

Fostering Coffee-Minds by Developing Customer Perspective from Simple Public Cupping: Study Case in Bumi Kopi, Malang

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Abstract. The massive growth through the trends toward coffee-lover communities has pushed the new revolution of coffee waves in Indonesia, previously from the second wave into the third wave. In the Malang area, this phenomenon at the same time had brought new challenges and opportunities, especially improving the awareness for the lovers, which a major role as the coffee-shop customers. Moreover, this study focused on describing customers and semi-trained testers perspectives towards the taste of available coffee species which is provided by new experiences from simple public cupping. As many 31 customers and 9 semi-trained testers have been chosen for the demonstration which was conducted in Bumi Kopi Coffee Shop, Malang. Four types of coffee samples; including *Coffea arabica var typica* (arabica), *Coffea liberica var liberica* (liberica), *Coffea canephora var robusta* (robusta), and *Coffea liberica var dewevrei* (excelsa) have been used during the test. The findings based on the test showed that customers and semi trained testers tend to enjoy fruity coffee such found in arabica and liberica, while the robusta and excelsa also still enjoyed for fewer customers. Based on this research, its hoped if these activities could be improved, such a creative business optimization and could be a part of gastronomic tourism.

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1 Introduction

As the fifth largest coffee producer in the world, Indonesia contributes to supplying 5% of global coffee production, with a total output recorded is about 8.5 million 60kg bags in 2023/2024 [1]. This coffee production has also been aligned with the main chain of market demand, which makes an essential economic income of USD 1,15 billion during 2022 [2]. In Indonesia, coffee has been thriving since introduced with Dutch colonization in the 17th century, until the present. This may be influenced due to the durable cultural integration of coffee consumption, which has recently evolved in the lifestyle trend [3]. Thus, the presence of coffee wave movement that linked this lifestyle also started transitioning, from the second wave to the third wave [4]. Yet, this phenomenon emphasizes a deeper consumer understanding of coffee processing, considering the aspect of quality, origin, and the unique characteristics of different coffee varieties, rather than simply consuming coffee known for its bitterness [5, 6].

The coffee shops, such found in Malang, play an important role in supporting the growing coffee wave movement. They not only function as a place for social interaction but also as an educational center to foster appreciation for the unique taste and profile of various coffee species among the customers [7]. The diversity in customers' preferences regarding coffee becomes a challenge for coffee entrepreneurs to optimize their strategy to increase sales [8]. Many customers have a basic understanding of coffee but lack of training. Therefore, it is important to bridge this gap through education such as public cupping sessions to develop the customer perspective [9].

Cupping has become a widely used sensory evaluation tool for assessing the characteristics of coffee beans and the flavor quality of coffee samples, which can be conducted publicly and involve customers directly [10]. Public cupping offers an accessible and effective method for engaging consumers to taste various brews and explore the flavors of the different coffee samples presented [11]. This activity provides a discussion forum to increase consumer's understanding of coffee. Despite its potential, research on the impact of public cupping in the Malang area remains limited, thus highlighting the need for further investigation to understand its effectiveness and benefits.

This study focuses on exploring customer perspectives on the flavor profiles of various coffee species through the experience of a simple public cupping session conducted at the Bumi Kopi cafe, Malang. In its implementation, data triangulation was carried out to find customer preferences for the four types of coffee provided, including Robusta (*Coffea canephora* var *robusta*), Arabica (*Coffea arabica*), and Liberoid (belongs to Liberica (*Coffea liberica* var *liberica*) and Excelsa (*Coffea liberica* var *dewevrei*). This research also focused on finding matches in flavor identification by participants which would be confirmed by a semi-trained tester. It is hoped that this research can support the development of coffee shops in the third wave of coffee marketing by mapping customer preferences in the Malang area.

2 Materials and Methods

The event of simple public cupping was demonstrated in Bumi Kopi café on 9-11 August 2024. Using a small event scheme, this demonstration has reached 31 coffee consumers who agreed to join as participants. This section aimed to explore their abilities to describe each coffee's flavor characteristics, and to vote for consumers' favorite coffee preferences This survey was also guided by 9 semi- trained testers who played as descriptors. They also confirm and foster the participant's knowledge about flavor details which they feel on each coffee sample in the discussion section after doing the public-cupping test.

2.1 Sample Preparations

The coffee samples which include three species from four origins were prepared at least one month before the test. The details of each sample include: 1. Robusta coffee (*Coffea cannenphora var robusta*) from Ampelgading District; 2. Arabica Coffee (*Coffea arabica*) from Singosari District; and 3. Liberoid coffee (Liberica Coffee (*Coffea liberica var liberica* from Betara District) and Excelsa coffee (*Coffea liberica var dewevrei* from Kalipuro District). The mature cherries from each coffee sample were processed by natural sun-drying. The harvested cherries were poured on top of para-nets and put inside the greenhouses. We didn't control the time range during the drying periods until the hulling process. Overall, green beans provided from each coffee sample were sorted by removing defects (black beans, insect damages, and chipped beans) and stored inside PP5 food- grade plastic at room temperature.

All coffee samples were prepared for the roast process. Each green beans were roasted using Normon Machine type n1000i with a total batch/roast of around 0.8 – 1 kilogram. The total roasting duration was 12 to 16 minutes. The final roast level on each coffee sample was medium. After roasted, the bean was rested for about 96 hours before the descriptive flavor test.

The descriptive-analytic approach was conducted through the questionnaire in paper format. The questionnaire was prepared at least about two days before the event. There were two types of questionnaires, including the form of SCAA Standard of Cupping Protocols (for semi-trained testers), and the simple parameters form (for customers). The form of SCA cupping includes 11 attributes including fragrance/aroma, flavor, aftertaste, acidity, body, balance, uniformity, clean cup, sweetness, defects, and overall [12]. The customer's simple parameters form consists of basic parameters, including acidity, sweetness, bitterness, aroma (dry and wet), and overall (personal perspective through the most preferred taste on each sample). It was filled using a Likert scale with scores ranging from 1 to 5 [13] on each sample and additional notes to explain the flavors that may be found.

2.2 Tracing Consumer's Preferences through Simple Public Cupping

In the public cupping events, four coffee samples were given the code name and served with the coffee ratio $16,00 \pm 0.25$ gram per 256 mL of water within maximum temperatures (96.0-100°C). All participant were given their glass (paper-based glass), and questionnaire papers. After filling out the basic information (name, sex, and age), participants and semi-trained testers were instructed to taste all samples (Figure 1). The total duration of the test was around 40 minutes.

During the test, each customer was allowed to share their perception and their favorite coffee samples before the discussion sections, but semi-trained testers were not allowed. We maintained the range of flavor since the samples were served from hot to cold. All environmental factors were ignored during the event start until finished. After finishing the test, all the questionnaires were compiled for further analysis. On the last part, we took the vote for the most enjoyable sample and opened the sharing session to tell the details of each sample that all participants enjoyed.



Fig. 1. The event of Simple Public Cupping that demonstrated in Bumi Kopi Café on 11 August 2024. Photo by Ayu Tri Widyawati

2.3 Data Analysis

The compiled data were tabulated including population among the participants, vote for the most favorite coffee, and the flavor descriptors found on each coffee sample. Besides that, we also compared the mean from basic character attributes on each sample provided by customers and SCA attributes from semi-trained testers [12]. Principal Component Analysis (PCA) in PAST Software Version 4.11 was performed to assess the correlation between flavor lists and coffee samples [14].

3 Result and Discussion

3.1 Descriptive-analytic Survey

The population characteristics among the customers and semi-trained testers are shown in Table 1. From the total of customers and semi-trained testers, we found that most of the population consisted of males (67.5%), compared to females (32.5%). Despite that, from this study case, the data in Table 1 can't be adequately determined because there was a lack of subject quantities. This also highlights the urgency for improving the number of samples to describe the differences between the genders in coffee consumption.

The data from Table 1 could be linked to the coffee habits in Indonesia that historically have been connected with the patriarchist mode refers to European culture [15]. Since introduced by the Dutch, coffee has adapted and projected to be a popular beverage in shaping cultural and social relationships, particularly among men. It is also used as a symbolization of masculinity through black colorization [16]. Compared by current condition, the phenomenon through masculinity of coffee may still relevant, even through the coffee drinks become universal. It was proven by study cases comparison. The reports created by [17, 18] still shown if the men tends consume more daily coffee.

The voting results show that customers have their favorite type of coffee with the most preferred coffee being arabica (51,61%), followed by liberica and robusta which had an equal

number of voters (19,35%), and excelsa receiving the fewest votes (9,68%). The semi-trained testers showed similar preferences. Most of them favored arabica coffee while one panelist preferred excelsa as their favorite choice (Figure 2). Based on the vote, the arabica coffee was enjoyed based on its complexity of fruity flavors, mild body, and low caffeine intensity compared to other coffee species [19, 20]. Besides that, the liberoids coffee (liberica coffee and excelsa coffee) were presumed based on their complex characteristics which is a mix of the arabica coffee and robusta coffee. It's known for its mix of fruity and earthy flavors, bold body, and moderate caffeine intensity. While, the robusta coffee was already known for its strong caffeine level, highlighting the bitterness and earthy flavors [21, 22, 23].

Overall, each coffee samples also have its characteristics which reveals the necessary further studies. It was needed to enhance the depth of knowledge about customer preferences towards coffee species. Then, toward this vote, we might assume that the coffee wave movement and the growth of coffee shops may influence the coffee preferences among the customers and semi- trained testers. Their coffee knowledge becomes deeper or may have been improved from just simply interpreting the bitter taste through the cup of coffee.

Table 1. Demographic data represent the population characteristics among public cupping participants

Participants	Sex		Ages			
	Male	Female	15-25 yr	26-35 yr	36-45 yr	46-55 yr
Customers	20	11	20	6	4	1
Semi-trained testers	7	2	3	5	1	0
Total	27	13	23	11	5	1

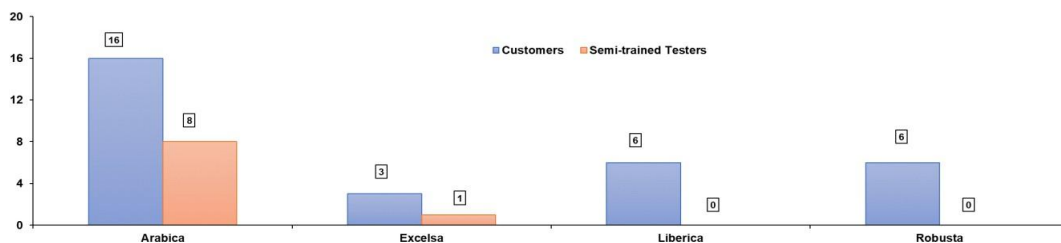


Fig. 2. Vote result for the most favorite coffee between customers and semi-trained testers.

3.2 Assessment through Sensory Analysis

Sensory experience discusses about flavour, which compromises of taste and aroma. In terms of taste, consisting of acid, sweet, bitter, salt and umami. Combination of aroma and taste determine coffee flavor outcome in sensory analysis. Sensory analysis in coffee flavour mainly considering acid, bitter, sweet, mouthfeel and aroma. This sensory element give each coffee its unique flavor characteristic [6, 10].

Basic flavor comparisons conducted by customers show that each type of coffee has different characteristics (Figure 3). Arabica coffee has low bitterness, medium- high sweetness, and high acidity. and aroma. Arabica is known to has fruity flavor, described as citrus, apple, mango, lychee, papaya, jackfruit, banana, and berry notes. Acidity in coffee is caused by the presence of organic acids, either naturally contained due the coffee's metabolic processes or produced during the post harvest process [24]. Arabica coffee is known has a higher organic acids than other types of coffee, which contributes to its higher acidity. The fruity taste of Arabica coffee may be influenced by compounds in the ester and butanone groups [25, 26].

Liberica also marked by high acidity and sweetness with moderate bitterness. The sweetness of coffee is caused by the presence of sugars such as mannose, sucrose, fructose,

glucose, arabinosa, and rhamnosa [27]. Liberica also considered to shares similar fruity flavor with arabica coffee, featuring mango, lychee, banana, lime, papaya, and jackfruit notes. However, Liberica coffee also has smoky and nutty notes caused by the presence of phenol, furan and pyrazine compounds [28].

Excelsa coffee has moderate acidity, lower sweetness, and a medium level of bitterness. Even both are classified as liberoid coffee, excelsa dan liberica have different morphological structures which have an impact on their sweetness. Liberica is considered to have a high sweetness intensity due to its thick fruit pulp and mucilage which is rich in sugar therefore can influence the perception of sweetness in the coffee beans produced. In contrast, excelsa coffee has thinner pulp compared to liberica [29, 30]. Excelsa presents a more subtle profile, with by woody, smoky, cocoa, and nutty as its basic flavors caused by the presence of furan, pyrazine, pyridine, and pyrrole compounds [21].

Robusta coffee stands out with its strong bitterness compared to other coffee species. Bitterness in coffee often associated to the caffeine, where robusta known to have the highest caffeine content (2,09 – 2,26%) compared to arabica (1,09 – 1,6%) and liberoid (1,02 – 1,69%) [31, 32, 33]. The sucrose and reducing sugar content in robusta tends to be lower than in arabica and liberica coffee which results in inferior sweetness compared to arabica [34]. Robusta coffee has low acidity, and commonly described has nutty, brown sugar, and cocoa flavor. Based on the assessment, the coffees were ranked according to the intensity of their taste and aroma profiles. In terms of acidity, arabica was rated the highest, followed by liberica, excelsa, and robusta coffee.

Based on the sweetness level of coffee, customers found liberica have the highest level of sweetness, followed by arabica, robusta, and excelsa. This pattern changed slightly in bitterness level with robusta was rated the most bitter, followed by liberica and excelsa, while arabica being the least bitter. Based on the dry aroma, arabica is perceived to have the strongest aroma, with liberica coming next, followed by robusta and excelsa. Similar pattern remained consistent after brewing, although the aroma intensity tended to decrease.

The strong intensity of coffee aroma is related to the presence of the volatile compounds. Coffee contains over 1,000 volatile compounds, but only approximately 5% of the total are key contributors to the coffee's aroma which belong to different chemical classes including hydrocarbon, furan, pyrazine, ester, pirydin, thiol, alcohol, pyrole, ketone, aldehide, and others [35]. The majority of volatile compounds are formed through the * Corresponding author: annisaizzah14@gmail.com degradation of non-volatile compounds through roasting process, such as carbohydrates, proteins, lipids, phenolic compounds, and alkaloids [36]. By considering the intensity of basic taste and coffee's aroma, customers gave the highest overall score to arabica coffee, followed by liberica and robusta both with the same average overall score while excelsa came in last.

Based on the assessment by semi-trained panelists (Table 2), Arabica coffee was found to be superior in almost all attributes including fragrance, flavor, aftertaste, acidity, balance, sweetness, and overall. However, the highest score for the body was achieved by liberica coffee. It was found interesting that the liberoid coffees frequently ranked in second places for some attributes, especially *Coffea liberica* var *liberica* coffee. Robusta coffee often found to have the lowest scores among all samples for six attributes including fragrance, flavor, acidity, balance, sweetness and overall.

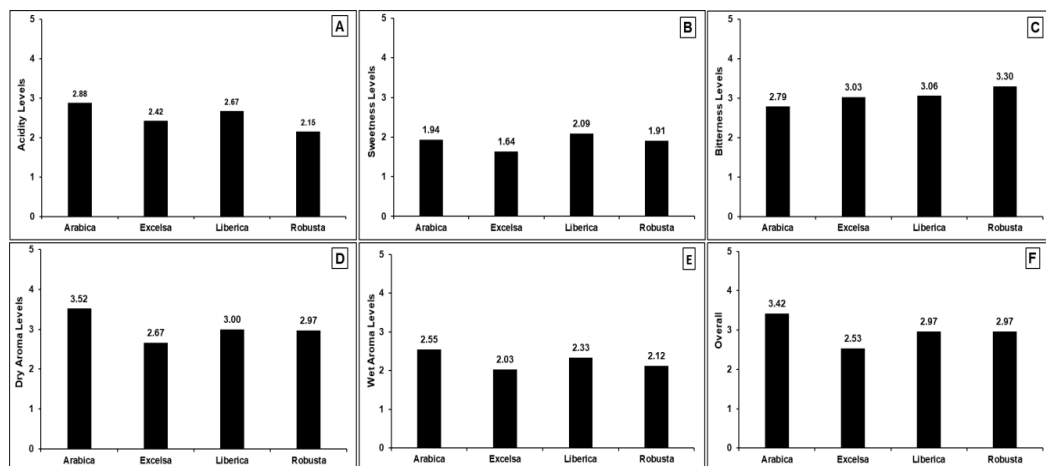


Fig. 3. Basic Flavour comparison levels provided by customers towards four coffee samples during the Simple Public Cupping event. Six parameters including: A. Acidity; B. Sweetness ; C. Bitterness; D. Dry Aroma; E. Wet Aroma; F. Overall.

Table 2. SCA attributes scores comparison on four coffee samples provided by Semi-trained testers

Attributes	Coffee Samples			
	Arabica	Excelsa	Liberica	Robusta
Fragrance	7,88	7,19	7,44	7,08
Flavor	8,09	7,05	7,19	6,94
Aftertaste	7,68	6,97	6,86	7,27
Acidity	7,80	7,05	7,19	6,63
Body	7,25	7,12	7,43	7,15
Balance	7,86	7,25	7,17	7,14
Sweetness	7,87	6,96	6,57	6,37
Overall	7,85	7,14	7,35	6,71

The flavor of coffee is closely related to the chemical compounds present within it. Carbohydrates and proteins contribute to the sweetness, while lipid fractions influence the body and mouthfeel [36]. Coffee contains various organic acids and chlorogenic acids that play a significant role in shaping its overall sensory properties. Additionally, Volatile compounds also play a role in enhancing both aroma and distinct flavor perceptions. These volatile compounds must reach a specific threshold to trigger receptors in the brain, resulting in distinct aroma and flavor profiles [37, 38]. The diversity and concentration of both non-volatile and volatile in coffee can result in a flavour profile complexity that is defined as pleasant or unpleasant taste [39].

Based on the public cupping carried out, customers and semi-trained panelists were able to provide an overview of the flavor notes of the served coffee (Table 3). Semi-trained panelists were able to provide broader note descriptions with a total of 33 descriptors while customers were able to identify 18 notes. There are similar notes found by customers and semi-trained panelists. This information can be an important indicator in describing the basic notes of each type of coffee served. These similarities can also show that both groups of panelists were able to identify basic notes in coffee in general.

In addition to pleasant flavor notes, several off- flavors, classified as defects, were identified by both customers and semi-trained panelists. Arabica coffee displayed rubbery notes. In Excelsa coffee, defects such as woody, dusty, smoky, moldy, vegetal, soil, rubbery,

and musty flavors were found. Liberica coffee presented rubbery, vegetal, soil, herbal, phenolic, and medicinal notes. Meanwhile, Robusta showed defects including vegetal, dusty, soil, and smoky flavors.

Flavor defects often caused by post-harvesting fault [40]. Phenolic and medicinal flavors often result from post-harvest processing fault, such as harvesting overripe cherries or using improper fermentation techniques [41]. Rubber and musty notes can develop from inadequate drying practices, while dusty and soil flavors influenced by the poor storage conditions [42]. Errors during the roasting process can lead to smoky and vegetal notes, while woody flavors may be caused by parchment remains left on the beans during roasting [43].

Table 3. Comparison of flavor descriptors generated by customers and semi-trained testers on each coffee sample.

Coffee Samples	Flavor Descriptors	
	Customers	Semi-trained testers
Arabica	Floral, Apple, Spices, Fruity , Milky, Rubbery, Starfruit, Pleasant bitter, Watermelon	Brown Sugar, Cocoa, Nutty, Orange, Floral, Honey, Apple, Spices, Mango, Caramel, Fruity , Tamarine, Sugar cane, Lychee, Banana, Lime, Papaya, Plum, Jackfruit, Berry
Excelsa	Cocoa , Nutty , Spices, Fruity, Lime, Woody , Smoky , Pleasant bitter, Musty	Brown Sugar, Cocoa , Nutty , Caramel, Lime, Jackfruit, Toast, Vegetal, Dusty, Woody , Berry, Moldy, Milky, Soil, Rubbery, Smoky
Liberica	Nutty , Orange, Apple, Spices, Fruity , Sugar cane, Jackfruit , Rubbery, Smoky	Brown Sugar, Nutty , Honey, Spices, Mango, Caramel, Fruity , Lychee, Banana, Lime, Papaya, Jackfruit , Vegetal, Berry, Soil, Herb, Starfruit, Tea, Smoky , Phenolic, Medicinal
Robusta	Brown Sugar , Cocoa , Nutty , Apple, Caramel, Fruity, Sugar cane, Lime, Cinnamon	Brown Sugar , Cocoa , Nutty , Honey, Spices, Plum, Toast, Vegetal, Dusty, Soil, Smoky, Pleasant bitter

*Notes : The bold marks showed same flavor descriptor among semi-trained testers and customers.

The PCA assessment taken from the customers (67%) and semi-trained testers (68%) showed the differences in flavor identities among the tested coffees (Figure 4). This identity also represents the most highlighted flavor descriptors on each coffee found and may describe the expression of the volatile compounds in shaping the mouthfeels. In this case, from both PCA assessments, we found that the liberoids (*C. liberica var liberica* and *C. liberica var dewevrei*) were located between the arabica and robusta, while robusta and arabica have a negative correlation which arabica tends to fruity while robusta tend to nutty and earthy.

Flavor correlations from customers showed that arabica tends to correlate with fruity, spices, pleasantly bitter, floral, starfruit, and rubbery, while semi-trained testers shown if arabica was correlated with jackfruit, lime, fruity, berry, caramel, cocoa, plum, banana, mango, and brown sugar. From both species of liberoids, the customers represent similar flavors such apple, smoky, nutty, and sugarcane. If compared with semi-trained testers, they represent both liberoid have slightly different flavors, liberica coffee was strongly correlated with fruit flavors (e.g berry, fruity, banana, lime, jackfruit) - and tended to like arabica, while excelsa strongly correlated with earthy flavors (e.g., cocoa, soil, spices, brown sugar, smoky, and nutty) - tend to like robusta. The robusta, based on customer preferences was correlated with nutty and sugar cane, while the semi-trained customers showed the flavor preferences of robusta coffee strongly correlated with vegetal, smoky, nutty, soil, and spices.

The result of the descriptors from both customers and semi-trained testers shows if the flavor perspective could be so diverse. Even though customers didn't get any training in organoleptic sensing, they could describe the coffee taste and elaborate their minds through coffee flavors, although the results tend to be less accurate and might be more difficult to use in in-depth analysis. The role of semi-trained testers urgently needed to confirm and provide a clearer and more reliable picture of the flavor profile of the coffee types tested. The higher consistency and specificity in attributing flavor attributes to specific coffee types make this data more useful for quality analysis and product development.

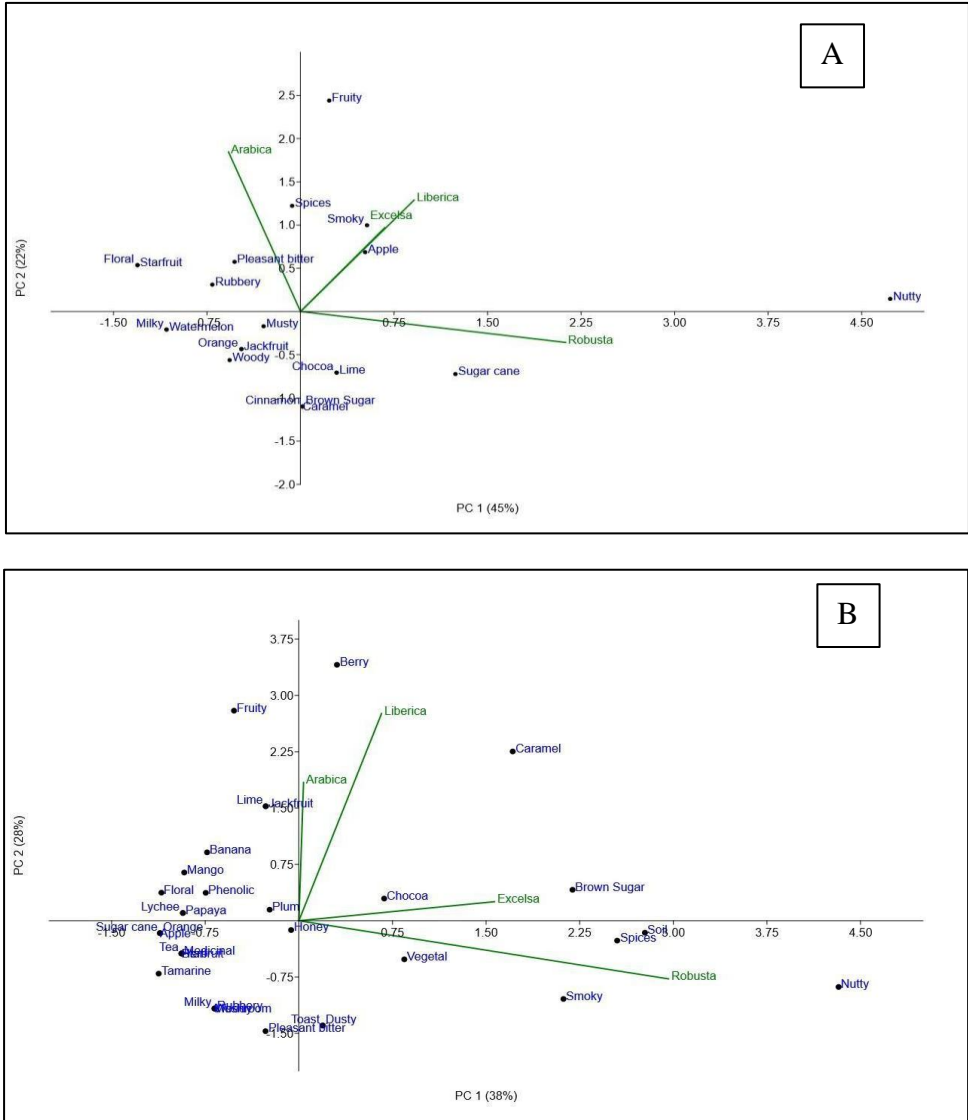


Fig. 4. Correlation between the coffee samples and flavor descriptors showed by Principal Component Analysis (PCA) that separated between: (A). Customers; (B). Semi-trained testers.

3.3 The Big Picture of Simple Public Cupping

The evidence through the demonstration from the Simple Public Cupping qualitatively represents the effectiveness of this method in improving coffee minds, particularly for customers and semi-trained testers. They learned, explored, and had a discussion to track the diversity of flavors which is created by species variation. The results showed that from the customer perspective, arabica and liberica coffee tend to be liked more than robusta and excelsa. It showed that customers at this particular event tend to like coffee that has a fruity flavor rather than an earthy flavor. The fruity flavor is also considered more pleasant by customers.

In several opportunities, the customer perspective of coffee flavor can be used as a map for the coffee entrepreneur to optimize their business [6]. Developing coffee that produces pleasant flavour such as fruity and sweet should be aimed by coffee-preneur. Simple Public Cupping method is limited by customers demographic and culture. Implementation of the simple public cupping method as a communal movement by coffee business actors can provide a more comprehensive data.

Further, these methods could be developed for several comparisons, including post-harvest process, terroirs, level of roast, origins, type of fermentation, and varieties[44, 45, 46]. The implication through Simple Public Cupping was expected to encourage both professionals and amateurs to understand the bibliography's knowledge for in-depth terminology of coffee characters [47]. From a different perspective, the method of simple public cupping could be integrated with an organoleptic experiment based on a laboratory for volatile compounds confirmation which emphasizes the flavor's identity [48] in defining coffee products.

Simple Public Cupping could give an added value through tourism implication. This method itself can be used as a tourism attraction that introduce coffee knowledge for tourist. Application of this method can be set as a tourism package or as an event itself. As a special interest tourism, this attraction will be relied on explanation of interpreter. As described by [49], Coffee tourism would offer holistic knowledge of coffee including sensory experience. Simple public cupping could be integrated with several tourist activities i.e., coffee-agroforestry tours, traditional coffee processing, and coffee wellness spa.

4 Conclusion

The exploration taken between customers and semi-trained testers through simple public cupping event have been explored as many thirty-five flavors descriptors that shown different preferences towards four types of coffee species. Most of the customers and semi-trained testers have been chosen two coffee species with fruity-notes as their preferences, such found in arabica (as the most matches) and puts liberica in second places. Both robusta and excelsa which highlight the earth-like flavor also still enjoyed even though have fewer numbers. In the further context, this research may could be used as a preliminary study for exploration of substitution for arabica coffee that predicted will be threat in the future during the trends of climate change. Besides that, this research offers that *Coffea liberica* var. *liberica* might become a potential candidate for arabica substitute, due on its similarity in pleasant and fruity flavour attributes.

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