Organoleptic Properties, Sensory Analysis and Nutritional Quality of Roasted Charice Maharlika Rice *(Oryza sativa)* Beverage

Carlos Caesar Caday, Ariel Luis Daga, Ronnel Zuasola, Enrico Garcia
Bachelor of Science in Biology

ABSTRACT

Rice grain (Oryza sativa) is the staple food crop in the Philippines, and Filipinos are consuming it not just for food but also for beverages, where literature shows that caffeine consumption in the country rapidly increasing compared to the past decade. The main objective of this study is to reassess the sustainability of roasted rice grain beverages as alternative non-caffeine beverages. Specifically, it aims to determine which among the three commercially available rice grains has the best organoleptic property. Sensory analysis and nutritional quality were examined in the identified rice grains, the Charice Maharlika variety. In addition to that, hedonic scaling results also show that roasted rice beverage exhibits very similar sensory properties with coffee with an average of 7.07 points, interpreted as Like Very Much. Moreover, it was found that there is a small presence of ash (0.1-0.3%), crude fat (4%), crude fiber (0.5%), crude protein (4-5%), and moisture content (2%) but high in total carbohydrates (89-90%) using proximate analysis.

Keywords: *Organoleptic property, Charice Maharlika, sensory analysis, nutritional quality*

INTRODUCTION

Drinking coffee has become a tradition that is inclined to the sociological aspect of society. There are different kinds of coffee that are commercially available, and some of those are 3-in-1, brewed, and decaffeinated, yet caffeinated coffee is still largely consumed in the market. As a matter of fact, caffeine consumption has become a part of the daily routine of humankind with roughly 150 million bags of coffee, which is equivalent to almost 10 million tons of coffee consumed each year worldwide. Caffeine induces components that give alertness, which helps in exerting activities and reduces the risks of different neurodegenerative diseases. Despite this, it may still have a harmful impact on the body, thus it would be much healthier if there were another alternative to commercially available coffee that did not include any caffeine, aside from decaffeinated. One of the potential coffee alternatives is roasted rice grains, which can be turned into a coffee-like beverage but caffeine-free. This will become an addition to decaffeinated coffee, which will benefit conscious coffee lovers, the caffeine-intolerant, and also farmers.

Roasted rice grains beverage is not new to the country, in some cases, it is used as an additional component to actual coffee products. The availability of roasted rice beverages in the Philippine market is still hidden from consumers since it is commonly used only as extenders and the knowledge of this is somewhat limited to some people. Additionally, the social condition of society implicates more reason to ignore the intrinsic value of roasted rice beverage

There is limited research and publications about the roasted rice grain beverage added by the mindset of the society wherein consumption of this has a significant correlation with the living status where those who usually patronize it belong to the lower class of society. The researchers wanted to debunk this generalization therefore they aim to promote the roasted rice grain as an additional and safe alternative beverage while determining the nutritional aspects of this and the acceptance of a particular community. A scientific analysis of the nutritional content and sensory analysis of the beverage is done by the researchers in order to provide sufficient data for the roasted rice beverage to be commercially available in the Philippine market on its own, not as an extender but as its own type of beverage.

Review of Literature

Rice has a lot of advantages when it comes to giving necessary nutrients that humans need daily, especially for Asian countries that are prominent when it comes to rice. Asian people consume rice which is their staple food. It gives energy that will be immediate for the body to produce which can control and improve bowel movements, etc. Asian people are versatile when it comes to creating new delicacies. An example of this is the high-fiber cereal bars that came from rice bran and it is accepted by the consumers with a level of 10 to 20 %. (Garcia, Lobato, Benassi, & Soares Júnior, 2012). The researchers thought of the idea that rice can also be a beverage and a substitute for coffee, which is also important when it comes to giving energy to their daily activities. There are different rice grains that are being produced from some wheat, while there are 40,000 kinds of (Oryza sativa) rice that is known to people in public. While there is 90,000 existing rice that is cultivated and wild that is stored in the International Rice Gene Bank. Several ways in judging the attributes of rice quality could be characterized by taste, texture, and color. (Cuevas, Pede, McKinley, Velarde, & Demont, 2016).

Moreover, rice coffee is a common beverage in the mountainous region of the Philippines though it is not popular in the market. They use rice as a substitute for coffee beans, however, it does not have the caffeine which is present in usual coffee, and some people who have upset stomachs that already tried the rice coffee guarantee that it can help. Rice coffee is gluten-free while containing low-calorie and it is stomach-friendly as it does not induce acid reflux. Rice coffee can be a substitute though it cannot guarantee the same satisfaction as coffee does. Compared to coffee beans, rice coffee is much cheaper and safe to be drunk by children. It is a common morning brew of some Filipinos. (Galici, 2017).

The commercial availability of rice coffee in the Philippine market shows that demand and supply exist. There is a Multi-Purpose Cooperative called BAGNOS that was organized way back on December 21, 2000. BAGNOS stands for Bassit A Ganansia Naurnong Omado Sanikua which means the assets will be increased when the little profit is well-managed. They produced a product named Banana Blend Rice Coffee which is a coffee-like product that is made from roasted rice. The product name is inspired by the place of its origin which is Banna, New Era, and Pinili, Ilocos Norte. According to Amelia in order to make rice coffee, the rice will be roasted for about two hours until it turns golden brown. It will then be cooled for an hour and afterward will be ground by machine. In order to remove the moisture, it will be placed into a cooling machine for about 24 hours and the rice coffee powder will be finally packed into bottles and sachets. Rice coffee is a caffeine-free drink that is rich in fiber, vitamin B, and carbohydrates that also provides some health benefits. The Banana Blend is mixed with soya that contains high proteins, potassium, phosphorus, dietary fibers, and vitamins, however, the rice itself can provide several health benefits. It was chosen as the Best Rice Coffee in the National Product Quality on August 28, 2015, and was a regional winner for the BEST DOLE Livelihood-Assisted Project Group Category in Region 1 which provide employment in the municipality of Banna. (Bautista & Era, 2016).

Objectives of the Study

This study aims to reassess the sustainability of roasted rice grain beverage as an alternative non-caffeine beverage. Moreover, this study aims to select the best variety out of three commercially available rice through its organoleptic properties, evaluate the roasted rice grain beverage product through sensory analysis, and determine the nutritional properties of roasted rice grains through proximate analysis.

METHODOLOGY

The study employed a descriptive-quantitative research design. Prior to the data gathering proper, pre-taste testing among the three selected commercially available rice namely: Charice Maharlika, Blue Dragon, and Jasmine showed that Charice Maharlika rice exhibited the most favorable taste. The researchers have done the traditional method of preparing a roasted rice beverage. First, they roasted a total of 100 grams of Charice Maharlika rice, after roasting, a 200 mL cup of water is boiled. While boiling, the roasted rice was added and brewed for the next 5 minutes. Using the random sampling method, the researchers gathered a total of 30 respondents. Then, an actual product of the roasted rice beverage was presented for taste testing and a sensory evaluation questionnaire. Next to that, the data gathered from the questionnaire for sensory evaluation of food product was evaluated using the Hedonic scale scoring scale. Lastly, a proximate analysis was done by the Institute of Food Science and Technology - University of the Philippines, Los Baños to determine the nutritional properties present in the roasted rice wherein 100 grams of sample was used since it is the minimum requirement for the analysis.

RESULTS AND DISCUSSIONS

Pre-taste testing for the best variety of commercially available rice namely: Blue Dragon, Charice Maharlika, and Jasmine was conducted. Sensory evaluation of these roasted rice beverage was interpreted for their general acceptability. Among the three selected commercially available rice, the Charice Maharlika rice got an average score of 7.6 which shows that the respondents liked the rice very much. According to the respondents, the coffee-like flavor is more distinct in the Charice Maharlika variety. As a result of this, the Charice Maharlika variety is used as the main variety of rice which was used in the study

Table 1. Sensory evaluation of three selected commercially available rice

Rice Variety	General Acceptabilty	Interpretation
Charice Maharlika	7.6	Liked Very Much
Jasmine	7.3	Liked Very Much
Blue Dragon	6.6	Liked Moderately

Color, odor, texture, taste, and general acceptability were evaluated by the respondents through a hedonic scale scoring scale. moreover, the objectives of the study were presented to the respondents, thus their insights were exerted through verbal statements. Based on the result the majority of the respondents very much liked the roasted rice beverage in terms of its sensory properties.

Table 2. Sensory evaluation results of roasted rice beverage

Rice Variety	General Acceptabilty	Interpretation
Texture	7.27	Liked Very Much
Color	7.20	Liked Very Much
Odor	7.07	Liked Very Much
Taste	6.60	Liked Moderately
General Acceptability	7.07	Liked Very Much

In addition, the respondents very much liked the color of the roasted rice beverage as shown in Table 3. Based on the respondent's perspective about coffee, they did not find a difference between the roasted rice beverage and coffee in terms of color. On the other hand, the respondents found the smell of the roasted rice coffee to be very much likely since they have an

average of 7.07. They have stated that the beverage has a fragrant odor that is pleasing to them. A total of 82.5% of the respondents moderately liked the taste of the beverage. This shows that overall, roasted rice beverage is generally accepted by the respondents.

Table 3. Proximate analysis of nutritional properties of roasted charice maharlika rice

Properties	Results
Ash (%)	0.24 ± 0.08
Crude Fat (%)	4.50 ± 0.21
Crude Fiber (%)	0.53 ± 0.03
Crude Protein (%)	5.06 ± 0.18
Moisture Content (%)	2.13 ± 0.08
Total Carbohydrates(Nitrogen Free Extract) (%)	90.11 ± 0.26

A total of 100 grams of sample was used since it is the minimum requirement for nutritional quality testing in the Institute of Food Science and Technology - University of the Philippines, Los Baños. In relation to this, the average ratio for a cup of coffee is 22 grams of coffee to 350 mL of water according to "The Golden Ratio for Brewing Coffee" (McPhee 2019). The breakdown indicates that these nutrients are still acquired by the consumer since it takes part in the dissolvent of the solute. Moreover, the traditional process of creating roasted rice beverages differs in the gram content in a cup. A 350 mL cup of roasted rice beverage has 16 grams of roasted rice.

Nutrient content based on the literature shows that the roasted rice beverage is gluten-free and yields low calories, iron, calcium, fiber, and protein (Echendu, 2009). The roasted rice beverage is not only caffeine-free, but it also contains necessary nutrients for the human body. In addition, the caloric content of the rice, which is 68 calories, indicates that it contains 17 grams of carbohydrates. Since the process included roasting, the fat content of the rice is affected to a lower to no value. This also supports the presence of fiber content in the beverage.

In contrast, based on the proximate analysis done by the Institute of Food Science and Technology - University of the Philippines, Los Baños, it was found that there is a little presence of ash (0.1-0.3%) followed by crude fiber (0.5%). The amount of crude fat (4%) and crude protein (4-5%) is much larger than previously stated properties. It was found that the roasted rice grain has a low moisture content (2%) whereas according to Zambrano, M.V et. al., (2019), the proximate moisture content of the food must be kept below 10% to prevent microbial growth. Therefore, roasted rice grains are capable to be stored without worrying that much about its shelf-life due to bacterial contamination. On the other hand, according to an article published by Zambrano, M.V. et. al. (2019), the acceptable range of total carbohydrates was 80%. For that reason, the total carbohydrate of roasted Charice Maharlika rice is substantially greater than the acceptable range. The roasted rice grain beverage has high total carbohydrates (89-90%) and is caffeine-free while the commercially available coffee consumed by people according to Zainol, M. K. et al., (2020), has least to no carbohydrates and usually contains caffeine.

CONCLUSIONS

Charice Maharlika was founded to be the best variety of rice as it was evaluated to be more pleasing in terms of its organoleptic properties. The Charice Maharlika rice variety has a richer flavor than those of the remaining two varieties namely: Jasmine and Blue Dragon. One of the most significant findings is that the roasted rice beverage is caffeine-free. In terms of the roasted rice beverage's sensory analysis, the majority of the respondents evaluated the roasted rice beverage as being generally accepted in terms of the sensory analysis that they have done through taste testing. Implications of general acceptability were evaluated by the average answer of the respondent which corresponds to like very much. Based on the respondents, the

authenticity of roasted rice beverages is like that of coffee. The bitterness of the roasted rice beverage resembles the taste of coffee. The majority of the respondent exhibited a positive response to the product's color, and taste since their answers are averaged to be interpreted as liked extremely. The odor and texture, on the other hand, were evaluated by the respondents as to like very much. Based on the proximate analysis, there is a small presence of ash (0.1-0.3%), crude fat (4%), crude fiber (0.5%), crude protein (4-5%), and moisture content (2%) but high in total carbohydrates (89-90%) wherein the amount of moisture content present in the roasted rice grains are beneficial for longer storage without contamination, therefore, have a long shelf-life.

The study recommends that people who have a low tolerance for caffeinated products but want to be satisfied with the taste of coffee should take this roasted rice beverage into consideration since it is caffeine-free and contains essential nutrients for the human body. The study also recommends that the roasted rice beverage's nutritional properties should be included in the product's description as it becomes commercially available in the Philippine Market.

REFERENCES

Ariola, J. T. (n.d.). Sara-sara : Coffee made from black rice. Retrieved from https://www.sunstar.com.ph/article/27318/sara-sara-coffee-made-from-black-rice

Champagne, E. T., Bett-Garber, K. L., Fitzgerald, M. A., Grimm, C. C., Lea, J., Ohtsubo, K., … Reinke, R. (2010). Important sensory properties differentiating premium rice varieties. Rice, 3(4), 270–281. https://doi.org/10.1007/s12284-010-9057-4

Cuevas, R. P., Pede, V. O., McKinley, J., Velarde, O., & Demont, M. (2016). Rice Grain Quality and Consumer Preferences: A Case Study of Two Rural Towns in the Philippines. PloS One. https://doi.org/10.1371/journal.pone.0150345

Dominguez, N. C. (2016). Aroma of Success of Bagnos. 8(3), 24–25. Retrieved from http://bwsc.dole.gov.ph/images/e-Kwento/2016/March/e-Kwento.pdf

Galici, S. (2017). Rice Coffee is popular in the mountainous region of the Philippines. Retrieved from https://blog.lovers.coffee/the-rice-coffee/#:~:text=Rice%20Coffee%20is%20popular%20in,than%20your%20regular%20coffee%20beans%3F

Lat, D., (2017). LOOK: Rice beverages featured in Puerto Princesa market. Retrieved from https://news.abs-cbn.com/life/03/28/17/look-rice-beverages-featured-in-puerto-princesa-market

Lee, B.-Y., O, J.-H., Kim, M.-H., Jang, K.-H., Lee, J.-C., & Surh, J.-H. (2010). Influences of Roasted or Non-roasted Brown Rice Addition on the Nutritional and Sensory Properties and Oxidative Stability of Sunsik, Korean Heated Cereal Powder. Korean Journal of Food and Cookery Science, 26(6), 872–886.

Mabunga, D. F. N., Gonzales, E. L. T., Kim, H. J., & Choung, S. Y. (2015). Treatment of GABA from fermented rice germ ameliorates caffeine-induced sleep disturbance in mice. Biomolecules and Therapeutics, 23(3), 268–274. https://doi.org/10.4062/biomolther.2015.022

McIlvain, G. E., Noland, M. P., & Bickel, R. (2011). Caffeine consumption patterns and beliefs of college freshmen. American Journal of Health Education, 42(4), 235–244. https://doi.org/10.1080/19325037.2011.10599193

Mcphee, H. (2019). The Golden Ratio For Brewing Coffee. Retrieved from https://fellowproducts.com/blogs/learn/the-golden-ratio-for-brewing-coffee.

Nutrition of beans and rice .pdf. (n.d.).

Sohn, B. E. (2015). Arsenic out of Rice.

"Sweet sorghum coffee," a healthier alternative ? (2015). Retrieved from https://www.pchrd.dost.gov.ph/news_and_updates/sweet-sorghum-coffee-a-healthier-alternative/

Temple, J. L., Bernard, C., Lipshultz, S. E., Czachor, J. D., Westphal, J. A., & Mestre, M. A. (2017). The Safety of Ingested Caffeine: A Comprehensive Review. Frontiers in Psychiatry, 8. https://doi.org/10.3389/fpsyt.2017.00080

Vera Zambrano, M., Dutta, B., Mercer, D. G., MacLean, H. L., & Touchie, M. F. (2019, June). Assessment of moisture content measurement methods of dried food products in small-scale operations in developing countries: A review. Trends in Food Science & Technology, 88, 484–496. https://doi.org/10.1016/j.tifs.2019.04.006

Vittayaporn, V., Chompreeda, P., Haruthaithanasan, V., & Rimkeeree, H. (2010). Preference mapping of Thai consumers for commercial green tea with roasted brown rice. Kasetsart Journal - Natural Science, 44(4), 652–663.

Whiteman, H. (2015). Caffeine: how does it affect our health? Medical News Today. Retrieved from http://www.medicalnewstoday.com/articles/271707.php

Zainol, M., Mohd Subri, I., Izzwan, Z. A., Mohd Zin, Z., Ahmad, F., & Mamat, H. (2020). Antioxidative properties and proximate analysis of spent coffee ground (SCG) extracted using ultrasonic-methanol assisted technique as a potential functional food ingredient. Food Research, 4(3), 636–644. https://doi.org/10.26656/fr.2017.4(3).358