Analysis of consumer preferences for 5 varieties of mandarins

Emi Budiyati1), Septiadinur Rejeki2), and Lizia Zamzami1)

1) Indonesian Citrus and Subtropical Fruits Research Institute, Jl. Raya Tlekung No.1, Junrejo, Batu, Indonesia
2) Undergraduate Student at Agribusiness Study Program, Agricultural Socio-Economics Departement, Brawijaya University, Malang, Indonesia

Email: emi.budiyati@yahoo.co.id

Abstract. The development of commercial citrus varieties must be in line with consumer preferences. The purpose of this study was to identify the consumer preferences for 5 varieties of mandarins, namely Batu 55, Monita Agrihorti, Terigas, Madura, and Garut. The study was conducted at Indonesian Citrus and Subtropical Fruits Research Institute (ICSFRI) by performing an affective test. The sensory attributes assessed were fruit cleanliness, fruit shape, fruit skin color, ease of peeling, fruit flesh color, fruit flavor, and number of seeds. The results showed that for Mandarin cv. Batu 55, Monita Agrihorti and Madura, consumers liked all the sensory attributes of those varieties including fruit cleanliness, fruit shape, fruit skin color, ease of peeling, fruit flesh color, fruit flavor, and number of seeds. For Mandarin cv. Terigas, consumers liked the fruit shape and fruit flesh color. For Mandarin cv. Garut, consumers liked the attributes of fruit cleanliness, fruit shape, ease of peeling, fruit flesh color and number of seeds. The attributes of fruit shape and fruit flesh color at all types of mandarins were preferred by consumers. While the attributes of fruit cleanliness, skin color, ease of peeling, fruit taste, and number of seeds at several types of mandarins were still less favored by consumers. Thus, improving the lacking quality of the mandarins needs to be done.

1. Introduction

Consumption of citrus fruits as a source of vitamin C and antioxidants in Indonesia continues to increase. Indonesian citrus consumers like citrus fruit with sweet fruit flavor, attractive skin and no seeds. This has led to an increase in public consumption of imported fruit with these characters. Whereas in Indonesia there are many national and regional superior varieties that can substitute imported citrus, including Mandarin cv. Batu 55, Monita Agrihorti, Terigas, Madura, and Garut. These varieties have been released by the Indonesian Ministry of Agriculture over the last few years.

Preference is a basic part of consumers overall behavior towards two or more objects [1]. Consumer preference or acceptance is the attitude of consumers on the choice of various brands of products by evaluating various brands in the available choices [2]. Someone will not make a preference for a product if that person has not tried and felt the product. Before consumers decide to buy, consumers need to pay attention and consider the attributes that exist in the product [3].

A study by [4] indicates that consumers consider the size, taste and price to buy oranges. Meanwhile, the attribute of skin color is not really considered by consumers. In addition, the study of [5] shows that...
consumers prefer local and organic fruits over the imported and non-organic ones. According to [6], in buying local citrus, fruit attributes considered by consumers are the advantages of taste, price, accessibility, water content, condition of freshness and degree of maturity. Meanwhile, the analysis of [7] suggests that the consumers in Bojonegoro Regency prefer tangerine with the attributes of freshness and taste.

Furthermore, many factors may influence the consumers’ preferences. According to [6], consumer preferences are affected by three factors, namely: Individual characteristics include age, gender, education, income, ethnicity and family size, environmental characteristics include season, geographical location and origin, and product characteristics include taste, color, aroma, packaging, and texture.

This study aims to determine certain attributes favored by consumers in five superior Mandarin varieties, i.e., Batu 55, Monita Agrihorti, Terigas, Madura and Garut. The findings would be important as the reference for potential improvement of citrus industry in Indonesia.

2. Materials and Methods
The study was carried out at Indonesian Citrus and Subtropical Fruits Research Institute (ICSFRI). Primary data collection was conducted by survey to 43 consumer respondents where they were recruited from visitors of Agri Edu Tourism at Tlekung Experimental Field of ICSFRI in July 2019. The determination of the consumer sample was by using a non-probability approach. Specifically, the method used convenience/accidental sampling where the sample was taken from a group of people that were easy to reach.

The method used for consumer test was organoleptic test by conducting affective testing. It was a preference testing performed by many untrained panelists in order to measure the individual attitude of consumers for a food product [8]. The measurement of the preference was made on a hedonic scale, which was then converted into a numeric scale with numbers based on the level of preference, in order to make it easier to determine the preference values. The numeric scale was categorized into 4 levels, where 1 = Strongly Dislike, 2 = Dislike, 3 = Like, and 4 = Strongly Like. The fruit attributes evaluated by consumers in this study were fruit cleanliness, fruit size, skin color, ease of peeling, fruit flesh color, fruit taste, and number of seeds. The cronobach's alpha value was used to measure the reliability of the items used in the analysis. The value of attributes used in the analysis was 0.776, greater than the R table 0.308. Therefore, the scale in this study was internally reliable. Subsequently, the collected data were analyzed descriptively. Similar method had been used in another research conducted by [9].

The steps to conduct the study was as follows, firstly, the researcher communicated directly to respondents to give information regarding the study. Then each respondent tested one by one of the Mandarin types which have been provided by the researcher. Finally, the respondents were asked to fill out a questionnaire indicating the fruit attributes such as the fruit cleanliness, fruit size, skin color, ease of peeling, fruit flesh color, fruit taste, and number of seeds. The varieties of Mandarin fruits used for the test were Batu 55, Monita Agrihorti, Terigas, Madura, and Garut. The fruits were harvested and prepared from the Tlekung Experimental Field of ICSFRI.
3. Results and Discussion

3.1. General Characteristics of Consumer Respondents

Based on gender, the ratio of male and female respondents was 32.6% male and 67.4% female. The sample was dominated by females, indicating that females were the main grocery shoppers in their households and made the majority decision for household purchase [10]. In terms of age, most respondents were at age around 16 – 25 years old (62.8%), followed by 46 – 65 year of age (18.6%). According to [11], the factor of consumers’ age and gender significantly affects fruit consumption.

The level of respondent education varied considerably from elementary to postgraduate level, with the largest number of samples being at the undergraduate degree as much as 81.4%. This reflects that most respondents in the study had completed the level of education that is higher than that of being regulated as compulsory in Indonesia. Meanwhile, based on the profession, the majority of respondents were students (53.5%), and followed by civil servant (14%). This implies that even students were also interested to consume citrus fruits. Based on several previous studies [12]; [13] educational level and employment have been reported to be related with vegetable and fruit intakes.

| Characteristic   | Category                  | Percentage (%) |
|------------------|---------------------------|----------------|
| Gender           | Male                      | 32.6           |
|                  | Female                    | 67.4           |
| Age (Years)      | 7 – 15                    | 7              |
|                  | 16 – 25                   | 62.8           |
|                  | 26 – 45                   | 11.6           |
|                  | 46 – 65                   | 18.6           |
| Education        | Elementary school¹        | 4.7            |
|                  | Junior high school²       | 0              |
|                  | Senior high school³       | 9.3            |
|                  | Undergraduate degree      | 81.4           |
|                  | Postgraduate degree       | 4.7            |
3.2. Consumer Preference on Mandarin Fruit Attributes

a. Fruit cleanliness
   The cleanliness attribute of the fruit was seen from the physical appearance of the Mandarin peel. The result (Table 2) showed that based on the fruit cleanliness, all respondents liked Mandarin cv. Batu 55, Monita Agrihorti, Madura, and Garut. However, they disliked Terigas since the appearance was dull and had black lines. This condition was because of sooty mildew by the \textit{Capnodium citri} fungus [14]. Therefore, consumers prefer citrus fruits that are clean and smooth.

b. Fruit size
   Fruit size attribute can be seen from the maximum size of the fruit. The study indicated that respondents liked the size of all types of Mandarin tested (Table 2). They did not strongly consider the size of the citrus fruit. Some respondents might like smaller size due to the practicality in consuming. However, this contradicted with [15] who said that citrus fruit consumers prefer citrus with large size because they believed that citrus with larger size has higher water content than that of smaller one.

c. Fruit skin color
   The result indicated that based on the fruit skin color, respondents liked Mandarin cv. Batu 55, Monita Agrihorti and Madura. Since the plants were planted at high land, the skin color of these fruit varieties was orange and very interesting to consumers. On the contrary, the respondents disliked Mandarin cv. Terigas and Garut because their skin color were yellowish green (Table 2). This was in line with [15] article that consumers prefer citrus with interesting orange color. Such interesting color could arouse appetite to consume citrus fruits.

d. Ease of peeling
   Based on the result of ease of peeling attribute (Table 2), the respondents liked Mandarin cv. Batu 55, Monita Agrihorti, Madura, and Garut. However, the respondents strongly disliked Mandarin cv. Terigas since it had a thin skin and difficult to peel. Mandarin cv. Terigas itself was actually the result of a cross between Mandarin and Tangerine [16]. This was in accordance with previous study [17] showing that consumers dislike citrus that is difficult to peel.

e. Fruit taste
   Consumers often consider fruit taste as one of the most important attributes for fruit product. Respondents’ valuation towards fruit taste attribute in this study (Table 2) indicated that Mandarin cv. Garut strongly liked by the respondents because the taste was sweet and fresh (Decree of the Minister of Agriculture Number 760/Kpts/TP.240/7/97 of 1999). While Mandarin cv. Batu 55, Monita Agrihorti and Madura liked by the respondents since the taste was a mixture of sweet and sour. However, the respondents disliked Mandarin cv. Terigas because the taste was sour and fresh. This was contradicted with the Decree of the Minister of Agriculture of 2009 stating that actually the taste of Mandarin cv. terigas was a mixture of sweet, sour and fresh. The variety of taste in Mandarin cv. Terigas might be caused by the lack of tree maintenance which affected the quality of the fruits [18].
f. Number of Seeds

In terms of the number of seeds, the respondents liked Mandarin cv. Batu 55, Monita Agrihorti, Madura and Garut since these ones had less seeds. However, the respondents disliked Mandarin cv. Terigas because it had more seeds than others (Table 2). This result was supported by similar previous study that consumers prefer citrus that is seedless, so they don't bother with the seeds when eating the citrus fruit [15]; [17].

g. Fruit flesh color

The color of the fruit flesh can be seen after peeled and thereby, the respondents could observe the pulp color. Based on the valuation of this attribute, the respondents liked all the Mandarin types tested because all these varieties had similar fruit flesh color that was yellow. This result implies that consumers prefer citrus fruits with yellow flesh color and consider such color as interesting.

| Types of Mandarin | Fruit cleanliness (%) | Fruit size (%) | Skin color (%) | Ease of peeling (%) | Fruit taste (%) | Number of seed (%) | Flesh color (%) |
|-------------------|-----------------------|----------------|----------------|--------------------|----------------|--------------------|----------------|
| Batu 55           | 74.4 (L)              | 60.5 (L)       | 53.5 (L)       | 55.8 (L)           | 55.8 (L)       | 55.8 (L)           | 58.1 (L)       |
| Monita Agrihorti  | 62.8 (L)              | 48.8 (L)       | 48.8 (L)       | 55.8 (L)           | 48.8 (L)       | 69.8 (L)           | 48.8 (L)       |
| Terigas           | 48.8 (D)              | 48.8 (L)       | 53.5 (D)       | 37.2 (SD)          | 44.2 (D)       | 46.5 (D)           | 51.2 (L)       |
| Madura            | 74.4 (L)              | 58.1 (L)       | 46.5 (L)       | 79 (L)             | 46.5 (L)       | 62.8 (L)           | 60.5 (L)       |
| Garut             | 65.1 (L)              | 53.5 (L)       | 39.5 (D)       | 69.8 (D)           | 34.9 (SL)      | 58.1 (L)           | 58.1 (L)       |

L = Like, SL = Strongly Like, D = Dislike, SD = Strongly Dislike

4. Conclusions

The study has shown that the respondents liked all attributes such as fruit cleanliness, fruit size, skin color, ease of peeling, fruit taste, fruit flesh color and number of seeds of Mandarin cv. Batu 55, Monita Agrihorti and Madura. Meanwhile, for Mandarin cv. Terigas, the respondents liked its fruit size and fruit flesh color, but they disliked the fruit cleanliness, skin color, ease of peeling, fruit taste, and the number of seeds. As for Mandarin cv. Garut, the respondents liked the fruit cleanliness, fruit size, ease of peeling, fruit flesh color, and the number of seeds, but they disliked the skin color.

Therefore, it is suggested that more intensive plant treatment for Terigas was required to produce better quality of fruits to attract consumers. In addition, Mandarin cv. Batu 55, Monita Agrihorti, Madura, and Garut had the potential to be further developed in order to meet the consumer demand and reach the growth of the citrus industry.
References

[1] Kotler Philip. (2002). Marketing Management, Millennium Edition, Volume 2. Jakarta: Prenhallindo.

[2] Kotler, Phillip and Kevin Lane Keller. (2009). Marketing Management (13th Edition Volume 1). Jakarta: Erlangga Publisher.

[3] Khusna Khurin Abqoria Millata, Heru Irianto and Setyowati. (2016). Analysis of Consumer Preferences on Watermelon in Surakarta. Agrista Journal, 4 (3), 461-468.

[4] Isen, Arifuddin Lamusa and Effendy. (2016). Analysis of Consumer Preferences on Local Citrus Fruits and Imported Citrus Fruits (Sunkis) in Palu City. Agrotechbis Journal, 4 (4), 479-484.

[5] Sumarwan Ujang and Eny Palupi. (2017). Consumer Preference for Local and Organic Fruits and Its Implications for Consumer Education on Love for National Products. Family and Consumer Scientific Journal. 10 (2), 157-168.

[6] Herista Mutia Intan Savitri. (2015). Attitudes and Preferences of Local Citrus Fruit Consumers and Imported Citrus Fruits (Case of Bandar Lampung City, Lampung Province). IPB: Thesis.

[7] Probowati Deviana Dialh, Suprapti Supardi and Sri Marwanti. (2016). Analysis of Consumer Preferences and Marketing Strategy of Tangerines in Bojonegoro Regency. SEPA Journal, 12 (2), 120-132.

[8] Directorate General of Teachers and Education Manpower. (2017). Organoleptic Testing. Textbook of Agricultural Product Processing Techniques, Ministry of Education and Culture, Jakarta.

[9] Zamzami L, Andrini A and Budiyyati E. (2020). Consumer Preferences for a Candidate New Variety of Grapes (Vitis vinifera) Paras 61. Annals of Biology. 36 (2), 159-162.

[10] Slamat AS and Nakayasu A. 2017. Consumer Preferences for Traceable Fruit and Vegetables and Their Influencing Factor in Indonesia. International Journal Sustainable Future for Human Security. 5(1), 47-58.

[11] Konopacka, D., Jesionkowska, K., Kruczynska, D., Stehr, R., Schoorl, F., Buehler, A., Egger, S., Codarin, S., Hilaire, C., Höller, I., Guerra, W., Liverani, A., Donati, F., Sansavini, S., Martinelli, A., Petiot, C., Carbó, J., Echeverria, G., Iglesias, I. & Bonany, J. (2010). Apple and peach consumption habits across European countries. Appetite, 55(3), 478–483.

[12] Estaguio, C., Druesne-Pecollo, N., Latino-Martel, P., Dauchet, L., Hercberg, S. and Bertrais, S. (2008). Socioeconomic differences in fruit and vegetable consumption among middle-aged French adults: adherence to the 5 a day recommendation. Journal of the American Dietetic Association. 108(12), 2021-2030.

[13] Tamers, S.L., Agurs-Collins, T., Dodd, K.W. and Nebeling, L. (2009). “US and France adult fruit and vegetable consumption patterns: an international comparison”, European Journal of Clinical Nutrition. 63(1), 11-17.

[14] Endarto Otto and Anang Triwiratno. (2007). Pest Control the Causes of Dull Orange Fruit. Retrieved 26 July 2019 from http://balitjestro.litbang.pertanian.go.id/wpcontent/unduhan/Leaflet/Leaflet%20Burik.pdf

[15] Monica Regina Elsa. (2015). Analysis of Consumer Attitudes and Price Sensitivity of Medan Oranges and Mandarin Oranges at Yogyakarta Juction. IPB: Thesis.

[16] Wiguna Imam. (2009). Enchanting Tangerines in 20 Hectares. Trubus Online. Accessed on July 30, 2019 from https://www.trubus-online.co.id/keprok-memp Pesona-di-20-hectare.

[17] Zamzami L and Andrini A. (2018). Level of Consumer Preferences for New Superior Variety of Mandarin Topazindo Agrihorti (Citrus reticulata. Balnco). Proceedings of National Seminar of UNS Dies natalis

[18] Purba Tommy, M. Zuhran, and Arry Supriyanto. (2016). Improvement of the Quality of Tangerines Tangerines through Water Management and Fertilization Technology in Sambas Regency, West Kalimantan. Journal of Agricultural Informatics. 25 (1), 1-8.