

## Consumers' preference on goat's milk based on sensory attributes

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### Abstract

Increasing global population has resulted in a corresponding increase in global demand for meat and milk. For high quality milk, the demand is particularly for goat's milk due to consumers' increasing awareness on its benefits. However, there remain negative perceptions associated with goat's milk. Therefore, research on new feeding formulation (NFF) has to be undertaken to improve goat's milk production and quality assurance. In the present work, a sensory evaluation was performed to analyse the characteristics of four different samples of fresh goat's milk; two commercial, and two non-commercial. Face-to-face interviews using a structured questionnaire were conducted, utilising the Central Location Test (CLT) with 828 respondents being selected through the purposive sampling method. Data were analysed using descriptive analysis and one-way ANOVA. Based on the descriptive analysis outcomes, majority of the respondents ( $n = 662$ ) had an experience consuming goat's milk. They also perceived goat's milk as fatty ( $n = 362$ ) and sweet taste ( $n = 147$ ). One-way ANOVA analysis on respondents' perception indicated their desires for goat's milk with attributes that are medium white, slightly weak of goaty aroma, and slightly viscous. They also favoured slightly sweet, slightly not salty, slightly creamy, and medium fresh milk. Next, the acceptance level of goat's milk attributes of four different samples showed that sample B (researched sample) scored higher ranging between 5 (either like or dislike) to 7 (medium like), as compared to the other samples. Importantly, most respondents (59.7%;  $n = 494$ ) chose sample B as the most preferred milk. Therefore, the findings of the present work provided a solid basis in understanding the sensory characteristics of goat's milk most preferred by consumers to be used in product development and quality assurance by food processors and marketers.

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### **Introduction**

Milk for human consumption is commercially produced across the globe by a limited number of animal species such as dairy cattle, buffalo, sheep, and goat (Lanfranchi *et al.*, 2017). Several regions have also adopted specialised species common in their area for the purpose of producing milk, such as camel, horse, and donkey. Goat's, donkey's, and camel's milk are considered good substitutes for human consumption (Agnoli *et al.*, 2016). Goat's milk has garnered appreciable attention in the livestock subsector, and is becoming established. Goat's milk is known as a nutritious food that contains superior nutrients over cow's milk. It is also an alternative to meet community demands towards milk in the future. It is quite stimulating to develop goat's milk products that are packed with animal

protein. However, although goat's milk has a high nutrient value, not many consumers have recognised its benefit. For instance, processed goat's milk such as kefir can be used as a functional food beneficial for human health. Furthermore, new methods have been developed to increase goat's milk and cheese quality, such as the introduction of plant by-products in the goat's diet, and the development of new sensors for quality control. Such development of newly added value products has led to the increased interest in specific studies focusing on optimising goat's milk production and consumption.

Product choice depends on consumers' assessment of information based on several characteristics or attributes of the product. Product attribute is mainly used in characterising product evaluation and preference (McAlister, 1982). Product appearance refers to a number of attributes that are

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readily observable by consumers (*e.g.*, shape, size, colour, *etc.*), and blended holistically by the designer to achieve a particular sensory effect. Essentially, product appearance is the first connection made by the consumer. Causal judgement, as illustrated by attribution theory, is formed by a person who uses available cues. Different cues are used for matters of objectivity and subjectivity. According to Kelley (1973), people rely on the situation for objective truths, and personal interaction for matters of taste.

Sensory evaluation can enhance information on milk products in terms of product quality and shelf-life, thus allowing milk to compete with other popular, innovative, and shelf-stable products. Sensory evaluation is also essential for a product to gain consumer's acceptance. According to Schiano *et al.* (2017), sensory evaluation is crucial in new product development, such that proper feeding in goat's diet could change the attributes of the resulting fresh goat's milk (Miller and Lu, 2019). Rapid methods in sensory profiling have gained a solid position in the field of sensory evaluation. It is a direct analysis technique that requires no specific training, and is easy to be applied by the consumers. Such analysis also simultaneously enhances knowledge of consumer's perception of various products.

Sensory evaluation is the development and the use of principles and methods for evaluating human responses to foods (Sidel *et al.*, 1981). Sensory evaluation or sensory science has been defined as "a scientific discipline used to evoke, measure, analyse, and interpret reaction to those characteristics of foods and materials as they are perceived by the senses of sight, smell, touch, taste, and hearing" (Stone and Sidel, 2012). From a product perspective, properties such as visual appearance, texture, and flavour are primary criteria to establish consumer's sensory and hedonic responses. According to Schiano *et al.* (2017), the latest mainstream sensory approaches have been applied to fluid milk research and investigations into predicting and preserving acceptable milk quality.

Sensory evaluation is critical for each application of milk to understand the sensory qualities of milk due to the worldwide awareness of fluid milk and its typical sensory profile. The problems identified during handling or production before the milk is processed can cause changes to the flavour or the aroma of raw milk. Schiano *et al.* (2017) stated that sensory evaluation is a parameter that can be tested only by humans. There is a series of tools or

tests with a subjective or objective application within the construction of selected testing procedures and parameters. The continuous evaluation of sensory characteristics of food is therefore a crucial method for evaluating product quality. Hence, the quantitative science of sensory evaluation involves the collection of numerical data to determine the relationship between product characteristics and human perception (Hashmi *et al.*, 2007).

## Materials and methods

In determining the applicable sample size for the present work, Krejcie and Morgan (1970) guideline was employed. The present work involved 828 respondents who were chosen using purposive sampling method of Central Location Test (CLT) which was the best method and cost-effective option for the present work (Schiano *et al.*, 2017). The present work was conducted during the Malaysia Agriculture, Horticulture, and Agrotourism Show 2018 (MAHA) held at the Malaysia Agro Exposition Park Serdang (MAEPS), Selangor.

Purposive sampling can be described as a sampling technique where researchers specify the characteristic of their respondents based on the requirements and purpose of the study (Lavrakas, 2008). The target respondents in the present work were selected based on their experience in consuming goat's milk in the past, or never consumed before but are willing to consume the milk samples as the actual respondents in the present work.

A structured questionnaire consisting of close-ended questions was constructed for the present work. It contained three sections; Section A (socio-demographic profile), Section B (respondents' perception towards sensory characteristic), and Section C (respondents' acceptance towards sensory characteristics). Data were collected from a total of 828 respondents who were interviewed face-to-face.

### Sample preparation

Four goat's milk samples (fresh and pasteurised) were used for the sensory evaluation and respondents' testing. Samples A and C were obtained commercially, while samples B and D were obtained from the farmers. Sample B was specifically produced from the introduction of a new feeding formulation. All samples were stored in an icebox full of ice cubes to maintain low temperature (2 - 4°C) and avoid milk damage. New samples were brought in

every two days throughout the fortnight of the exhibition. Then, 10 mL of sample was served in 50 mL white polyethylene cups, and randomly coded as A, B, C, and D. Respondents were served with the four sampling cups at one time without additives during the test.

Prior to the interview session, the definition of sensory attributes for fluid milk was described by the enumerators to the respondents. A straightforward explanation is imperative to enable the respondent to understand the attribute of goat's milk. For appearance attribute in terms of colour, the enumerator explained the visibility degree of yellow or white, in which, the respondent could see from the four samples. For odour attribute, the enumerator explained the overall orthonasal effect of the four samples. Orthonasal perception is equated with "the sniff", which explains the entrance of odour molecules into the nasal cavity, followed by the contact with the receptor neurons of the odour (Dietrich, 2009).

Next, for viscosity attribute, the enumerator explained the substance's resistance to flow. In milk and milk products, viscosity is crucial to determine the cream's flowing rate, mass rate, and heat transfer, as well as the conditions of the flow during the dairy processes. In the present work, the enumerator asked the respondents to slowly slurp the goat's milk. As a matter of fact, instrumental viscosity is highly correlated with sensory viscosity when slurping is used as a means of assessment as compared to mouth-feeling or swallowing (Valentova *et al.*, 1998). Meanwhile, respondents were asked to taste and evaluate their perception and preference towards goat's milk in terms of sweet, salty, or creamy. Finally, the enumerator asked the respondents to evaluate the flavour of goat's milk, whether it was fresh or not.

### *Sensory evaluation*

In the present work, sensory evaluation was used to obtain the information on sensory characteristics of different types of goat's milk samples, as well as respondents' acceptance and preference based on their perception. Both discrimination and affective tests were used to achieve the objectives of the present work.

Discrimination test is a part of analytical sensory to test sensory profiles, sample variability, or other product features that are not biased from liking considerations. The purpose of discrimination

analysis is to determine the differences between samples. It is also used to profile products objectively, and has been applied extensively in fluid milk (Schiano *et al.*, 2017). In fact, many fluid milk studies have used descriptive analysis to evaluate and differentiate samples (Schiano *et al.*, 2017).

Affective test, also known as acceptance test, preference test, or hedonic test, is used to measure consumers' preference or degree of liking or disliking of a product. The purpose of the test is to evaluate consumer's acceptance and preference for different types of fresh milk samples with a specific characteristic. Since the introduction of hedonic scaling methods in the 1940s, evaluating consumer acceptance is essential to ensure the acceptability of various fluid milk products and treatments. Consumer tests may be constructed in multiple ways with fluid milk, but the most common are Central Location Test (CLT) and home usage test. Moreover, administering consumer evaluations to untrained populations represent the true consumer base of a product. Previous studies by Schiano *et al.* (2017) on the hedonic qualities of fluid milk have attempted on extrapolating consumers' acceptance from trained panellists; however, the lack of trained panellists to expect or predict the preferences of consumer populations is well documented. Consumers or untrained panellists are usually used to complete a hedonic test, where they are asked to indicate their preferences (Lawless and Heymann, 2010). It is unlikely that the untrained panellists are able to differentiate the subtle differences between the products, but they can indicate what products are acceptable and provide the consumer perspective (Morin *et al.*, 2018). Practical uses of consumer tests include examining the effects of various processing methodologies, flavour additions or fortifications, and shelf-life of fluid milk to maintain sufficient consumers' acceptance and lead to new product development.

### *Sensory characteristics of goat's milk based on respondents' perception*

The questions were constructed using an ordinal scale (9-point scoring scale). The scoring scale is fundamentally used as a measurement in a discrimination analysis to observe differences among the samples. The rating is assigned by numerical scores, and the number of specified attributes is used to evaluate the samples. The intensity is evaluated by the consumer panellists, whereas the attribute is

judged with a score. The interval on the scale is labelled with numbers and attribute term that starts and ends in objective and bipolar form, namely “1 = extremely yellow, to 9 = extremely white” for appearance (colour); “1 = extremely weak, to 9 = extremely strong” for odour (milky aroma); “1 = extremely not viscous, to 9 = extremely viscous” for texture (viscosity); “1 = extremely not sweet/salty/creamy, to 9 = extremely sweet/salty/creamy” for taste (sweetness/saltiness/creamy); and “1 = extremely not fresh, to 9 = extremely fresh” for flavour (freshness) of the sampled milk.

#### *Respondents' acceptance level of goat's milk attributes*

The questions were constructed to evaluate the respondents' acceptance of goat's milk based on their perception. The objective of this section was to determine the significant difference in respondents' acceptance levels for different types of goat's milk samples. A 9-point hedonic scale is a suitable approach to match and compare samples to determine respondents' acceptance and preference of likes and dislikes towards goat's milk samples. In the present work, the acceptance and preference rating for goat's milk were also based on the 9-point hedonic scales ranging from “1 = dislike extremely, to 9 = like extremely”. The respondents were asked to choose and mark one of the nine alternatives for each characteristic. The standardisation of the equal-interval scale allowed respondents to measure the acceptability of different goat's milk samples.

#### *Data analysis*

Data were analysed using descriptive analysis and one-way analysis of variance (ANOVA). The descriptive analysis was used to describe respondents' socio-demographic profiles, and to elucidate the general information of goat's milk consumption. Frequency distribution and percentage were used to summarise the importance of each category in socio-demographic profiles (age, gender, education, occupation, and income), as well as the general information about goat's milk consumption.

One-way analysis of variance (ANOVA) was utilised to determine the sensory characteristics of different samples of goat's milk based on respondents' perceptions and preferences. The *post-hoc* test was used to control Type I error, and the differences among the four groups of means were

compared to determine the significance of the difference. In the present work, Tukey's honest significance difference (HSD) was used as a means of separation. The five sensory attributes were appearance, odour, texture, taste, and flavour.

Accordingly, the null hypothesis ( $H_0$ ) stated that there was no significant difference among the samples, while the alternative hypothesis ( $H_1$ ) stated that there was a significant difference between different samples of goat's milk. According to Anderson *et al.* (2011), if the  $p$ -value is less than  $\alpha$ , then  $H_0$  is rejected.

Null hypothesis  $H_0: \beta_0 = \beta_1 = 0$

Alternative hypothesis  $H_1: \beta_1 \neq 0$

where,  $H_0$  = there was no significant difference between different samples of goat's milk towards sensory characteristics and respondents' preferences; and  $H_1$  = there was a significant difference between different samples of goat's milk towards sensory characteristics and respondents' preferences.

## **Results and discussion**

#### *Respondents' socio-demographic profiles*

Table 1 shows the socio-demographic profiles of the respondents. It was found that majority of the respondents belonged to the age group of 25 to 34 years old, which accounted for 30.9% ( $n = 255$ ). In the present work, respondents between the ages of 18 to 60 years old were the main target as they possessed purchasing power for agricultural produce. Meanwhile, respondents aged above 60 years old were not considered as fit because they lack specific sensory characteristics. According to Dr. Joseph Hotchkiss, appealing milk to children is a strategic method to increase milk sales, since they can be nurtured at a young age for sustained consumption through their adolescence (Griffiths, 2010). The gender of respondents in the present work were 57.4% females ( $n = 475$ ), and 42.6% males ( $n = 353$  respondents). In terms of occupation, 26.7% of the respondents were government employees, while 22.9% were private employees. In terms of income distribution, 37.8% of the respondents earned monthly income between RM1,001 and RM3,000.

**Table 1.** Respondents' socio-demographic profile ( $n = 828$ ).

Demographic variable		Frequency ( $n$ )	Percentage (%)
Age (year)	Below 18	29	3.5
	18 - 24	246	29.7
	25 - 34	255	30.9
	35 - 44	123	14.9
	45 and above	175	21.1
Gender	Male	353	42.6
	Female	475	57.4
Race	Malay	781	94.3
	Chinese	20	2.4
	Indian	15	1.8
	Others	12	1.4
	Education level	SPM/STPM	260
	Diploma	182	22.0
	Bachelor	291	35.1
	Master	58	7.0
	PhD	8	1.0
	Others	29	3.5
Occupation	Government worker	221	26.7
	Private worker	190	22.9
	Self-employed	138	16.7
	Unemployed	197	23.8
	Housewife	82	9.9
Income level (RM)	No income	254	30.7
	Less than RM1,000	76	9.1
	RM1,001 - RM3,000	313	37.8
	RM3,001 - RM5,000	119	14.3
	RM5,001 and above	66	8.0
Marital status	Single	422	51.0
	Married	406	49.0
Household size (person)	1	35	4.2
	2 to 3	376	45.4
	4 to 5	236	28.5
	6 to 7	132	15.9
	More than 8	49	5.9

#### *Respondents' attitudes towards goat's milk consumption*

For respondents' experience of goat's milk consumption, a great majority of the respondents ( $n = 662$ ) were able to perceive the goat's milk quality because they had prior experience in goat's milk consumption. Meanwhile, there were 166 respondents without consumption experience, and

thus, they were not able to perceive the taste of goat's milk.

Taste is a crucial determinant of intake control. Besides sweetness, other tastes also improve the pleasure of meals and snacks (Shin *et al.*, 2018; Sweetman *et al.*, 2018). As shown in Table 2, 362 respondents described the taste of goat's milk as fatty. The milk fat attribute plays a critical role in the

sensory perception of fluid milk. It is also preferred by all consumer segments at various levels, and considered a contributor to creaminess, which is positively correlated with product liking (Richardson-Harman *et al.*, 2000; McCarthy *et al.*, 2017). Moreover, a previous study reported that differences among individuals in taste perception and sensitivity are associated with consumer's perception and food preference (Koster and Mojet, 2018). However, findings by Nguyen and Wismer (2019) contradicted where no relationship was observed between consumer's perception and sensory attribute, perception, and liking.

**Table 2.** Respondents' perception on the taste of goat's milk.

Taste of goat's milk	Frequency (n)	Percentage (%)
Grassy	69	9.2
Thick	107	14.2
Weak	40	5.3
Fatty	362	48.1
Sweet	147	19.5
Goaty	27	3.7

$n = 662$ ; respondent can choose more than one option.

Previous studies have demonstrated that consumers preferred sweet tastes and pleasant smells in foods, and rejected bitterness and sourness (Messer, 1989; Clark, 1998). In the present work, 147 respondents described the taste of goat's milk as sweet. On the contrary, Ozawa *et al.* (2009) revealed that the bad impression of goat's milk could be surmised at infancy, which was carried into adult life with majority of the respondents describing the goat's milk as 'not delicious' or had a 'bad after-taste'. The negative impression on goat's milk is also associated with other tastes, such as grassy ( $n = 69$ ), weak ( $n = 40$ ), and goaty ( $n = 27$ ). According to Jerop *et al.* (2013), the goaty taste is the least desirable attribute that could be caused by poor milking practices, which add to unpleasant odour and taste.

#### *Sensory characteristic for goat's milk samples based on respondents' perception*

One-way analysis of variance (ANOVA) was used to determine any statistical significance between the means of four samples of goat's milk with five different sensory characteristics, namely appearance, odour, texture, taste, and flavour. Table 3 summarises the mean scores of the four samples of goat's milk and their sensory characteristics based on the respondents' perception.

**Table 3.** Mean scores of four different samples of goat's milk based on respondents' perception.

Sensory characteristic	Mean score				F-value	p-value
	Sample A	Sample B	Sample C	Sample D		
Appearance						
Colour	5.40	5.05	5.04	6.32	137.708	0.000
Odour						
Milky aroma	4.16	4.16	4.83	4.77	23.886	0.000
Texture						
Viscosity	4.24	5.20	5.19	4.48	61.152	0.000
Taste						
Sweetness	3.78	5.16	4.96	4.96	112.609	0.000
Saltiness	3.90	3.82	3.97	4.34	11.711	0.000
Creamy	4.44	5.64	5.43	4.47	98.936	0.000
Flavour						
Freshness	5.10	6.04	5.67	4.92	71.158	0.000

In terms of milk quality, the colour of sample D was most significantly ( $p < 0.05$ ) perceived as good by the respondents as compared to samples A, B, and C. The colours of samples A (5.40), B (5.05), and C (5.04) were scored as slightly white to medium white, whereas sample D was scored as medium white to very white. In terms of odour based on milky aroma,

there was no significant difference between samples A and B, while samples C and D were significantly different from each other. This showed that respondents perceived samples C and D with a milkier aroma as compared to samples A and B. The goat's milk samples were characterised by their scores in ascending order from slightly weak to

slightly strong. The viscosity of milk texture varied significantly with the respondents perceiving samples B and C as more viscous than samples A and D. The viscosity texture of sample A (4.24) and sample D (4.48) were scored as slightly not viscous to slightly viscous, while sample B (5.20) and sample D (5.19) were scored as slightly viscous to medium viscous.

The sweetness of goat's milk samples varied significantly with the respondents perceiving sample B as sweetest as compared to samples A, C, and D. The sweetness of sample A (3.78) was scored as medium not sweet to slightly not sweet, while sample C (4.96) and sample D (4.96) were scored as slightly not sweet to slightly sweet. Sample B (5.16) was scored as slightly sweet to medium sweet. The saltiness also varied significantly among the four samples. They perceived sample A (3.90), sample B (3.82), and sample C (3.97) as medium not salty to slightly not salty, whereas sample D (4.34) was scored as slightly not salty to slight salty. In terms of milk creaminess, sample B was the most perceived by the respondents, and highly significant (5.64) among all samples at  $p < 0.05$ . The creaminess taste of sample A (4.44) and sample D (4.47) were scored as slightly not creamy to slightly creamy, while sample B (5.64) and sample C (5.43) were scored as slightly creamy to medium creamy. In terms of freshness flavour, sample B (6.04) was the most significantly perceived by the respondents, whereas sample D (4.92) was the least perceived. Sample D (4.92) scored as slightly not fresh to slightly fresh, sample A (5.10) and sample C (5.67) scored as slightly fresh to medium fresh, and sample B (6.04) scored as medium fresh to very fresh.

#### *Sensory characteristics for goat's milk samples based on respondents' acceptance and preferences*

The purpose of this analysis was to assess the personal responses (acceptance and preference) on goat's milk attributes among the four samples. The analysis also provided insights on the acceptance level among the respondents, *i.e.*, the most preferred sample of goat's milk.

Table 4 shows the acceptance level of four different samples of goat's milk. Sample B ranked the highest among the samples, as the most preferred by the respondents. Significant differences were observed among the samples in all attributes ( $p < 0.05$ ). With regards to goat's milk appearance, respondents scored the colour of sample A as either like or dislike to slightly like (5.57), whereas sample B was scored slightly like to medium like (6.31). Both odour and texture of sample A were scored either like or dislike to slightly like, with both attributes sharing the same sample mean (5.03). The goaty aroma of sample B scored the highest (5.90) as compared to the other samples; sample A (5.03), sample C (5.51), and sample D (5.39), although there were no significant differences between the four samples. The sweet taste of samples B and D showed significant differences, with scores of slightly like to medium like (6.11) and slightly dislike to either like or dislike (4.75), respectively. Sample B had the highest scores in terms of sweetness, saltiness, and creaminess. It was also statistically different from samples A, C, and D. There were significant differences in flavour of freshness between samples A and B, with sample B scored slightly like to medium (6.40), and sample A scored either like or dislike to slightly like (5.01).

**Table 4.** Mean scores of four different samples of goat's milk based on respondents' acceptance and preferences.

Sensory characteristic	Mean score				F-value	p-value
	Sample A	Sample B	Sample C	Sample D		
Appearance						
Colour	5.57	6.31	6.03	6.03	20.186	0.000
Odour						
Milky aroma	5.03	5.90	5.51	5.39	22.258	0.000
Texture						
Viscosity	5.03	6.11	6.02	4.93	81.433	0.000
Taste						
Sweetness	4.85	6.11	5.85	4.75	93.074	0.000
Saltiness	4.72	5.73	5.64	4.60	72.695	0.000
Creamy	4.90	6.21	5.93	4.87	87.063	0.000
Flavour						
Freshness	5.01	6.40	6.14	5.28	83.451	0.000

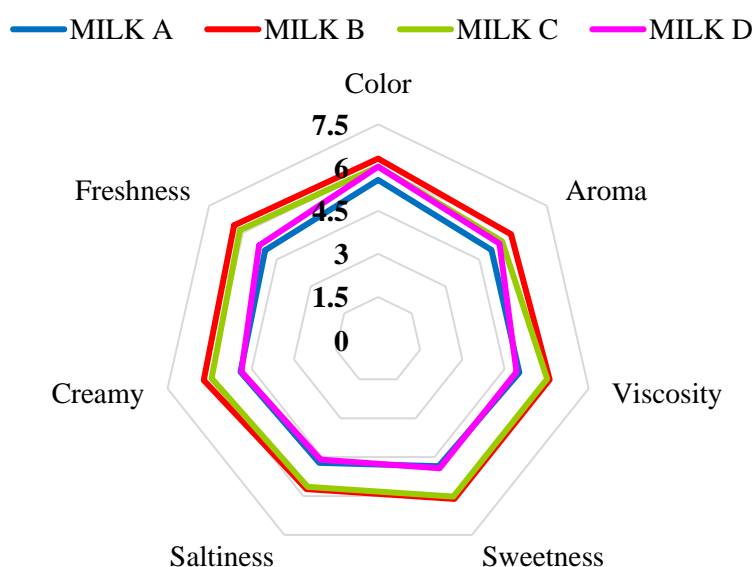
Overall, the present work provided a comprehensive characterisation of sensory, and demonstrated that respondents preferred the milk in slightly white to medium white in appearance, slightly weak to slightly strong in odour, slightly viscous to medium viscous in texture, slightly sweet to medium sweet, medium salty to slightly not salty, slightly creamy to medium creamy in taste, and medium fresh to very fresh in flavour. An interesting finding was that the respondents rated sample B the highest in the holistic attribute of freshness. In the sensory literature, flavour complexity is defined as the total number of separate recognisable sensory qualities in a stimulus (Giacalone *et al.*, 2014). The second rating of the mean score of sample B was the colour appearance. White appeared as the most appealing to consumers' eyes, hence the preference for milk consumption. According to Schiano *et al.* (2017), milk fat plays a critical role in the sensory perception of fluid milk. It is preferred by all consumer segments at various levels that contribute to the creaminess and correlated positively with product liking (Richardson-Harman *et al.*, 2000; McCarthy *et al.*, 2017).

The viscosity texture and taste of sweetness contribute to consumer preference. Previous study by Balthazar *et al.* (2018) showed that with respect to beverage texture, consumers accept or highly prefer the thicker texture of viscosity. In a study using trained descriptive analysis panellists, Chapman *et al.*

(2001) reported the strong association between sweetness and viscosity where the increased sweetness of lactose-free milk could be causing a halo effect, resulting in a perceived increase in viscosity. Milky aroma is a desirable attribute for dairy products as evidenced by the high-fat type of products that are characterised by a combination aroma of creaminess, buttery, and sweet aromatic/vanilla flavour. This indicates that desirable flavour attributes are closely associated with fat content (Richardson-Harman *et al.*, 2000), and therefore, the pleasant odour of goat's milk can attract consumption. Lastly, the taste of saltiness is the least preferred attribute by the respondents.

#### *Respondents' preferences of four goat's milk samples*

Descriptive analysis was used to identify the percentage of respondents' preferences among the four goat's milk samples. Based on the results, sample B had the highest percentage of preference, accounting for 59.7% of all responses. Meanwhile, 22.4% of respondents preferred the sample from commercial products. Figure 1 shows the respondents' preferences between the four goat's milk samples using spider web, where the red-coloured outer layer of the web indicates sample B as the most preferred sample. That is, sample B had all the attributes positioned on the most outer layer, thus highlighting the milk as the most preferred by the respondents as compared to the other samples.



**Figure 1.** Respondents' preference of four different samples of goat's milk using spider web ( $n = 828$ ).



Among all attributes, colour was the most chosen among all samples, which was slightly white to medium white in colour appearance. According to Geraldi *et al.* (2020), colour is the most significant attribute that the consumers notice first. The eyes are the first sense that evokes consumers to evaluate when consuming a food (Hutchings, 1999; Delwiche, 2012; Zellner, 2015). Although food colours are seldom used as the primary reason for making a specific food choice, it is thought to be based on the informative function of colours. Colours are said to evoke perceptions of taste, quality, safety, and familiarity in foods. The freshness is also associated with colour, especially in fresh foods (Paakki *et al.*, 2019).

Aroma is the second sense that influences a consumer's purchasing decision, and commonly used by consumers to evaluate the product (Mitchell, 1994). Food choices are highly reliant on the appearance of the food, including the appearance of standards and the visual quality of the food (Imram, 1999; Shankar *et al.*, 2010).

## Conclusion

The present work demonstrated consumers' acceptance towards fresh goat's milk that has been fed with a new formulation of diet ingredient. The acceptance test showed that goat's milk sample B received positive responses in all sensory attributes evaluated (appearance, odour, texture, taste, and flavour) as compared to the other samples. The ideal product with the highest level of consumer's preference of goat's milk attributes was characterised by medium white in colour attribute; slightly weak of goatly aroma in odour attribute and slightly viscous in texture attribute; slightly sweet, slightly not salty and slightly creamy in taste attribute; and medium fresh in freshness attribute. Therefore, the present work has provided a foundation for product optimisation from a sensory point of view, with a high potential of success in consumer marketing and the development of new fresh goat's milk to fulfil the demand for milk consumption. This helps producers in discovering which qualities of the product need to be developed and emphasised. Furthermore, since the product was examined by a panel of consumers' preferences, the outcomes could be regarded as a representation of the preference of a large section of the population that can be used to predict the market position for a product.

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