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Quality Assessment of Arabica and Robusta Coffee Under Different Post-Harvest Processing Methods Using Solar Dryer Technology

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ABSTRACT

Post-harvest processing methods significantly influence coffee quality, yet traditional sun-drying techniques require 15-17 days and often result in inconsistent quality, particularly during rainy seasons. This study investigated the effects of four post-harvest processing methods (Natural, Full Wash, Semi Wash, and Honey) on quality characteristics of Arabica Sigararutang and Robusta Toraja coffee varieties using solar dryer dome technology. The research employed a factorial design with five replications for each treatment combination, resulting in 40 experimental plots. Coffee cherries were harvested from West Sumatra plantations at elevations of 1050-1150 masl for Arabica and 780-900 masl for Robusta. Quality assessment encompassed physical parameters (fresh weight, drying duration, color changes, dry weight, and yield), chemical parameters (moisture content, caffeine content, and pH level), and sensory parameters (color intensity, aroma, and overall acceptance) evaluated by certified panelists using 1-7 scoring scales. Results demonstrated that the Honey process yielded superior overall quality for both varieties, achieving highest sensory scores for color (5.30-5.35), aroma (5.36-6.21), and overall acceptance (3.81-4.64). The Semi Wash process exhibited the most efficient drying performance, requiring only 22.7-24.6 days compared to 33.4-32.9 days for Natural process. All treatments successfully achieved optimal moisture content (11.3-12.3%) using solar dryer dome technology. Arabica beans demonstrated higher fresh weight and caffeine content than Robusta across all processing methods. The Honey processing method combined with solar dryer dome technology represents an optimal approach for enhancing coffee quality and market competitiveness in small and medium-scale enterprises.

Keywords: coffee processing, Arabica, Robusta, solar dryer dome, sensory quality

1. INTRODUCTION

Coffee (Coffea sp.) represents one of the most significant agricultural commodities globally, with production supporting over 125 million livelihoods worldwide. In Indonesia, particularly West Sumatra, coffee production constitutes a vital local commodity, averaging 70,000 tons annually from approximately 27,000 hectares of plantation area, with 20% Arabica coffee cultivated in highland regions and 80% Robusta coffee predominantly exported to America, Middle Eastern countries, and European nations (Dekopi, 2022). National processed coffee exports have demonstrated consistent growth, escalating from 145,000 tons in 2016 to 216,000 tons in 2018, representing a 21.49% increase (Ministry of Industry, 2019). However, regional nuances,

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processing methods, and varietal distinctions significantly shape the sensory evaluation and quality attributes of coffee, with Arabica beans exhibiting distinct sensory characteristics while Robusta beans present more nuanced variations (Bressanello et al., 2024).

Despite increasing global coffee consumption, quality standardization remains a critical challenge as foreign exporters implement stringent certification requirements that frequently undervalue local coffee quality. This situation primarily stems from small and medium-scale enterprises lacking adequate processing technology and possessing predominantly traditional post-harvest handling knowledge (Yasin, 2020). Post-harvest processing activities contribute approximately 60% of green coffee bean quality, making this stage crucial for final product quality and market competitiveness (Meja et al., 2025). Traditional sun-drying methods typically require 15-17 days to achieve 18-20% moisture content, extending beyond three weeks during rainy seasons, resulting in mold contamination and undesirable flavors that compromise coffee quality and market value (Silaban et al., 2022).

The post-harvest processing challenge has prompted extensive research into more efficient drying technologies and processing methodologies. Small and medium-scale coffee industries commonly employ various processing methods including natural process, full wash process, semi-wash process, and honey process, each producing distinct sensory characteristics and quality parameters (Purnamayanti, 2019). Recent research demonstrates that different post-harvest processing methods significantly influence functional properties, sensory characteristics, and physicochemical properties including moisture content, water activity, color, caffeine, trigonelline, chlorogenic acid, and sugar content of coffee beans (Błaszkiewicz et al., 2023). Solar dryer technologies have emerged as promising solutions, with recent innovations demonstrating improved drying efficiency while reducing fossil fuel dependency (Yani and Fajrin, 2013). Furthermore, varietal differences between Arabica and Robusta significantly impact flavor profiles, aroma characteristics, and acidity levels, creating distinct market preferences that influence cultivation decisions (Afrikiana, 2018).

This study investigates the application of post-harvest processing technologies on two coffee species (Coffea sp.), specifically examining natural, full wash, semi-wash, and honey processing methods on Arabica Sigararutang variety and Robusta Toraja variety. The research employs solar dryer dome technology to address drying efficiency challenges while systematically evaluating quality parameters including moisture content, color, aroma, caffeine content, pH levels, and overall sensory acceptance. The objectives are twofold: first, to determine the optimal post-

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harvest processing method aligned with consumer flavor preferences; second, to identify the most effective processing technique for each coffee variety to achieve superior bean quality. This research addresses the critical gap in understanding how processing method interactions with varietal characteristics influence final coffee quality under controlled solar drying conditions.

2. RESEARCH METHOD

Research Location

This research was conducted from September to October 2025 at three locations. The harvesting and post-harvest drying processes were performed at UMKM Pokalanso in Kanagarian Tabek Patah, Tanah Datar District, West Sumatra. The roasting process was carried out at UMKM "Bengkel Kopi Uda Parjok", while sensory analysis and laboratory testing were conducted at the State Polytechnic of Lampung.

Research Design

This study investigated the effects of four post-harvest processing methods on two coffee varieties. The coffee varieties examined were Arabica Sigararutang (A1) and Robusta Toraja (A2), while the processing methods included Natural (B1), Full Wash (B2), Semi Wash (B3), and Honey (B4). Each treatment combination was replicated five times, resulting in 40 experimental plots.

Materials and Equipment

The research utilized fresh coffee cherries from two varieties: Arabica Sigararutang harvested from UMKM Pokalanso plantation in Kanagarian Tabek Patah, Tanah Datar District (elevation 1050-1150 masl), and Robusta Toraja from "Pandan Wangi" Farmer Group in Jorong Padang Kuniang, Kanagarian Situjuah Gadang (elevation 780-900 masl). Each sample consisted of 5 kg of freshly harvested coffee cherries collected directly from sample plants. Equipment included solar dryer dome, analytical balance, pH meter, electric oven, fermentation tank, drainage basin, huller machine, drying rack, roasting machine, spectrophotometer, terratester, and coffee brewing equipment.

Processing Procedures

Four post-harvest processing methods were applied in this study. In the Natural Process (B1), harvested coffee cherries were directly dried without fermentation, washing, or skin removal until achieving optimal dryness, representing the conventional approach commonly practiced by West Sumatran coffee farmers. The Full Wash Process (B2) involved 24-hour water fermentation in covered fermentation tanks to facilitate skin removal, followed by hulling, thorough washing,

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and drying in the solar dryer dome until reaching optimal moisture content, with parchment skin removal (hulling) performed after complete drying. For the Semi Wash Process (B3), cherries were fermented for 24 hours, then both fruit skin and parchment were removed before washing, and the cleaned beans were subsequently dried in the solar dryer dome until achieving optimal moisture content. The Honey Process (B4) employed extended fermentation for 48 hours (2 x 24 hours), followed by fruit skin removal and washing while retaining the mucilage layer, with beans dried with the mucilage intact and parchment removal performed after complete drying.

Roasting and Sample Preparation

Dried coffee beans (green beans) were roasted using a medium roast profile Bengkel Kopi Uda Parjok roastery facility. All treatments received identical roasting duration of 10 minutes. Roasted beans were ground into powder for quality assessment analysis.

Quality Parameters

Quality assessment encompassed physical, chemical, and sensory parameters. Physical parameters included fresh weight of 100 beans measured immediately post-harvest using analytical balance, color changes during drying observed visually using categories of very dark, dark, faded, and very faded, drying duration recorded as days required to reach optimal dryness, dry weight of 100 green beans measured after hulling, and yield calculated as percentage ratio of dry weight to fresh weight. Chemical parameters comprised moisture content measured using terratester instrument, caffeine content determined by spectrophotometry UV-Vis at 274 nm wavelength following Fitri (2008) method where 1 gram coffee powder was extracted with hot aquades, filtered, treated with calcium carbonate, and extracted four times with 25 mL chloroform, then evaporated and diluted for measurement, and acidity level (pH) measured using calibrated digital pH meter on 10 gram sample diluted in 100 mL hot aquades. Sensory parameters consisted of color intensity of brewed coffee scored by certified panelists using 1-7 scale (yellow to very dark), aroma intensity evaluated by five certified coffee panelists with expertise certificates using 1-7 scoring scale, and overall acceptance assessed through hedonic testing by five panelists evaluating taste, aroma, and color attributes using 1-7 scoring scale.

Data Analysis

All observational data from physical, chemical, and sensory parameters were recorded, tabulated, and analyzed descriptively. Comparative analysis was conducted between coffee varieties and processing methods to identify patterns and optimal treatment combinations based on quality parameters measured.

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3. RESULTS AND DISCUSSION

Fresh Weight of 100 Beans Post-Harvest

Coffee cherries, often referred to as wet coffee berries, represent freshly harvested coffee fruits from plantations. Following harvest, 100 beans were selected and weighed as samples. Analysis of fresh weight for 100 beans post-harvest revealed no significant differences between Arabica Sigararutang variety and Robusta Toraja variety across all processing methods (Table 1).

Table 1. Fresh weight of 100 coffee beans (g) for two coffee types with various post-harvest processing methods

Treatment	Fresh weight of 100 coffee beans (g)	
	A1	A2
B1	99.23	98.24
B2	103.79	97.38
B3	99.47	97.09
B4	98.93	98.59

Data in Table 1 demonstrated that Arabica coffee exhibited higher fresh weight compared to Robusta coffee generally, though differences were not statistically significant. This corresponds with the physical characteristics of Arabica Sigararutang variety beans, which possess thicker fruit skin, slightly larger size, and oval shape, whereas Robusta beans are smaller and rounder. Given that Arabica coffee beans are physically larger than Robusta coffee beans, the weight of 100 Arabica beans naturally exceeds that of 100 Robusta beans (Yuliasih, 2019).

Drying Duration

Sun-drying constitutes a critical post-harvest processing stage for obtaining ready-to-process coffee beans. Coffee beans must be dried to eliminate mucilage layer and reduce moisture content. The final drying stage aims to decrease water content to 12%. Drying duration influences coffee flavor characteristics, as the length of sun exposure affects the flavor profile of coffee beans (Musika, 2017). Analysis results indicated that processing method treatments significantly affected only Semi Wash method on Arabica Sigararutang variety, while other treatments applied to both Arabica Sigararutang and Robusta Toraja varieties showed no significant effects (Table 2).

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Table 2. Drying duration (days) for two coffee types with various post-harvest processing methods

Treatment	Drying duration (days)	
	A1	A2
B1	33.4	32.9
B2	26.3	26.8
B3	22.7	24.6
B4	27.4	25.5

Data in Table 2 demonstrated that various post-harvest processing methods influenced drying duration. The longest drying period for both Arabica Sigararutang and Robusta Toraja varieties occurred with the Natural method. Natural post-harvest processing involved direct sun-drying after harvest without removing fruit skin or bean skin. Since cherry coffee fruit skin remained unpeeled, longer time was required to penetrate the green bean, whereas other treatments had parchment skin removed. Semi Wash treatment required the shortest drying time compared to other treatments. This was attributed to the post-harvest processing procedure where, after 24-hour fermentation, cherry beans were washed and both fruit skin and bean skin were removed before drying. With beans having opened skin, water evaporation from inside the beans occurred more readily, achieving optimal dryness more rapidly.

Color During Drying

Physical changes occurred in coffee fruits during the drying process, particularly color transformation from red to brownish/black. This research categorized color changes as very dark, dark, faded, and very faded. Analysis results for color change parameters during drying showed no significant effects across all post-harvest processing methods for both Arabica Sigararutang and Robusta Toraja varieties (Table 3).

Table 3. Bean color during drying for two coffee types with various post-harvest processing methods

Treatment	Bean Color	
	A1	A2
B1	Dark	Dark
B2	Faded	Faded
B3	Dark	Faded
B4	Very Dark	Dark

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Table 3 data revealed that by the final drying day, bean colors for Natural process in both Arabica and Robusta remained dark, while Full Wash and Semi Wash processes appeared faded. Honey process yielded very dark color for Arabica and dark color for Robusta. Throughout drying, visually distinguishable color changes occurred, progressing from red to reddish-brown, then faded brown, brown, and dark brown. These color changes correlated with drying duration. This resulted from decreasing water content in beans, where lower bean moisture content produced darker bean color (Purnamayanti, 2019).

Dry Weight of 100 Green Beans

Following completion of optimal drying, coffee skin removal represented the next step. Coffee skin removal utilized a huller machine. Before entering the hulling process, coffee beans were rested overnight to prevent cracking or breaking during removal, as they had just completed drying. Hulled coffee beans were then weighed. Research results indicated that post-harvest processing with various methods applied to Arabica Sigararutang and Robusta Toraja varieties showed no significant effects on dry weight of 100 green beans (Table 4).

Table 4. Dry weight of 100 coffee beans (g) for two coffee types with various post-harvest processing methods

Treatment	Dry weight of 100 coffee beans (g)	
	A1	A2
B1	18.01	17.26
B2	17.42	16.17
B3	16.98	15.99
B4	17.13	16.23

Table 4 data showed Natural process achieved the heaviest weight compared to other treatments due to higher moisture content in Natural process compared to other treatments. This occurred because during drying, cherry beans for Natural treatment were dried intact, causing water contained within beans to evaporate slowly. Standard dryness testing involved physical appearance observation and moisture content testing of coffee beans. Semi Wash post-harvest processing method produced the lowest dry bean weight, influenced by low moisture content in both Arabica Sigararutang and Robusta Toraja varieties. Low moisture content correlated with drying duration. Semi Wash post-harvest processing for both varieties represented the fastest

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method to achieve optimal dryness during sun-drying. This was attributed to fruit skin and bean skin removal before drying. With beans clean of bean skin during drying, water evaporation from inside coffee beans occurred more easily. Additionally, dry weight of 100 Arabica beans exceeded that of 100 Robusta beans, visually evident from the form, type, and size differences between Arabica and Robusta varieties.

Yield Percentage

Bean yield derived from the formula comparing dry weight to fresh weight percentage for each treatment. Analysis calculations revealed that Arabica Sigararutang and Robusta Toraja varieties with various post-harvest processing methods showed no significant effects on coffee bean yield (Table 5).

Table 5. Coffee bean yield (%) for two coffee types with various post-harvest processing methods

Treatment	Dry weight of 100 coffee beans (g)	
	A1	A2
B1	0.142	0.139
B2	0.168	0.166
B3	0.171	0.165
B4	0.173	0.168

Table 5 data indicated highest yield occurred with Honey processing method for both Arabica and Robusta varieties. Yield variation resulted from volatile compound evaporation including aldehydes, furfural, ketones, alcohols, and esters. Besides volatile compound evaporation, yield was influenced by pyrolysis reactions of hydroxide compounds causing weight loss in sun-dried coffee beans under specific light intensity. This aligned with Winarno (2017) stating that longer drying time resulted in decreased water content. Bean water content inversely related to yield. Yield reduction resulted from increased drying duration in coffee post-harvest processing. Sun-dried coffee beans experienced weight reduction due to moisture content decrease, consequently reducing coffee powder yield. Taib et al. (2018) stated that material water content reduction caused material weight decrease, subsequently reducing resulting yield.

Color (Scoring)

Coffee color plays an important role in consumer acceptance and attraction. Although possessing desired flavor, inappropriate or unattractive color reduces consumer interest in coffee.

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Quality assessment of both Arabica Sigararutang and Robusta Toraja varieties revealed significant differences with Honey processing method, while Full Wash, Semi Wash, and Natural post-harvest processing methods showed no significant differences between varieties (Table 6).

Table 6. Scoring coffee bean color for two coffee types with various post-harvest processing methods

Treatment	**Scoring**	
	A1	A2
B1	2.89	3.98
B2	4.67	4.81
B3	4.68	3.76
B4	5.3	5.35

Table 6 data demonstrated Honey method treatment achieved highest scores for brewed coffee color in both Arabica Sigararutang powder and Robusta Toraja powder. Scoring ranged from 1 to 7 (yellow to very dark). Highest scores occurred with Honey treatment with similar values for both Arabica and Robusta powder. Dark color in both Arabica and Robusta coffee powder resulted from Maillard reactions forming volatile compounds, carbohydrate caramelization, and CO_2 formation as oxidation products during drying. According to Sari (2021), coffee represents a brown color pattern resembling dried coffee bean color. Primary factors affecting coffee color included temperature and drying duration. Extended sun exposure influenced decreasing bean moisture content with longer drying. This also resulted from longer drying increasing water content evaporation during drying, consequently decreasing coffee powder moisture content. Additionally, sugar caramelization processes caused color transformation to dark.

Bean Moisture Content

During fermentation, temperature increases occurred where microbial activity increased, enzyme activity became more active, causing mucilage liquefaction. Heat affected mucilage degradation from beans, bean pores opened allowing water content evaporation. Additionally, longer drying increased water content evaporation during drying, consequently decreasing coffee powder moisture content (Wahyudi, 2022). Analysis results for various post-harvest processing

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method treatments on Arabica Sigararutang and Robusta Toraja varieties showed no significant effects on bean moisture content measured using terratester instrument (Table 7).

Table 7. Bean moisture content (%) for two coffee types with various post-harvest processing methods

Treatment	Bean moisture content (%)	
	A1	A2
B1	12.3	12.1
B2	11.8	11.5
B3	11.5	11.4
B4	11.9	11.3

Table 7 data showed all treatment bean moisture contents reached dryness limits where dry bean moisture content ranged 11.5-12.5% (Afrikiana, 2020). Green beans with this moisture content underwent subsequent sorting to separate beans from non-coffee contaminants, small leaves, coffee skins, and physical sorting based on size and defective beans according to SNI 01-2907-2008 standards, enabling continuation to organoleptic quality analysis (BSN, 2008). Longer drying duration increasingly decreased Arabica and Robusta bean moisture content, where Natural treatment experienced longest drying influencing bean moisture content for maintaining coffee storage durability for both Arabica and Robusta, affecting coffee taste, aroma, and flavor (Santoso, 2018).

Aroma (Scoring)

Coffee aroma characteristics generally indicated coffee flavor. Coffee aroma encompassed fragrance (coffee smell when dry/powder) and aroma (coffee smell when brewed with hot water). Flavor represented combinations perceived by tongue and nose sensory organs. Data analysis showed Arabica Sigararutang powder with various post-harvest processing methods showed no significant effects across all treatment methods. For Robusta Toraja variety, Honey method treatment significantly affected coffee aroma, while Natural, Full Wash, and Semi Wash post-harvest processing methods showed no significant effects (Table 8).

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Table 8. Scoring coffee powder aroma for two coffee types with various post-harvest processing methods

Treatment	**Scoring**	
	A1	A2
B1	2.44	3.01
B2	3.78	4.21
B3	4.11	4.98
B4	5.36	6.21

Table 8 data demonstrated optimal processing method differences with Honey treatment in Robusta affecting brewed coffee powder aroma compared to Semi Wash, Full Wash, or Natural processing methods. Honey post-harvest processing method fermentation occurred longer than other methods. Coffee fermentation purposes included dissolving sugar compounds located between fruit skin and bean skin layers, causing dissolved sugar compounds to absorb into beans. Additionally, bean mucilage contained mucilage producing distinctive flavors (Mulato and Suharyono, 2012). Arabica coffee aroma fundamentally tended more fragrant with highly varied flavor characteristics compared to Robusta. Blueberry-like aromas emerged when unroasted Arabica beans were smelled. This research obtained average brewed Arabica powder aroma scores with highest treatment at Honey method of 5.36 meaning strong coffee aroma and lowest at Natural treatment with 2.44 score meaning very weak coffee aroma (Rahardjo, 2017). However, this research showed Robusta aroma with Honey post-harvest processing method demonstrated highest value of 6.21 categorized as strong coffee aroma. Post-harvest processing treatments revealed that different Robusta post-harvest handling produced different flavors. Additionally, post-harvest processing improved aroma quality especially for Robusta variety.

Caffeine (mg)

Research results showed post-harvest processing treatments based on data analysis demonstrated no significant differences in caffeine content for Arabica Sigararutang and Robusta Toraja varieties, though overall Arabica caffeine content exceeded Robusta caffeine content (Table 9).

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Table 9. Caffeine (mg) for two coffee types with various post-harvest processing methods

Treatment	**Caffeine (mg)**	
	A1	A2
B1	0.249	0.189
B2	0.456	0.432
B3	0.563	0.365
B4	0.656	0.541

Table 9 data showed caffeine percentage content decreased in coffee powder for both Arabica Sigararutang and Robusta Toraja varieties due to post-harvest treatment influences. This correlated with optimal drying duration for each treatment affecting evaporation processes of volatile compounds including aldehydes, acetic acid, furfural, ketones, alcohols, and formic acid (Mulato, 2019). Arabica characteristics included fragrant aroma, cold and cool climate adaptation, slightly acidic taste, thick mouthfeel, bitterness, and finer texture. Arabica also possessed higher caffeine content than Robusta. Coffee caffeine content was influenced by planting region, plant varieties, plant age, planting season length, and rainfall. Arabica powder caffeine content did not meet SNI 01-3542-2004 minimum standard limits with maximum 2% and minimum 0.9% caffeine content, presumably due to approximately 6-month Arabica bean storage duration according to Mulato (2019).

Acidity Level

Acidity or pH represented factors influencing coffee flavor. Coffee acidity was influenced by fermentation processes, both dry fermentation by piling coffee in shade for 2-3 days and wet fermentation by soaking in water for 36-40 hours (Najiyati and Daniarti, 2012). Laboratory research results using pH meters revealed analysis results showing no significant differences across all treatments (Table 10).

Table 10. Acidity level for two coffee types with various post-harvest processing methods

Treatment	**pH**	
	A1	A2
B1	4.97	5.25
B2	5.15	5.36
B3	5.06	5.42
B4	4.83	5.8

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Table 10 data showed acidity levels remained above normal without exceeding pH 7. Optimal acidity percentages approached neutral pH due to not excessively high acidity. Acidity value reduction resulted from evaporation of acidic substances, both chlorogenic acid and carboxylic acid during sun-drying, causing decreased coffee acid content. This aligned with Mulato (2019) stating coffee beans naturally contained various volatile compound types including aldehydes, furfural, ketones, alcohols, esters, and acetic acid easily evaporating when exposed to heat.

Overall Testing

Overall testing encompassed hedonic testing or panelist preference levels for taste, aroma, and brewed Arabica and Robusta coffee powder color. Testing was conducted by panelists providing scoring numbers. Average overall hedonic testing scores for Arabica Sigararutang and Robusta Toraja powder with various post-harvest processing methods appear in Table 11.

Table 11. Average overall hedonic test scores for two coffee types with various post-harvest processing methods

Treatment	**pH**	
	A1	A2
B1	2.24	2.11
B2	4.16	3.67
B3	4.12	3.45
B4	4.64	3.81

Table 11 data demonstrated overall analysis revealed significant differences with Full Wash, Semi Wash, and Honey treatments for both coffee varieties. Observations showed optimal treatment differences with Honey post-harvest processing method for overall hedonic testing of brewed Arabica and Robusta powder. Average treatment scores showed highest Arabica brewed powder hedonic testing with Honey method scored 4.64 meaning liked, and lowest with Natural scored 2.24 categorized as less liked. Similarly, Robusta powder with Honey method scored 3.81 meaning liked though lower than Arabica, and lowest with Natural method scored 2.11 categorized as less liked. Hedonic testing assessments of brewed Arabica and Robusta powder for aroma, taste, and color were influenced by drying duration, returning to post-harvest treatments for accelerating optimal bean drying processes. During drying, compounds contained in coffee beans evaporated extensively (Mulato, 2019). Hedonic overall testing for aroma, taste, and brewed coffee color

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preferred by panelists with Honey method treatment scored 4.64. Resulting flavors formed from combined acidic, bitter, and sweet tastes formed from post-harvest processing. This caused degradation of constituent components forming unified entities. Coffee taste was influenced by carbohydrate compound degradation converted to sucrose during roasting producing sweet taste, alkaloid degradation results becoming kafeol and crude fiber breakdown forming bitter taste, while acidic taste formed from chlorogenic acid degradation and other coffee acids.

4. CONCLUSIONS

This study demonstrated that post-harvest processing methods significantly influence the quality characteristics and sensory attributes of both Arabica Sigararutang and Robusta Toraja coffee varieties. Among the four processing methods examined, the Honey process yielded superior overall quality parameters for both varieties, achieving the highest scores in sensory evaluation including color intensity (5.30 for Arabica and 5.35 for Robusta), aroma strength (5.36 for Arabica and 6.21 for Robusta), and overall acceptance (4.64 for Arabica and 3.81 for Robusta). This superior performance was attributed to the extended fermentation period (48 hours) and retention of the mucilage layer during drying, which allowed sugar compounds to absorb into the beans, producing distinctive flavor characteristics preferred by consumers. Although the Semi Wash process demonstrated the most efficient drying performance, requiring the shortest duration (22.7 days for Arabica and 24.6 days for Robusta), it did not achieve the highest sensory quality scores. The Natural process, representing the conventional approach, required the longest drying duration (33.4 days for Arabica and 32.9 days for Robusta) and produced the lowest sensory acceptance scores across all parameters.

Solar dryer dome technology proved effective in facilitating controlled drying conditions for all processing methods, with all treatments successfully achieving optimal moisture content within the acceptable range of 11.3-12.3%. The findings indicate that small and medium-scale coffee enterprises can enhance product quality and market competitiveness by adopting the Honey processing method combined with solar dryer dome technology. This approach addresses both quality standardization challenges and drying efficiency limitations faced by traditional methods, particularly during rainy seasons. The study confirms that processing method interactions with varietal characteristics significantly influence final coffee quality, with the Honey process representing the optimal choice for both Arabica Sigararutang and Robusta Toraja varieties when consumer flavor preferences and overall quality attributes are prioritized.

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