(a)}$	3,32 $^{B(a)}$	3,84 $^{A(a)}$	3,72 $^{A(a)}$	3,64 $^{A(a)}$	3,80 $^{A(a)}$
Color	3,32 $^{A(a)}$	3,40 $^{A(a)}$	3,76 $^{A(a)}$	3,52 $^{B(a)}$	3,56 $^{B(a)}$	4,00 $^{A(a)}$
Odor	3,44 $^{A(a)}$	3,32 $^{A(a)}$	3,60 $^{A(a)}$	3,32 $^{A(a)}$	3,48 $^{A(a)}$	3,64 $^{A(a)}$
Flavor	3,04 $^{B(a)}$	2,92 $^{B(a)}$	3,56 $^{A(a)}$	3,08 $^{B(a)}$	3,32 $^{AB(a)}$	3,64 $^{A(a)}$
Texture	2,60 $^{B(a)}$	2,68 $^{B(a)}$	3,68 $^{A(a)}$	2,80 $^{B(a)}$	3,20 $^{AB(a)}$	3,56 $^{A(a)}$

Remarks : 1 = very dislike; 2= dislike; 3= normal; 4= like; 5= very like

4. Conclusion

Processing of cooked rice consists of washing, adding water, and cooking by using an electric rice cooker, rice pot, and steamer. The cooking method has a significant effect on the chemical and organoleptic characteristics of cooked rice. Cooking with an electric rice cooker can maintain the nutritional content better than other treatments. Cooked rice from Inpari IR Nutrizinc which is processed using an electric rice cooker has a higher nutritional value than rice from Inpari 45 rice, which contains 54.88% water, 0.19% ash, 0.07% fat, 6.03 protein. %, carbohydrates 38.83% and zinc 14.89 ppm. However, results of organoleptic test showed that the panelists preferred rice cooked using a steamer compared to castor and electric rice cookers. Rice cooked with a rice cooker can provide a higher protein and zinc value, contributing to the selection of an appropriate method of cooking rice for the benefit of fulfilling nutritional assurance.

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