

SENSORY PROFILE OF 3 IN 1 INSTANT COFFEE USING EMOTIONAL-SENSORY MAPPING, FLASH PROFILE, AND CATA (CHECK-ALL-THAT-APPLY) METHODS

[Profil Sensori Kopi Instan 3 in 1 dengan Metode Emotional-Sensory Mapping, Flash Profile, dan Cata (Check-All-That-Apply)]

Dase Hunaefi^{1,2)*} dan Wicensky Marusiva¹⁾

¹⁾ Departemen Ilmu dan Teknologi Pangan, Fakultas Teknologi Pertanian, IPB University, Bogor

²⁾ South East Asian Food and Agricultural Science and Technology (SEAFAST) Center, IPB University, Bogor

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ABSTRACT

Three in one instant coffee is popular among university students. A variety brands of such instant coffee are available on the market. However, the literature on the sensory aspects of the instant coffee is rather limited slim. The project aimed to test three-in-one instant coffee sachets for their sensory characteristics. Two methods, CATA (Attributes and Emotional Mapping) and Flash Profile (extension of Free Choice Profiling) were employed to generate the attribute profiles and emotional dashboard. Sixty IPB University students were selected as panelists. Sensory attributes terminologies and their relation to emotion were generated using Focus Group Discussion among instant coffee heavy drinker. Profile of coffee D showed a creamy texture, while sweetness and milky was dominant when it came to coffee B and coffee C. The creaminess in coffee G was strongly related to feelings of happiness in a consumer. In addition, the sweet and milky taste and flavor in coffee B was seen as a relaxing and luxurious feeling. A Preference Mapping was constructed, and it showed that sweetness, milky, and creaminess improved the liking of the student consumers that make coffee C the most preferred brand among the panelists. In short, the use of flash profiles and check-all-it-dilute/CATA (attributes and emotional) equipped with preference mapping can provide emotional attributes and dashboards that will be important to understand products more than just consumer liking.

Keywords: CATA, emotional sensory mapping, flash profiling, instant coffee, sensory profiling

ABSTRAK

Kopi instan 3 in 1 sangat digemari oleh kalangan mahasiswa. Terdapat beragam merek kopi instan 3 in 1. Informasi mengenai karakteristik sensori kopi instan relatif sedikit. Penelitian ini bertujuan untuk mengevaluasi karakteristik sensori pada produk kopi instan 3 in 1 dalam kemasan sachet. Dua metode, Check-All-That-Apply/CATA (Atribut dan Pemetaan Emosional) dan Flash Profile (yang disatukan dengan Free Choice Profiling) digunakan untuk menghasilkan profil atribut dan konsep emosional yang terikat. Enam puluh mahasiswa IPB University terpilih melalui skrining sebagai panelis. Terminologi atribut sensori dan keterkaitan emosional dihasilkan dengan menggunakan Focus Group Discussion konsumen berat kopi instan. Profil kopi D menunjukkan tekstur yang lembut, sedangkan rasa manis dan susu mendominasi kopi B dan kopi C. Tekstur creamy dalam kopi D sangat terkait dengan perasaan bahagia seorang konsumen. Selain itu, rasa manis dan susu pada Kopi B dipandang sebagai perasaan yang menenangkan dan mewah. Preference Mapping yang dibangun menunjukkan bahwa rasa manis, rasa susu, dan creamy mouthfeel meningkatkan kesukaan konsumen mahasiswa yang menjadikan kopi C sebagai merek yang paling disukai di kalangan mahasiswa IPB University. Melalui flash profile dan CATA (Attributes and Emotional) yang dilengkapi dengan pemetaan preferensi memberikan atribut dan peta emosi yang akan menjadi penting untuk memahami produk lebih dalam dari sekedar keinginan konsumen.

Kata kunci: CATA, emotional sensory mapping, flash profiling, kopi instan, sensory profiling

*Corresponding Author: E-mail: dashcbdk@apps.ipb.ac.id

INTRODUCTION

Coffee is one of the most recognized drinks in the world besides tea and chocolate (Zanin *et al.*, 2021; Ribeiro *et al.*, 2021). Based on data from the International Coffee Organization (ICO, 2021), the level of world coffee consumption in 2020 reached 171.9 million bags million bags per 60 kg of coffee packs and an annual average increase of 6.1% since 2019. Several countries in Europe, such as Finland, have consumed coffee reaching 9.60 kg per capita or 2.64 cups per day (Bemfeito *et al.*, 2021). In Indonesia, coffee consumption in the last year has increased by 60% from 2010-2019, with a total domestic consumption of 4.08 millions of 60 kg bags, with export volume of 4.5 millions of 60 kg bags resulted in 4th position in the world, while the total volume coffee produced was 761 000 metric tons (Hirschmann, 2020; Hirschmann, 2021).

Two types of processed coffee are widely available on the market, namely ground coffee and instant coffee (Yusianto and Nugroho, 2014). The difference between these two types of processed coffee is that ground coffee is a pure coffee powder that is directly brewed with boiling water, has a coarser texture, contains more pulp, has a more pungent coffee aroma, has higher side effects and a level of thickness that can be adjusted accordingly—*the tongue of the connoisseur*. Meanwhile, instant coffee is coffee that is ready to serve by the rehydration. Instant coffee has a fragrant aroma, does not contain much waste, and has various flavors (Gao *et al.*, 2021). The habits or lifestyles of today's society that tend to be practical have led to increased consumption of instant coffee (Huang *et al.*, 2021).

Emotion is one of the critical factors that consumers consider when making product purchase decisions (de Melo *et al.*, 2021; Nasermodeli *et al.*, 2012). Positivity in emotions can add value to a product, whereas negativity can subtract value. External factors like advertising and packaging can influence consumer emotions while internal factors like the sensory profile of a product have an impact on it (Jaeger *et al.*, 2019). Consumers will make a relationship between the sensory attributes of a product (taste, aroma, mouthfeel, aftertaste, and flavor) with the internal experience/emotions experienced when tasting the product (feeling comfortable and relaxed) (Huseynov *et al.*, 2021; Nezlek *et al.*, 2021).

The description of the product's sensory characteristics has become an integral part of food and beverage companies (Valentin *et al.*, 2012). Information obtained from descriptions of product sensory characteristics enables companies to make more precise business decisions, become a reference in developing ideal products according to consumers, know the effects of changes in formulas and processes, and are also useful for quality

control purposes (Varela and Ares, 2012). Descriptive tests are used to identify important sensory characteristics in a product and provide information about these characteristics intensity (Pramudya *et al.*, 2021). However, using descriptive methods to evaluate the sensory characteristics necessitates panelists who have been trained to do so. Developing the trained panelists normally takes a lot of time and effort. Luckily, current development methods for the test, such as the Flash Profile Method and Check-All-That-Apply (CATA) (Verissimo *et al.*, 2020; Belusso *et al.*, 2016), are not contingent on having trained panelists.

Based on research, according to Rabelo *et al.* (2021), the flash profile method is an accurate method for sensory mapping and can also provide relevant results. Also, the flash profile method is a method that can be used to obtain product profiling when trained panelists are not available quickly.

The industry's pressure to develop alternative methods that eliminate the need and the cost for panelist training and collect sensory information directly from consumers has made several consumer profiling methods developed rapidly in the last decade (Berget *et al.*, 2020). One of those methods is CATA. The Check-All-That-Apply (CATA) method is a simple and fast method of gathering information about a product based on consumer perceptions (McCain-Keefer *et al.*, 2020). Besides, this method is very appropriate for naive consumers who can see how consumers understand the product from a sensory perspective and how sensory characteristics can compose consumers' perception patterns (McCain-Keefer *et al.*, 2020).

Sensory evaluation in the food industry is an important thing to do. Determination of consumer selection of an instant coffee product is based on consumers' emotions when tasting an instant coffee product, and these emotions are influenced by the sensory profile contained in instant coffee products. This study aimed to determine the sensory profile of instant coffee using consumer panelists with emotional-sensory mapping, flash profile, and Check-All-That-Apply (CATA) methods. This study's results were expected to obtain information about instant coffee products' sensory profile that can be used for new product development using emotional-sensory mapping, flash profile, and CATA methods using consumer panelists.

MATERIALS AND METHODS

Materials

The main samples used in this research are three-in-one (coffee, non-dairy creamer, and sugar)-instant coffee products packed in sachet. Eight coffee products are 1) Coffee A, 2) Coffee B, 3) Co-

ffee C, 4) Coffee D, 5) Coffee E, 6) Coffee F, 7) Coffee G, and 8) Coffee H. Other materials used are mineral water and crackers. The tools used in this study were cups, trays, spoons, labels, paper, stationery, and questionnaire paper. The sensory analysis was performed using Emotional-Sensory Mapping, Flash Profile, and check-all-that-apply (CATA) methods in the sensory laboratory Department of Food Science and Technology, IPB University.

Methods

The research was conducted in four stages: the first stage involved panelist screening, the second stage involved Focus Group Discussions (FGDs), the third stage involved sensory evaluations of eight 3 in 1 instant coffees using the flash profile method, emotional-sensory mapping, and check-all-that-apply (CATA) with consumer panelists, and the fourth stage involved data processing using XLSTAT. In order to satisfy the applicant's interest in Good Sensory Practices, along with safety concerns, the general guideline on ISO 11136 (<https://www.iso.org/standard/73557.html>) was followed.

Sample preparation and presentation

Sample in the form of instant coffee 3 in 1 dissolved in hot water at 80°C according to the packaging's serving instructions. All samples were then presented at the same temperature to avoid bias. The sample was presented as 80 mL in a small glass measuring 100 mL, given a random three-digit number code. Mineral water and crackers were given to the panelists as neutralizers to neutralize the taste buds at each sample change.

Testing of 3 in 1 instant coffee profiles using the flash profile method (free elicitation) (Manstan *et al.*, 2020)

The free choice profiling methods were conducted in conjunction with the Flash Profile methods (FCP). This method uses 30 panelists, who are coffee consumers after the first stage of screening. Each sample of 3 in 1 instant coffee was served as much as 80 mL with mineral water and cracker as a neutralizer. The panelist tested the sample and wrote down the sensory attributes he/she thought were present, without any guidance or being guided by the panel leader regarding the attributes that should be assessed. After the panelists wrote the list of attributes, the panelists were asked to rank each attribute's intensity from the entire sample (Manstan *et al.*, 2020).

Testing of 3 in 1 instant coffee profiles using the emotional-sensory mapping method (Mané *et al.*, 2021)

This test method used 30 panelists who are coffee consumers. Each sample of 3 in 1 instant

coffee was served as much as 80 mL in 100 mL cup with mineral water and cracker as a neutralizer. Panelists were asked to taste the sample and rate their emotions when tasting the sample (Mané *et al.*, 2021).

3 in 1 instant coffee profile testing using the check-all-that-apply (CATA) method follow by the preference mapping (Lobo *et al.*, 2021)

In the Check-All-That-Apply (CATA) test method, there is a selection of ideal perception profiling in consumers' mind. The panelists used were 30 consumers. In the beginning, the panelists were asked to fill in the attribute column for the ideal coffee before tasting the sample. The panelist then tasted the sample and assessed what sensory attributes were felt in the sample by marking the sensory attributes that he/she thinks can describe the sample (Lobo *et al.*, 2021). Panelists were also asked to rate the intensity of liking for the coffee samples with a 6 hedonic scale (very dislike to very much like). The preference mapping was generated based on the frequencies of the liking (Lobo *et al.*, 2021).

Flash profile data analysis (Reinbach *et al.*, 2014)

The flash profile method's data processing was performed using XLSTAT covering Generalized Procurement Analysis (GPA) tools. The result of this GPA tool was in the form of product configuration consensus to show how the product is assessed or perceived by each panelist (Montanuci *et al.*, 2015). One of the resulting data analyses was PCA, which was compared with other methods, namely CATA (Reinbach *et al.*, 2014).

Emotional-sensory mapping data analysis with Check-All-That-Apply (CATA) (Grasso *et al.*, 2016)

Emotional-sensory Mapping method data analysis was performed using XLSTAT covering CATA analysis tools. The resulting data analysis was in Cochran's Q test, correspondence analysis, Principal Coordinate Analysis (PCoA), and penalty analysis. Cochran's Q test was used to identify significant differences between samples in each of the CATA test attributes (Ares *et al.*, 2014). If the p-value was <0.05, there was a significant difference between samples, whereas if the P-value is > 0.05, there was no significant difference between samples (Grasso *et al.*, 2016).

Correspondence analysis (CA) was used to obtain a two-dimensional representation of the sample and the relationship between attributes and samples in the CATA test. This analysis was commonly used to visualize frequency tables, where rows represent samples and columns represent attributes. The ideal product was added as a complement to the analysis (Ares *et al.*, 2014).

Principal Coordinates Analysis (PCoA) was applied to visualize the correlation between coefficients and results on a two-dimensional map (Meyners *et al.*, 2013). In this case, the data displayed was the sensory profile, emotional attributes, and favorite data in dots.

Penalty analysis was carried out based on a comparison of consumer perceptions between the sample and the ideal product and its effect on preference value. Based on the penalty analysis results on XLSTAT, the samples' sensory attributes were grouped into 5 categories: must-have, nice to have, must not have, do not influence, and do not harm.

RESULTS AND DISCUSSION

Panelists' profile

The total panelists for the flash profile test, CATA, and Emotional Sensory Mapping were 60 students from IPB University who are 3 in 1 instant coffee consumers with a male to female ratio of 30 to 70%. The total panelists used in the flash profile test, CATA, and Emotional Sensory Mapping used 60 panelists selected from the IPB University students who are the 3 in 1 instant coffee consumers with a ratio of 30% male and 70% female. The panelists included 30 participants for the flash profile (as an extension of free choice profiling) and 30 participants for the emotional sensory mapping and CATA. The panelists' ages ranged from 19 to 22 years. The frequency of panelist coffee consumption can be seen in Figure 1.

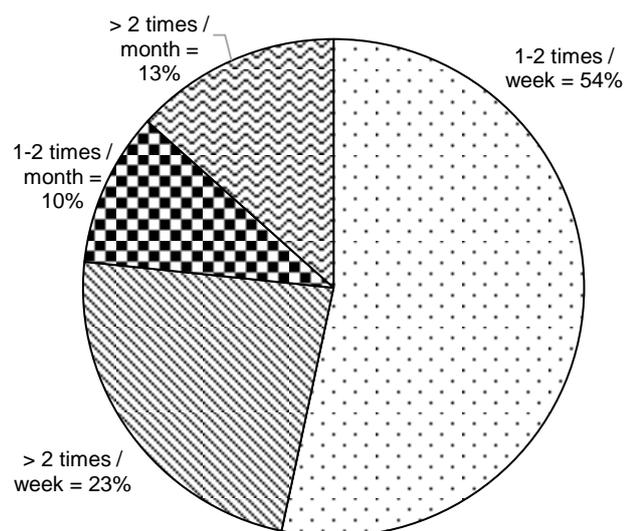


Figure 1. Frequency of panelist coffee consumption

Focus group discussion (FGD)

This Focus Group Discussion (FGD) was conducted to ascertain the sensory and emotional attributes associated with 3 in 1 instant coffee products used in the CATA and Emotional Sensory Mapping methods. There were 27 sensory attributes to describe characteristics of coffee and their descriptions were provided to the panelists. Table 1 summarizes the results of the FGD.

The discussion results obtained 10 emotional attributes, namely happy, nostalgic, calm, satisfied, luxurious, bored, energetic, flat, anxious, and safe. There were 15 sensory attributes divided into 4 categories, namely aroma, taste, aftertaste, and mouthfeel. The sensory attributes for aroma were roasted, caramel, smokey, and burnt. Taste attributes were milky, bitter, sweet, and sour. Aftertaste attributes were sour, bitter, dry, and sweet, while mouthfeel/texture attributes were creamy, viscosity, and watery.

3 in 1 instant coffee sensory profile with flash profile method

Testing the sensory profile of instant coffee 3 in 1 with the flash profile method using 30 panelists obtained a total of 8 dominant sensory attributes. Acquired sensory attributes include milky, sweet, bitter, caramel, nutty, coffee, sour, and creamy. The test results were processed using the GPA tools on XLSTAT to produce a Procrustes Analysis of Variance (PANOVAs) table, which can be seen in Table 2.

The PANOVAs table serves to determine which sources of variation have a significant impact on overall consensus resolution. This table summarizes each GPA transformation's efficiency in terms of reducing total variability (Keskin *et al.*, 2012; Labbe *et al.*, 2021). Table 2 shows that translation was the most efficient transformation and significantly reduces the deviation or deviation between the panelists' results because it had the smallest *P*-value.

Another result obtained from the GPA tools is a PCA curve, which showed the correlation between the eight dominant attributes and the 3 in 1 instant coffee sample. The first quadrant was the E sample with sensory characteristics of bitter, coffee, sour, and nutty. The second quadrant contained samples of coffee F, coffee H, and coffee G, which had creamy sensory characteristics. The third quadrant contained coffee A and coffee G with caramel sensory characteristics. The fourth quadrant contained coffee C and coffee B with milky and sweet sensory characteristics. The correlation between sensory attributes and samples were tested by the flash profile method can be seen in Figure 2.

Table 1. Summary of focus group discussion

Emotion	Aroma	Taste	Aftertaste	Mouthfeel
Happy	Roasted	Milky	Sour	Creamy
Nostalgic	Caramel	Coffee ID	Bitter	Viscosity
Calm	Smokey	Bitter	Dry	Watery
Satisfied	Burnt	Sweet	Sweet	Dry *
Luxurious	Sweet *	Sour	Astringent *	Plain *
Bored	Beany *	Umami *		
Energetic	Dry ashy *			
Flat	Nutty *			
Anxious	Raw *			
Safe				
Aktive *				
Fun *				
Regret *				

Note: * Unselected attributes

Table 2. PANOVA

Source	DF	Sum of Squares	Mean Squares	F	Pr > F
Residuals after scaling	783	799,831	1,021		
Scaling	29	20,007	0,690	0,675	0,903
Residuals after rotation	812	819,838	1,010		
Rotation	812	747,224	0,920	0,901	0,930
Residuals after translation	1624	1567,063	0,965		
Translation	232	1845,171	7,953	7,786	< 0,0001
Corrected total	1856	3412,233	1,838		

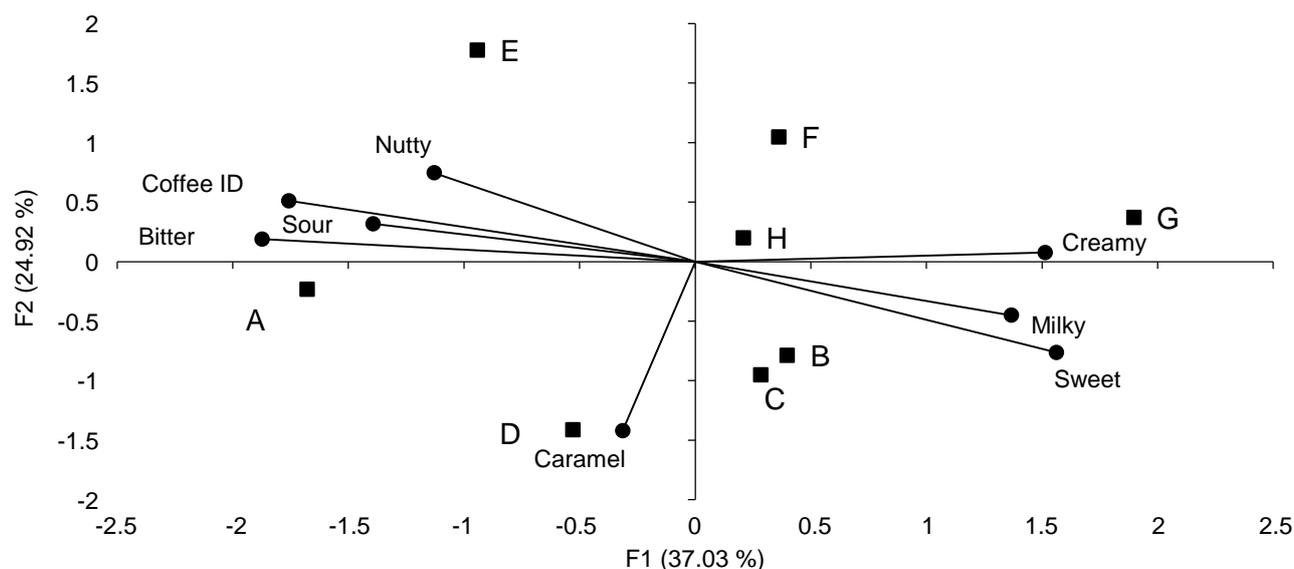


Figure 2. PCA curve of the flash profile method of commercial 3 in 1 coffees used generalized procrustes analysis

3 in 1 instant coffee sensory profile with CATA method

The Cochran's Q test analysis of McNemar's multiple pairwise comparisons compared each of the sensory attributes in each sample with a significance level of 5%. The results of the Cochran's Q test showed that all sensory attributes were significantly different in each sample at a significance level of 5%, except for sour taste ($P= 0.055$), dry aftertaste

($P= 0.312$), viscous ($P= 0.270$) and mouthfeel watery ($P= 0.844$). The correspondence analysis results were that a biplot map was obtained that represents the profile of 3 in 1 instant coffee and ideal coffee according to the appropriate sensory attributes (Ares *et al.*, 2014; Fujimoto *et al.*, 2021). A biplot map depicting the correlation between the sample, the ideal coffee product, and the sensory attributes can be seen in Figure 3.

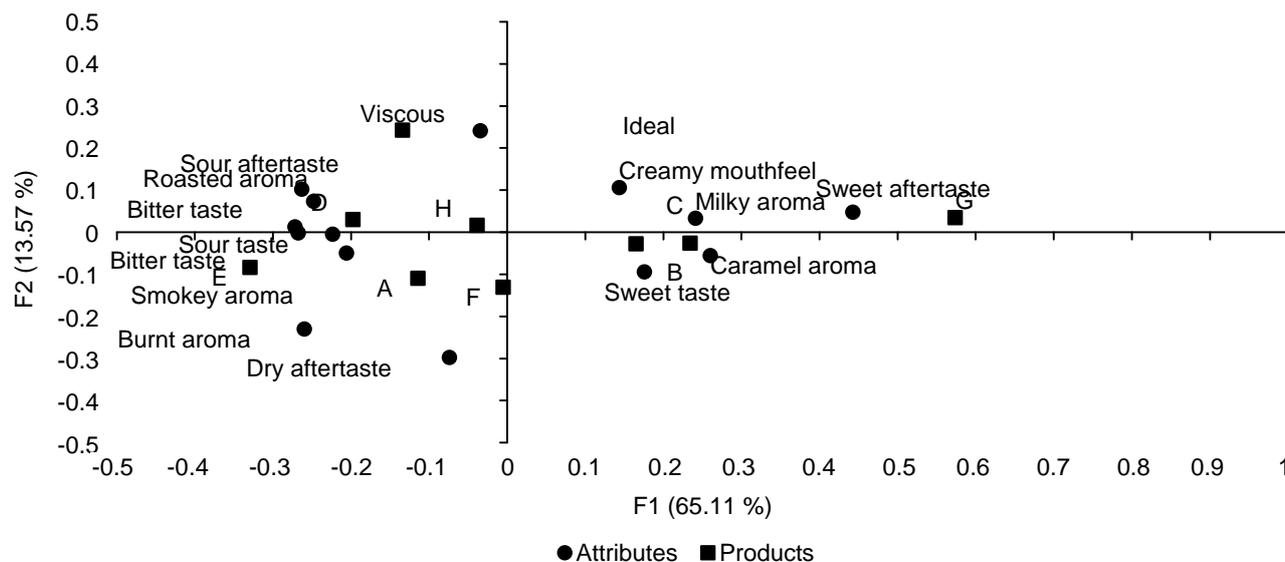


Figure 3. The sensory profile of 3 in 1 instant coffee and ideal coffee was represented using XLSTAT CATA Analysis – Coffee C is the most closely related product to the IDEAL Characteristics

Based on the results of the Correspondence analysis in Figure 4, it showed that the ideal sensory profile of coffee was coffee that has roasted aroma, creamy mouthfeel, milky taste and viscous. The sample closest to the criteria for ideal coffee was coffee C and coffee B. Coffee C has dominant attributes, namely creamy mouthfeel and milky aroma. Coffee G has dominant attributes, namely sweetness aftertaste, while coffee B has dominant attributes, namely caramel aroma and sweet taste. Meanwhile the sample farthest from the ideal coffee criteria is coffee G. Meanwhile, coffee F has a dominant attribute, namely a dry aftertaste.

Based on the CATA Analysis results, there was Principal Coordinate Analysis (PCoA) graph that illustrates the correlation between sensory attributes and panelists' preferences for commercial coffee samples that have been tested. The PCoA analysis results in Figure 5 shows that the dominant attributes that affect the panelists' preferences are sweetness, smokey aroma.

Preference mapping is a technique that connects consumer acceptance data (hedonic data) with product sensory characteristics (descriptive data) to determine product characteristics that affect consumer preferences (Ferini *et al.*, 2020; Gidlöf *et al.*, 2021). The part that is also included in preference mapping is the contour plot, whose function is to show the number of clusters with a preference level above average. The level of preference for each cluster is expressed in percent (%), and each color has a different percentage (Manik *et al.*, 2016). The results of the preference mapping can be seen in Figure 5.

The preference mapping results showed that there was no red zone. It meant that there was no

single product that has high liking score above the average liking of the panelists for 80-100%. The yellow area on the contour plot shows the panelists' preference percentage of 60-80% were coffee C, while in the light blue area there are 33% of panelists like coffee A, coffee D, coffee E, coffee F, and coffee B.

Panelists' attributes were sour taste, dry aftertaste, smokey aroma, sour aftertaste, viscous, creamy mouthfeel, sweet taste, caramel aroma, milky taste, and sweet aftertaste. The panelists' attributes were the watery mouthfeel, bitter aftertaste, bitter taste, burnt aroma, and aroma of roasting.

Penalty analysis identifies sensory attributes that can decrease or increase liking so that they can be used for product development. Penalty analysis on the CATA method can only be carried out if data on preferences and ideal product data were available. This analysis is divided into five groups of sensory attributes, namely must have, nice to have, does not influence, does not harm, and must not have (Khalafyan *et al.*, 2021; Meyners *et al.*, 2013), but only must-have, nice to have, and must not have. which will be analyzed because it has more influence on product development.

According to the panelists, the must-have attribute analysis was based on the mismatch of attributes that are not found in real products but ideal products. The attribute is based on the condition P (No) | (Yes) and P (Yes) | (Yes). P (No) | (Yes) is a condition where a sensory attribute is not found in the sample product but is desired in the ideal product. In contrast, P (Yes) | (Yes) is a condition in which these sensory attributes are present in both the sample product and the ideal product (Meyners *et al.*, 2013).

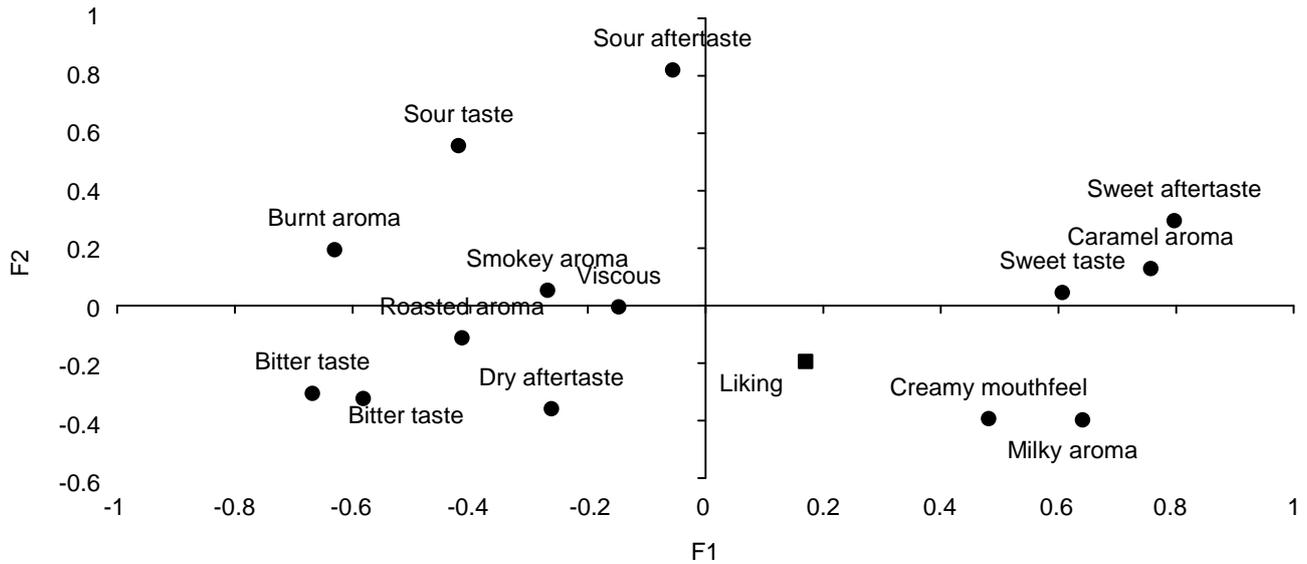


Figure 4. The correlation between the attributes and preferences of commercial 3-in-1 coffees demonstrates the attributes that contribute to liking

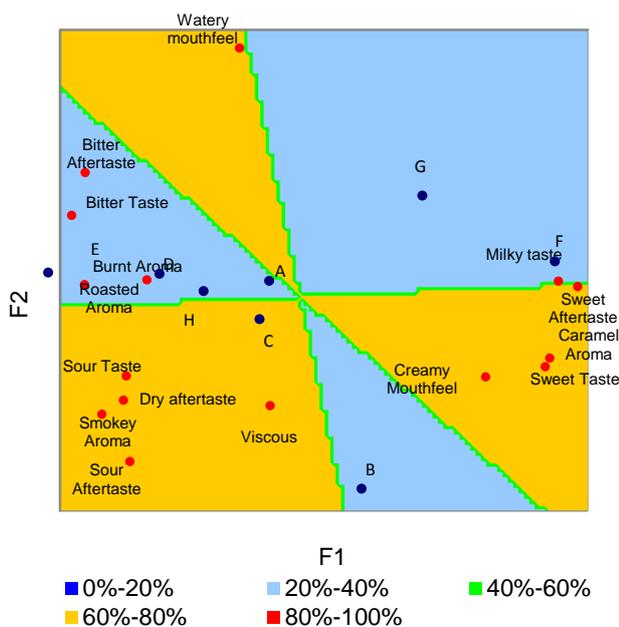


Figure 5. Preference mapping for 3-in-1 instant coffee samples among panelists

The higher the X coordinate value (% P (No) | (Yes)) and Y (mean drops) or the position of the sensory attributes, the more they are above the right of the graph, the better the sensory attribute is to have (must have).

The must-have attribute can be determined from the mean drops value and the condition P (No) | (Yes). The attributes that have the condition P (No) | (Yes), which is more than 20%, are attributes in the form of roasted aroma (42%), milky taste (24%),

bitter taste (35%), bitter aftertaste (33%), sweet aftertaste (21%), creamy mouthfeel (40%), and Viscous (40%). Figure 6 shows that the attributes that have a positive mean drop value include milky taste (0.575), creamy mouthfeel (0.396), sweet aftertaste (0.099), bitter taste (0.152), bitter aftertaste (0.074), roasted aroma (0.183), and Viscous (0.015). The significant positive mean drops in the attributes of milky taste (0.575) and mouthfeel creamy (0.396) cause milky taste and creamy mouthfeel to have the potential to be a must-have attribute and significant at the 5% test level.

The must not have attributes are the opposite of the must have attribute, namely the suitability of the attributes found in real products but not in ideal products according to panelists (Meyners *et al.*, 2013). The difference between the nice to have and must not have attributes is that the nice to have attribute increases the panelists' liking, while the must not have attribute decreases the panelists' liking (Rocha *et al.*, 2021). A sensory attribute has the potential to become a nice to have attribute if the mean value drops is positive, while if the mean drop value is negative it is categorized as a must not have attribute.

The attributes that have the condition P (Yes) | (No) which is more than 20% are attributes in the form of caramel aroma (22%), sweet taste (25%), dry aftertaste (25%), and mouthfeel watery (39%). As illustrated in Figure 7, positive mean drop values are associated with caramel aroma (0.004) and dry aftertaste (0.028), whereas negative mean drop values are associated with mouthfeel watery (-0.404) and sweetness (-0.014).

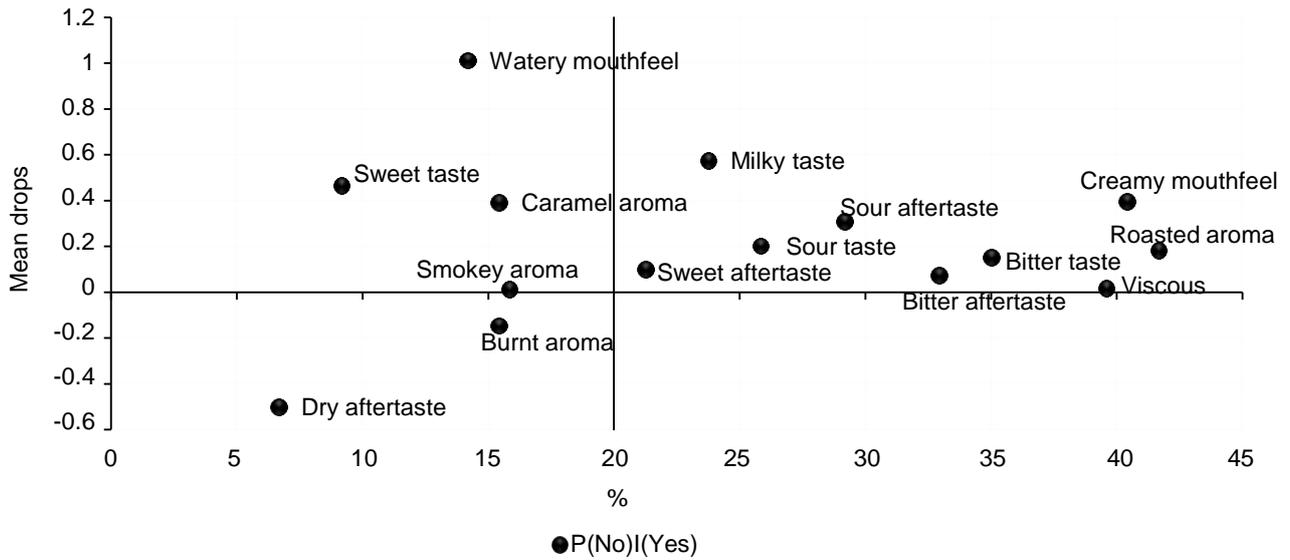


Figure 6. Penalty analysis of the must-have characteristics of commercial 3-in-1 coffees was conducted

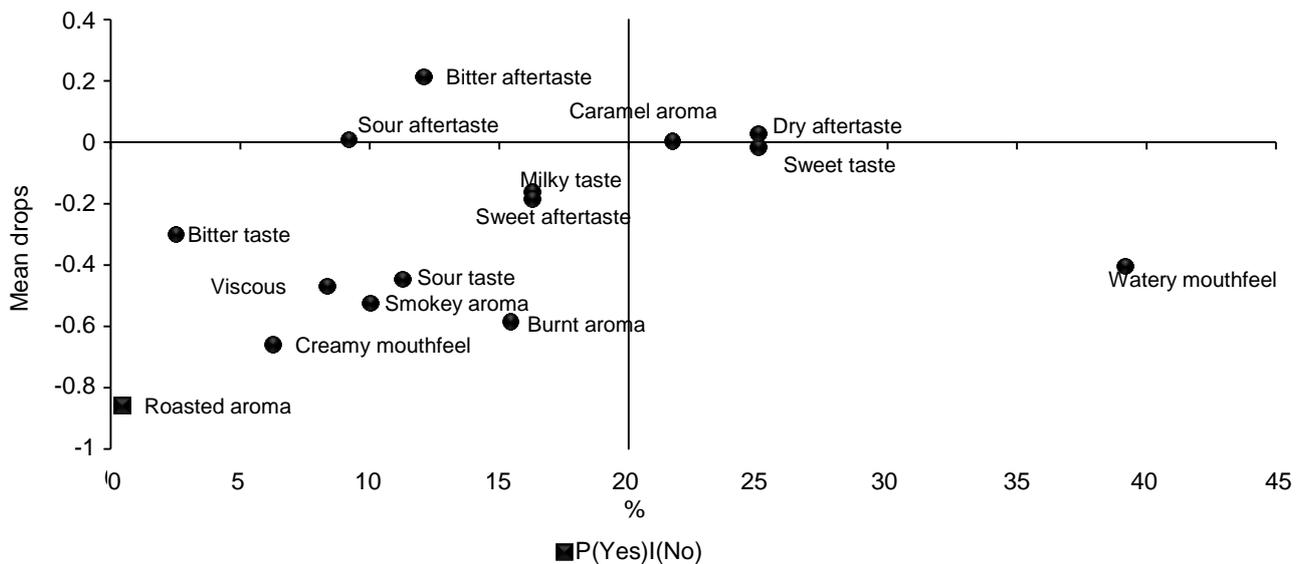


Figure 7. Penalty analysis of the nice to have and must not have attributes of commercial 3-in-1 coffees

The significant negative mean drop value (-0.404) for the mouthfeel watery attribute results in mouthfeel watery potentially becoming a must not have attribute at the 5% test level. The results of the nice to have attribute analysis show that there are no attributes that fall into the nice to have category. This is because the mean value of positive drops is very low (close to 0.000) so it can be ignored (Córdoba *et al.*, 2021).

The summary results of penalty analysis in Table 3 show that the sensory attributes that fall into the must have category are milky taste and creamy mouthfeel. Sensory attributes that fall into the does not influence category are roast aroma, bitter taste,

bitter aftertaste, and Viscous. Sensories that fall into the does not harm category are smokey aroma, burnt aroma, sour taste, sour aftertaste, dry aftertaste, and sweet aftertaste, mouthfeel watery sensory attributes the must not have the category. No sensory attributes fall into the category nice to have.

3 in 1 instant coffee emotion profile

Cochran's Q test shows that all emotional attributes are not significantly different in each sample at the 5% significance level, except for happy emotions ($P= 0.034$). A biplot map that illustrates the correlation between the sample and the emotional attributes tested can be seen in Figure 8.

Table 3. Penalty analysis summary

Must Have	Nice to Have	Does not Influence	Does not Harm	Must not Have
Milky taste		Roasted aroma	Smokey aroma	Watery mouthfeel
Creamy mouthfeel		Bitter taste	Burnt aroma	
		Aftertaste pahit	Sour taste	
		Viscous	Sour aftertaste	
			Dry aftertaste	
			Sweet aftertaste	

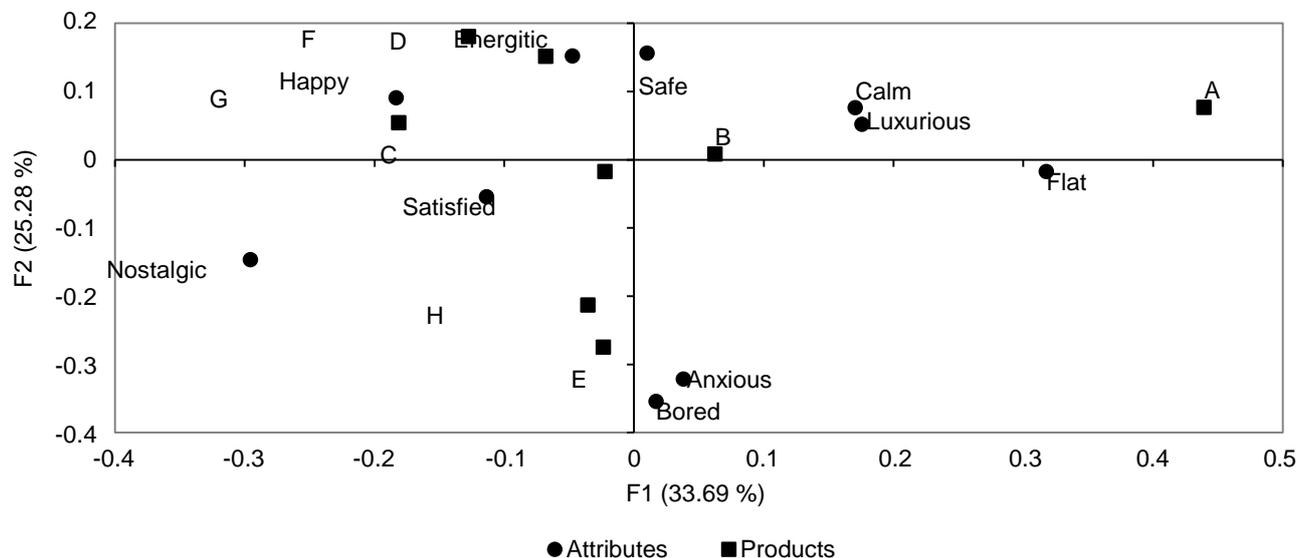


Figure 8. Representation of the emotional profile of commercial 3 in 1 instant coffees

According to the Correspondence analysis results in Figure 8, consumers experience happy and energetic emotions when tasting coffee D. The emotions evoked by tasting coffee G are positive. In comparison, the emotions evoked by the taste of coffee F are energizing. When tasting coffee B, one feels secure, calm, and luxurious, whereas when tasting coffee A, one feels flat. When tasting coffee C, the emotions were satisfied and happy, whereas when tasting coffee E, the emotions were bored and anxious.

The association between sensory profiles and emotions reveals that several sensory profiles are identical between the flash profile and CATA methods, specifically milky attributes on coffee C, bitter attributes on coffee E, and sweet attributes on original coffee B. Table 4 demonstrates that sensory attributes have an effect on the emotions experienced when tasting a product. Positive emotions can be evoked by sensory attributes with a sweet aroma and taste, whereas bitter aromas and tastes are more effective at eliciting negative emotions. Positive emotional characteristics such as happiness, vitality, satisfaction, security, calmness, and opulence are influenced by sensory characteristics such as sweetness, sweet aftertaste, milky taste, caramel aroma, creamy mouthfeel, and roasted aroma. In comparison, negative emotional charac-

teristics such as boredom and anxiety are influenced by the bitter aftertaste and burnt aroma.

CONCLUSION

The application of relatively new methods in the sensory evaluations of 3 in 1 instant coffee, Emotional-Sensory Mapping, Flash Profile, and CATA (Check-All-That-Apply) methods, resulted in a better understanding of the overall concept of sensory profiling, which the food industry can use to locate the targeted sensory space, including the emotions elicited by the product sensory attributes. Three samples of 3 in 1 instant coffee, namely coffee C, coffee E, and coffee B have the same sensory attributes in the flash profile and CATA methods. According to the panelists in around IPB Darmaga Campus, the most preferred product and approaching ideal coffee was coffee C with sensory attributes in the form of milky taste, creamy mouthfeel, roasted aroma, and viscous and resulted in satisfied and happy emotional attributes. Employing wider consumers area is advisable. Revalidating attributes selected in the first FGD with data collected in the second FGD is recommended.

Tabel 4. Correlation summary 3 in 1 instant coffee

Sample	Dominance Attributes Sensory Profiling		
	Flash Profile	CATA	Emotional Sensory Mapping
A	Caramel aroma	Smokey aroma	Flat
B	Milky taste	Burnt aroma	Safe
	Sweet taste	Caramel aroma	Calm
C	Milky taste	Creamy mouthfeel	Luxurious
	Sweet taste	Milky taste	Satisfied
D	Caramel aroma	Smokey aroma	Happy
		Sour taste	Energetic
E	Bitter taste	Bitter aftertaste	Bored
	Coffee id	Burnt aroma	Anxious
	Sour taste		
F	Nutty aroma		
	Creamy Mouthfeel	Sweet taste	Energetic
G	Creamy mouthfeel	Sweet aftertaste	Happy
H	Creamy mouthfeel	Roasted aroma	Satisfied
		Sour aftertaste	
		Viscous	

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