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## Consumers' Attitude and Preference toward Fresh Tomatoes in Special Region of Yogyakarta, Indonesia

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### ABSTRACT

Increasing tomatoes consumption which is driven by needs and desires, changes consumers' tastes and preferences. This study aimed to determine consumers' attitudes and preferences towards tomato's attributes. A convenience sampling which consisted of 150 respondents in the Special Region of Yogyakarta was selected for this research. Fishbein's Multi-attribute was used to analyze consumers' attitude, and a conjoint analysis was employed to identify consumers' preferences. According to the findings of this study, consumers have a favorable attitude toward tomato attributes such as freshness, color, firm texture, surface appearance, and taste. Meanwhile, the findings of the conjoint analysis revealed that the color of the tomatoes was the most favored characteristic. The most preferred combination of tomato characteristics was red color, highly fresh, firm texture, spot-free surface look, and sweetness.

**Keywords:** Attributes; Conjoint analysis; Consumers' attitude; Consumers' preference; Multi-Attribute Fishbein

### INTRODUCTION

Since the spread of Covid-19, people have become more concerned about their health as a long-term investment. To prevent the COVID-19 infection, people change their behavior to be a healthier lifestyle and become aware of the nutritional facts' balance (Rohmani, 2020). Many people choose a healthy diet as a preventive measure due to the virus infecting the human immune system. The COVID-19 pandemic has prompted people to change their consumption of fresh fruit and vegetables into the most consumed products by 62% compared to others (GDP Venture, 2020).

The increased consumption of fruits and vegetables is vital because of their wealthy nutrients (Dossou et al., 2007). Tomatoes are a product of high nutritional facts, especially vitamin C, which is relatively safe to consume and essential in maintaining immunity (Soetiarso, 2010; Dias, 2012; Salehi et al., 2019). In addition, tomato is the most globally produced vegetable and is considered a favorite vegetable in many countries (Serio et al., 2006). Tomatoes can be a high-priority vegetable to consume if it is associated with health. This fact is clarified by the consumption of tomatoes in Indonesia which is expected to

sustainably increase in 2017-2021 with an average growth of 5.32% per year (Pusat Data dan Sistem Informasi Pertanian, 2017).

Special Region of Yogyakarta is the highest of vegetable consumption in Indonesia (Ridwan, 2017). On the other hand, population diversity and increased consumption will always be accompanied by consumer tastes and preferences changes. Moreover, the COVID-19 pandemic has been claimed to be one of the most disturbing incidents in recent history, affecting almost all aspects of consumers' lives. Lockdown and social distancing policies to combat the COVID-19 virus have caused significant disruptions to consumer behavior (Sheth, 2020).

Food choices are complex because they are influenced by previous experiences, beliefs, and consumer knowledge about the product, lifestyle, and situations (Steptoe, Pollard, & Wardle, 1995; Steptoe et al., 1995; Brunsø et al., 2004). On the other hand, consumer dissatisfaction with taste quality has stimulated breeders to improve tomatoes' sensory quality according to their demands (Sinesio et al., 2021).

Quality of product is a set of attributes that are evaluated by the end user to determinate the product's performance (Widiyanto et al., 2016). Therefore, when consumers are faced with several choices, consumers must first be assumed to identify the attribute dimensions that are relevant to the decision and then evaluate each option based on the existing attributes (Ajzen, 2015a). A product attribute concept approach may consumer apply to identify the quality characteristics of product (Adiyoga & Nurmalinda, 2012). The specificity of attributes in tomatoes is essential in determining consumers' attitudes and preferences.

Attitude is a combination of consumers' beliefs, feelings, and behavioral intentions towards several products in the market that are perceived simultaneously due to the highly interdependent and represent forces that influence how consumers will react to objects (Perner, 2010). Therefore, more positive, and stronger beliefs will make better attitudes. A person may have beliefs about many objects and problems that not only come from the logical reasoning process but come from partiality by emotions or desires and can fulfill various personal needs (Ajzen, 2015b). Based on their product assessment, consumers' attitudes can be shown through positive or negative attitudes. This follows the findings, which confirm that attributes with positive values indicate key factors influencing consumer attitudes and tendencies in making their choices (Widayanti et al., 2020). In other words, consumers who have a positive attitude will make purchases and recommend them to others, while those who have a negative attitude will make a rejection.

Tomato's quality commonly describes as fresh one. However, such a consumer's definition of freshness is a complex issue involving a diversity of attributes consisting of sensory and non-sensory components (Péneau, Linke, Escher, & Nuessli, 2009; Dinnella, Torri, Caporale, & Monteleone, 2014; Zhang, Lusk, Miroso, & Oey, 2016; Hardyastuti & Perwitasari, 2021). Sensory attributes primely contribute to the concept of freshness than non-sensory attributes (Péneau et al., 2009). A survey investigating the relationship between sensory traits and perceived freshness showed that freshness evaluation was positively related to appearance attributes (Dinnella et al., 2014). The expectations and sensory perceptions are

important factors that influence one's choice (Krishna, 2012). This is supported by the findings, which state that visual inspection is the main process conducted by consumers to evaluate vegetable products to rise to a perspective (Barrett et al., 2010). Meanwhile, several studies have revealed that primarily sensory attributes which describe appearance and texture are related to the level of freshness perceived by consumers (Ares, Giménez, & Gámbaro, 2008; Fillion & Kilcast, 2002; Jung, Padmanabahn, Hong, Lim, & Kim, 2012; Løkke, Seefeldt, & Edelenbos, 2012; Péneau, Hoehn, Roth, Escher, & Nuessli, 2006). Another author who researched with a sample of consumers in the Special Region of Yogyakarta explained that freshness attributes strongly influenced consumer interest in tropical vegetables (Hardyastuti & Perwitasari, 2021). Consumers realize that vegetables are perishable products, so freshness attribute is the main priority in buying vegetables.

In particular, the quality of tomatoes as fresh consumption depends on many properties which are related to external attributes, i.e., appearance, firmness, and internal attributes, i.e., texture, taste, and nutritional value (Baldwin, Scott, & Bai, 2015; Grandillo & Cammareri, 2016; Zhao et al., 2019; Sinesio et al., 2021). It is critical to examine the characteristics of tomatoes to understand them better and meet consumer needs. In another consumer research study with cherry tomatoes, preference mapping was dominated by consumer groups who like red tomatoes and their sweetness (Pagliarini et al., 2001). The other findings reveal that color is an essential indicator of tomato quality for consumers (Oltman, Jervis, & Drake, 2014; Adegbola et al., 2019). Specifically, red is the familiar color consumers desire to buy and do not want to take risks by buying tomatoes other than red.

Several studies mention that texture and taste attributes are also important aspects of consumer perceptions of fresh tomatoes and purchasing decisions (Serrano-Megías & López-Nicolás, 2006; Usse et al., 2010; Oltman et al., 2014). In addition, the visual appearance of tomatoes is also considered very important for consumer purchasing decisions. Consumers' purchase intentions for fruits and vegetables are significantly influenced by visual appearance (Loebnitz & Grunert, 2014; Barbe, Dewitz, & Triay, 2017; Symmank, Zahn, & Rohm, 2018; Lombart et al., 2019). Consumers are willing to buy fruits and vegetables with a perfect appearance that shows no defects compared to others.

In tomato market, each consumer has some preferences for various attributes. A finding asserts that consumer becomes the center of attention concerning satisfying consumer needs and desires, which are interconnected (Frenqvist, 2014). The unanswered question is how fulfill these needs and desires to tomato's characteristic. Based on these conditions, it is undoubtedly a fascinating problem to study. The previous study shows that limited research explicitly discusses the role of attributes in tomatoes as a determinant of consumer preferences. Therefore, this study aims to determine consumers' attitudes toward tomato attributes and examine consumers' preferences towards tomato attributes.

## RESEARCH METHOD

The population of this study includes the entire people in Special Region of Yogyakarta, which was spread over one city and four districts. A total of 150 samples were selected using

the convenience sampling technique. The distribution of samples was 16 in Yogyakarta City, 48 in Sleman Regency, 40 in Bantul Regency, 29 in Gunung Kidul Regency, and 17 in Kulon Progo Regency. In this study, the sample size determination is based on the method developed by (Green & Srinivasan, 1978), which requires a minimum sample size of 100 to apply the conjoint analysis.

The data was collected by distributing online questionnaires to meet two criteria of participants. First, the respondent must be domiciled in the Special Region of Yogyakarta, and second, respondents must decide to buy and consume tomatoes at least in the last month. The research questionnaire consisted of three parts. The first part was related to socio-demographic questions, buying behavior and consumption of tomatoes, and purchase location. The second part related to the question of respondents' attitudes towards tomato attributes on a five-point Likert scale ranging from 1 (strongly distrust) to 5 (strongly believe) for the trust component and 1 (very unimportant) to 5 (very important) for the evaluation of importance. The third part was related to respondents' assessment of eight combinations of tomato attributes by sorting them from 1 (most preferred) to 8 (least preferred).

This study began by testing the research instrument's validity and reliability using the Statistical Program for Social Sciences (SPSS) application. The validity test criteria can be seen from the value of *r*-count, which was higher than *r*-table with a significance level of 0.05. Meanwhile, the reliability test criteria used the Cronbach Alpha method, which was declared reliable when the value was 0.60.

The analytical tools used in this research were Fishbein Multi-attribute and Conjoint Analysis. Fishbein's Multi-attribute analysis model was considered capable of describing consumer behavior towards a product which was determined by two points, i.e., 1) belief in the attributes of a product (*bi* component), and 2) evaluation of the importance of a product (*ei* component) (Engel, Blackwell, Winiard, & Budijanto, 1994). The tomato attributes assessed through Fishbein's Multi-attribute analysis include color, freshness, texture, fruit surface appearance, taste, and size.

Meanwhile, the conjoint analysis described consumer ratings or alternative product choices to estimate the utility value and importance value attached to each product attribute (Green & Srinivasan, 1978). The analysis is used to model consumer preferences based on consumer perceptions of various product attributes, beginning with determining the attributes and attribute levels (Firdaus, 2011). Attributes are selected based on attributes that have positive values from the results of Fishbein's Multi-attribute analysis and supporting studies, including freshness (Hardyastuti & Perwitasari, 2021), color (Oltman et al., 2014; Adegbola et al., 2019), texture (Usse et al., 2010), fruit surface appearance (Lombart et al., 2019), and taste (Oltman et al., 2014).

Some selected attributes had not been specifically capable of representing consumer preferences, so it was necessary to extend the level for each attribute. Attributes and attribute levels include freshness (fresh, weak), color (red, orange, yellow), texture (firm, soft), surface appearance (without spots and wounds, with spots and wounds), and taste (sour, sweet).

Attributes and attribute levels were developed with a qualitative level definition to be easily understood by consumers.

After the attributes were selected and the level was determined, the next step in the conjoint analysis was to design the attribute combination. This study adopted a full profile approach with combinations formed from various attribute levels, namely 48 stimuli. Theoretically, a respondent should rate 48 combinations of tomatoes. However, evaluating 48 stimuli was not possible for consumers and tended to risk non-objective assessment. Therefore, to avoid this situation, the number of stimuli submitted for consumer evaluation was reduced by applying an orthogonal fractional factorial design using the Statistical Program for Social Sciences (SPSS) software, which maintains the experiment's validity. Based on this orthogonal process produces eight stimuli (Table 1).

**TABLE 1. DESIGN OF THE CONJOINT EXPERIMENT FOR PREFERENCE TOWARD FRESH TOMATO**

Profiles	Color	Freshness	Texture	Surface appearance	Taste
1	Red	Fresh	Firm	Without spots and wounds	Sweet
2	Red	Weak	Soft	Without spots and wounds	Sour
3	Red	Fresh	Firm	With spots and wounds	Sweet
4	Red	Weak	Soft	With spots and wounds	Sour
5	Orange	Fresh	Soft	With spots and wounds	Sweet
6	Orange	Weak	Firm	Without spots and wounds	Sour
7	Yellow	Fresh	Firm	With spots and wounds	Sour
8	Yellow	Weak	Soft	Without spots and wounds	Sweet

The eight stimuli created from the orthogonal results were then represented in eight tomato profiles, each of which had different attributes. In the survey, respondents were asked to assess the eight tomato profiles by ranking the most preferred combination of tomato attributes (1) to the least preferred (8).

The conjoint analysis was measured by examining the correlation value of Pearson and Tau Kendall as a basis for decision-making. This test measured whether the score was significant or not at the 0.05 significance level. The test showed that it was significant, so the opinions of n respondents were acceptable in describing the population's desire to buy tomatoes with specific characteristics.

## RESULT AND DISCUSSIONS

The validity test using the Pearson correlation of 150 respondents at a significance level of 0.05 showed an r-table of 0.160. The validity test results showed the overall r-count > 0.160, which means that all the question items in the questionnaire were valid. The complete results regarding the validity test are presented in Table 2.

Furthermore, the reliability test on 150 respondents showed that all the question items had a Cronbach Alpha value of 0.812 was higher than 0.60 (Table 2). This result showed that all of tested items revealed a good reliability level and can be trusted.

TABLE 2. VALIDITY AND RELIABILITY TEST

Indicators	Items	Score r-count	Score r-table	Criteria
Attribute interest of tomato	Color	0.637	0.160	Valid
	Freshness	0.546	0.160	Valid
	Texture	0.568	0.160	Valid
	Surface appearance	0.550	0.160	Valid
	Taste	0.527	0.160	Valid
	Size	0.641	0.160	Valid
Attribute importance of tomato	Color	0.697	0.160	Valid
	Freshness	0.601	0.160	Valid
	Texture	0.520	0.160	Valid
	Surface appearance	0.561	0.160	Valid
	Taste	0.603	0.160	Valid
	Size	0.536	0.160	Valid
Cronbach's Alpha		0.812		Reliable

### Respondent Characteristics

The characteristics of tomato consumers in the Special Region of Yogyakarta were described by several variables, such as gender, age, marital status, education, type of work, income and consumption frequency, purchase frequency, and purchase location (Table 3).

TABLE 3. RESPONDENT'S CHARACTERISTICS OF CONSUMERS' ATTITUDE AND PREFERENCE TOWARD FRESH TOMATOES

Characteristics		Frequencies	Percentage (%)	Characteristics		Frequencies	Percentage (%)
Gender	Male	17	11.30	Income	< 1,000,000	4	2.67
	Female	133	88.70		1,000,000 – 2,000,000	26	17.33
Age	20-27 y	72	48.00		2,100,000 – 3,000,000	83	55.33
	28-35 y	24	16.00		3,100,000 – 4,000,000	11	7.33
	36-43 y	18	12.00		4,100,000 – 5,000,000	12	8.00
	44-51 y	18	12.00		> 5,000,000	14	9.33
	52-59 y	13	8.67	Frequency of Consumption	Rarely (1-4 times a month)	34	22.67
60-67 y	5	3.33	Often (12 times a month)		72	48.00	
Marital Status	Married	88	58.70		Always (30 times a month)	44	29.33
	Single	62	41.30	Frequency of Purchase	2-3 times a week	42	28.00
Family Size	1-2 people	43	28.70		Once a week	64	42.67
	3-4 people	64	42.70	2 times a month	16	10.67	
Education	5-6 people	35	23.30	Purchasing Location	Once a month	28	18.67
	> 7 people	8	5.30		Modern market	6	4.00
	Elementary school	4	2.70	Others	Traditional market	72	48.00
	Junior high school	9	6.00		Stall	24	16.00
	Senior high school	38	25.30		Mix (Modern market, traditional market, and stall)	39	26.00
	Associate degree	10	6.70		Others	9	6.00
	Undergraduate	80	53.30				
Postgraduate	9	6.00					
Types of work	College student	35	23.30				
	State-owned enterprises or Civil servants	14	9.30				
	Employees	41	27.30				
	Entrepreneur	19	12.70				
	Housewife	34	22.70				
	Others	7	4.70				

Consumer characteristics indicate that most tomato consumers in the Special Region of Yogyakarta were women, with 88.70%. The average consumer was productive age between 20-27 years and was married. In aggregate, most tomato consumers (42.70%) had family members ranging from 3-4 (households with 1-2 children). All consumers, 59.30% had an education level of more than 12 years (high school and above). The majority of respondents (54.0%) were employed, rest of respondents were a student in college (23.3%) and housewives (22.7%). Most consumers' income in the Special Region of Yogyakarta had reached the Regional Minimum Wage of Special Region of Yogyakarta (79.99%). 48% of consumers stated that consume tomatoes at least 12 times a month, and almost half of the consumers (42%) buy tomatoes at least once a week. Most consumers (48%) prefer to buy tomatoes in traditional markets than other purchasing locations.

### Consumers' Attitude

The assessment of consumer attitudes towards tomatoes' attributes was analyzed using Fishbein's Multi-attribute analysis, which was seen from consumer evaluation of interest and important attributes for tomatoes. The evaluation of interest attributes describes the consumer's assessment of the tomatoes' specific attributes' performance. The results of the assessment of tomato interest attributes (Table 4) indicate that freshness attribute had the best performance in consumer perception. Respondents considered that freshness contributed most to satisfying respondents' expectations, compared to the attributes of color, texture, surface appearance, taste, and size. The results of the evaluation of the level of interest in tomato attributes can be seen in Table 4.

**TABLE 4. CONSUMER'S EVALUATION OF INTEREST ATTRIBUTES FOR TOMATOES**

Attributes	Interest (bi)	Category
Color	4.25	Good
Freshness	4.38	Very Good
Texture	4.22	Good
Surface Appearance	4.17	Good
Taste	3.97	Good
Size	3.90	Good

Based on assessing the importance of tomato attributes in Table 5, respondents rated freshness as the most important attribute in purchasing tomatoes. Four other attributes that were also very important were color, texture, surface appearance, and taste. Respondents assessed size of tomatoes as an important product but were not prioritized in buying tomatoes.

**TABLE 5. CONSUMER'S EVALUATION OF IMPORTANT ATTRIBUTES OF TOMATOES**

Attribute	Important (ei)	Category
Color	4.44	Very Important
Freshness	4.69	Very Important
Texture	4.43	Very Important
Surface Appearance	4.33	Very Important
Taste	4.30	Very Important
Size	3.69	Important

The assessment of interest and important tomato attributes based on the consumer's perspective resulted a positive and negative attitude expressed through consumer behavior. Table 6 shows five attributes of tomatoes: freshness, color, texture, surface appearance, and taste attributes, categorized as positive attitudes (> 15.4). Positive attributes indicate key factors influencing consumer attitudes and tendencies in making choices (Widayanti et al., 2020).

The freshness attribute was dominant with the highest score of 20.56, meaning that respondents tend to behave pleasantly to decide on a purchase by prioritizing the freshness attribute in tomatoes. Other findings state that the level of freshness in tomatoes indicates the level of quality in the tomatoes themselves (Adeoye et al., 2016). Even the level of freshness was an initial assessment that can represent the color, taste, and size of tomatoes due to an indication of sensory or visual assessment or perception from consumers. Consumer opinion on tomato freshness highly depends on their situational context (Saba et al., 2018). In conclusion, it was unquestionable that consumers concerned freshness as most substantial attribute.

**TABLE 6. CONSUMER'S ATTITUDE TOWARD TOMATO ATTRIBUTES**

Attribute	Interest (bi)	Important (ei)	Consumer Attitude (Ao)	Category of Attitude
Color	4.12	4.44	18.86	Positive
Freshness	4.25	4.69	20.56	Positive
Texture	4.17	4.43	18.68	Positive
Surface appearance	4.23	4.33	18.08	Positive
Taste	3.91	4.30	17.09	Positive
Size	3.86	3.69	14.38	Neutral

On the other hand, size attribute was categorized as neutral (10.7-15.4). Size was the last attribute that consumers considered in buying tomatoes. It means that respondents' attitudes towards this attribute might be construed as pleasant or unpleasant. The size attribute was difficult for respondents since there were disparities in consumer comprehension or perception of the "ideal" tomato size. Based on previous findings, it is infrequent to find research examine size as an assessment attribute due to no apparent preference for size in tomatoes (Jürkenbeck et al., 2020).

### Consumers' Preference

The estimation results of the conjoint analysis accuracy level show that the Pearson & Kendall Tau scores were 0.000 and 0.001, respectively. That is, this value was significant at the 0.05 significance level (Table 7). The results of this test prove that there was a strong correlation between estimates and actual, where the opinions of 150 consumers were acceptable and can represent the desire of the population in the Special Region of Yogyakarta to consume tomatoes.

Conjoint analysis is a powerful tool for studying "customer's value". We can define incentives and test them with simulations to determine what consumers need. In this research, the purpose of the conjoint analysis was to determine the relative importance of the attributes and the utility value of each attribute level. The relative importance of an attribute reveals



how important consumers consider an attribute. The higher score indicates that attribute is more important to consumers. The utility score describes the level of attractiveness of attribute, a higher utility score indicates more attractive attribute level. A negative utility score did not necessarily indicate that an attribute was unattractive but rather less attractive than a positive utility score in the same attribute. The estimation of the relative importance of attributes and the utility score of each attribute level is presented in Table 7.

**TABLE 7. CONSUMER'S PREFERENCE FOR ATTRIBUTES EVALUATED IN THE CONJOINT SURVEY**

Attribute	Average Importance (%)	Level	Average Utility	Preference
Color	40.35	Red	1.272	Red
		Orange	-0.158	
		Yellow	-1.114	
Freshness	20.24	Fresh	0.761	Fresh
		Weak	-0.761	
Texture	10.77	Firm	0.339	Firm
		Soft	-0.339	
Surface Appearance	12.06	Without spots and wounds	0.432	Without spots and wounds
		With spots and wounds	-0.432	
Taste	16.57	Sweet	0.664	Sweet
		Sour	-0.664	
Pearson's R = 0.994				Significant = 0.000
Kendall's tau = 0.857				Significant = 0.001
Constant = 4.184				

The results of previous studies explain that one of the indicators of tomato quality for consumers is color (Oltman et al., 2014; Adegbola et al., 2019). This finding was in line with the results of this study that color was attributed with the highest importance score, which was 40.35% (Table 7). It proves that consumers prioritize color attributes over other attributes in buying tomatoes. For utility scores, red tomatoes were preferred by consumers. Respondents believed tomatoes were popular and identical to red, so consumers were less willing to explore different color. Furthermore, respondents always assume they were end consumers who bought tomatoes for direct consumption. This opinion was reinforced by the research findings, which explain that tomato producers and wholesalers prefer green tomatoes, while retailers and final consumers prefer red tomatoes (Moraes et al., 2017).

The second most important attribute consumers considered in buying tomatoes was freshness, with an importance score of 20.4% of the total preference (Table 7). The utility value of consumer preferences was more interested in buying fresh tomatoes. This was consistent with the research finding which confirmed that freshness is an important attribute of the perceived quality of a product (Tsiros & Heilman, 2005; Farruggia, Crescimanno, Galati, & Tinervia, 2016; Hardyastuti & Perwitasari, 2021). Tomatoes were classified as agricultural products, and the characteristics of agricultural products were always synonymous with freshness. Based on the respondent's perspective, the concept of freshness was interpreted differently according to their respective opinions. Consumer opinions about freshness attributes have different styles, depending on personal factors and situational contexts (Saba et al., 2018).

As a finding, it confirms that consumers could evaluate level of freshness based on color expectations (Dinnella et al., 2014; Farruggia et al., 2016). Another opinion asserts that texture is one of essential components involved in the concept of freshness (Péneau et al., 2009). Meanwhile, several studies reveal that level of freshness is closely related to the period or shelf life of the affected product because it is limited by odor and changes caused by appearance (Ares et al., 2008; Lareo et al., 2009; Medina, Tudela, Marín, Allende, & Gil, 2012).

Furthermore, consumers choose the taste attribute as the third most essential attributes in buying tomatoes, with an importance score of 16.57% (Table 7). The results of this study were appropriate to the findings, which grouped taste attributes into organoleptic factors and became the main factor consumers prioritized in buying tomatoes (Fernqvist & Hunter, 2012; Moraes et al., 2017). Taste is a key attribute that can increase consumer interest in tomato purchasing decisions (Oltman et al., 2014; Fernqvist & Göransson, 2021). Consumers stated that sweetness was their higher preference, with a utility score of 0.664 (Table 7), in line with the findings, which stated that consumers are more likely to choose tomatoes that have a non-sour taste (Usse et al., 2010). This finding confirms that tomatoes' taste is a very complex phenotype, mainly influenced by sensory evaluation involvement (Klee & Tieman, 2018). However, the limitations of consumers to directly taste the tomatoes that are purchased are very small, so retailers usually expand their product range and try to give a taste signal to consumers, for instance, by using taste descriptors (Moser et al., 2011). More practical, respondents usually easily make an analogy with the color of tomatoes. The sour taste in tomatoes could decrease from the green phase to the ripe phase (Carrari & Fernie, 2006). Thus, redder tomatoes produce less sour.

In addition to the attributes of color, freshness, and taste, the appearance attribute of fruit surface was one of the most critical factors for consumers in buying tomatoes, with an importance score of 12.06% (Table 7). This study found that respondents were more interested in tomatoes with clean fruit surfaces or no spots and wounds (positive utility). This finding was consistent with several previous studies which stated that consumers' purchase intentions toward fruits and vegetables are significantly influenced by visual appearance (Loebnitz & Grunert, 2014; Barbe et al., 2017; Symmank et al., 2018; de Hooge et al., 2017; Lombart et al., 2019). Consumers were willing to buy fruits and vegetables with perfect appearance (no defects) compared to fruits and vegetables whose appearance was moderate or flawed. In practice, retailers have sold fruit and vegetables flawlessly for the past few decades, so they have formed consumer expectations about the appearance of fruits and vegetables and set a reference point for their evaluation. Respondents assume that injured tomatoes will speed up the decay process, thereby shortening the shelf life of the fruit. This study's results support the notion that tomatoes' appearance affects respondents' expectations, perceived satisfaction, liking, and purchase intentions.

The last most crucial attribute that consumers considered in buying tomatoes was the texture attribute of the fruit, with an importance score of 10.77% (Table 7). The study found that consumers preferred tomatoes with a firm texture (positive utility value). This result was

in line with the previous findings that confirmed texture is an essential aspect of consumer perception of fresh tomatoes, and most consumers prefer firm texture tomatoes (Pagliarini et al., 2001; Causse, Buret, Robini, & Verschave, 2003; Serrano-Megías & López-Nicolás, 2006). Other findings underline that the texture attribute is a decision driver to assist consumers in the tomato selection process because they will touch the tomatoes directly before making a purchase (Piombino et al., 2013; Oltman et al., 2014). Respondents understand that the texture of tomatoes was always associated with weight loss of fruit. So, consumers perceive that the harsher tomato texture was better quality because they are juicier than the soft one.

## CONCLUSION

Consumers had favorable attitudes towards tomato attributes, i.e., freshness, color, firm texture, surface appearance, and taste. The study found that the tomato's color was the most preferred attribute. The combination of attributes that most consumers needed was red tomatoes, very fresh, firm texture, surface appearance without spots and wounds, and sweetness. The results of this study suggested that tomato producers or farmers produce tomatoes that meet the consumers' needs and desires. In addition, this study is also important for marketers and retailers to maintain tomato attributes, especially those considered necessary by consumers.

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