Consumer Acceptance of the Lemongrass (*Cymbopogon citratus*) Dried at Different Temperatures

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A report submitted in fulfillment of the requirements for the degree of Bachelor of Applied Science (Product Development Technology) with Honors

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DECLARATION

I hereby declare that the work embodied in this report is the result of the original research and has not been submitted for a higher degree to any universities or institutions.

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I certify that the report of this final year project entitled Consumer Acceptance of the Lemongrass (*Cymbopogon citratus*) Dried at Different Temperatures" By Nurul Ashiqin Bt Mohd Noor, matric number F15A0180 has been examined and all the correction recommended by examiners have been done for the degree of Bachelor of Applied Science (Product Development Technology) with Honors, Faculty of Agro-Based Industry, University Malaysia Kelantan.

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Consumer Acceptance of the Lemongrass (*Cymbopogon citratus*) Dried at Different Temperatures

ABSTRACT

This study is to find out the best temperature to prepare dried lemongrass (*Cymbopogon citratus*) and performed consumer acceptance test toward sample. This study was conducted at University Malaysia Kelantan Jeli campus. This study is to find a drying process with a suitable temperature for the drying of lemongrass with the aroma and colour that consumer prefers. Then, the shelf life of the fresh lemongrass is short and to overcome that, preservation methods are used. Drying is the preservation method that is chosen. The aims of this study are to identified the effect of different drying temperatures to the aroma of the dried lemongrass using sensory analysis. Then, to identify the acceptance of the dried lemongrass toward a level of preference of the consumers. Method of preparing the dried lemongrass that involve is collecting a fresh sample, washing, wipe excess water, cutting process and drying. The drying process will be using oven dried method with different temperatures of 40ºC, 50ºC, 60ºC, and 70ºC. The drying was continuing until the weight of the lemongrass are constant to make sure it dried completely. The dried lemongrass and water samples were tested using questionnaire sensory analysis. the questionnaire is developed according to the aims of the study involving consumer as the respondents. The outcome is analysed using descriptive analysis. The temperature of the drying process affects the aroma of dried lemongrass. The suitable temperature in drying that preserves the aroma of lemongrass and most are at the lowest temperature used. The drying process can retard the microbial activity and longer the shelf life of the lemongrass.

Keywords; drying temperature, aroma of lemongrass, consumer preference, sensory analysis, descriptive analysis.

Penerimaan Pengguna Terhadap Serai Makan (*Cymbopogon citratus*) Yang Dikeringkan Pada Suhu Yang Berbeza

ABSTRAK

Kajian ini adalah untuk mengetahui suhu terbaik untuk menyediakan serai kering (*Cymbopogon citratus*) dan ujian penerimaan pengguna terhadap sampel. Kajian ini dijalankan di Universiti Malaysia Kelantan, kampus Jeli. Pernyataan masalah adalah mencari proses pengeringan dengan suhu yang sesuai untuk pengeringan serai dengan aroma dan warna yang diterima oleh pengguna. Kemudian, jangka hayat serai segar adalah pendek dan untuk mengatasinya, kaedah pemeliharaan digunakan. Pengeringan adalah kaedah pemeliharaan yang dipilih. Tujuan kajian ini adalah mengenalpasti kesan suhu pengeringan yang berbeza kepada aroma serai kering dengan menggunakan analisis deria. Kemudian, untuk mengenal pasti penerimaan serai kering ke arah tahap kegemaran pengguna. Kaedah penyediaan serai kering yang melibatkan mengumpul sampel segar, membasuh, mengelap air yang berlebihan, proses pemotongan dan pengeringan. Proses pengeringan akan menggunakan kaedah pengering oven dengan suhu yang berbeza iaitu 40ºC, 50ºC, 60ºC, dan 70ºC. Pengeringan akan berterusan sehingga berat serai adalah tetap untuk memastikan ia dikeringkan sepenuhnya. Sampel kering dan sampel air diuji menggunakan soal selidik analisis deria. Soal selidik itu dibangunkan mengikut matlamat kajian yang melibatkan pengguna sebagai responden. Hasilnya dianalisis menggunakan analisis deskriptif. Suhu proses pengeringan mengubah aroma serai kering. Suhu yang sesuai dalam pengeringan yang mengekalkan aroma serai dan kebanyakannya adalah pada suhu terendah yang digunakan. Proses pengeringan dapat merendahkan aktiviti mikrob dan jangka hayat serai lebih lama.

Kata kunci; suhu pengeringan, aroma serai, keutamaan pengguna, analisis deria, analisis deskriptif.

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LIST OF ABBREVIATION & SYMBOLS

°C	Degree Celsius
Kg	Kilogram
G	Gram
m	Meter
cm	Centimetres
mL	Millimetre
%	Percentage
H_0	Hypothesis Null
H_1	Hypothesis Alternative
SPSS	Statistic Package for Science Social
RM	Ringgit Malaysia
UMKKJ	University Malaysia Kelantan Kampus Jeli

CHAPTER 1

INTRODUCTION

1.1 Background of Study

The plant that are used in the study are lemongrass. Lemongrass or its botanical name (*Cymbopogon Citratus*) is a plant from the family of Graminae / Poaceae perennial herb that widespread in tropical regions Asia, America and Africa (Forestry Department of Peninsular Malaysia, 2016). The lemongrass is easy to grow, does not require a neat rug, can be planted in many types of soil except in swamp area, can achieve height up 1.0 to 1.5 meters high and It produces a large and thick leafy clump of solid rhizomes (Harress, 2017). Lemongrass is used in the cuisine from ancient time in Malaysia. The fresh lemongrass has a short shelf life, but with the proper way of storage, its shelf life can hold for 2 weeks, and dried lemongrass can be stored for a year (Bonnier Corporation Company, 2007).

Drying proses are used in the research as the preparation of dried lemongrass. Drying is a process that removes water and retards the growth of microbes hence longer the shelf life (Soliva, & Martín, 2003). Drying process has been used as a preservation method in Malaysia for a long time ([NRCS], n.d.). Various types of food ingredient can

use this method for preservation including lemongrass. Drying can preserve the flavour, aroma and the

benefit of the ingredient. The drying method that is used in this research is the oven-dry method because it is suitable to the mass production for marketing as it will also increase the rate of drying (Arslan & Özcan, 2010).

Sensory evaluation was used in this research. Sensory evaluation is a scientific discipline used to generate, measure, analyse and interpret thoughts on products perceived by the senses of sight, smell, touch, taste and hearing, (Stone, & Sidel, 2004, p.12). Descriptive analysis is one of the most widely used tools in the field of sensory analysis. It enables the objective description of the nature and magnitude of the sensory characteristics to be used in designing, manufacturing and communicating product-driven products, (Stone, H. & Sidel, J. L.,2004, p.201).

1.2 Problem Statement

Lemongrass is used in various types of cuisine in Malaysia. Besides, it also gives income in the export field. The shelf life of the fresh lemongrass is short, it makes the exporter have to transport it as soon as it harvested making a higher transportation budget. If the lemongrass did not sell well, the seller has to face huge losses. Hence to solve it, preservation method shall be used as it is the lowest cost preservation method. The drying process also has its own risk. Drying process with unsuitable temperature drags production time, makes the colour of the dried lemongrass seem not attractive and may result in huge losses as it will not be chosen by the consumer. With this, we need to find the most suitable temperature for drying lemongrass using the industrial oven. Customer acceptance also needs to take into account in this research as the product is made for the consumer in the market.

1.3 Objective

Objectives of this study are:

1) to identify the effect of different drying temperatures to the aroma of the dried lemongrass using sensory analysis.

2) to identify the colour effect of the dried lemongrass and the preference of the consumer.

3) to identify the acceptance of the dried lemongrass toward a level of preference of the consumers.

1.4 Research Purpose

The main purpose of the research is to identify the effect of lemongrass drying using different temperatures on lemongrass aroma through sensory evaluation methods. In addition, another purpose is to identify the effect of the dried lemongrass colour on consumer preference. Another one of the purposes of research is to identify the overall acceptance of the dried lemongrass toward the preference of the consumer. The sensory test has been conducted to a few respondents and the questionnaire are distributed. The result of the questionnaire has been analysed.

1.5 Significant of Study

Drying method using the oven or the oven-dry method is the most suitable method for this research because it is relevant to the industry mass-produced product. The temperature of drying process will distress the fragrance and colour of dried lemongrass. Hence it is important to know the suitable temperature that will involve in the industry. The low temperature will save the aroma of lemongrass. The drying process can impede the microbial activity and longer the shelf life of the lemongrass. From the industrial view, this study will give knowledge about dried lemongrass product and consumer acknowledgement. Hence it will benefit the market of the lemongrass in the future.

CHAPTER 2

LITERATURE REVIEW

2.1 Lemongrass (*Cymbopogon Citratus*)

2.1.1 General Characteristic

Lemongrass or *C. citratus* is one of the ornamental grasses that come from Poaceae family. The Poaceae family has about 700 genera and 11,000 species: widely distributed in all regions of the world. Lemongrass also has many names that are barbed wire grass, serai makan, silky heads, citronella grass, cha de Dartigalongue, fecer grass and many more according to its geographical (Harress, 2017). Lemongrass gives lemon taste and aroma in the dish like curry, rending, tom yam soup, fried herbal chicken for making it tastier (Yim, 2018).

The leaves are simple, green, linear, lanceolate, smooth, parallel leaves vein, tapered at the tip and leaf base, pebbles, elongated and functioned as stems as shown in Figure 2.1 (Lonkar, Chavan, Pawar, Bansode, Amarowicz., 2013). The lemongrass tree in Figure 2.2, also produces flowers at mature levels. Rhizome strong and robust,

creeping, durable and yellowish white when cut. According to Living & In, (2018) and Itankar, Tauqeer & Dalal, (2018), each blade of grass is actually attached to a thick bulbous and this part is the one that we will used in this research. It high are around 1 to 1.5 meter in this country.

Figure 2.1 Lemongrass Stem

Figure 2.2: Lemongrass Plant

The phytochemical of *C. citratus* analysis showed that various plant secondary metabolites and primary metabolite are present in the plant were flavonoids, carbohydrates, chlorophyll, steroids, phenolics and tannins, alkaloids, steroids, and phytosteriods, saponins, glycosides, protein and amino acid, lipids, anthraquinone,(Umar, Mohammed, Oko, Tafinta, Aliko, Jobbi, (2016); Byadgi.S (2016)). According to Dc & Dc, (2018), the chemical composition of *C. citratus* aldehydes (geranial (45.2%), neral (32.4%), and citronellal (0.2%)).

2.1.2 Taxonomy

The taxonomy of the lemongrass according to natural resources conservation service [NRCS], (2014) and Gilman,(1999) are as follow :

Kingdom: Plantae – Plants

Subkingdom: Tracheobionta – Vascular plants

Super division: Spermatophyta – Seed plants

Division: Magnoliophyta – Flowering plants

Class: Liliopsida – Monocotyledons

Subclass: Commelinidae

Order: Cyperales

Family: *Poaceae* – Grass family

Genus: *Cymbopogon Spreng*.

Species: *Cymbopogon citratus* (DC. ex Nees) Stapf

2.1.3 Uses and Benefit

The lemongrass plant has many uses and benefit. Generally, it can be used as a source of food, medicine and cosmetic ingredient. It can be the ingredient in many

cuisines such as in soups (Joy, Skaria, Mathew, Mathew, Joseph, Sreevidya, 2004). The stems and bulb are used to produce a scent for food. it serves as the natural additive, add flavour and aroma.as the natural additive it will lowering the use of synthetic chemical additive (Joy, et. al, 2004)

Water decoction of the leaves and roots of lemongrass can make teas. The teas can wash the kidneys, help for lower the risk of cancer, treat insomnia, boost digestive system treating diuretics, urinating, tonic and stimulating the production of sweat and lowers cholesterol levels (Shameem, 2016).

The dietary fibre of lemongrass is a high-value herb for the treatment of indigestion, stomach twisting, acts as an ointment for the relief of chronic joint pain, sprains and mild pain treatments (Joy, et al, 2004; FactO, 2018). In traditional medicinal herb, lemongrass oil has antifungal properties to cure a cough and colds (Yim, 2018). The crushing leaf can remove a toothache and joint pain (Perak Forestry Department [PFD], 1888; Devi, Sim, & Ismail,2012).

In the extraction root of lemongrass can be used as an aroma of shampoo and perfume ([PFD], 1888). Extraction of lemongrass oil can also dispel mosquitoes as can act as an insect repellent also aromatic healer, treat body odour, teat respiratory disorders like asthma ([PFD], 1888).

2.1.4 Economic Value

Lemongrass is easily found in the market, this indicates that it has its own economic value. In the market, lemongrass can be purchased fresh, powdered form or as

the lemongrass oil. In Malaysia, 1kg of lemongrass can cost RM 2.00 to RM 3.00 (Rafi, 2017). On the other hand, the cultivation and market demand for lemongrass is increasing as it has a lot of uses and benefit. In the market, it gets demand from all over the world.

2.1.5 Uses in Industry

Lemongrass giving aroma, flavour, medicinal and cosmetics properties that give many uses in industry. The oil has a strong lemon-like odour, due to the high percentage of citral makes its uses in scenting of soaps, detergents, insect repellent (Mosquera, 2016). The major use of the oil is as an in perfumery, cosmetics, beverages and starting material for the manufacture of ionone's, which produces vitamin – A (Mittal, Singh, 2007).

2.2 Drying

2.2.1 Meaning of Drying

Drying is a mass transfer process consisting of the removal of water by evaporation from one mass. It is one of the processes used to extend the storage. Drying is one of the most commonly used preservation methods of preserving food. the purpose of drying is to reduce the water content in food to prevent undesirable microbial growth (Angraiyati & Hamzah, 2017). In addition, drying purposes also increase resilience, reduce packaging costs, reduce transport weight, improve ingredient flavour and maintain

nutrient content. Ingredients produced from agricultural products generally contain a lot of water content. Water content can affect the physical condition of the food. Mostly of the freshest ingredients contain 70 % or more water. The drying process will cause the dried product to undergo a change in colour texture, taste and aroma (Sinaga et al., 2017).

2.2.2 Factor Affecting the Drying Process

The first factor that can affect the drying process are the temperature that are use. This is the main focus in this proposal. Temperature is scales in the degree Celsius in this research. The temperature can fast the rate of drying or the vice versa. If the temperature is higher, the rate of drying will be higher (Ibrahim, Sopian, & Daud, 2009). For the research, the temperature that were choose is 40ºC, 50 ºC, 60ºC and 70ºC. Temperature will also make the ingredient over dry that will disturb the texture, colour and the aroma.

The second one is the humidity or the moisture content in the drying place. The high humidity will cause the drying proses to become slower (Ibrahim, et al 2009). The viscosity of the air also one of the factors in the drying rate to be slow or fast drying or something. The high air viscosity will slow the rate of the drying process (Hihat, Remini, Madani, 2017). In this research, the humidity and the viscosity of the air are ignored as the oven are the close place and the movement of air are domain. Another factor is the exposure to heat time, but in this research, the drying time is not into account the ingredient will be dry until the mass of the ingredient is the same as the last weight (Tal, 2017).

Next one is the surface area of the ingredient prepared for drying. The bigger the surface area that exposes to the heat will fasten the drying process. The exposed part

will make the heat dry the ingredient equally. The ingredient has been cut before the drying process (Sinaga et al.,2017).

2.2.3 Process of Drying

There are many types of drying process among others is sundry (using the sun ray), freeze dry, the hot air drying, infrared drying, the oven drying and many more (Arslan & Özcan, 2010). The sundry is the cheapest drying process as it uses sun ray that is free. But it also has a high risk of contamination from the air surrounding the sample (Shahi, Khan, L. Other than that, the sun drying is dependent on the weather, if it sunny the process is on the go but when it raining the process has to be delayed. Hence it is not suitable for the industrial mass produce product.

Then, the oven drying. It is the most suitable drying method as the industrial oven have big space to dry the ingredient. Other than that, the temperature is easy to control. The drying place is also in close place, it will minimise the risk of contamination to the ingredient (Arslan & Özcan, 2010). After that, the hot air drying also the industrial familiar of the drying process. But the dehydration using the hot air method took longer time making the product low in quality (Azhar ,2018).

From Azhar (2018), the freeze dry is the process of dehydration with ice sublimation of frozen material with the absent od liquid and low temperature used to stop the microbe growing. In this process, the aroma, taste, nutrition is pretty much the same as the fresh. The process is high in cost thus it not be used in this research.

Infrared also one of the drying processes, it used radiation that increases the temperature and support vaporization. The water in the ingredient will go out of the ingredient. The IR process is faster than hot air drying, it increases the quality of the product but the temperature cannot be controlled in this process (Azhar ,2018).

2.3 Sensory Analysis

Sensory evaluation is a scientific discipline that uses for the measure, analyse, and interpreted the reaction of food characteristic and ingredient through sensory vision, smell, taste, touch and hearing. In the industry, this method is still used to check the quality of the food. The method in this evaluation is two type which is analytic and effective (Singh & Maharaj, 2014). This method can be used for the sensory evaluation. Analytic give the analysis of the product and effective method give the level of likeness or preference in one product. Discrimination and descriptive method are the analysis method (Delarue et al., 2015).

The discrimination method allows one to determine whether the difference between the product is seen at a certain level of interest or a predetermined confidence. The methods used in discrimination are paired comparison methods, A-not-A rules, duo-trio methods and Triangle methods. Other methods are also used to test more samples and are often developed in the industry. Descriptive method is defined as a method that gives a quantitative description of the product, obtained from the completeness of a qualified subject. It is a complete sensory description taking into account all visual-sensing, hearing, kinaesthetic, and so on when the product is evaluated. This assessment is defined partly by product features and partly by the nature of the problem (Delarue et al., 2015).

The affective method has two type that is hedonic and choosing. The hedonic method will give the level of likeness while the preference is used for knowing which product are loved by the consumer. Hedonic give more information in term of the level of preference and the range of the likeness. The choose pairing method also include in affective method but it rarely used as the information are limited from the product. The 9 point that were used more than century were the hedonic method and it has been used in many countries by all consumer in all range of age, (Delarue et al., 2015). The sentence helps the customer to provide adequate feedback to researcher for assess the reactions of product acceptance, (Pimentel et al., 2016).

CHAPTER 3

3.0 MATERIALS AND METHODS

3.1 Material

3.1.1 Plant Sample

Lemongrasses (*C. citratus*) are collected from Jeli's market, Jeli, Kelantan in July 2018. The sample will undergo the preparation of the sample before the analysis been conducted.

3.1.2 Equipment

The equipment that will be use in this research are aluminium foil, weight scale (Sartorius, Germany), hot plate and electric oven (Memmert, Germany).

3.2 Methods

3.2.1 Preparation of Dried Sample

Lemongrasses was collected at Jeli's market, Jeli, Kelantan. The lemongrasses that were collected are stored in the plastic bag. Then, the lemongrass was washed and wiped from excess water. After that, the lemongrass samples were weighted using weight scale (Sartorius, Germany) and the mass of the lemongrass was recorded. Next, the lemongrasses were cut to small size in the scale of 1.0 cm long. The small lemongrasses then cut again for another half vertically in the middle and each layer was separated. The small pieces of lemongrass then were put on the aluminium foil and put in the oven at a temperature of 40ºC. After 24 hours, the small pieces of lemongrass were weighted and the mass was recorded. The lemongrass pieces then were put back to the oven. After another 24 hours, the sample was weighted and the reading was recorded. The weighing and recording were repeated. The drying process was stopped when the weight of the lemongrass pieces did not change for 2 days. The methods were repeated using different temperature of 50ºC, 60ºC and 70ºC.

All the dried lemongrass samples were put in zip lock bag. The Ziplock bag with dried lemongrass was stored in the airtight container to avoid the aroma of the lemongrass spread to the atmosphere. Each of the containers was labelled sample B, sample C, sample D and sample E. Sample B was the dryings using temperature of 40ºC, for sample C was the drying using temperature of 50ºC, sample D was the drying using temperature of 60ºC, sample E was the drying using temperature of 70ºC. On the other hand, the water loss percentage of the sample was calculated using this formula, ((weight before (g) - weight

after (g)) × 100 and the water loss percentage were recorded. and water loss after the drying process were calculated and recorded.

3.2.2 Development of Questionnaire of sensory evaluation.

Questionnaire that are used as the medium for this research are develop according to the objective of the research. Sensory evaluation model theory was used as the base for developing and make questionnaire. The questionnaire was divided into six part that is part A, part B(I), part B(II), part C, part D and part E. The part A is to get the basic information about the demographical factor. Part BI and BII is for sensory evaluation for the dried lemongrass and water sample. Part C as for respondent background knowledge on ingredients. Part D is for the cooking experience of respondent. Lastly, part E for customer preference of the dried lemongrass. The total of question is 27 question.

3.2.3 Preparation Sample for Sensory Analysis Questionnaire

About 1.5 g of dried lemongrass that was used in each sample with a different temperature of drying to prepared the sample for sensory evaluation. The distilled water was heated using a hot plate until it boils. Each sample was mixed with 100 mL of boiled distilled water in 250 mL beakers. The mixture was seated an about 3 minutes close the beaker using aluminium foil. The mixture was sieved, then poured to close the container and are labelled as B for 40ºC, C for 50ºC, D for 60ºC and E for 70ºC. Sample A is the

fresh lemongrass. About 5 g of the fresh lemongrass that was used to mix it with boiled distilled water and followed the method of other samples.

3.2.4 Analysation of Sensory evaluation

The questionnaire about the acceptance of aroma to dried lemongrass that being dried in different temperature were conducted around University Malaysia Kelantan, Jeli Campus. The respondent of the questionnaire were 80 people that were in UMKKJ. A few sample A, B, C, D and E was prepared before the questionnaire being distributed. The questionnaire was distributed to the respondents with all the sample that were sample A, B, C, D, and E for evaluation. The questionnaire was collected after the respondents done answered. The data of the questionnaire were analysed and presented for result and discussion. The data were analyse using descriptive analysis in SPSS.

CHEPTER 4

RESULT

4.1 Preparation of Dried Sample

The preparation of dried sample was following the method in chapter 3 at methods 3.2.3 of this thesis. The lemongrass *C. citratus* sample were used in the preparation of dried sample. Table 4.1 shows lemongrass have dried at four different temperature that is 40°C, 50°C, 60°C and 70°C. The time taken for the lemongrass drying was different according to the temperature that were used. The lemongrass drying in lowest temperature, 40°C take 5 days to dried. Lemongrass drying at temperature of 70°C take 2 days to dried completely. The total of water loss was calculated. From this result, the percentage of water loss were between 78.23% to 78.97%.

Table 4.1 Initial Weight, Final Weight, Total and Percentage of Water Loss After Drying of Lemongrass

Temperature	Initial weight (g)	Final weight day 1 (g)	Final weight day 2 (g)	Final weight day 3 (g)	Final weight day 4 (g)	Final weight day 5 (g)	Total of water loss (g)	Percentage of water loss (%)	Day require to dry (Day)
40°C	55.30	14.20	13.97	13.38	12.04	12.04	43.26	78.23	5
50°C	51.40	13.88	12.86	11.16	11.16	-	40.24	78.28	4
60°C	55.35	12.09	11.86	11.86	-	-	43.49	78.58	3
70°C	55.18	11.60	11.60		-	-	43.58	78.97	2

In the questionnaire one question were asked about the colour of the sample. Table 4.2 indicate the colour of dried lemongrass sample after drying with different temperature. The colour of sample B is orange yellowish, the colur of sample C is dark yellow, the sample D is yellow and the colour for sample E is golden yellow.

Table 4.2 Colour of Dried Lemongrass Sample

Sample B (dried at 40°C)	**Sample C (dried at 50°C)**	**Sample D (dried at 60°C)**	**Sample E (dried at 70°C)**
			
Orange yellowish	Dark Yellow	yellow	Golden yellow

The percentage of water loss are discussed in chapter 5 in the thesis. Next the colour of dried lemongrass are discussed in chapter 5. This colour result are the reference for sensory analysis of dried lemongrass in part B in questionnaire. With this result the consumer preference can be analyzed clearly.

4.2 Sensory Assessment Survey Analysis

4.2.1 Demographic

The purpose of this section is to identify the statistical characteristics of human population which used to identify consumer. Figure 4.1 show the gender percentage of respondents. The number of the respondent are 80 that is 40 male and 40 females. The percentage of each gender are the same.

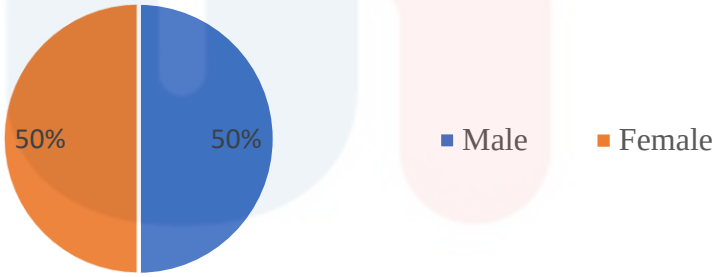

Figure 4.1 Gender of respondents

The Figure 4.2 illustrate the age percentage of the 80 respondents. The highest percentage of the age range 15 – 24 years old. The moderate number of age range in 25 – 34 years old. The least percentage fall for both age in range 35 – 44 years old and 45 and above.

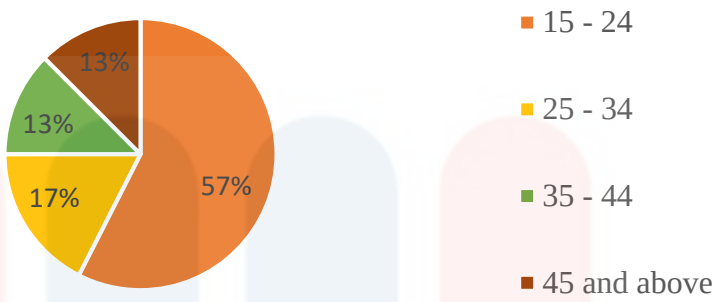

Figure 4.2 Age of respondents

Next, is the race percentage of the respondents shown in Figure 4.3. The highest percentage are the Malay race. The medium percentage are Chinese race followed by is Indian races.

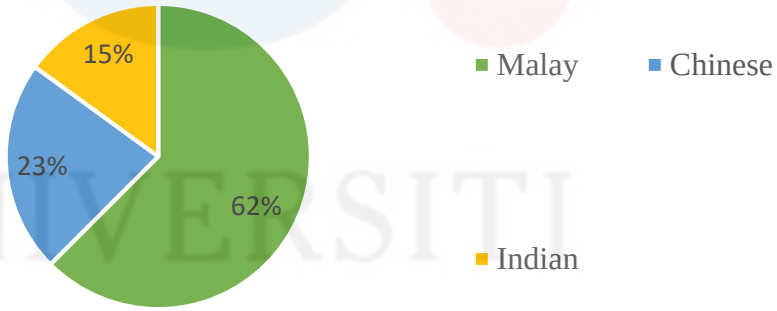

Figure 4.3 Race of respondents

The highest percentage of the residential area are in city in Figure 4.4. in the other hand in the same figure, the rural area is the least residentials area among the respondents.

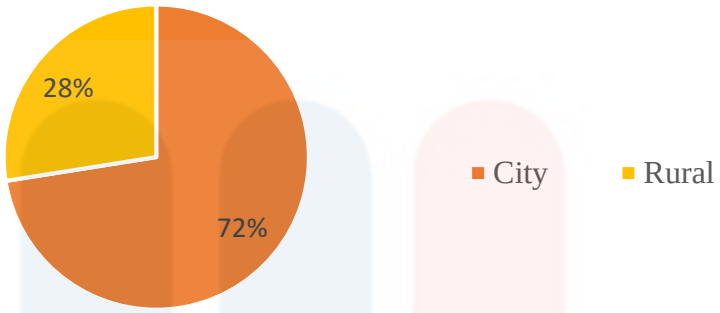

Figure 4.4 Residential area of respondents

In the next question guide by Figure 4.5, show the respondent current job percentage in pie chat. The uppermost percentage of the respondent are the students in UMK. The medium percentage are the employee. The lowermost percentage of current job are the others categories.

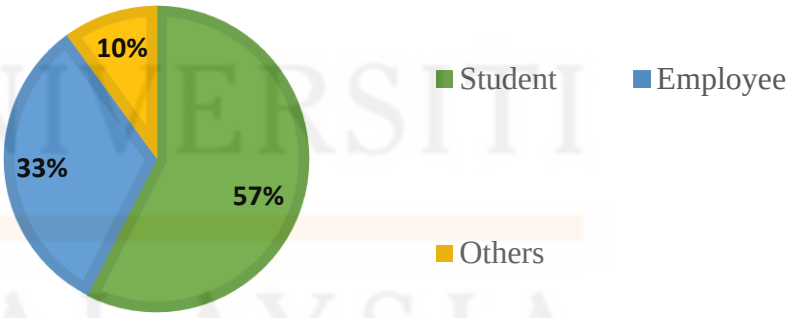

Figure 4.5 Current job of respondent.

4.2.2 Sensory Evaluation of Dried Sample

In this section respondent are required to used their sensory organ to answers the questions about the dried sample. Figure 4.6 show the strongest aroma preferences percentage among sample as the first question in this section. The highest preference of strongest aroma is for sample B. The least chosen as the strongest aroma between sample is sample C.

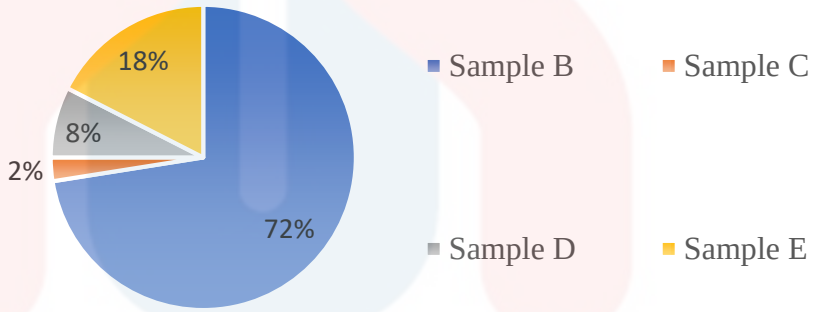

Figure 4.6 Strongest aroma preferences among respondents

Next, Figure 4.7 illustrate the percentage of sample that closest aroma to fresh lemongrass (sample A). The most sample that are choose as closest aroma to fresh lemongrass (sample A) are sample B. The lowest percentage that respondent choose are sample D and sample C.

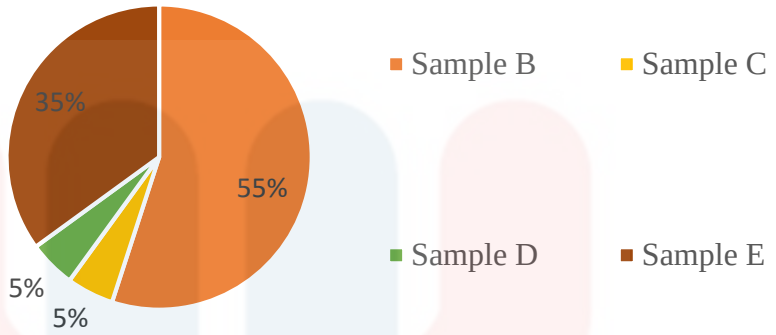

Figure 4.7 Preference sample that closest aroma to fresh lemongrass (sample A).

Figure 4.8 indicate the percentage of sample that are like the most by the respondent. The highest liked sample are sample B. Next, lowest percentage are for sample C and sample D both.

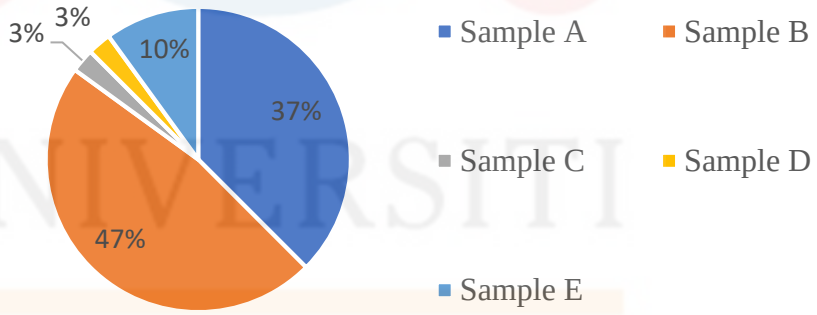

Figure 4.8 Preference sample that are liked the most

The percentage of liked sample colour of respondent are shown in Figure 4.9. The highest liked colour sample are sample A. The sample that have the lowest liked colour are sample B.

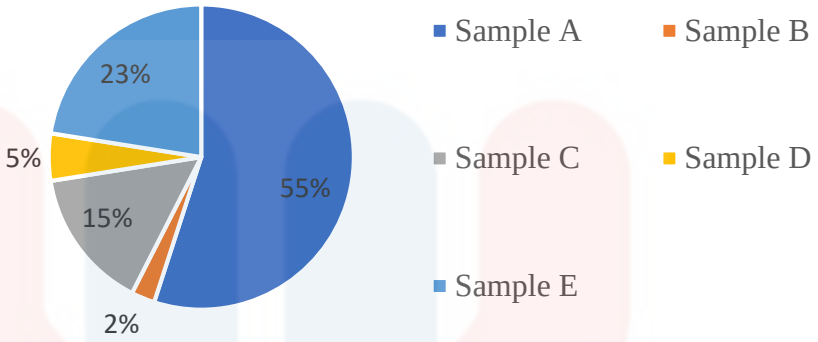

Figure 4.9 Liked sample colour by respondent

4.2.3 Sensory Evaluation of Water Sample

The question in this part are for the water sample of dried lemongrass answer according to respondent sensory evaluation. Figure 4.10 shows the strongest aroma preference percentage among respondents. the most sample that are prefers to be the strongest aroma are sample B. The lowest percentage are choosing is sample D.

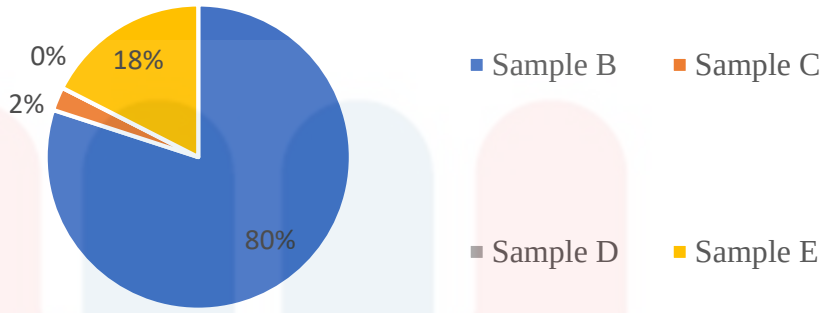

Figure 4.10 Strongest aroma preference

Next, Figure 4.11 indicate the percentage of sample that are chosen as closest aroma to fresh lemongrass (sample A). The highest chosen as the closest aroma to fresh lemongrass (sample A) is sample B. The respondent lowest chosen sample that closest aroma to fresh lemongrass (sample A) is sample D.

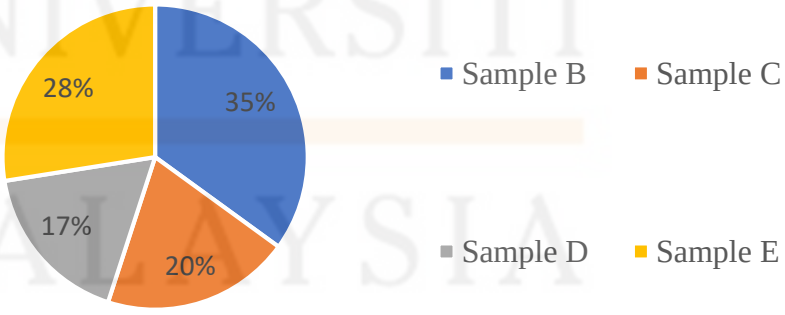

Figure 4.11 Sample chosen as closest aroma to fresh lemongrass (sample A).

The percentage of sample that are like the most by the respondents giving in Figure 4.12. At the top most chosen as liked sample is sample B. The bottom chosen as most liked sample are sample D.

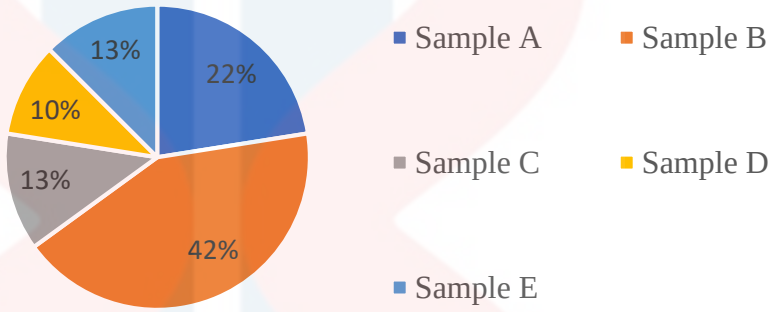

Figure 4.12 Chosen of sample that are like the most

After that, Figure 4.13 indicate the percentage of liked sample colour of respondents. At top, the chosen liked colour sample is sample A. The bottommost liked colour sample are sample E.

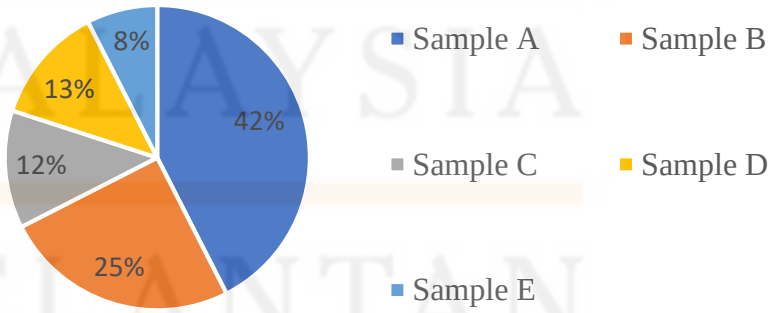

Figure 4.13 Liked sample colour of respondents

4.2.4 Background Knowledge on Food Ingredients

This part was asking about respondent background knowledge on food ingredients. Figure 4.14 show the percentage of familiarity to the food ingredient for respondents. The no familiarity to the ingredient are not chosen. As for yes or very familiar to the ingredient are chosen mostly.

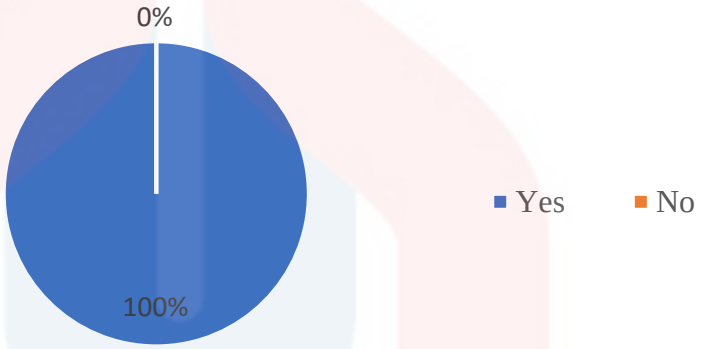

Figure 4.14 Familiarity to the food ingredient

Next, Figure 4.15 indicate the percentage of food ingredient uses for the respondents. The respondent choses the ingredient are uses as aroma. The lowest pick that are act as colour and others for the respondents.

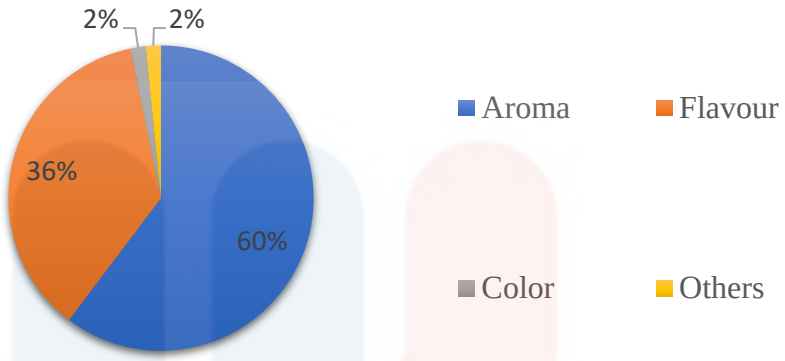

Figure 4.15 Lemongrass uses

Figure 4.16 give percentage of place can find the lemongrass. For the top most, chosen place to find the food ingredient is the supermarket. At lowest the night market is chosen to easily find the food ingredient.

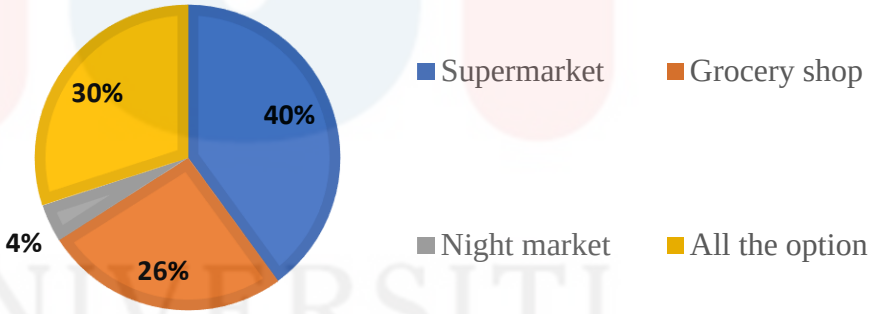

Figure 4.16 Place can find food ingredient.

The percentage can ingredient be replaced by another ingredient according to the respondents are indicate in Figure 4.17. The yes is the most chosen by the respondent for is there food ingredient can be replaced by another ingredient. As for the least chosen by respondent as no for the other ingredient that can replace the food ingredient sample.

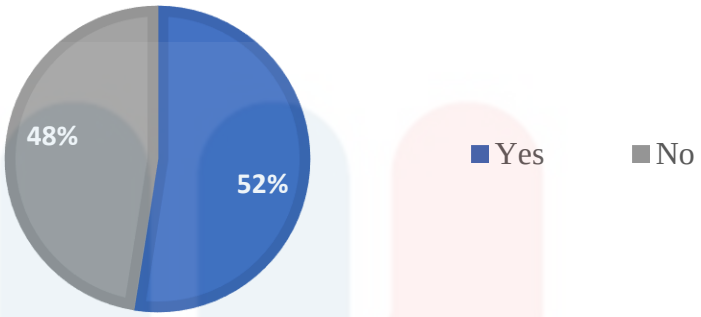

Figure 4.17 Ingredient be replaced by another ingredient

After that, Figure 4.18 give the percentage of stated ingredient by the respondents that can replace the food ingredient sample. The highest percentage at are not stated by the respondent. Both be the lowest stated ingredient are ‘coriander leaf’ and ‘herb’.

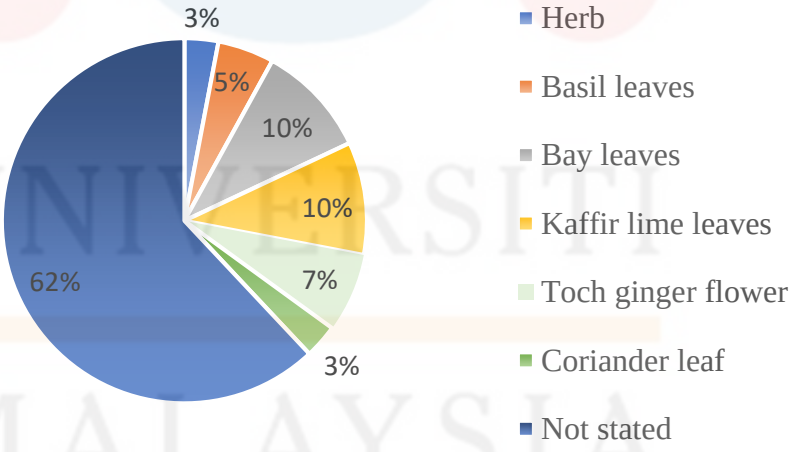

Figure 4.18 Stated ingredient by the respondents

4.2.5 Cooking Experience

In this part the respondent were ask about their cooking experience. Figure 4.19 show the percentage of cooking method for the food ingredient sample according to the respondents. The top pick of cooking method is boiling by the respondents. The low pick is Others the cooking method.

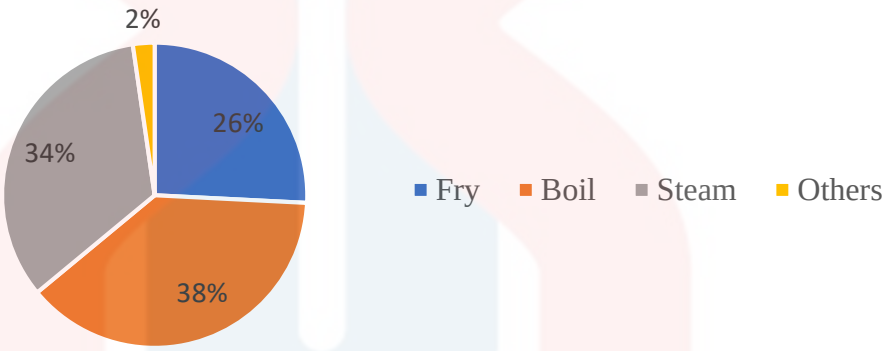

Figure 4.19 Cooking method for the food ingredient

Next, Figure 4.20 give the percentage of respondent have been using the food ingredients. The most chose is Yes for ever the respondent uses the food ingredients. At the lowest choose is No to have the respondents uses the food ingredients.

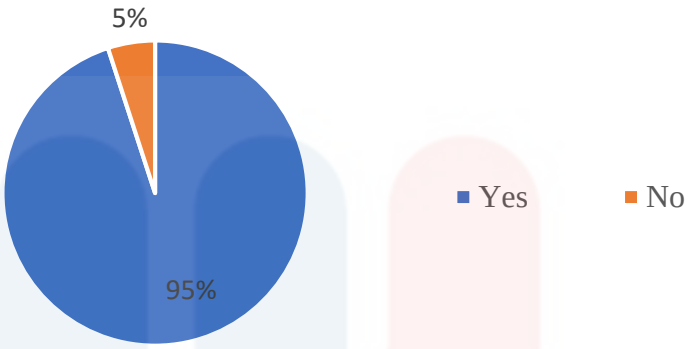

Figure 4.20 Respondent have been using the food ingredients

The stated dish can be made from the lemongrass were indicate in Figure 4.21. The most stated dish is Tomyam for the food ingredient. In lowest stated dish is Asam Pedas.

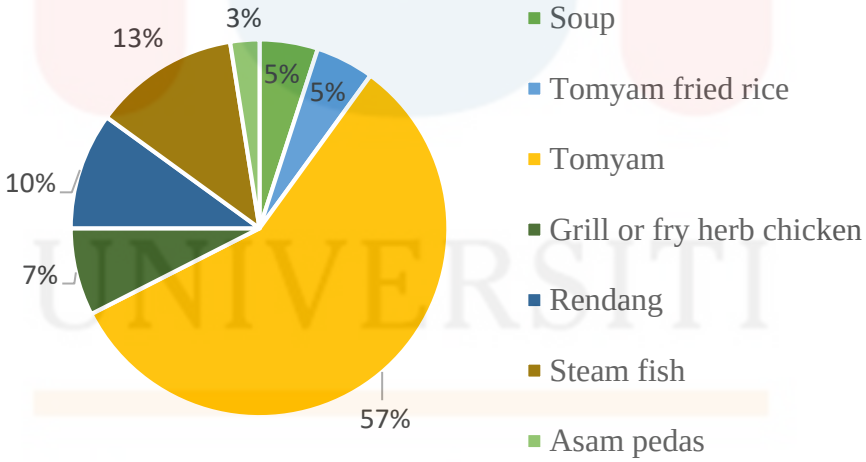

Figure 4.21 Dish can be made from the food ingredient

The percentage of how respondents handle the food ingredient were given in Figure 4.22. The highest pick is to used immediately after buying the food ingredients. On the other hand, least respondent chose to store in the fridge the food ingredient.

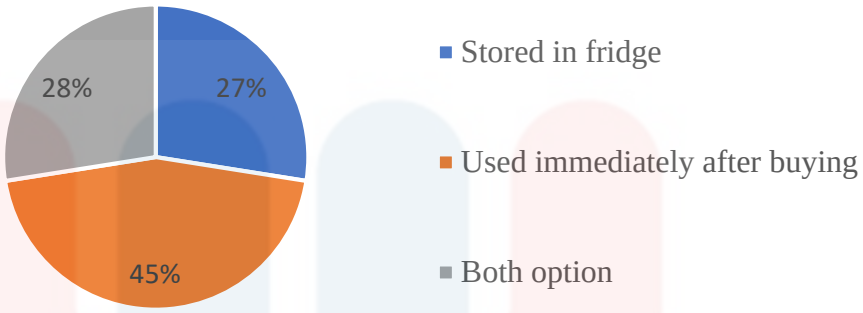

Figure 4.22 Respondents handle the food ingredient

4.2.6 Customer Preference

This part gives the respondent preference on purchases of the sample. Figure 4.23 show the percentage of willingness to buy the dried food ingredient in the market by the respondents. The yes response is the highest. The No respond is the lowest.

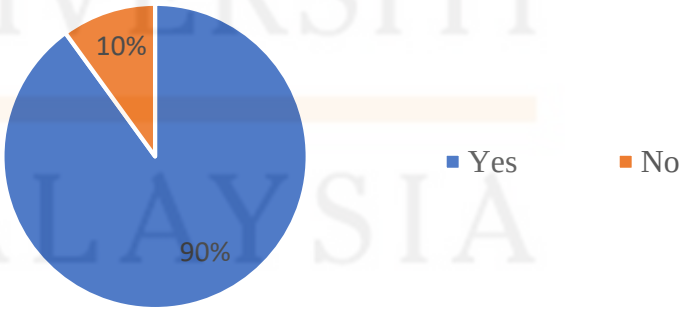

Figure 4.23 Willingness to buy the dried food ingredient

Next, Figure 4.24 indicate the percentage of if the dried sample have same aroma with the fresh sample, do respondents prefer to purchase it. The Yes answer get highest percentage from the respondents. The No answer is at the lowest from the respondents.

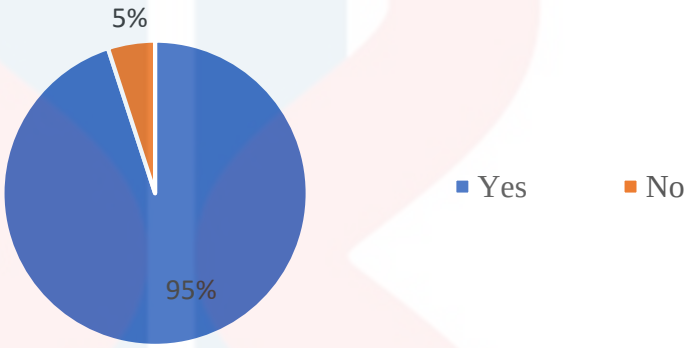

Figure 4.24 Willingness to buy the dried sample if have same aroma with the fresh sample

The percentage of willingness to purchase the food ingredient at higher price to keep it longer were given in Figure 4.25. The Yes response from the respondents at top. The No response from the respondent at lowest.

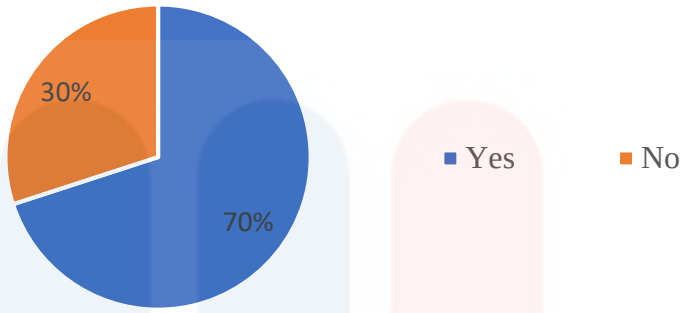

Figure 4.25 Willingness to buy the food ingredient at higher price at longer shelf life.

The percentage of packaging type that respondents suggest were indicated in Figure 4.26. The most suggested type of packaging is plastic. At the lowest suggested packaging is the paper box.

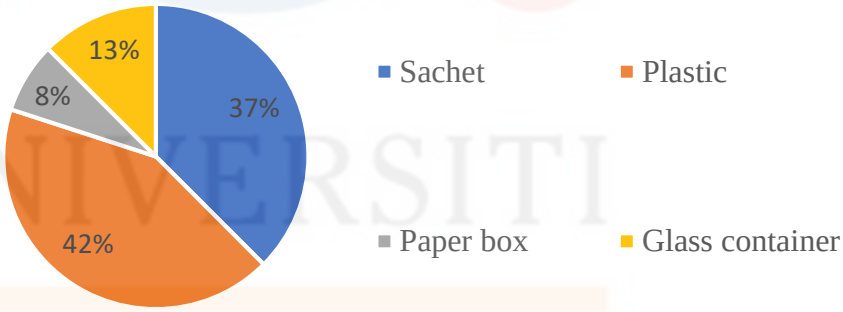

Figure 4.26 Type of packaging that respondent suggests

The overall preference percentage of the respondent to the sample were indicated in Figure 4.27. The preference says that they Liked very much the food ingredient sample are at the highest. At the bottom is the Neither like nor dislike of the food ingredient.

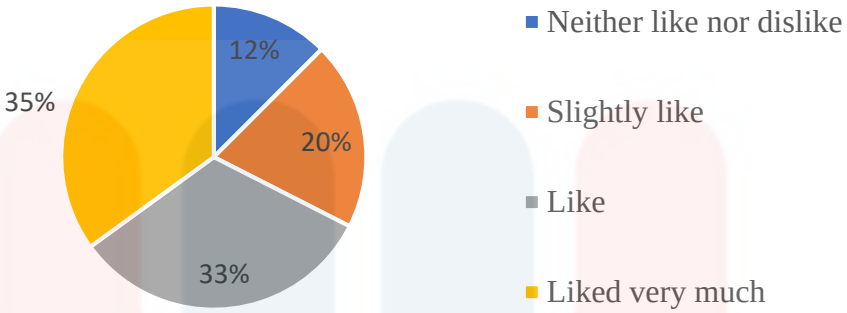

Figure 4.27 Overall preference of the respondent to the sample.

Every part of the questionnaire was crucial to answer the objective of the thesis in the whole point view according to the respondents as the consumer of the ingredient. The ingredient as in the dried lemongrass need to be favour by the consumer if it wants to stay in the market. The interaction between the part of the questionnaire were discuss in the chapter 5 of this thesis.

CHAPTER 5

DISCUSSION

6. 1 Preparation of The Dried Lemongrass

In the preparation of dried lemongrass *(C. citratus)*, the oven drying is used to evaporate all the moisture in the sample (Soliva, & Martín, 2003). Removal of the water will affect the physical property of the food and retard the growth of bacteria and prolong the shelf life of the lemongrass (Lonkarbr, Chavanbr, Pawarbr, & Amarowicz, 2013). Form the result, the highest percentage of water loss is at a temperature of 70°C while the lowest percentage of water loss is at a temperature of 40°C. Form this, it a certain that the rate loss of body mass is related to the use of the different temperature (Hitat et al., 2017).

Drying causes the colour of the fresh lemongrass to change drastically from light green to the colour that is recorded. Result show all the sample giving a different shade of yellow colour. The result indicates that oven drying with a temperature of 40°C,50°C,60°C and 70°C did not preserve the colour of the lemongrass.

6.2 Sensory Assessment Survey Analysis

The most important part of the build questionnaire is part B and part E as it is the sensory evaluation by the respondent and the consumer preferences toward the dried lemongrass product. On the other hand, every part of the questionnaire is also giving the knowledge about the respondents as the consumer of lemongrass.

Part A is the collection of demographical data among the respondent. This demographical data is important as to identify the target consumer for dried lemongrass (Stone, & Sidel, 2004). The question that is asked in this part is gender, age, race, residential area and the current job of the respondents. The total of the respondents is 80 people. As the lemongrass is the food ingredient the gender of the respondents that being kept at balance or the same amount. Most of the respondent in UMKKJ is in the age of 15-24 years old, stay in the city area and the student of UMK. As for the races of the respondents, the most races in UMK is Malay followed by Chinese and then Indian.

Part B is the sensory evaluation of the lemongrass sample. The part B(I) is for the dried sample of the lemongrass and the part B(II) is the water sample of dried lemongrass. Both of this part have the same question and the respondent must use their sensory organ like eye and nose to be able to answer the question (Stone, & Sidel, 2004).

The result of both parts is slightly different. For question on the strongest aroma both dried and water sample of dried lemongrass highest pick are sample B. Whereas, the lowest pick for the strongest aroma sample in dried lemongrass are sample C and the water sample of lemongrass lowest pick are sample D. Next, the highest pick on the closest aroma to sample A (fresh lemongrass) in both parts are sample B and the lowest pick in both parts are for sample D. Then, the chosen aroma that is liked the most in both

parts is sample B and the least chosen in this are sample D in both parts. After that, the most pick for colour preference in both parts is sample A, the fresh lemongrass. On the other hand, the least pick for colour preference for dried lemongrass sample is sample B and for the water sample of dried lemongrass is sample E. This slightly different result can be the cause of personal preference, knowledge and different presentation of the sample, the dried sample and water sample of the dried lemongrass (Stone, H., & Sidel, 2004).

Part C of the questionnaire is the background knowledge on lemongrass. As the sample that is evaluated by the respondent are not in the usual shape of lemongrass (a bulb and stem of lemongrass) the respondent is only guest the ingredient according to the aroma or smell of the dry ingredient. This is to avoid the bias judged between the sample. All of the respondents are familiar with the lemongrass. After that, the respondent chooses the purpose of the lemongrass is for giving the aroma and flavour to one product. Next, the most pick on the place that can easily find the lemongrass is at the supermarket. The respondent most chooses that lemongrass can be replaced by other food ingredient and the most stated ingredient are bay leaves and kafir lime leaves. The evidence in the result indicates that the respondent is knowledgeable and familiar to the lemongrass plant.

The part D design to know the respondents cooking experience with the lemongrass. The first question in this part is the cooking method to cook lemongrass. The respondent mostly chooses the method of boiling and steaming as the cooking method for lemongrass. Second, the respondent is asking did they ever use lemongrass before and the result given by most of the respondents have used lemongrass before in their cooking. The next question for the respondent is the dish that can be made from lemongrass and the most stated dish or cuisine are tomyam. Last of the question in this part is how do the respondent handle the lemongrass and the most pick are to use it immediately after buying

followed by stored in the fridge. From the result, clearly, the respondent has the cooking experience with the lemongrass and a consumer of lemongrass product.

The last part, part E give the information on the customer preference for the dried lemongrass. The respondent is willing to buy the dried lemongrass especially if the colour and the aroma of the dried lemongrass are the same as the fresh lemongrass. Also, the respondent is willing to get the lemongrass at a higher price if they can store it longer. The most suggested packaging from the respondent is plastic. Last but not least the overall preference percentage of the respondent to the dried lemongrass is liked very much.

With this, the temperature of 40°C is the most suitable temperature to dried the lemongrass as the aroma and colour of it is the most preferred among the respondent that are the consumer of the lemongrass product.

CHAPTER 6

Conclusion

6.1 Conclusion

The aims of this thesis are to identify the effect of the different drying temperature to the aroma and colour of dried lemongrass using the sensory evaluation and to identify the consumer acceptance toward the level of preference for lemongrass product. The result indicates that there is the effect of different temperature use in drying the lemongrass according to the respondent sensory analysis for the dried samples. The preference temperature for drying the dried lemongrass is at 40°C because it can maintain the aroma but not the colour of the lemongrass.

6.2 Recommendation

As for future recommendation, to study design the different method of producing the dried lemongrass with the same colour and aroma as the fresh. Furthermore, the method that are use can also maintain the phytochemicals component in the lemongrass tested using chromatography technic FTIR and another test that are suitable.

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APPENDICES

Appendix A

Table A: Average Weight of Dried Lemongrass

Lemongrass	Initial weight (g)	Final weight (g)		Water loss (g)
		Day 1	Day 2	
1	13.9	3.02	3.02	10.88
2	13.5	2.93	2.93	10.57
3	14.7	3.19	3.19	11.51
4	13.2	2.87	2.87	10.33
5	12.85	2.7	2.7	10.15
6	13.56	2.85	2.85	10.71
7	13.02	2.74	2.74	10.28
8	11.97	2.52	2.52	9.45
9	13.83	3.01	3.01	10.82
10	13.74	2.99	2.99	10.75
11	14.82	3.23	3.23	11.59
12	12.96	2.82	2.82	10.14
13	13.99	3.0	3.0	10.99
14	13.77	2.95	2.95	10.82
15	13.82	2.96	2.96	10.86
16	13.60	2.91	2.91	10.69

Appendix B

QUESTIONNAIRES ON MARKET ACCEPTANCE OF FOOD INGREDIENT

Good day! This survey is dedicated to improve the dried product as raw ingredient. Through this brief survey, your answers will be helpful in enhancing drying product and meeting market needs. Your response will only be used for survey purposes. Thank you very much for your time.

PART A: DEMOGRAPHIC

Instruction: Please (/) only one answer for each question

In this part, demographic data will be collected. The purpose of this section is to identify statistical characteristics of human populations such as gender, race and etc. which used specially to identify markets. The market that are involve here are dry ingredients.

1. Gender

   ☐ Male ☐ Female

2. Age

   ☐ 15 – 24 years ☐ 35 – 44 years

   ☐ 25 - 34 years ☐ 45 and above

3. Race

   ☐ Malay ☐ Indian

   ☐ Chinese ☐ Others:

4. Please state your residential area

   ☐ City ☐ Rural

5. What is your current job?

☐ Student

☐ Employee

☐ Others:

PART B (I): SENSORY EVALUATION

Instruction: Please (/) only one answer for each question

The aim of this section is to determine the food quality characteristics and analyse the **dried sample** with their senses and answer the question with multiple choices.

1. Which of the sample have the strongest aroma?

☐ Sample B ☐ Sample D

☐ Sample C ☐ Sample E

2. Which of the sample have the closest aroma to sample A?

☐ Sample B ☐ Sample D

☐ Sample C ☐ Sample E

3. Which aroma of the sample that you like the most?

Sample: _____

4. Which colour of the sample that you like the most?

Sample: _____

PART B (II): SENSORY EVALUATION

Instruction: Please (/) only one answer for each question

The aim of this section is to determine the food quality characteristics and analyse the **water sample** with their senses and answer the question with multiple choices.

1. Which of the sample have the strongest aroma?

   ☐ Sample B ☐ Sample D

   ☐ Sample C ☐ Sample E

2. Which of the sample have the closest aroma to sample A?

   ☐ Sample B ☐ Sample D

   ☐ Sample C ☐ Sample E

3. Which aroma of the sample that you like the most?

   Sample: _____

4. Which colour of the sample that you like the most?

   Sample: _____

PART C: BACKGROUND KNOWLEDGE ON FOOD INGREDIENTS

Instruction: You may (/) <u>more than one</u> answer for each question

For this section, the question will test the evaluator background knowledge of the food ingredients. The objective is to understand the evaluator idea on the food ingredients.

1. Do you familiar with this food ingredient?

   ☐ Yes ☐ No

2. What is purpose of the food ingredient?

   ☐ Act as aroma

   ☐ Act as flavor

   ☐ Act as color

   ☐ Others:

3. In your opinion, which place you can get the food ingredient easily?

   ☐ Supermarket

   ☐ Grocery shop

   ☐ Night market

4. In your opinion, does the food ingredient can be replaced with other ingredient in cooking?

   ☐ Yes ☐ No

   Please state: _____

PART D: COOKING EXPERIENCE

Instruction: You may (/) <u>more than one</u> answer for each question

The question in this part will focus on the cooking experience of the evaluator. Any cooking method like boiling, frying and etc. are the example of cooking experience.

1. What basic cooking method being used for the food ingredient?

☐ Fry ☐ Steam

☐ Boil ☐ Others: _____

2. Have you ever been using the food ingredient?

☐ Yes ☐ No

3. In your opinion, what kind of dish can be made from the food ingredient?

_____

4. Based on your experience, how do you handle the food ingredient?

☐ Stored in fridge ☐ Use immediately after buying

PART E: CUSTOMER PREFERENCE

Instruction: Please (/) only one answer for each question

The main purpose of this section is to identify evaluator expectations, likes, dislikes, motivations and inclinations that drive customer purchasing decisions. They complement customer needs in explaining customer behaviour that allow marketer to improve the product.

1. If this sample available in market, will you buy it?

☐ Yes ☐ No

2. If the dried sample have exactly the same aroma with the fresh sample, do you prefer to purchase?

☐ Yes ☐ No

3. Are you willing to purchase in higher price if the food ingredient able to be kept in longer time?

☐ Yes ☐ No

4. If this product exists in the market, which type of packaging do you suggest?

☐ Sachet ☐ Paper box

☐ Plastic ☐ Glass container

5. Overall, how much do you like or dislike this dried food ingredient sample?

(Dislike very much) (Neither like nor dislike) (like very much)

Appendix C

Table C: Statistical analysis for questionnaire of sensory analysis

Demographic

Gender

		frequency	percent	Valid percent	Cumulative percent
valid	Male	40	50.0	50.0	50.0
	Female	40	50.0	50.0	100.0
	Total	80	100.0	100.0	

Age

		frequency	percent	Valid percent	Cumulative percent
valid	15 - 24	46	57.5	57.5	57.5
	25 - 34	14	17.5	17.5	75.0
	35 - 44	10	12.5	12.5	87.5
	45 and above	10	12.5	12.5	100.0
	Total	80	100.0	100.0	

Race

		frequency	percent	Valid percent	Cumulative percent
valid	Malay	50	62.5	62.5	62.5
	Chinese	18	22.5	22.5	85.0
	Indian	12	15.0	15.0	100.0
	Others	0	0	0	100.0
	Total	80	100.0	100.0	

Please state your residential area

		frequency	percent	Valid percent	Cumulative percent
valid	City	58	72.5	72.5	72.5
	Rural	22	27.5	27.5	100.0
	Total	80	100.0	100.0	

What is your current job

		frequency	percent	Valid percent	Cumulative percent
valid	Student	46	57.5	57.5	57.5
	Worker	26	32.5	32.5	90.0
	Others	8	10	10	100.0
	Total	80	100.0	100.0	

Sensory Evaluation of Dried Sample

Which of the sample have the strongest aroma?

		frequency	percent	Valid percent	Cumulative percent
valid	Sample B	58	72.5	72.5	72.5
	Sample C	2	2.5	2.5	75.0
	Sample D	6	7.5	7.5	82.5
	Sample E	14	17.5	17.5	100.0
	Total	80	100.0	100.0	

Which of the sample have the closest aroma to sample A?

		frequency	percent	Valid percent	Cumulative percent
valid	Sample B	44	55.0	55.0	55.0
	Sample C	4	5.0	5.0	60.0
	Sample D	4	5.0	5.0	65.0
	Sample E	28	35.0	35.0	100.0
	Total	80	100.0	100.0	

Which aroma of the sample that you like the most?

		frequency	percent	Valid percent	Cumulative percent
valid	Sample A	30	37.5	37.5	37.5
	Sample B	38	47.5	47.5	85.0
	Sample C	2	2.5	2.5	87.5
	Sample D	2	2.5	2.5	90.0
	Sample E	8	10	10	100.0
	Total	80	100.0	100.0	

Which colour of the sample that you like the most?

		frequency	percent	Valid percent	Cumulative percent
valid	Sample A	44	55.0	55.0	55.0
	Sample B	2	2.5	2.5	57.5
	Sample C	12	15.0	15.0	72.5
	Sample D	4	5.0	5.0	77.5
	Sample E	18	22.5	22.5	100.0
	Total	80	100.0	100.0	

Sensory Evaluation of Water Sample

Which of the sample have the strongest aroma?

		frequency	percent	Valid percent	Cumulative percent
valid	Sample B	64	80.0	80.0	80.0
	Sample C	2	2.5	2.5	82.5
	Sample D	0	0.0	0.0	82.5
	Sample E	14	17.5	17.5	100.0
	Total	80	100.0	100.0	

Which of the sample have the closest aroma to sample A?

		frequency	percent	Valid percent	Cumulative percent
valid	Sample B	28	35.0	35.0	35.0
	Sample C	16	20.0	20.0	55.0
	Sample D	14	17.5	17.5	72.5
	Sample E	22	27.5	27.5	100.0
	Total	80	100.0	100.0	

Which aroma of the sample that you like the most?

		frequency	percent	Valid percent	Cumulative percent
valid	Sample A	18	22.5	22.5	22.5
	Sample B	34	42.5	42.5	65.0
	Sample C	10	12.5	12.5	77.5
	Sample D	8	10.0	10.0	87.5
	Sample E	10	12.5	12.5	100.0
	Total	80	100.0	100.0	

Which colour of the sample that you like the most?

		frequency	percent	Valid percent	Cumulative percent
valid	Sample A	34	42.5	42.5	42.5
	Sample B	20	25.0	25.0	67.5
	Sample C	10	12.5	12.5	80.0
	Sample D	10	12.5	12.5	92.5
	Sample E	6	7.5	7.5	100.0
	Total	80	100.0	100.0	

Background Knowledge on Food Ingredients

Do you familiar with this food ingredient?

		frequency	percent	Valid percent	Cumulative percent
valid	Yes	80	100.0	100.0	100.0
	No	0	0	0	100.0
	Total	80	100.0	100.0	

What is purpose of the food ingredient?

		frequency	percent	Valid percent	Cumulative percent
valid	Act as aroma	76	60.3	60.3	60.3
	Act as flavour	46	36.5	36.5	96.8
	Act as colour	2	1.6	1.6	98.4
	others	2	1.6	1.6	100.0
	Total	126	100.0	100.0	

In your opinion, which place you can get the food ingredient easily?

		frequency	percent	Valid percent	Cumulative percent
valid	Supermarket	40	40	40.0	40.0
	Grocery shop	26	26.0	26.0	66.0
	Night market	4	4.0	4.0	70.0
	All the option	30	30.0	30.0	100.0
	Total	100	100.0	100.0	

In your opinion, does the food ingredient can be replaced with other ingredient in cooking?

		frequency	percent	Valid percent	Cumulative percent
valid	Yes	42	52.5	52.5	52.5
	No	38	47.5	47.5	100.0
	Total	80	100.0	100.0	

If yes please state

		frequency	percent	Valid percent	Cumulative percent
given	herb	2	2.5	2.5	2.5
	Basil leaves	4	5.0	5.0	7.5
	Bay leaves	8	10.0	10.0	17.5
	Kaffir lime leaves	8	10.0	10.0	27.5
	Etlingera elatior (bunga kantan)	6	7.5	7.5	35.0
	Coriander leaves	2	2.5	2.5	37.5
	Not stated	50	62.5	62.5	100.0
	Total	80	100.0	100.0	

Cooking Experience

What basic cooking method being used for the food ingredient?

		frequency	percent	Valid percent	Cumulative percent
valid	Fry	46	25.8	25.8	25.8
	Boil	68	38.2	38.2	64.0
	Steam	60	33.7	33.7	97.7
	others	4	2.3	2.3	100.0
	Total	178	100.0	100.0	

Have you ever been using the food ingredient?

		frequency	percent	Valid percent	Cumulative percent
valid	Yes	76	95.0	95.0	95.0
	No	4	5.0	5.0	100.0
	Total	80	100.0	100.0	

In your opinion, what kind of dish can be made from the food ingredient?

		frequency	percent	Valid percent	Cumulative percent
given	soup	4	5.0	5.0	5.0
	Nasi goreng tomyam	4	5.0	5.0	10.0
	Tomyam	46	57.5	57.5	67.5
	Grill or fry herb chicken	6	7.5	7.5	75.0
	Rendang	8	10.0	10.0	85.0
	Steam fish	10	12.5	12.5	97.5
	Asam pedas	2	2.5	2.5	100.0
	Total	80	100.0	100.0	

Based on your experience, how do you handle the food ingredient?

		frequency	percent	Valid percent	Cumulative percent
valid	Stored in fridge	22	27.5	27.5	27.5
	Used immediately after buying	36	45.0	45.0	72.5
	Both option	22	27.5	27.5	100.0
	Total	80	100.0	100.0	

Customer Preference

If this sample available in market, will you buy it?

		frequency	percent	Valid percent	Cumulative percent
valid	Yes	72	90.0	90.0	90.0
	No	8	10.0	10.0	100.0
	Total	80	100.0	100.0	

If the dried sample have exactly the same aroma with the fresh sample, do you prefer to purchase?

		frequency	percent	Valid percent	Cumulative percent
valid	Yes	76	95.0	95.0	95.0
	No	4	5.0	5.0	100.0
	Total	80	100.0	100.0	

Are you willing to purchase in higher price if the food ingredient able to be kept in longer time?

		frequency	percent	Valid percent	Cumulative percent
valid	Yes	56	70.0	70.0	70.0
	No	24	30.0	30.0	100.0
	Total	80	100.0	100.0	

If this product exists in the market, which type of packaging do you suggest?

		frequency	percent	Valid percent	Cumulative percent
valid	Sachet	30	37.5	37.5	37.5
	Plastic	34	42.5	42.5	80.0
	Paper box	6	7.5	7.5	87.5
	Glass container	10	12.5	12.5	100.0
	Total	80	100.0	100.0	

Overall, how much do you like or dislike this food ingredient sample?

		frequency	percent	Valid percent	Cumulative percent
valid	dislike very much	0	0	0	0
	dislike	0	0	0	0
	slightly dislike	0	0	0	0
	neither like nor dislike	10	12.5	12.5	12.5
	slightly like	16	20.0	20.0	32.5
	like	26	32.5	32.5	65.0
	best	28	35.0	35.0	100.0
	Total	80	100.0	100.0	