

## Emotional Sensory Mapping of PET-Packaging Tea Product

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**Abstract.** Tea is one of the most popular drinks in Indonesia. However, there is limited researches on emotional sensory mapping in relation to the attributes of tea products. In addition, stability of the tea in PET bottles is one of the problems faced by tea producers in Indonesia. Focus Group Discussion was performed to develop the questionnaire while CATA (Check All That Apply) sensory method was applied for the attributes of the tea products and related emotions. Five brands of the PET tea bottles were stored in room temperature, 37 °C and 45 °C incubators. Total polyphenols, theaflavins, thearubigins, and pH of the PET tea bottles were analyzed. Results showed that floral aroma has high correlation with the emotion of free and satisfied feeling. Sweetness correlate with the happiness and calm. In contrast, bitterness and bitter aftertaste have high correlations with the flat and mild feelings. The total polyphenols of five brands PET bottles were above 400 ppm which comply National Indonesian Standard for tea beverage. The high reduction of the pH occurred for one brand while the others remain stable. Increasing thearubigins were observed. In opposite, reduction of theaflavins were significant in 45oC stored samples. The longer the product stored in 45oC incubator, the highest reduction observed in all tea samples. To sum up, from the five commercial tea brands were quite stable when subjected to high temperature of storage 45oC incubator and sweetness attribute for the PET tea bottles makes the consumer feeling happy and fulfilled.

**Keywords:** Polyphenol, pH, sensory profile, emotion profile, CATA

### 1. Introduction

Packaged tea drinks are one of the most popular soft drinks in Indonesia. According to the MARS Research Institute (2015), tea has been consumed by more than 79% of the majority of Indonesia's population. One factor that causes the growth of tea consumption is the presence of packaged tea (Baso and Anindita 2018). Packaged tea drinks in Indonesia are in second place with sales volume growth of 44% and outperforming carbonated soft drinks with sales volume growth of 14% (Euromonitor 2014). The growth chart for ready-to-drink soft drinks can be seen in Figure 1. This makes packaged tea drinks a potential market share for the soft drink business. The results of research institutions include AC

Nielsen, Mars, and Swa, showing the level of market penetration for tea reached more than 95%. Euromonitor data (2014) shows that the growth of packaged tea drinks has increased from year to year. In 2010 the market share for Ready to Drink Tea / RTD Tea reached 8.9%. The high business potential and the ever-increasing trend, especially among young people and adolescents, has driven many industries that produce various tea products in packaging. Figure 2 and Table 1 show the market share of packaged tea in Indonesia and the companies that control most of the bottled tea business in Indonesia.

Packaged tea can experience changes during storage due to several factors, including temperature and light which can accelerate the oxidation reaction which will cause a decrease in quality. Oxidation will change the polyphenols to theaflavins and thearubigin which will have an effect on taste and color (Kusumaningrum 2010). In addition, changes in polyphenols will affect the pH value of the final product and the pH value of a tea product will also affect the stability of the polyphenols. The minimum polyphenol value for packaged tea products is 400 ppm (BSN 2011). Reduction in the value of excessive polyphenols will cause tea products not to meet the standards so that they cannot be marketed and harm producers.

Information on the sensory characteristics of the product is very critical for the successful development of food products. This information is usually obtained by descriptive sensory analysis with trained panelists. However, there is a possibility that trained panelists describe products differently from consumers and or account for attributes that are not relevant to products that consumers receive (Kleij and Musers 2003), whereas companies must understand consumer perceptions of products to ensure product development success (Varela et al 2010). Therefore, a consumer-based sensory test is needed, one of which is Check-All-That-Apply.

The Check-All-That-Apply (CATA) method is a fast and simple method for obtaining information about consumer perceptions of a product (Ares 2010). The CATA method consists of a list of words describing the sample and the panelist will choose a sensory attribute which he thinks can describe the sample. An important consideration in the CATA test is to determine the attributes used in the list that can be obtained in several ways, namely by trained panelists, by consumers during testing, and through Focus Group Discussion (Dooley et al. 2010). In this study, the CATA method was used to evaluate the sensory and emotional profiles of tea products in PET packaging that had been commercialized.

Emotion is one of the keys that determines consumer selection of a product (Eertmans et al. 2006). Positive emotions can give more value to the product and vice versa negative emotions can reduce the value of a product. Consumer emotions towards a product can be formed through external factors such as advertising and packaging and through internal factors such as the sensory profile of a product (Thomson et al. 2010). Consumers will make connections between the sensory attributes of a product (taste, aroma, mouthfeel, aftertaste, and flavor) with the internal / emotional experience experienced when tasting the product (feeling comfortable and relaxed) (Thomson et al. 2010) so that this study aims to find out stability of pH and polyphenols during storage and knowing the sensory and emotional profiles found in tea commercial products in PET packaging with the CATA method.

## 2. MATERIALS AND METHODS

### 2.1. Material

The materials used in this study include the main ingredients of tea products in PET packaging with codes 309, 911, 286, 457, Teh 713, and 676 obtained from supermarkets.

### 2.2. PH value

Before use, the pH meter (Thermo Scientific, Orion) is calibrated first using a pH buffer solution of 4 and 7. The sample is placed in a 100 ml glass beaker then the electrode is placed in the sample (until the electrode is sufficiently immersed) so that the measured pH value can be read. Electrodes are removed and rinsed with distilled water (AOAC 1995).

### 2.3. Total Phenol Analysis

Total Phenol analysis was determined by colorimetric method using Folin Ciocalteu's reagent (Merck, Germany) with gallic acid (Sigma-Aldrich, China) as standard. Galic acid is used as a standard because it is a polyphenol compound found in almost all plants, including tea. The tea sample was diluted with a dilution factor 10. The analysis was carried out by mixing in a test tube: 1 ml of diluted tea sample, 5 ml of 10% Folin Ciocalteu reagent diluted with distilled water, and 4 ml of 7.5% anhydrous sodium carbonate (Merck, Germany). The blank used was prepared by mixing 1 ml of distilled water, 5 ml of 10% Folin Ciocalteu reagent diluted with distilled water, and 4 ml of 7.5% sodium carbonate anhydrous. The sample is then incubated for 60 minutes in a room that can be exposed to light. The absorbance was measured using a UV-Vis Spectrophotometer (Shimadzu, Japan) at a wavelength of 765 nm and then the absorbance value in each sample was recorded. The same procedure is applied to make a standard solution of gallic acid. Based on the results obtained through a standard curve, the unit of analysis of total phenol is mg / ml. Then, conversion of units to ppm is carried out. The principle of this method is the formation of a complex blue compound that can be measured at a wavelength of 765 nm. The complex is produced from the reduction of phosphotungstomolybdate phosphoric acid contained in the folin ciocalteu reagent by polyphenols in an alkaline atmosphere. The higher the polyphenol component contained in tea, the greater the absorbance value and vice versa (Shahidi and Nacz 2004).

### 2.4. Analysis of theaflavins and thearubigines

Theaflavin and Thearubigin analysis were carried out using UV-Vis spectrophotometer. The analysis was carried out by mixing 50 ml of tea sample which was filtered with 50 ml of ethyl acetate (Merck, Germany) (Akuli 2016). 1. Preparation of solution A was carried out by taking 4 ml of ethyl acetate layer and aligned with 25 ml of methanol (Merck, Germany) in a 25 ml measuring flask. Preparation of solution B was carried out by taking 25 ml of ethyl acetate layer and then mixing with 2.5% aqueous sodium hydrogen carbonate (Merck, Germany) and the ethyl acetate layer separated again. 4 ml of ethyl acetate layer was applied to 25 ml with methanol in a 25 ml measuring flask. 3. Preparation of solution C was carried out by mixing 2 ml of saturated oxalic acid solution (Merck, Germany) with 6 ml of distilled water and 2 ml of tea layer obtained from the first extraction, then adjusted with methanol to a 25 ml measuring flask. Blank preparation is done by the same method as the sample, but by not extracting the tea first. Measure the absorbance of each solution using a UV-Vis spectrophotometer with a wavelength of 380 nm. Then, measure the levels of Theaflavin and Thearubigin with the following formula:

$$\% \text{ Theaflavin} = 2.25 \times E1$$

$$\% \text{ Thearubigin} = [375 \times 0.02 \times 6.25 (AC + AA - AB)] / 0.733 \times 9$$

E1 = Absorbance of solution A at  $\lambda = 380$  nm after standardized with blank

AA = Absorbance of solution A at  $\lambda = 380$  nm after standardized with blank.

AB = Absorbance of solution B at  $\lambda = 380$  nm after standardized with blank.

AC = Absorbance of solution C at  $\lambda = 380$  nm after standardized with blank.

## 2.5. Sensory analysis

The panelist selection stage was designed to collect consumer background information including gender, age, and intensity of panelist consumption of packaged tea products for one week. Questionnaires are available online using Google Form. The number of panelists used in the test was 30 people for each test. Panelists used in the hedonic rating test and emotional profiling consisted of 14 men and 16 women with an age range of 20-22 years while the panelists used in the hedonic rating test and sensory profiling consisted of 12 men and 18 women with age range 19-22 years. Panelists are selected in the 19-22 year age range because packaged tea products are products that are increasing in trend in young children and adolescents. Panelists in both tests were panelists who consumed tea more than twice a week. The second test questionnaire can be seen in Table 2.

The sample was presented in a plastic cup with a size of  $\pm 25$  mL and was labeled with a different three digit random number code. Samples are presented in one testing session for each test. The time given to the panelists to sample and fill out questionnaires is 15-20 minutes and mineral water is given to neutralize the senses before proceeding to the next sample.

In hedonic rating and emotional profiling, panelists were asked to sample the sample and rate with a 9-point preferred scale (1 = extremely dislike, up to 9 = extremely like). After that, the panelists were asked to sample the samples again and assess what emotions they felt when tasting the sample (King and Meiselman 2010). The list of emotions used in the questionnaire was 10 emotions as in Table 2. The list of emotions used was obtained through focus discussion groups and arranged in alphabetical order.

In hedonic rating data collection and sensory profiling, before tasting the sample, the panelists were given questions about the perception of the sensory profile of tea in the ideal packaging by giving a check mark on the sensory attributes that are considered to describe tea in ideal packaging. There are eleven attributes that can be selected by the panelist which includes aroma, taste, aftertaste, mouthfeel, and flavor. The eleven attributes used were obtained through a study of green tea products (Castiglioni et al. 2015) and focus discussion groups and presented with an explanation of attributes as in Table 2. Furthermore, the panelists were asked to sample the sample and rate with a 6-point preferred scale (1 = very dislike, up to 6 = very like). After that, the panelists were asked to taste the sample again and assess what sensory attributes were felt in the sample by giving a check mark on the sensory attributes attached to the questionnaire. The sensory attributes used in CATA are the same as the sensory attributes used in the question about the perception of tea sensory profiles in ideal packaging. Data analysis of the CATA method uses sensory software, XLSTAT 2016 with PCA tools. The results of the CATA test can also be known by sensory must have attributes, nice to have, and penalty analysis based must not have (Dooley et al. 2010).

## 3. RESULTS AND DISCUSSION

### 3.1. Ingredient tea products

The final characteristics of tea products are influenced by their constituent ingredients. Tea products generally have four constituent tastes, namely bitter, astringent, umami, and sweet (Tarachiwin et al. 2007). Sweet and thick (filled) taste is mainly caused by sugars such as glucose, sucrose, fructose, and some sweet amino acid compounds (Scharbert and Hormann 2005). The nature of astringency and bitter taste is mainly caused by tannin compounds which are widely found in tea leaves (Wright et al. 2000). Most of the tannins in the tea leaves consist of catechins such as epikatekin (EC), epigallocatekin (EGC), epicatechin errors (ECG), and

epigallocatechin gallate (EGCG). Epicatechin and epigallocatechin give rise to a little septic flavor with a little sweetness after drinking, while the epicatechin gallate and epigallocatechin gallate results in strong septic flavors with astringency properties. The umami taste in the product is due to the amino acid L-glutamate and 5-N-ethylglutamine content (Kaneko et al. 2006).

### 3.2. PH stability at 37°C

Figure 3 shows five tea products in PET packaging that have been commercialized (Ichi Ocha, Sosro, Frestea Green, Nu Green Tea, and Pucuk Harum Tea) along with changes in pH that occur for fourteen days in an incubator with a storage temperature of 37 °C. The graph shows that all tea products tested are acidic because they have a pH of <7. Frestea is a tea product that has the highest pH while Pucuk Harum Tea is a tea product that has the lowest pH value. Changes in pH in tea products are fluctuating and can still be accepted by consumers because of an insignificant decline. The decrease in pH that occurs may be due to changes in polyphenols to theaflavins and thearubigin. The polyphenol component which is oxidized to theaflavin and thearubigin will reduce the pH value because theaflavin and thearubigin are both acidic.

### 3.3. PH stability at 35°C, 45°C, and temperature exposed to sunlight

Figure 4 shows the effect of three different temperatures (35°C, 45°C, and sun exposure temperature) on the pH of tea products 911 and 676. Graphs of pH at 45°C are below the graph of the temperature of 35°C and the temperature exposed to sunlight shows the higher storage temperature then the pH of the product will decrease. This is due to higher temperatures which will increase the epimerization reaction and encourage the oxidation of polyphenols to theaflavins and thearubigin. The more theaflavins and thearubigin are formed, the pH of the product will decrease because theaflavins are weak acids and thearubigin is strongly acidic (Lelani 1995). The pH value on the chart is fluctuating at the three different temperature treatments and has an insignificant decrease. This shows that the pH of 911 and 676 products is quite stable at a storage temperature of 45°C, 35°C, and temperatures exposed to sunlight for fourteen days. Product A has a higher pH value.

### 3.4. Total phenol content of commercial tea products

Figure 5 shows the total phenol content of several tea products in packaging that have been commercialized. The graph states that all samples tested are commercially feasible because they meet the total phenol standard of at least 400 ppm (SNI 2011). Samples with the highest total phenol levels to the lowest in sequence were 911 (1122.68 ppm), 309 (969.07 ppm), 286 (653.61 ppm), 713 (529.90 ppm), 457 (413.40 ppm). This graph is supported by sensory profiling with the CATA method which shows that products 911 and 309 have bitter and astringent attributes. According to Scharbert and Hofmann (2005) polyphenol compounds are found to be the main cause of astringent (bitter) taste and bitter taste so that the higher the total phenol content of a tea product, the more bitter and astringent the product feels.

### 3.5. Effect of temperature on total phenol

Figure 6 shows the effect of three different temperatures (45°C, 35°C, and sun exposure temperature) on total phenol of 911 and 676 tea products. The graph shows the volatile total phenol changes between the three different storage temperatures. The decrease in total phenol that occurs due to the heating process causes the polymerization of polyphenols (catechins) and encourages the oxidation process of polyphenols to theaflavins and thearubigin so that the total phenol level decreases (Kusumaningrum 2010). Based on the analysis of variance using

SPSS 15.0, the storage temperature gave a very significant effect on the total phenol content of 911 products, but did not significantly affect the 676 product ( $p < 0.05$ ). This can be seen in Tables 3 and 4. Value of Sig. the product 911 is 0.002 ( $< 0.05$ ) while the product 676 is 0.388 ( $> 0.05$ ). This value indicates that there is a difference in the average total phenol levels due to storage temperature factors in 911 products, but there is no real difference in products 676.

### 3.6. Effect of temperature on theaflavins and thearubigin

Figure 7 shows the effect of three different temperatures (45°C, 35°C, and sun exposure temperature) on theaflavin and thearubigin levels of 911 and 676 tea products for three days of storage. The graph at a storage temperature of 45 ° C is above the storage temperature chart of 35 ° C and the graph of sun exposure is below the storage temperature chart of 45 ° C and 35 ° C. Higher temperatures will encourage the polyphenol epimerase process (catechins) and the oxidation process of polyphenols into theaflavins and thearubigin so that the higher the storage temperature, the more oxidized polyphenols and the more theaflavins and thearubigins are formed.

### 3.7. Sensory profile of packaged tea products

The sensory characteristics of commercial tea products and ideal tea were obtained through Cochran's Q test. Cochran's Q test and correspondence analysis with multiple pairwise comparisons. McNemar / Bonferroni compared each sensory attribute in commercial tea product preparations with a 5% test level, while correspondence analysis represented ideal tea products and commercial tea products in a biplot map according to the sensory attributes possessed (Meyners et al. 2013). Cochran's Q results panelist tests (Table 3) showed that all sensory attributes in each product were significantly different at the 5% test level except for the aroma of roasted, green aroma, and umami flavor. Ideal tea products according to panelists and commercial tea products are represented by correspondence analysis into a biplot map according to the sensory attributes possessed (Meyners et al. 2013). Figure 8 shows that among the five types of commercial tea products, there are no products that have a sensory profile such as ideal tea products or at least are in the same quadrant with ideal products while the products that are the furthest from the ideal are 911 products. Figure 8 also shows that products close to the attributes of floral aroma and mouthfeel plain while 911 products are close to the attributes of umami flavor and sour flavor.

The Principal Coordinates Analysis (PCA) is applied as a visualization of the correlation between coefficients and results on a two-dimensional map (Meyners et al. 2013). In this case the data displayed is sensory attributes and favorite data in the form of dots. PCoA results in Figure 9 can be seen that the preferred green tea products are close to the attributes of floral aroma, plain mouthfeel, and sweetness.

### 3.8. Sensory profile for tea product development

Penalty analysis identifies sensory attributes that have the potential to reduce or increase preferences so that they can be used for product development. This analysis is divided into three, namely the analysis of sensory attributes must have, nice to have and must not have (Meyners et al. 2013). The sensory must have attribute is a sensory attribute that is not found in real products even though the sensory attributes are desired by the panelists in the ideal product (Meyners et al. 2013). Table 4 shows the attributes including must have are floral aroma and sweet taste. The must have attribute can also be seen from Figure 10. The higher the X coordinate value (% P (No) | (Yes)) and Y (mean drops) or the position of the sensory attribute

the more it is on the top right of the graph, the better the sensory attribute is for owned (must have). This shows the floral aroma and sweetness are very good attributes for tea products. Table 5 shows that in the tests carried out, there are no nice to have or must not have sensory attributes.

### 3.9. Emotional profile of tea products in packaging

The results of Cochran's Q test (Table 5) show that all emotional attributes in each product are significantly different except boredom. Figure 11 is a graph showing the emotional attributes of a packaged tea product. According to the graph, the emotions that consumers produce when tasting 309 products are bored which are negative emotions, while the emotions produced when tasting products 286 and 713 are full of love, calm, excited, happy, and interested which are positive emotions. 457 products also produce positive emotions that are satisfied.

The Principal Coordinates Analysis (PCA) is applied as a visualization of the correlation between coefficients and results on a two-dimensional map (Meyners et al. 2013). In this case the data displayed is an emotional attribute and a favorite data in the form of a dot. The PCoA results in Figure 12 can be seen that the preferred tea products are close to the emotions of satisfaction, happiness, interest, enthusiasm, and compassion while the unwelcome product has an emotional attribute that is opposite and very far from the preferred product (yellow point), namely bored and irritated. This is consistent with the theory that negative emotions will keep us away from a product while we will be attracted to products that produce positive emotions (Presscott 2017).

### Emotional correlation and sensory attributes of packaged tea products

Figure 13 is a biplot curve which is a combination of two graphs, namely sensory profiling and emotion profiling. Through these images, it can be concluded that sensory attributes can affect the emotions that panelists feel when tasting a product. For example, positive emotions such as being free and satisfied are produced by the attributes of floral aroma and sweetness while negative emotions such as irritation and boredom are produced by sour and bitter tastes. The most ideal product is 713 because it produces positive emotions that are calm and loving while the product that is the furthest from the ideal is that produces negative emotions such as boredom and irritation, namely products 309 and 911.

## 4. CONCLUSION

The six tea products tested have met the polyphenol standard which is 400 ppm so it is feasible to be marketed to consumers. The pH, total phenol, theaflavin and thearubigin values experience changes during storage due to temperature factors and light exposure. Higher storage temperatures will increase the decrease in pH and polyphenols but these decreases are not significant. The CATA method can be used to map sensory and emotional profiles in detail and see correlations and their effects on panelist preferences. The product that is most preferred by consumers is a product that has the attributes of sweetness and produces emotions of loving and calm.

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## LIST OF TABLES AND IMAGES

Figure 1. Changes in the pH of commercial tea products in a 37 oC incubator

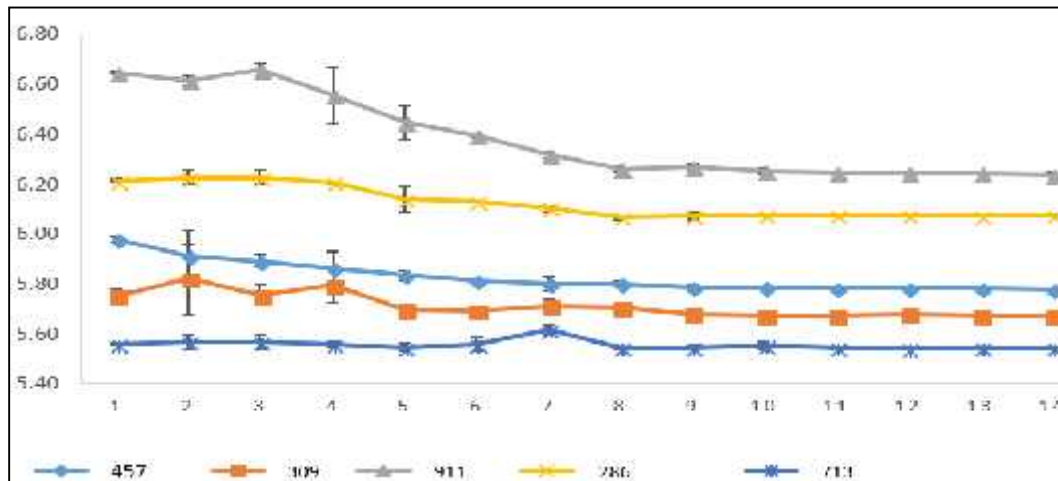


Figure 2. Effect of storage temperature on pH

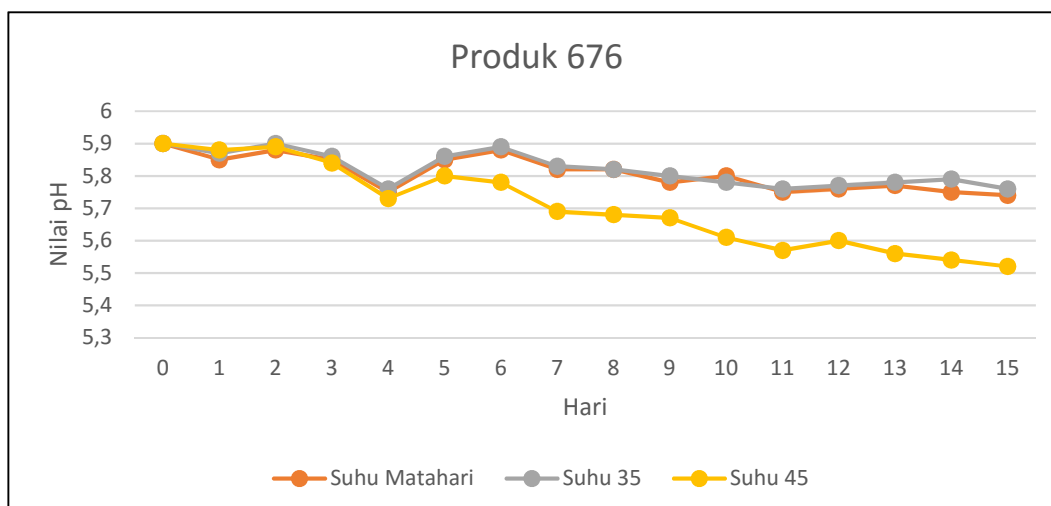
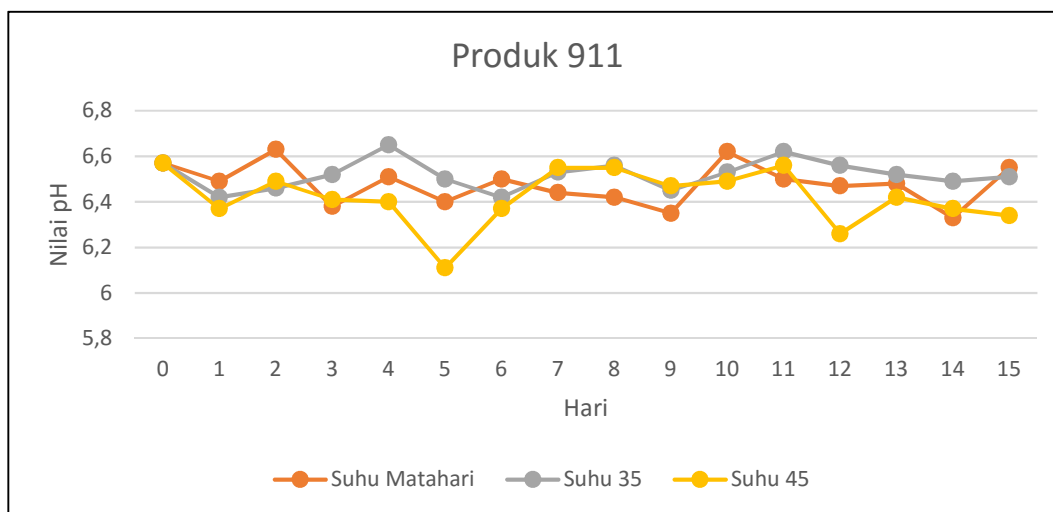


Figure 3. Total phenol content of various tea products in commercial packaging

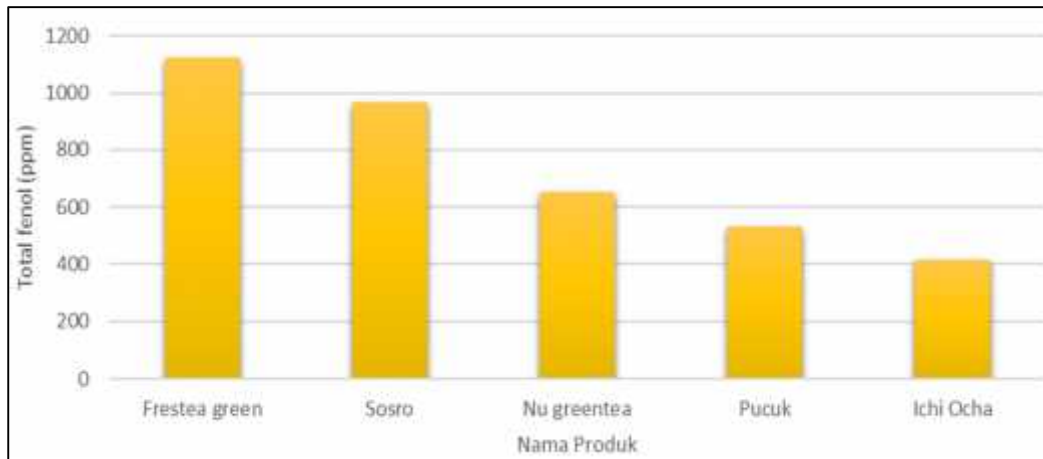
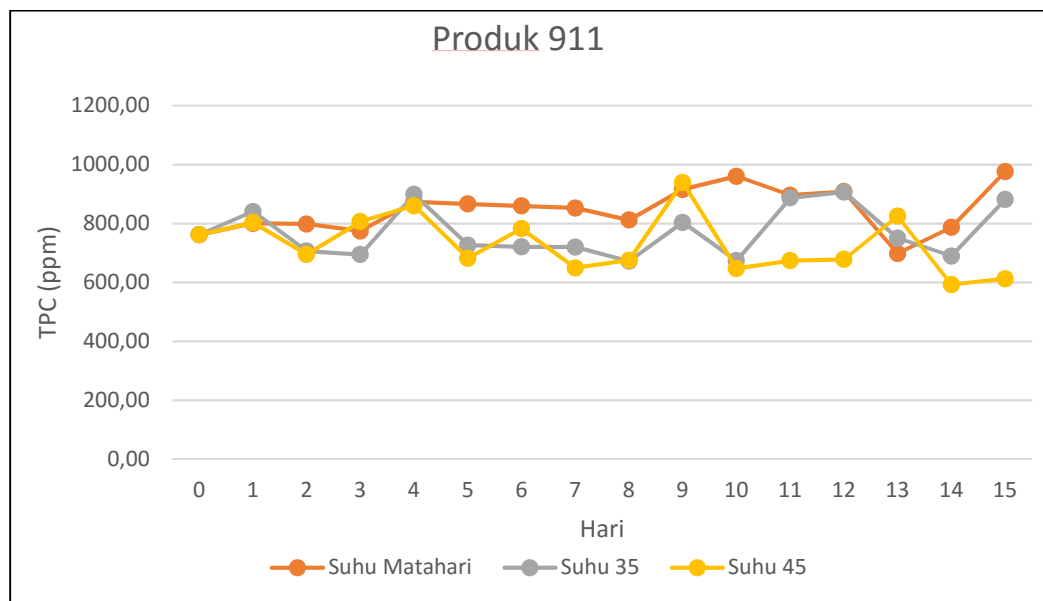


Figure 4. Effect of temperature on total phenol levels



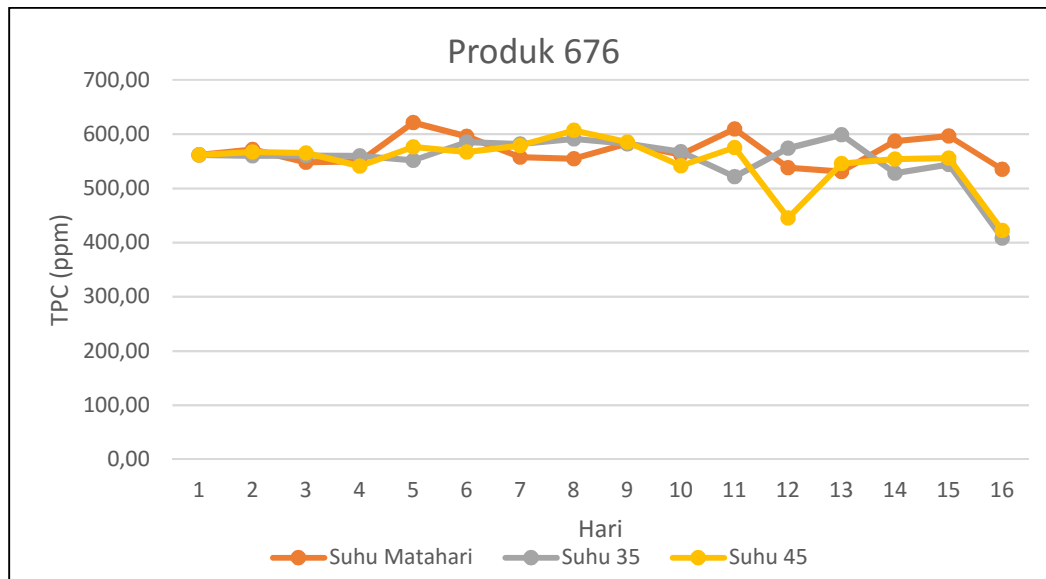


Figure 5. Effect of temperature on levels of theaflavins and thearubigin

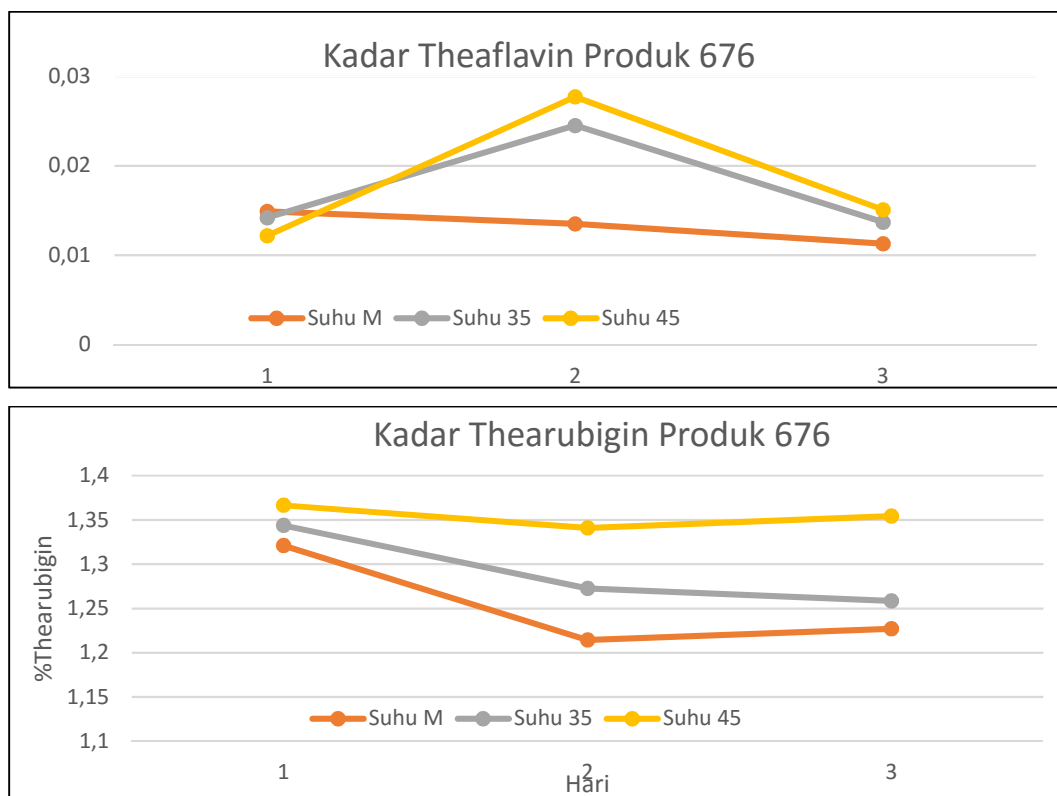


Figure 6. Representation of sensory profiles

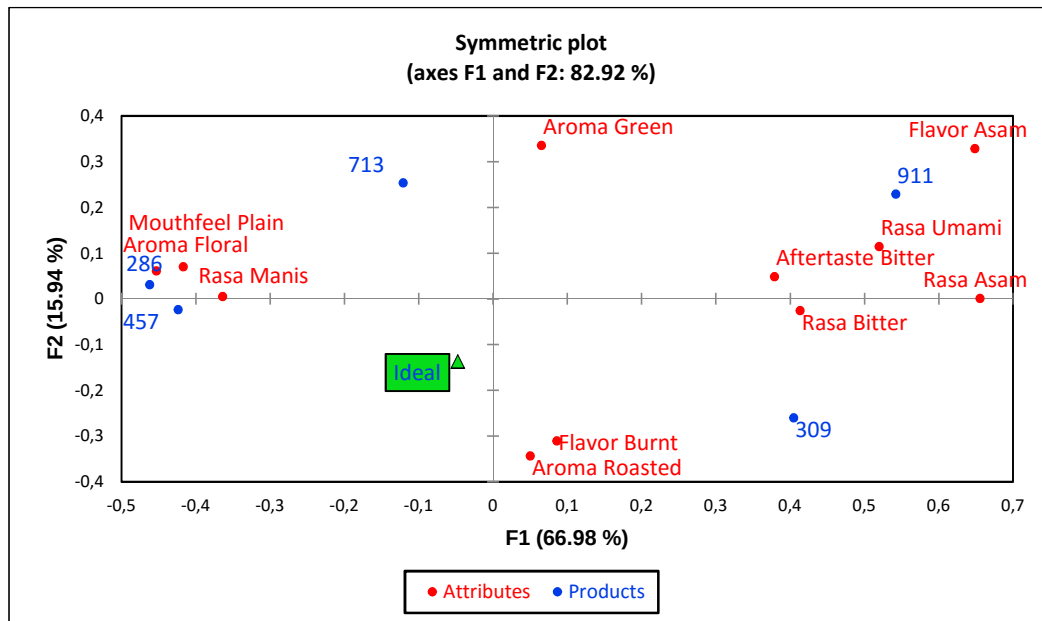


Figure 7. Correlation map of attributes and preferences

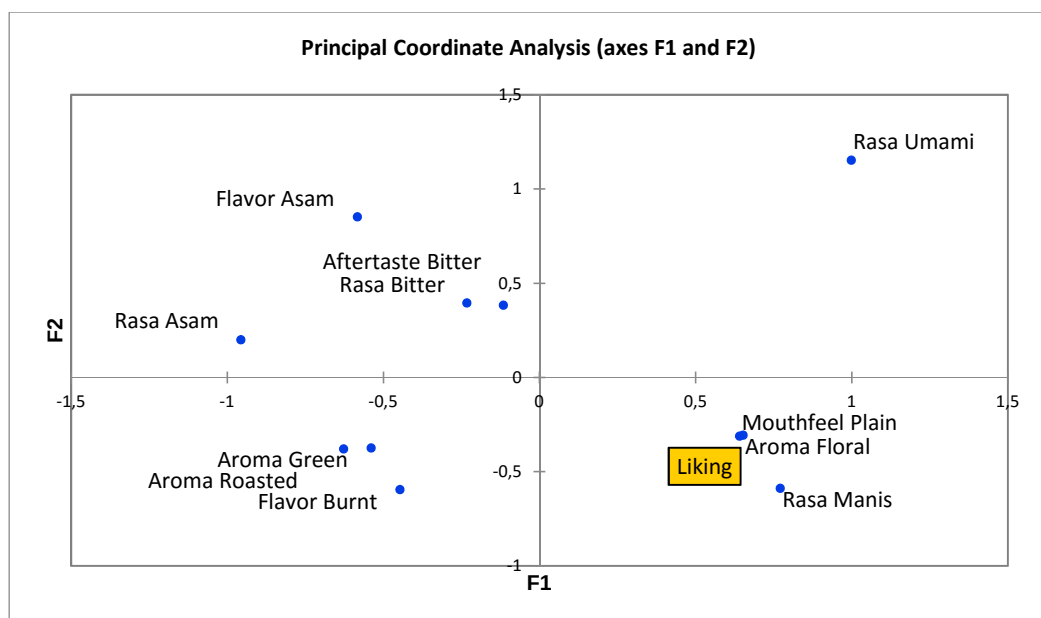


Figure 8. The must have attribute analysis curve

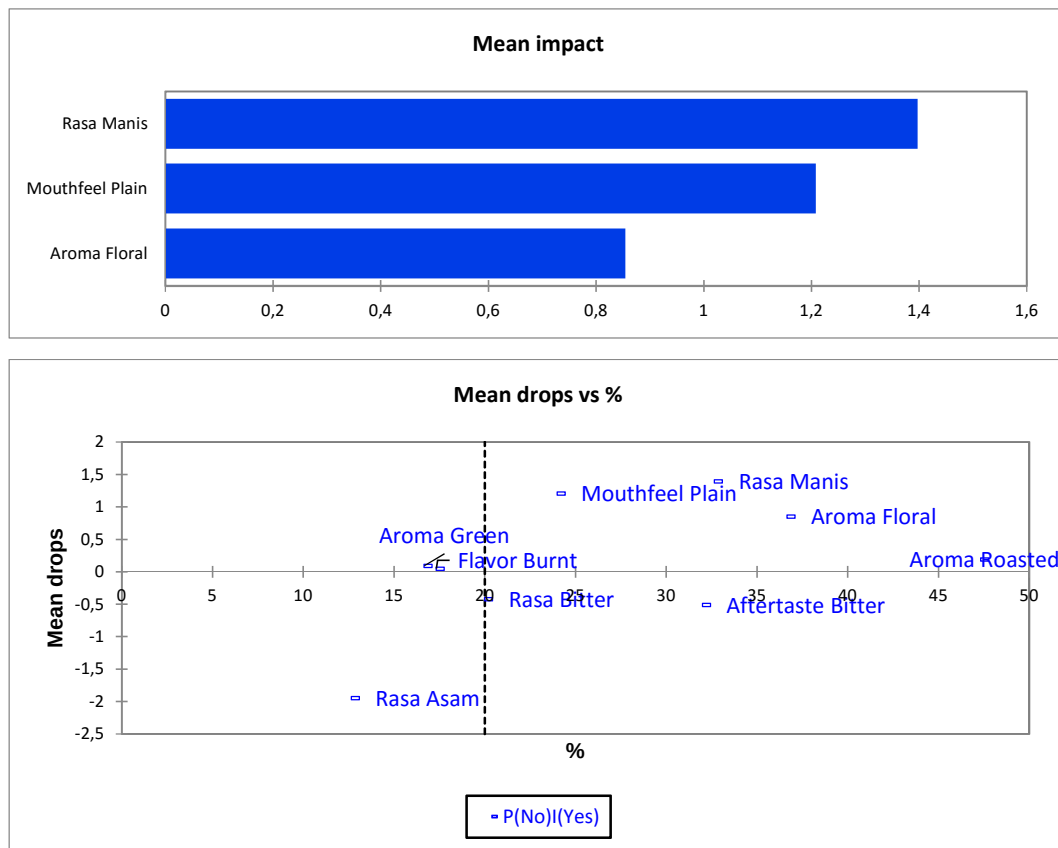


Figure 9. Emotional representation of packaged tea products

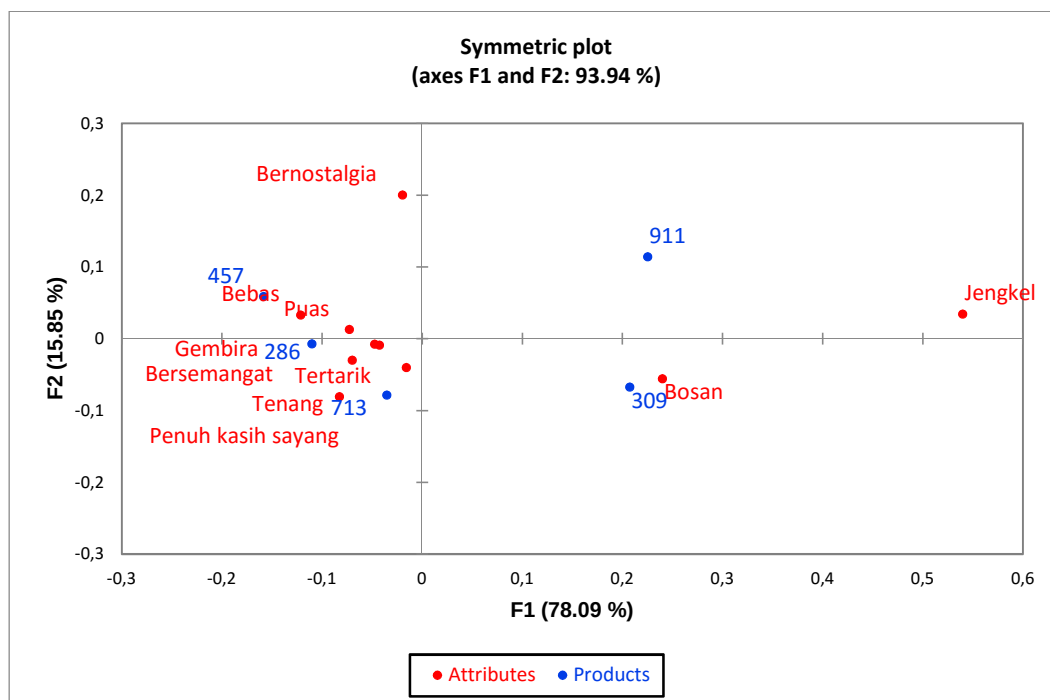


Figure 10. Charts of emotion profile of tea products in packs

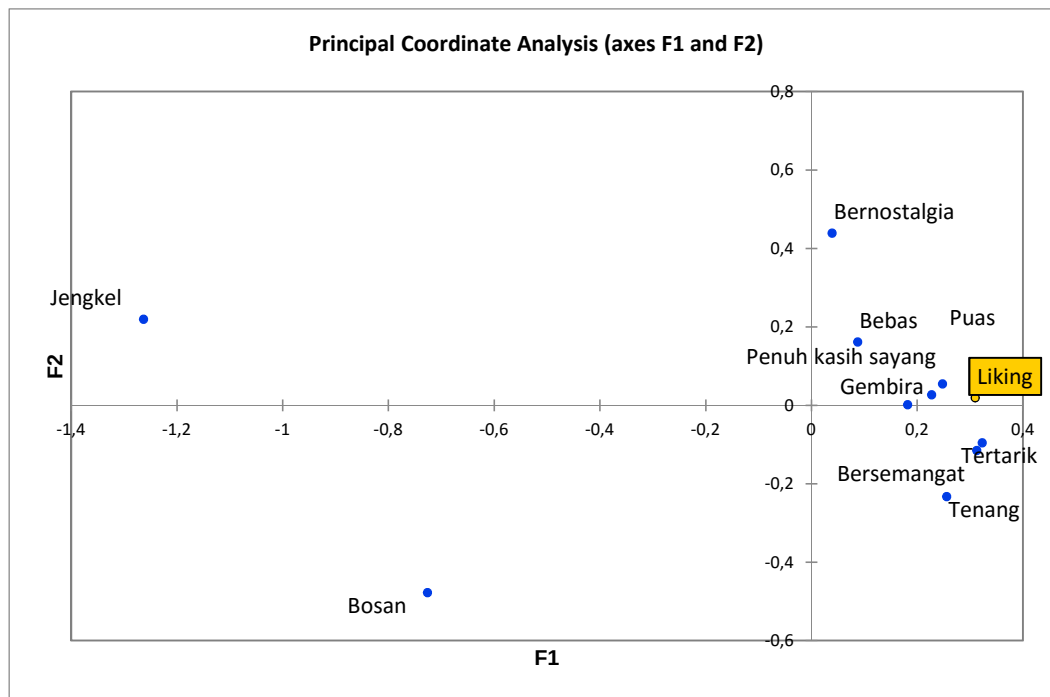


Figure 11. Biplot sensory and emotional profiling

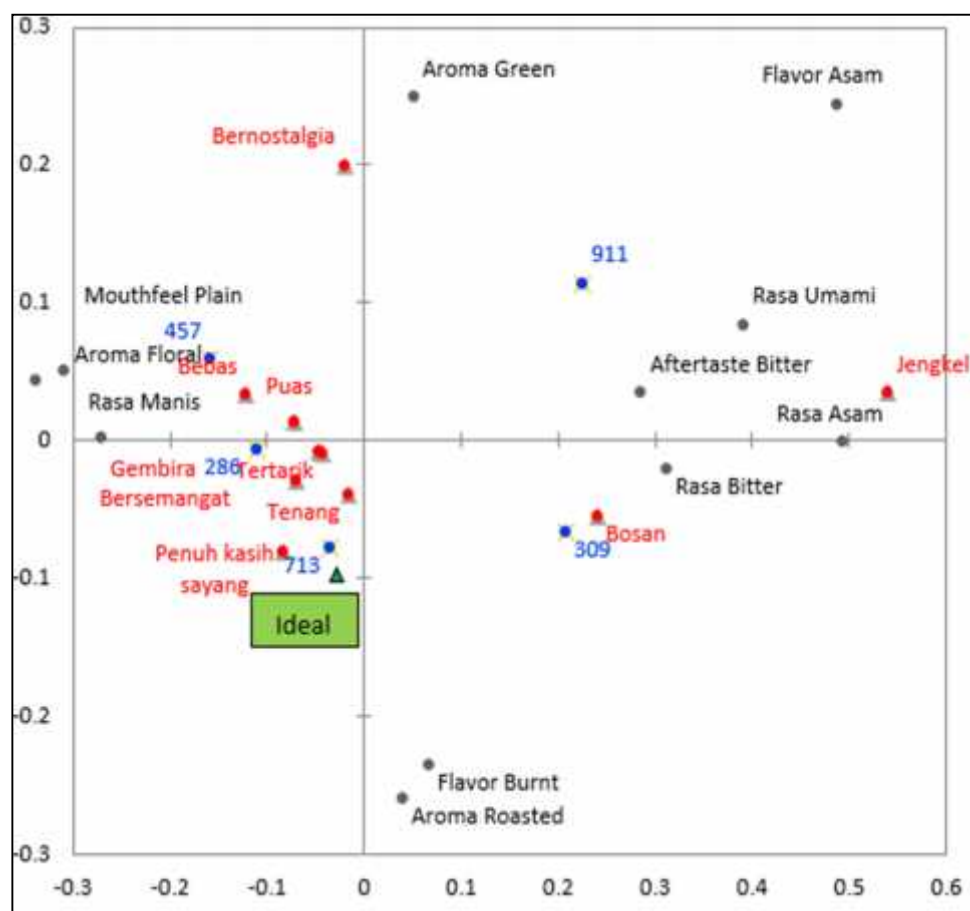


Table 1. *Popular Brand Index Result (PBI)*

| Rank of Popular | RTD Tea Bottle  | PBI  |
|-----------------|-----------------|------|
| 1               | Teh Botol Sosro | 42.1 |
| 2               | Teh Pucuk Harum | 15.6 |
| 3               | Teh Gelas       | 9.2  |
| 4               | Frestea         | 8.6  |
| 5               | Nu Green Tea    | 8.0  |
| 6               | Fruit Tea       | 3.8  |
| 7               | MYTEA           | 2.5  |
| 8               | TEBS            | 2.0  |
| 9               | Ichi Ocha       | 1.3  |
| 10              | Mirai Ocha      | 0.9  |

Source: W&amp;S Market Research

Table 2. Sensory and emotional profiling questionnaires

| Dislike<br>Extremely     | Dislike<br>very<br>much  | Dislike<br>moderately    | Dislike<br>slightly      | Neither<br>like nor<br>dislike | Like<br>slightly         | Like<br>moderately       | Like<br>very<br>much     | Like<br>extremely        |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| Emosi        | 286 | 713 | 457 | 309 | 911 |
|--------------|-----|-----|-----|-----|-----|
| Full of love |     |     |     |     |     |
| Quiet        |     |     |     |     |     |
| Happy        |     |     |     |     |     |
| Annoyed      |     |     |     |     |     |
| Bored        |     |     |     |     |     |
| Interested   |     |     |     |     |     |
| Excited      |     |     |     |     |     |
| Satisfied    |     |     |     |     |     |
| Nostalgia    |     |     |     |     |     |
| Free         |     |     |     |     |     |

| Attribute         | Description                                                       | 286 | 713 | 457 | 309 | 911 |
|-------------------|-------------------------------------------------------------------|-----|-----|-----|-----|-----|
| Roasted aroma     | Impression of the character of grilled aroma at high temperatures |     |     |     |     |     |
| Aroma of Green    | Associate with leaves / straw                                     |     |     |     |     |     |
| Floral Scent      | Associate with flowers / jasmine                                  |     |     |     |     |     |
| Burnt Flavor      | Associate with burned fruits / vegetables                         |     |     |     |     |     |
| Flavor Acid       | Associate with vinegar                                            |     |     |     |     |     |
| Bitter taste      | Basic taste of caffeine (bitter)                                  |     |     |     |     |     |
| Sweetness         | The basic taste of sucrose sugar                                  |     |     |     |     |     |
| Umami's taste     | Associate with MSG                                                |     |     |     |     |     |
| Sour taste        | Associate with vinegar                                            |     |     |     |     |     |
| Mouthfeel Plain   | Give flat impressions                                             |     |     |     |     |     |
| Bitter Aftertaste | The sensation of bitter taste left behind                         |     |     |     |     |     |

Table 3. Cochran Q sensory profiling test

| Attributes        | p-values | 286        | 309        | 457        | 713         | 911        |
|-------------------|----------|------------|------------|------------|-------------|------------|
| Aroma Roasted     | 0.369    | 0.100 (a)  | 0.267 (a)  | 0.200 (a)  | 0.100 (a)   | 0.167 (a)  |
| Aroma Green       | 0.132    | 0.233 (a)  | 0.167 (a)  | 0.200 (a)  | 0.333 (a)   | 0.400 (a)  |
| Aroma Floral      | 0.000    | 0.600 (c)  | 0.133 (a)  | 0.533 (bc) | 0.367 (abc) | 0.200 (ab) |
| Flavor Burnt      | 0.001    | 0.367 (ab) | 0.600 (b)  | 0.300 (ab) | 0.100 (a)   | 0.267 (ab) |
| Flavor Asam       | 0.002    | 0.033 (a)  | 0.133 (a)  | 0.067 (a)  | 0.067 (a)   | 0.333 (a)  |
| Rasa Bitter       | 0.000    | 0.233 (a)  | 0.800 (b)  | 0.200 (a)  | 0.400 (ab)  | 0.700 (b)  |
| Rasa Manis        | 0.000    | 0.733 (b)  | 0.400 (a)  | 0.900 (b)  | 0.567 (ab)  | 0.300 (a)  |
| Rasa Umami        | 0.736    | 0 (a)      | 0.033 (a)  | 0 (a)      | 0.033 (a)   | 0.033 (a)  |
| Rasa Asam         | 0.042    | 0 (a)      | 0.167 (a)  | 0.033 (a)  | 0.067 (a)   | 0.200 (a)  |
| Mouthfeel Plain   | 0.005    | 0.500 (a)  | 0.167 (a)  | 0.333 (a)  | 0.333 (a)   | 0.133 (a)  |
| Aftertaste Bitter | 0.001    | 0.167 (ab) | 0.400 (ab) | 0.133 (a)  | 0.233 (ab)  | 0.567 (b)  |

Table 4. Penalty analysis summary

| Must Have    | Nice to Have | Does not Influence | Does not Harm   | Must not Have |
|--------------|--------------|--------------------|-----------------|---------------|
| Floral Scent |              | Aroma Roasted      | Aroma of Green  |               |
| Sweetness    |              |                    | Burnt Flavor    |               |
|              |              |                    | Mouthfeel Plain |               |

Table 5. Cochran Q emotional profiling tests

| Attributes         | p-values | 286        | 309        | 457        | 713        | 911       |
|--------------------|----------|------------|------------|------------|------------|-----------|
| Penuh kasih sayang | 0.001    | 0.700 (b)  | 0.467 (ab) | 0.633 (ab) | 0.633 (b)  | 0.300 (a) |
| Bosan              | 0.406    | 0.500 (a)  | 0.600 (a)  | 0.400 (a)  | 0.533 (a)  | 0.467 (a) |
| Tenang             | 0.001    | 0.867 (b)  | 0.700 (ab) | 0.867 (b)  | 0.767 (ab) | 0.467 (a) |
| Tertarik           | 0.004    | 0.767 (a)  | 0.533 (a)  | 0.800 (a)  | 0.767 (a)  | 0.467 (a) |
| Bersemangat        | 0.000    | 0.733 (a)  | 0.500 (a)  | 0.767 (a)  | 0.733 (a)  | 0.400 (a) |
| Bebas              | 0.000    | 0.700 (ab) | 0.433 (ab) | 0.767 (b)  | 0.533 (ab) | 0.333 (a) |
| Jengkel            | 0.032    | 0.200 (a)  | 0.433 (a)  | 0.167 (a)  | 0.267 (a)  | 0.400 (a) |
| Gembira            | 0.001    | 0.800 (a)  | 0.533 (a)  | 0.833 (a)  | 0.833 (a)  | 0.500 (a) |
| Bernostalgia       | 0.030    | 0.567 (a)  | 0.333 (a)  | 0.667 (a)  | 0.400 (a)  | 0.467 (a) |
| Puas               | 0.006    | 0.700 (a)  | 0.400 (a)  | 0.667 (a)  | 0.633 (a)  | 0.400 (a) |

Table 6. Summary of dominant attributes

| sample | Dominant Attributes |                     |
|--------|---------------------|---------------------|
|        | Sensory Emotion     | Sensory Emotion     |
| 457    | Floral scent        | Free, satisfied     |
| 286    | Sweetness           | Excited, interested |
| 713    | Sweetness           | Calm, loving        |
| 309    | Bitter taste        | Bored               |
| 911    | Bitter aftertaste   | Annoyed             |