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INNOVATION IN CASCARA TEA FORMULATION TO INCREASE CONSUMER ACCEPTANCE

Khairul Nanda Munthe[1], Ika Ucha Pradifta Rangkuti[1], Rafael Remit Winardi[1]
[1]Program Studi Teknologi Pengolahan Hasil Perkebunan, Fakultas Vokasi,
Institut Teknologi Sawit Indonesia, Medan
*Email : nandamunthe127@gmail.com

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Abstract

The utilization of coffee husk waste (cascara) as a functional drink still faces obstacles due to low consumer acceptance because of its less favored taste and aroma. This study aimed to determine the effect of cascara tea formulation with the addition of ginger and roselle on physicochemical quality and consumer acceptance. The study used a Completely Randomized Design (CRD) non-factorial with four treatments and three replications, namely C0 (100% cascara), C1 (50% cascara + 50% ginger), C2 (50% cascara + 50% roselle), and C3 (40% cascara + 30% ginger + 30% roselle). Parameters observed included moisture content, pH, organoleptic characteristics (aroma, color, taste), and total phenols in the best treatment. The results showed that the formulation had a significant effect on pH ($P<0.05$), aroma, and taste ($P<0.01$), but no significant effect on moisture content and color ($P>0.05$).. The best treatment was obtained in C3 with an aroma score of 3.84 and a color score of 4.50. Analysis of total phenols in the best treatment showed a value of 44.39%. The combination of cascara, ginger, and rosella can improve consumer acceptance and produce an herbal drink that has the potential as a source of natural antioxidants.

Keywords: cascara, consumer acceptance, ginger, rosella, total phenols

INTRODUCTION

Arabica coffee is one of the leading plantation commodities in Indonesia that is famous even in the international market. Some areas producing high-quality Arabica coffee include Gayo in Aceh, Toraja in Sulawesi, Kintamani in Bali, as well as regions in Java such as Bandung and Malang. Indonesia is also known as one of the world's main Arabica coffee producers oriented towards both export and domestic markets. In addition to having high economic value, coffee has become one of the most widely consumed beverages in various countries. World coffee production continues to increase, from around 9.5 million tons in the 2017–2018 period to around 10.2 million tons in the 2018–2019 period (Adam et al., 2020). The increasing coffee production impacts the rise in the amount of waste generated during the processing. Various types of waste produced include pulp, husk, silver skin, and coffee grounds (Muzaifa et al., 2021). Among these wastes, wet coffee fruit skin is the largest component, reaching around 50–60% of the total coffee harvest (Seisa and Syabriana, 2018). If not utilized optimally, this waste can cause environmental problems as well as reduce the economic value of the coffee commodity.

One form of utilizing coffee husk waste that is currently beginning to develop is cascara. Cascara is the dried skin of the coffee fruit, which is then brewed like tea. Although in Indonesia and the United States this drink is still considered new (Yuliandari, 2016), people in Yemen and Ethiopia have long consumed it. In those countries, cascara is often prepared with various spices such as ginger, nutmeg, and cinnamon, known as "hashara." In fact, cascara has become one of the economically valuable export commodities in several South American countries, such as El Salvador and Bolivia (Umanzor, 2017). The processing of cascara tea is generally still carried out in a simple manner through drying under direct sunlight, making it difficult to control the cleanliness and quality of the product. Like regular tea, the quality of cascara beverages is influenced by the content of important compounds such as tannins, caffeine, and polyphenols. Tannins play a role in the formation of color and characteristic flavors, such as astringent,

dry, and bitter tastes, while caffeine provides a stimulating effect. Meanwhile, polyphenols function as antioxidants that contribute to health benefits (Sekarini, 2011).

In Indonesia, cascara beverages are still not widely known by the public. Research conducted by Limbong (2019) on the production of cascara from the peel of Gayo Arabica coffee with various pulp treatments and brewing times showed that this product has potential for further development. In addition, research by Wijayanri et al. (2025) revealed that cascara contains various bioactive compounds such as polyphenols, flavonoids, and antioxidants that are beneficial for health. The fairly high content of phenolic compounds makes cascara potentially a functional beverage with high added value.

Nevertheless, the level of consumer acceptance of cascara beverages is still relatively low. Cascara products on the market are generally served in their original form without added sweeteners or other supporting ingredients, so their taste is less favored by some consumers. The addition of ingredients such as fruits, spices, or natural sources of sweeteners is suspected to be able to improve the sensory quality and product acceptance. On the other hand, the existence of coffee peel tea is still not widely known by the Indonesian public, so its utilization has not developed optimally.

Various studies on the production of cascara tea from Gayo Arabica coffee husks have been conducted (Muzaifa et al., 2020; Arpi et al., 2021). However, the results obtained show that consumer acceptance of the product is still not optimal because the formulation used is still in the form of pure cascara without the addition of supporting ingredients (Limbong, 2019). Therefore, efforts are needed to innovate in the formulation of cascara tea to produce a product with taste characteristics that are more preferred by consumers. The development of this formulation is expected to increase the added value of coffee husk waste while also expanding its use as a functional beverage with promising economic and health prospects.

RESEARCH METHOD

Place and Time

The production of arabica coffee cascara was carried out in Uning Bertih Village, Wih Pesam District, Bener Meriah Regency, Aceh Province. The time of this research was conducted from December 2025 to January 2026.

Materials and Tools

The materials used include arabica coffee husks (cascara), ginger, rosella, honey, and distilled water. The main equipment consists of a blender, 10-mesh sieve, oven, pH meter, UV-Vis spectrophotometer, and tea maker.

Research Design

The study used a non-factorial Completely Randomized Design (CRD) with four treatments and three replications:

- C0 = 100% Cascara
- C1 = 50% Cascara + 50% Ginger
- C2 = 50% Cascara + 50% Roselle
- C3 = 40% Cascara + 30% Ginger + 30% Roselle

Observation Parameters

The observed parameters include:

1. Water content
2. pH
3. Organoleptic test (aroma, color, taste)
4. Total phenol content

The data were analyzed using ANOVA and followed by Duncan's Test at a 95% confidence level.

RESULTS AND DISCUSSION

Moisture Content

The results of the analysis of variance (ANOVA) showed that the cascara tea formulation did not have a significant effect ($P>0.05$) on moisture content, with a significance value of 0.179

Table 1. Moisture Content of Cascara Tea

Treatment	U1	U2	U3	Average (%)
C0	8,30	6,76	6,66	7,24
C1	8,46	8,71	8,01	8,39
C2	7,73	7,26	7,00	7,33
C3	8,26	7,13	6,89	7,43

The highest average moisture content was obtained in treatment C1 at 8.39%, while the lowest was in treatment C0 at 7.24%. Nevertheless, these differences were not statistically significant. The lack of a significant effect is suspected because all the materials underwent the same drying process, resulting in a relatively uniform final moisture content. In addition, the ginger and roselle used were in dry condition with low moisture content, so they did not have much impact on the product's moisture content. According to Ariva et al. (2020), the moisture content of cascara is influenced by the drying and storage processes of the material. Optimal drying can reduce moisture content and increase the product's shelf life. This aligns with the opinion of Puspaningrum and Sumadewi (2020), who stated that drying plays an important role in maintaining the quality stability of cascara during storage. Moisture content is an important parameter in food quality because it is related to the product's resistance to microorganism growth. The lower the moisture content, the better the product's stability and shelf life.

pH Level

The results of the analysis of variance (ANOVA) showed that the cascara tea formulation had a significant effect ($P<0.05$) on pH value, with a significance value of 0.014. This indicates that the addition of ginger and roselle affects the acidity level of the product.

Table 2. pH Value of Cascara Tea

Treatment	U1	U2	U3	Average pH
C1	7,00	6,25	6,80	6,17[a]
C0	6,08	6,32	6,10	6,68[ab]
C2	7,05	7,18	7,03	7,09[b]
C3	6,68	7,22	7,55	7,15[b]

Based on the data, treatment C1 had the lowest pH value of 6.17, while the highest pH was obtained in treatment C3 at 7.15. Treatment C1 was significantly different from C2 and C3, but not significantly different from C0. The difference in pH values is suspected to be influenced by the composition of additives in each treatment. The addition of ginger tends to lower the pH because it contains active compounds and organic acids that increase the acidity of the beverage. In addition, the phenolic compound content in cascara and other herbal ingredients also affects the pH characteristics of the product. According to Nalurita et al. (2023), the use of herbal materials can affect the physicochemical properties of beverages, including pH. Hanggaeni et al. (2022) also stated that the content of bioactive compounds and organic acids in cascara plays a role in pH changes during processing. The pH value is an important parameter in beverage quality because it affects taste, stability, and product shelf life. Beverages with lower pH generally have a more acidic taste and are more resistant to microbial growth. According to Xiaowei et al. (2021), the acidic characteristics in beverages made from cascara and roselle are influenced by the anthocyanin content as well as the natural organic acids present in the raw materials.

Organoleptic Test

1. Aroma

The results of the analysis of variance (ANOVA) showed that the cascara tea formulation had a very significant effect (P<0.01) on the panelists' aroma preference levels, with a significance value of 0.001.

Table 3. Aroma Preference Level

Treatment	Average
C0	2,68[a]
C1	3,76[b]
C2	3,80[b]
C3	3,84[b]

Treatment C0 had the lowest aroma preference score (2.68), while C3 obtained the highest score (3.84). However, C1, C2, and C3 did not differ significantly from each other. The low aroma score in C0 is suspected to be due to the use of pure cascara, which still has a fairly strong characteristic coffee cherry skin aroma. The addition of ginger and rosella in the other treatments was able to improve the product's aroma, making it more preferred by the panelists. The distinctive aroma of ginger from essential oils and the fresh impression from rosella played a role in increasing consumer acceptance. According to Sari et al. (2023), aroma is an important factor that influences consumers' initial impression of herbal drinks. The addition of spices can enhance the attractiveness of the aroma and product acceptance (Pratiwi and Nurhayati, 2022). According to Rangkuti et al. (2025), the sensory characteristics of Arabica coffee are influenced by the post-harvest processes applied, so proper processing can increase consumer acceptance of coffee products.

2. Color

The ANOVA results showed that cascara tea formulations did not have a significant effect (P>0.05) on the panelists' color liking level, with a significance value of 0.351.

Table 4. Color Liking Level

Treatment	Average
C0	3,25
C1	3,75
C2	4,00
C3	4,50

Although there are differences in mean values, statistically all treatments are not significantly different. This is suspected because the infusion color in all treatments still has similar characteristics, namely the characteristic reddish-brown of cascara. The addition of ginger does not significantly change the product color, while rosella only gives a slight reddish hue. Therefore, the color changes that occur are not strong enough to affect the panelists' level of liking. According to Putri et al. (2022), color is the first attribute observed by consumers, but its acceptance level is influenced by the suitability of the color with the product's characteristics. Natural colors that still match consumer expectations tend to be more easily accepted.

3. Taste

The results of the variance analysis show that the cascara tea formulation has a very significant effect (P<0.01) on the panelists' taste preference, with a significance value of 0.000.

Table 5. Taste Preference Level

Treatment	Average
C0	2,48[a]
C1	3,72[bc]
C2	3,96[c]
C3	3,36[b]

Treatment C0 had the lowest taste preference score (2.48), while C2 obtained the highest score (3.96). Treatment C2 was not significantly different from C1, but was significantly different from C0 and C3. The low taste score in C0 was due to the dominance of sour and astringent flavors from cascara, which come from tannin and phenolic compounds. The addition of ginger and rosella in other treatments was able to improve the taste by providing a warm, fresh, and more balanced sensation. According to Kusuma et al. (2023), herbal ingredients can enhance the sensory quality of beverages by balancing bitter, sour, and astringent tastes. The more balanced the resulting flavor, the higher the level of consumer acceptance of the product (Yuliani et al., 2024).

Total Phenol Content

Total phenol testing was conducted on the best treatment chosen based on the results of organoleptic tests of aroma, color, and taste. Treatment C3 (40% cascara, 30% ginger, and 30% rosella) was determined as the best treatment because it obtained the highest preference level for aroma and color and had good taste acceptance by the panelists. Analysis results showed that treatment C3 had a total phenol content of 44.39%. This high value is suspected to come from the combination of cascara, ginger, and rosella, which are rich in phenolic compounds and natural antioxidants. Cascara contains polyphenols, flavonoids, and tannins, while ginger contains gingerol and shogaol, and rosella is rich in anthocyanins and flavonoids that contribute to the increase in total phenol content. According to Febrianto et al. (2023), the total phenol content in herbal drinks is influenced by the type and combination of ingredients used. Lestari and Wahyuni (2022) also stated that a combination of ginger and roselle can increase phenolic compounds as well as the functional value of the product. The high total phenol content indicates that cascara tea formulation C3 has potential as a functional beverage due to its good antioxidant activity. Phenolic compounds play a role in neutralizing free radicals, inhibiting the oxidation process, and helping reduce the risk of degenerative diseases (Pranata et al., 2024). According to Winardi and Prasetyo (2024), coffee cascara contains phenolic compounds that have the potential to be a source of natural antioxidants.Therefore, formulation C3 not only has a good level of organoleptic acceptance but also provides higher health benefits.

CONCLUSION

Based on the research results, the cascara tea formulation has no significant effect on moisture content, but has a significant effect on pH value. In the organoleptic test, the formulation had a very significant effect on aroma and taste, while color did not show a significant difference. The best treatment was C3 (40% cascara, 30% ginger, and 30% roselle) because it achieved the highest preference level for aroma and color and had good taste acceptance. This treatment also produced a total phenol content of 44.39%, thus having the potential to be developed as a functional beverage rich in antioxidants.

RECOMMENDATION

Further research needs to examine the shelf life of the product to determine quality stability during storage. In addition, a more complete analysis of antioxidant content and nutritional value is needed to support the development of cascara tea as a functional beverage with high health value.

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