Consumer Acceptance on Dried Torch Ginger Flower (*Etlingera elatior*) as Food Ingredient

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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 On The Effect Of Dried Torch Ginger Flower (*Etlingera elatior*) as Food Ingredient" by Syamim Binti Mohd Idris, matric number F15A0305 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,

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LIST OF ABBREVIATIONS

℃	Celsius
g	Gram
SPSS	Statistical Package for the Social Sciences,
mL	Milliliter
RM	Ringgit Malaysia
MC	Moisture Content
FAMA	Federal Agricultural Marketing Authority

Penerimaan Pengguna Pengeringan Terhadap Bunga Kantan Kering (*Etlingera elatior*) Sebagai Bahan Makanan

ABSTRAK

Bunga kantan, dikenali sebagai *Etlingera elatior* ialah spesis tumbuh-tumbuhan herba. Ia tergolong dalam keluarga Zingiberaceae seperti lengkuas dan kunyit. Selain itu, ia juga mempunyai warna yang berbeza seperti merah, merah jambu dan putih. Bunga kantan boleh didapati di seluruh Asia Tenggara tropika seperti Malaysia, Thailand, dan Filipina. Bunga kantan boleh dimakan, mempunyai rasa dan mengandungi aroma yang baik. Ia adalah satu daripada herba dan tumbuhan yang digunakan pada masa dahulu oleh komuniti di dalam masakan seperti assam pedas. Ia selalunya digunakan sebagai bahan tambahan untuk rasa, warna, dan aroma. Musim hujan adalah musim yang sesuai untuk bunga kantan membesar. Ini kerana, bunga kantan selalunya memerlukan keadaan yang lembab dan tidak terdedah kepada keadaan yang kering untuk jangka masa yang lama kerana jangka masa hayat untuk bunga kantan adalah pendek tanpa pengawetan. Pengeringan adalah satu cara yang terbaik yang mana boleh menambah jangka masa hayat. Suhu yang digunakan dalam proses pengeringan adalah 40°C, 50°C, 60°C and 70°C. Bunga kantan telah keringkan sampai mencapai berat yang sama. Keputusan menunjukkan suhu memberi kesan terhadap berat, kehilangan kelembapan, warna dan aroma bunga kantan. Penilaian deria telah dibuat untuk 80 orang responden untuk mencari tahu penerimaan bunga kantan kering sebagai bahan makanan.

Kata kunci: *Bunga kantan (Etlingera elatior), pengeringan, jangka hayat, kehilangan kelembapan, penerimaan pengguna*

Consumer Acceptance on Dried Torch Ginger Flower (*Etlingera elatior*) as Food Ingredient

ABSTRACT

Torch ginger flower, known as *Etlingera elatior* is a species of herbaceous perennial herbs plant. It belongs to the family of Zingiberaceae such as galangal, curcumin, and turmeric. Besides, it also has avdifferent color such as red, pink and white. Torch ginger flower can be found throughout tropical South East Asia such as Malaysia, Thailand, and Philippine. Torch ginger flower is edible, flavorful and contains good aroma. It is one of the herbs and plant is being used a long time ago by the community in the dishes such as in 'Assam laksa'. It usually uses as an addition in ingredient to give taste, color and also aroma. The rainy season is a suitable season for the torch ginger flower to be growth. This is due to the torch ginger flower is always required humid condition and cannot expose to dry condition for a long time, make it withered easily. On the other hand, torch ginger flower cannot expose to the room temperature for a long time because of the shelf life of torch ginger flower is short without preservation. Drying is one of the best ways which can extend the shelf life. The temperature used in the drying process is 40°C, 50°C, 60°C and 70°C. The torch ginger flowers were dried until reach the constant weight. The results show that the temperature influences the weight, moisture loss, color, and aroma of the dried torch ginger flower. Sensory evaluation is conducted for 80 respondents to find out the consumer acceptance of dried torch ginger as food ingredient.

Keywords: *Torch ginger flower (Etlingera elatior), drying, shelf life, moisture loss, consumer acceptance*

CHAPTER 1

INTRODUCTION

1.1 Research Background

Nowadays, there are many kinds of research about the benefit of torch ginger flower to the human body. Besides, torch ginger flower was contained important nutrition substances such as protein (12.6%), fat (18.2%), and fiber (17.6%) (Jeevani Osadee Wijekoon, Karimand, & Bhat, 2011). Thus, torch ginger flower is widely consumed by indigenous communities as a condiment, eaten raw or cooked as a vegetable and used for food flavoring (Luachan, Thongtan, & Sontag, 2017). The flower of torch ginger is produced in an interesting way. The inflorescence of torch ginger flower was protected by a series of bracts arise from the rhizome under the ground. Flower of torch ginger has long filaments which can grow up to 5-6 m tall. When the final weight has been attained, the outer protective bracts gradually open. This new age, the use of torch ginger flower is an important ingredient in dishes for the aroma, flavors, and taste. The excess of torch ginger flower from the dishes will be withered. This is because the shelf life of torch ginger flower is short. Thus, this makes to come up with new research to extend the shelf life of

torch ginger flower by using the drying process. Drying is preservation way which always uses to preservation. Drying is the oldest method of preserving food. Compared with other methods, drying is quite simple. The spoilage organisms inside the dried foods are due to the low level of moisture content.

Dried foods keep well because the moisture content is so low that spoilage organisms cannot grow (Afolabi, 2014). Moreover, drying food preservation has a few different ways which are using sun drying, freeze drying, hot air drying, infrared drying, oven, and others. One of the commonest methods is by using an oven drying method to identify the effect of drying on the torch ginger flower. Besides, there are four different temperatures which are 40°C, 50°C, 60°C and 70°C. In addition, drying also increases durability, packaging cost, decreases the weight of transport, enhance the taste of dry sample and maintain the nutrient values. The plant of torch ginger flower cut into pieces before undergoing a drying process. After that, the samples go through with sensory evaluation toward aroma. Sensory evaluation comprises a set of techniques for the accurate measurement of human responses to food and minimizes the potentially biasing effects consumer perception (Lawless & Heymann, 2010).

1.2 Problem Statement

Torch ginger flower is usually used in culinary, landscape and medicine. This is due to aromatic, flavor, and inflorescence properties of the torch ginger flower make it different from other plant. Typically, torch ginger flower has a short shelf life. Thus, this flower cannot be kept at room temperature for a long time. The torch ginger flower will dry up within not more than 2 days. Therefore, the drying process can increase the shelf life of torch ginger flower by removing the moisture content inside the torch ginger. Other than that, the availability of fresh torch ginger flower is limited. This is due to high demand from consumers. Hence, increasing the production of torch ginger flower and also produce dried torch ginger flower might fulfill consumers needed. This is because of the exceeding use of torch ginger flower after cooking might become wastage. Thus, when using dried torch ginger flower can reduce the wastage and it can be used for other time without buying a new one. Moreover, there is no research about the drying process of torch ginger flower before. Therefore, this research was conducted to study the drying process of torch ginger flower by using different temperatures towards the aroma of torch ginger flower. The different temperature use might affect the aroma of the dried torch ginger flower. New research has now indicated that increases in temperature also lead to a decrease in the production of dried sample (CNA'ANI et al., 2015).

1.3 Objectives

The objectives are:

1. to identify the effect of drying to the torch ginger by using different temperature toward the torch ginger aroma.
2. to determine acceptance of torch ginger product against a favorite level of consumer

1.4 Scope of Study

The study has been focused on the drying process of torch ginger which is use different temperature. The temperature uses are 40°C, 50°C, 60°C and 70°C. Moreover, the sensory evaluation test has been focused to determine the accepted level of the customer on the aroma and color of dry torch ginger flower by using different temperatures.

1.5 Significance of Study

There are some potential benefits that can be gained by society after the completion of this study. Firstly, this study was focusing on drying process can help inhibit the growth of microbes and enhance the shelf life of the torch ginger flower. Moreover, the drying process would not affect the aroma and flavor of torch ginger flower. It also can be used as an ingredient in the culinary. Moreover, the drying process can help in storage time. Increasing in shelf life can keep dried torch ginger flower in a long time and can be used for other time comparing to the fresh torch ginger flower can only be kept for a short time. The exceeding of fresh torch ginger after cooking might become wastage.

CHAPTER 2

LITERATURE REVIEW

2.1 Torch Ginger Flower

2.1.1 General Knowledge

Torch ginger flower (*Etlingera elatior*) is also known as 'bunga kantan' in Malaysia. Moreover, torch ginger flower is categorized as herbaceous perennial plant species which can be found in areas where temperature not lower than 10°C (50 F) at night. Therefore, it can be found mostly in Southeast Asia such as Malaysia, Philippine, and Indonesia. Next, torch Ginger flowers are the buds that grow at the end of tall, straight stalks ("Torch_Ginger_Flower_11169.php8," n.d.) and torch ginger flower normally grows up until 17 to 20 feet in high. Plant it where it is somewhat protected from the wind, which can snap the shoots of this tropical plant. Due to the large height, growing torch ginger in containers may not be feasible (Badgett, n.d.).

Ismail (2009), reported that torch ginger flower is one of the 30 popular herbs or ne industrial crop that has high demand in Malaysia and this flower is cultivated on Australia, Thailand, and Costa Rica for cut flower production (Yunus, Aziz, Kadir, & Rashid, 2012). To cultivate of torch ginger flower is not difficult but need some care to make sure the torch ginger flower can grow well. The torch ginger flower is mostly grows in any range of soil type. Moreover, the cultivated of torch ginger flower is suitable in semi shade in well drained to make sure the soil moisture consistently. But, potassium insufficiency is the main problem when growing torch ginger flower. In addition, potassium is needed for the correct uptake of water, which is needed for the optimum growth of this kind of plant ("Etlingera elatior - Torch Ginger | World of Flowering Plants," 2017.). The potassium is added to the soil before the growing of torch ginger by planted it into 30 cm deep.

2.1.1 Taxonomy and Nomenclature

Figure 2.1: Fresh torch ginger flower (JyhSeng Ong, n.d.)

Torch Ginger flowers are the buds that grow at the end of tall, straight stalks. Next, the flower of torch ginger known as *E. elaior* is herbs plant species. Torch ginger flower has been formerly classified in various other true ginger genera including Alpinia, Phaeomoria, and Nicolaia (Wong, Ren, & Terh, 2008). The genus is named after the German botanist Andreas Ernst Etlinger while the specific name elatior, in Latin, has the meaning of "taller" (Wong et al., 2008). Torch ginger flowers may reach 17 to 20 feet in height (Badgett, n.d.). Besides, the flower of torch ginger is belonging to Zingiberaceae which is the largest families in Zingiberales. Zingiberales contain eight families include Zingiberaceae with more than 1200 species. Next, torch ginger flower is the type of inflorescence and usually found in red, pink and white color. The pink color is a commonly found while the other two which is red and white variants are rare. When young, the shape and structure of the flower closely resemble a flaming torch and when in full bloom the petals are waxy and deep pink with paler margin (Badgett, n.d.). Torch ginger flower is an herbaceous clumping plant that can be propagated sexually (seeds) and asexually (rhizomes) (Choon & Ding, 2016). The torch ginger is widely used as culinary in South East Asia such as Malaysia, Thailand, Indonesia, and Philippine. It is an important ingredient as the flavoring in many Malay, Chinese, Indonesia and Thai dishes (Choon & Ding, 2016).

2.1.3 Benefit of Torch Ginger Flower

There are many benefits of torch ginger flower to the human body. The petal of torch ginger flower was used by the community of Jawa Barat, Indonesia as an enhancer in food taste (Farida & Maruzy, 2016). The young flowering shoot (bud) of the torch ginger is an important ingredient for the 'rojak' and 'laksa', which are quintessential dishes of Malaysia and Singapore (Louisa, 2015.). On the other hand, the leaf of the torch ginger can also be added with other aromatic plants and can act as a remover of body smell. Leaves of torch ginger flower contain high antioxidant, antibacterial, and tyrosinase inhibition activity. In the traditional way, torch ginger flower can also heal wound and can cure ear disease because of their nutritious content. Next, in other country such as Australia use torch ginger flower as a landscape and ornamental to their garden and also placed at urban area.

2.1.4 Economic Value of Torch Ginger Flower

Economic value for torch ginger flower is expensive in price. This is because of the low percentage of community in Malaysia was not planted the torch ginger flower by themselves. They prefer to buy torch ginger flower at a supermarket. Due to high demand from consumer and a small amount of torch ginger production make it expensive. According to the Federal Agricultural Marketing Authority, the latest new price report pricing daily commodity retail center for 2018 was recorded. It shows the price is high in

Sabah which is RM 2.60 for one stalk of torch ginger flower and Selangor and Johor was share the same price which is RM1.00 per stalk of torch ginger flower. The value of economic will be high when production of a product is made from torch ginger flower. There is no official product that produces from torch ginger flower. Mostly these flowers were used as a culinary. In its native Thailand, Malaysia, Singapore, and Indonesia, the bud is thinly sliced or shredded, becoming a spice in many salads, sauces and dips including seafood stews. In the western country, torch ginger flower used as landscape and cut flower

2.2 Uses of Torch Ginger Flower

2.2.1 Cooking

Torch ginger flower is important in culinary purpose. Some of the countries in Southeast Asia use torch ginger flower as an important ingredient in dishes. Moreover, every country has their own style in making a food followed by their taste. It also acts as an aromatic plant in culinary dishes that give good aroma to the dishes and appealing appetite to anyone who gets a sniffing on it. In Malaysia, torch ginger flower or also called as 'Bunga Kantan' is used in making a dishes like 'asam laksa', 'asam pedas', 'nasi ulam', 'nasi kerabu', and other numerous 'kerabu' salad. In Sarawak, the 'Kelabits' cook with the inner buds of the opened blossom, using it as a vegetable in stir-fries (Julie Wong, 2018).

Furthermore, in southern Thailand it's served with 'nam prik' sauce as part of a raw salad (ulam) and spices up 'khao' jam, a rice salad that shares similar roots with the

Malaysian ‘nasi kerabu’. Moreover, in Indonesia, it’s used as an aromatic and vegetable. ‘Kecombrang’ finds its way into various salads like ‘urap’ and ‘pecel’. In Bali, ‘kecombrang’ adds punch to the basic sambal matah dip, the relish at every meal. In Jakarta, it animates the street food, ‘rujak’. In Singapore, it is called “rojak flower” for the same reason (Julie Wong, 2018).

2.2.2 Cosmetic

Cosmetic is normally used intended to restore or improve a person’s appearance. Thus, cosmetic is usually content some natural substances to act in improving skin or appearance. Torch ginger flower is one of the billion herbs can be used in cosmetic because of torch ginger flower contain some substance that can act to improve skin. Moreover, torch ginger flower rich in antioxidant substances such as Chlorogenic acids, Quercetin, Isoquercitrin, Catechin, Flavonoids, terpenoids Saponin and Tannins (Kilham, n.d.). In cosmetic, torch ginger flower can act as radiant skin enhancement because it contains antioxidant, antibacterial and antityrosinase activity. Next, hydrohglycolic extract from inflorescence *E. elatior* can use in beauty application that functioning for whitening and anti-aging effect (Nithitanakool & Teeranachaideekul, 2011). In addition, the rhizome and inflorescence of torch ginger flower are used as a natural ingredient in cosmetics such as soap, shampoo, and perfume (Voon, Bhat, & Rusul, 2012).

2.2.3 Pharmaceutical

Torch ginger flower also is known as ‘kecombrang’ or ‘honje’ in Indonesia act as traditional medicine. Moreover, mostly part of torch ginger flowers such as rhizomes, stems, leaves, fruits, and flower often use in their daily life. The other research indicates that torch ginger has a wide range of pharmacological activity as an antioxidant, antibacterial, anticancer, larviciding and repellent (Farida & Maruzy, 2016). Furthermore, the essential oil of torch ginger flower is used as the therapeutic agent for treating sore throats, sea and travel sickness, and relieves cramps and rheumatic pains (Choon & Ding, 2016). In addition, inflorescence bud extract has been reported to inhibit Colletotrichum gloeosporioides mycelial growth, and it has the potential use as an antifungal agent to control anthracnose diseases (Punnawich, Y., Montree, L., Warin, L., Walailak Univ., 2009). Furthermore, the extraction leaf of torch ginger flower can against the Gram-positive bacteria. In addition, a traditional Southeast Asian belief is that that a daily intake of raw ginger inflorescence can reduce diabetes and hypertension (“Heavenly Fragrance and Think Simple: Ginger flower ~ Bunga Kantan,” n.d.). Apart from that, women eat it together with the ginger’s bitter leaves to relieve postpartum flatulence (“Heavenly Fragrance and Think Simple: Ginger flower ~ Bunga Kantan,” n.d.).

2.2.4 Landscape and Ornamental

Other than culinary, cosmetic and pharmaceutical, torch ginger flower also popular to be planted as ornamental and landscape in the certain country. This is due to the physical appearance of torch ginger flower which is has a snowy inflorescence and bright color make it suitable to be used as a cut flower at the garden or urban area. Apart from that, they also have colorful flower make it attractive. Moreover, other reasons those make torch ginger flower used as landscape is because of the aromatic criteria which has inside the flower make it more fascinating. In addition, in Australia, Brazil, Hong Kong, Thailand and the United States of America, torch ginger has been used in floral arrangements (Choon & Ding, 2016). The used of torch ginger flower as a cut flower in Malaysia is rarely happen. There are only a small number of florists using the cut inflorescence as bouquet fillers (Choon, Ding, Mahmud, & Shaari, 2016).

2.3 Food Ingredient

2.3.1 General Knowledge

A food ingredient is any substance that is added to a food to achieve the desired effect ("What are Food Ingredients? - Food Ingredient Facts," n.d.). Moreover, food ingredient such as food additives is mostly added into a food to increase appetite and functioning purpose during processing or storage. Next, there are natural and botanical food

ingredients that can be owned easily by buying or plant it yourself. There are herbaceous and spices that also categorize as food ingredients that give flavor, aroma, and colour to the food. For example, torch ginger, ginger, lemonade, curry leaves and others. However, the used natural and botanical food ingredient give positive effect to body health and sometimes can cure some disease.

2.3.2 Types of Food Ingredient

There are a few types of food ingredients that commonly used in a cooking process. Firstly, a preservative is to prevent food spoilage from bacteria and fungi. The preservative is usually used in fruit sauce and jellies. For example of preservatives is ascorbic acid. Next, sweeteners act to add sweetness to the food, for example, sucrose (sugar). The sweeteners are commonly added inside beverage and baked goods. Moreover, color additives is one of food ingredient used to the product that has offset color loss due to exposure to light, air, temperature extremes, moisture and storage conditions ("U S Food and Drug Administration Home Page," n.d.). Furthermore, flavor enhancement is a food ingredient that naturally presents in food without providing their own separate flavor, for example, monosodium glutamate (MSG).

Other than that, a nutrient also become one of the food ingredients which acts as replacing vitamins and minerals lost in processing, for example, added in flour, bread and, cereals. Next, an emulsifier is functioning to allow smooth mixing of ingredients and prevent separation. The emulsifier is always used in peanut butter and chocolate. Flavor

and spices are categorized as food ingredients that act as specific flavor which is natural and synthetics. For example natural flavoring, artificial flavor, and spices ("U S Food and Drug Administration Home Page," n.d.). In addition, torch ginger flower is one of the food ingredients that categorized under flavor and spice that act as specific flavour which is natural and synthetics. Torch ginger is most important and main ingredient in cooking process such as 'Laksa' and 'Asam pedas'. Moreover, torch ginger also contain good nutrient to become healthy body to who are consume it.

2.3.3 Function of Food Ingredient

Food ingredients provide convenience and allow food makers to produce a wide variety of foods that are safe, appetizing, uniform, nutritious and tasty. They are used in very small quantities but contribute significantly to our vast and varied food supply to ensuring that the foods look, taste and feel the way we have come to expect. Moreover, food ingredients are used for a variety of reasons such as to support nutrient delivery. Vitamins and minerals (and fiber) are added to many foods to make up for those lacking in a person's diet or lost in processing or to enhance the nutritional quality of a food ("U S Food and Drug Administration Home Page," n.d.). Next, improve taste, texture, and appearance such as spices and natural ingredient added to enhance taste of the food

2.5 Consumer Acceptance

2.5.1 Introduction

Sensory evaluation is a scientific discipline that applies principles of experimental design and statistical analysis to the use of human senses such as sight, smell, taste, touch, and hearing for the purpose of evaluating consumer products. Moreover, visual interest becomes key in consumer acceptance. The texture of a food also plays into how it is perceived. In addition, sensory testing is a way to dissect and evaluate all of the factors that can contribute to food product success or failure. The sensory analysis utilizes panels of individuals who are selected to sample foods under controlled conditions. There are specific methods used in offering food samples to testers to ensure an unbiased evaluation and then the results are statistically analyzed (Brenda , 2011).

2.5.2 Method of Consumer Acceptance

Sensory evaluation has two types which are preference tests and discrimination tests. Preference test is supplied information about people's likes and dislikes of a product. Next, preference test is not intended to evaluate specific characteristics, such as crunchiness or smoothness. They are subjective tests and include pair comparison, hedonic and scoring. The hedonic scale is also known as degree-of-liking scale, is the most common hedonic scale for measuring product liking by consumers. Besides, scoring tests is samples are

scored on a scale, between like and dislike. Moreover, discrimination test also types of sensory evaluation. Discrimination test aims to evaluate specific attributes such as a characteristic of the product like crunchiness. Other than that, discrimination test is objective tests and include pair comparison.

CHAPTER 3

MATERIAL AND METHOD

3.1 Material

3.1.1 Torch Ginger Flower Sample

Fresh torch ginger flowers were obtained from the market at Jeli, Kelantan.

3.1.2 Equipment

The tools used in this experiment included aluminum, airtight container, weighing scale (Sartorius – BSA42025 – CW), Bunsen burner, tripod, gauze, and oven drying.

3.2 Method

3.2.1 Preparation of Dried Torch Ginger Flower

Fresh torch ginger flower was obtained. After that, clean and wash properly to avoid soil and dust. Next, the fresh ginger flowers were cut by using a knife into small pieces. The measurement was around 3-5 cm. Before that, the oven was preheated into the lowest temperature setting (40°C). While waiting the oven preheated, fresh torch ginger was weight and the data was recorded. Placed the fresh torch ginger on the aluminum and placed in the oven drying. The sample was left for a day. Moreover, the dried sample of torch ginger flower was weight and the data was recorded. The data was recorded until it became a constant weight. Keep the sample of dried torch ginger flowers in the airtight container and label as B. After that, repeat the same steps and label with C, D, and E.

Moreover, one stalk of torch ginger flower was dried to know the weight of preserving of torch ginger flower used in making a dish such as 'Laksa'. The weight was recorded until the weight is constant. This has prepared is to use for water sample containing dried torch ginger flower (Sensory survey).

3.2.2 Sensory Analysis

3.2.2.1 Fresh Sample Preparation

Some of the stalks of torch ginger flower were prepared. Next, the torch ginger flowers were washed cleanly. Moreover, the flower buds of torch ginger were separated from its stalk. After that, the two outer layers of torch ginger flower bud were removed and then the buds were cut into half lengthways. Furthermore, the fresh torch ginger flowers were placed in the airtight container with the labeling as sample A.

3.2.2.2 Dried Sample Preparation

The constant weight of dried torch ginger flower was placed inside an airtight container with labeled as sample B, C, D, and E.

3.2.2.3 Water Sample Containing Dried Torch Ginger

In preparation of the sample, 100 mL of distilled water was boiling in the 250 mL beaker. The temperature was checked with a thermometer until reached the boiling temperature. Placed dry 4.0 g (preserving) of sample a (fresh) of torch ginger flower inside the sachet (Figure 3.1) and placed it into boil water. Placed it for 3 minutes and placed in

the airtight container. The same steps were repeated and placed into the airtight container and label with B, C, D, and E.

Figure 3.1: The dried torch ginger flower in the sachet

3.2.2.4 Sensory Survey

80 respondents were required to answer the questionnaire. The questionnaires were divided into five parts which part A is questioning about dried torch ginger flower. Moreover, part B was about water sample containing dried torch ginger flower and part C was included background knowledge on food ingredient (torch ginger flower). In addition, part D was about the cooking experience of the respondents. Part E was about customer preference to improve the product.

3.2.2.5 Data Analysis

The data analysis use is the Statistical Package for the Social Sciences (SPSS). SPSS is software which to gather all the data from sensory survey and constructed a pie chart from the data. Moreover, water loss is calculated by using equation 1:

$$\boldsymbol{mc} = \frac{\boldsymbol{Initial\ weight - Oven\ dry\ weight}}{\boldsymbol{Oven\ dry\ weight}} \times \mathbf{100} \qquad \text{(Equation 1)}$$

CHAPTER 4

RESULTS

Table 4.1 shows the temperature use effect the final weight, days to be drying and percentage of moisture content. Temperature use is 40°C, 50°C, 60°C, and 70°C. The longest period of time used is 5 days at 40°C to be dried and the shortest period of time used is 2 days at 70°C to be dried. The percentage of moisture content produce for 40°C is 65.42% while for 70°C produce 88.49%.

Table 4.1: Initial weight, final weight, total and percentage of moisture content of dried torch ginger flower

Temperature (°C)	**Initial weight (g)**	**Final weight (g)**						**Day**	**Moisture content (g)**	**Moisture content (%)**
		1st	2nd	3rd	4th	5th	6th			
40	34.85	21.09	19.88	13.05	12.73	12.05	12.05	5	22.80	65.42
50	55.34	7.63	6.84	6.71	6.67	6.67	-	4	48.67	87.95
60	58.69	35.96	7.62	7.52	7.52	-	-	3	51.17	87.19
70	57.45	6.61	6.61	-	-	-	-	2	50.84	88.49

Table 4.2 shows the color of dried torch ginger flower. Temperature at 40°C and 50°C slightly affect the color comparing to fresh which is pink color. Moreover, temperature at 60°C and 70°C affect the torch ginger flower to be pinkish brown which is more darkness.

Table 4.2: The color of dried torch ginger flower

Sample A (Fresh torch ginger flower)	Sample B (40°C)	Sample C (50°C)	Sample D (60°C)	Sample E (70°C)
	Pink	Pink	Pinkish brown	Pinkish brown
				

Table 4.3 shows the amount of dried torch ginger flower per-serving. The sample per-serving is required 4 days to completely dried. The dried torch ginger flower for per-serving is 4.0 g

Table 4.3: The amount of dried torch ginger flower per-serving

Sample	**Initial weight (g)**	**Final weight (g)**			
		1st	2nd	3rd	4th
Fresh torch ginger flower	50.77	7.85	6.34	4.0	4.0

4.3 Sensory Analysis

4.3.1 Part A: Demographic

Figure 4.1 shows the percentage of respondent's gender in University Malaysia Kelantan (UMK), Kampus Jeli. The highest percentage is a female with 78% followed by a male is 22%

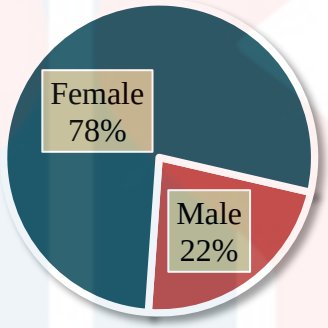

Figure 4.1: The gender of respondents

Figure 4.2 shows the race ranged from 71% to 1%. The percentages indicated Malay is 71% which is the highest followed by Chinese (18%), Indian (10%) and other (1%).

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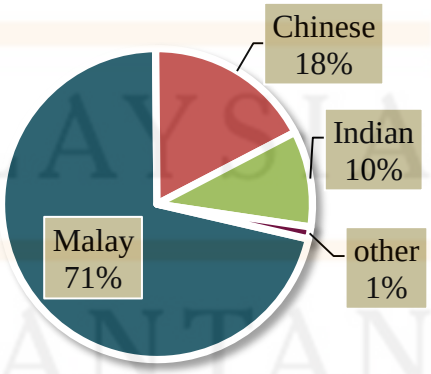

Figure 4.2: The race of respondents

Figure 4.3 shows the percentage of the respondent's age among students and staff UMK, Kampus Jeli. The percentage of age ranged from 15 to 24 years is 75% followed by 25 to 34 years (16%), 35 to 44 years (6%) and 45 to above (3%).

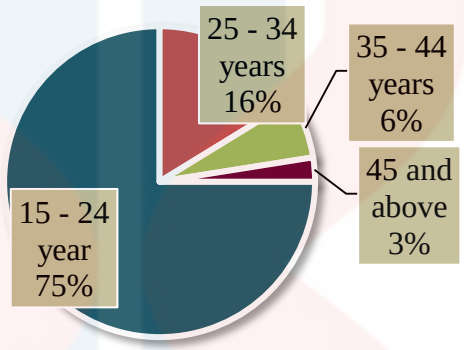

Figure 4.3: The age of respondent

Figure 4.4 shows the residential area of respondents. The rural area has the highest percentages which is 60% followed by city area, 40%.

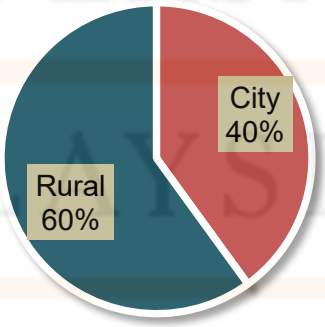

Figure 4.4: The residential area of respondents

Figure 4.5 shows the percentages of the respondent's current job. The students which have the highest percentage are 80% followed by worker is 20%.

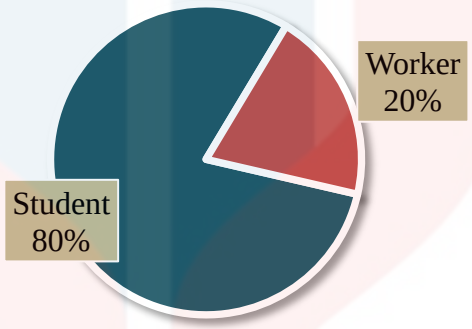

Figure 4.5: The current job of respondents

4.3.2 Part B (I): Sensory Evaluation (Dried Sample)

Figure 4.6 shows the percentage of the sample have the strongest aroma. The aroma indicates with sample E has 42% selected by respondents followed by sample D (24%), sample B (20%), and sample C (14%).

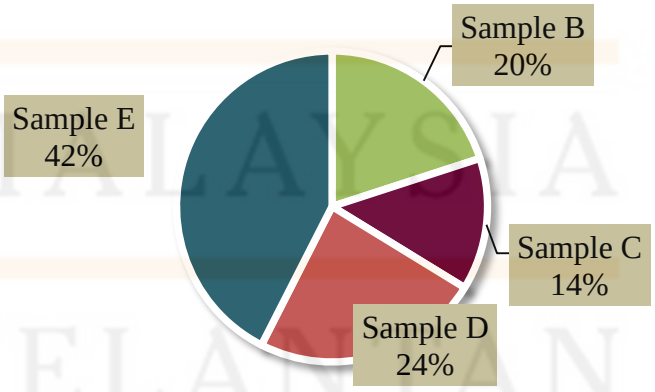

Figure 4.6: The samples have the strongest aroma

Figure 4.7 shows the percentage of the sample has the closest aroma to sample A (fresh). The sample B is 32% has been selected followed sample C (26%), sample D and sample E share the same percentage which are 21%

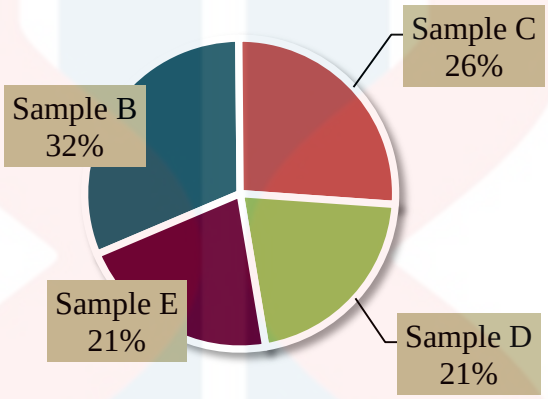

Figure 4.7: The samples have the closest aroma to sample A (fresh)

Figure 4.8 shows the aroma of the sample that respondents like the most. The percentage of sample E has the highest value which is 43% followed by sample B (29%), sample D (16%) and sample C (12%).

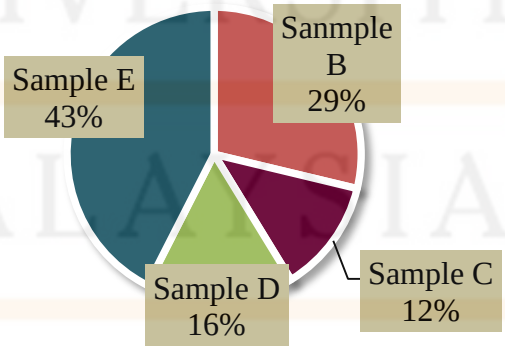

Figure 4.8: The aroma of the sample like the most

Figure 4.9 shows the color of the sample that respondent like the most. The highest percentages is sample D which is 31% followed by sample B (26%), sample C (24%), and sample E (19%)

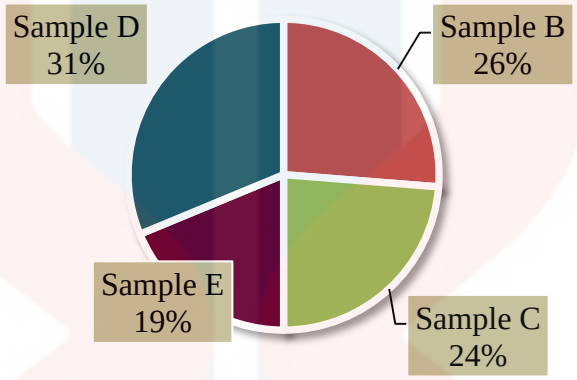

Figure 4.9: The color of the sample that like the most

Figure 4.10 shows the percentages of the samples have the strongest aroma selected by respondents. The percentage of sample E is the highest selected which is 45% followed by sample B (29%), sample C (16%), and sample D (10%).

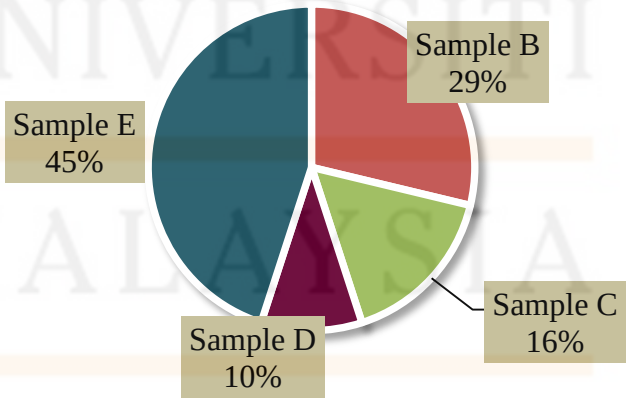

Figure 4.10: The samples have the strongest aroma

Figure 4.11 shows the percentage of the sample have the closest aroma to sample A (fresh). Sample B has the highest percentages which is 48% followed by sample C (26%), sample D (16%), and sample E (10%).

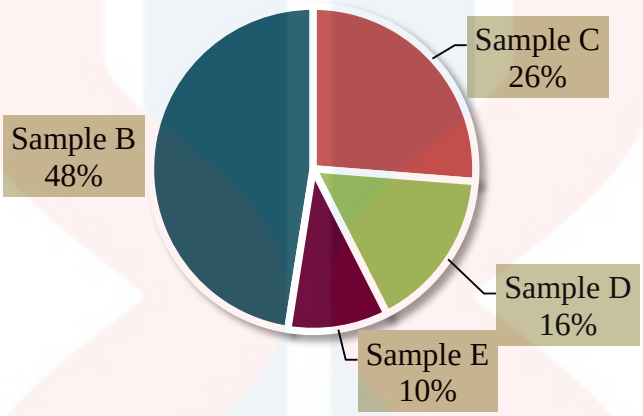

Figure 4.11: The samples have the closest aroma to sample A (fresh)

Figure 4.12 shows the percentage of the aroma of the sample like the most by respondents. The sample B has the highest percentage with 42% followed sample D (29%), sample C (20%) and sample E (9%).

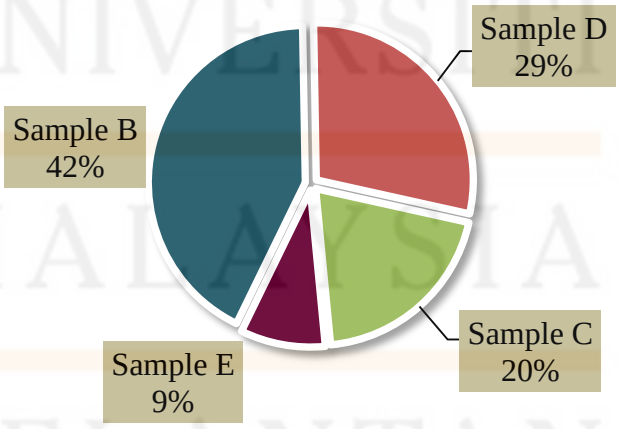

Figure 4.12: The aroma of the sample like the most

Figure 4.13 shows the percentage color of samples like the most by respondents. The highest percentages selected by respondents is sample C followed by sample D (26%), sample E and sample B share the same percentage which is 10%

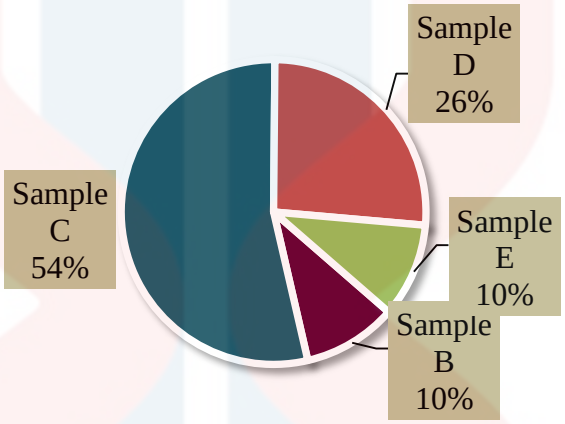

Figure 4.13: The color of the sample like the most

4.3.4 Part C: Background Knowledge of Dried Food Ingredient

Figure 4.14 shows the percentages of familiarity respondents with the food ingredients. The 'yes' answer is the highest selected by respondents with 94%. Besides, for 'no' answer is 6% selected by respondents.

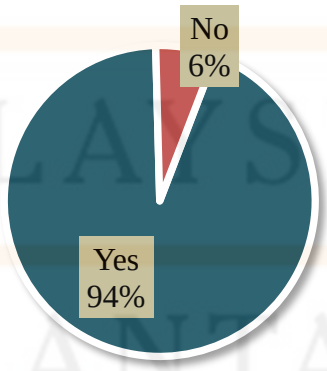

Figure 4.14: The familiar with food ingredient

Figure 4.15, 4.16, and 4.17 shows the purpose of the food ingredients. The purpose divided into three functions which is act as aroma, flavor, and color. The aroma is mostly selecting 'yes' answer with 96% while 4% for 'no' answer (Figure 4.15). Moreover, the purpose indicated with flavor is mostly answered 'yes' with 94% while 'no' answer has 6% (Figure 4.16). In addition, for the purpose indicated with color 'no' answer has the highest percentage with 81% and 'yes' answer has 19% (Figure 4.17).

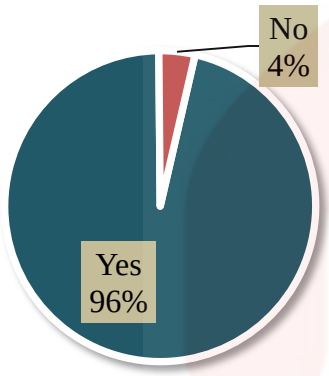

Figure 4.15: The aroma as the purpose of the food ingredient

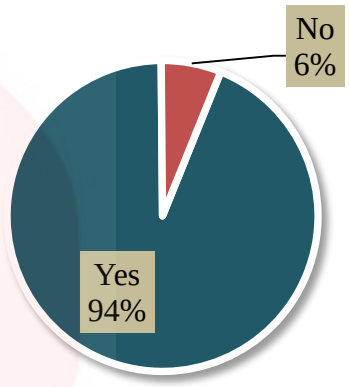

Figure 4.16: The flavour as the purpose of the food ingredient

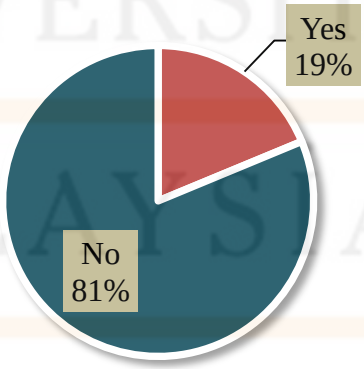

Figure 4.17: The color as the purpose of the food ingredient

Figure 4.18, 4.19, and 4.20 shows the place respondents can get the food ingredient easily. The place is divided into three kinds of place which usually can find food ingredient. Firstly, the supermarket is highly select 'yes' answer with 91% while 'no' answer is 9% (Figure 4.18). Next, the figure shows the percentage of night market has been selected. The highest percentage is going to 'yes' answer with 67% followed by 'no' answer is 33% (Figure 4.19). Last but not least, the grocery shop is mostly select 'yes' answer with 89% while 'no' answer is 11% (Figure 4.20)

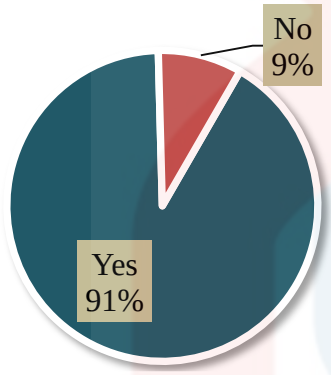

Figure 4.18: The supermarket as the place can get the food ingredient easily

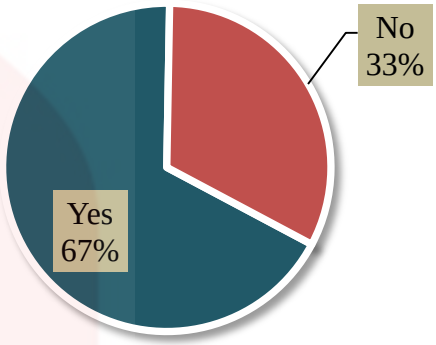

Figure 4.19: The night market as the place can get the food ingredient easily

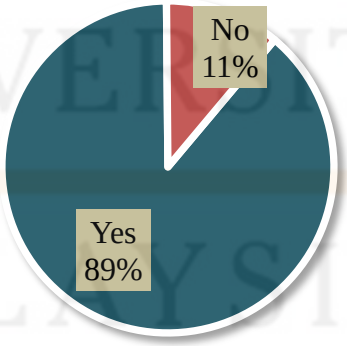

Figure 4.20: The grocery shop as the place can get the food ingredient easily

Figure 4.21 shows the percentage of respondents who selected food ingredient either can be replaced with other ingredients. The highest answer is 'yes' with 99% while 1% is 'no' answer. Next, the respondent who selected star fruit as a food ingredient to be replaced is 100% (Figure 4.22).

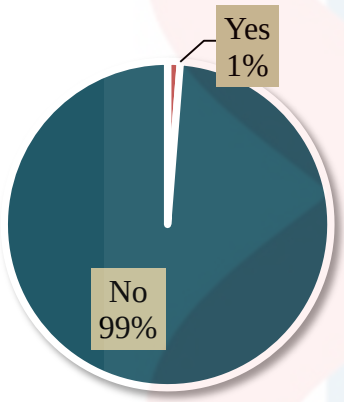

Figure 4.21: The food ingredient that can be replaced by other ingredients

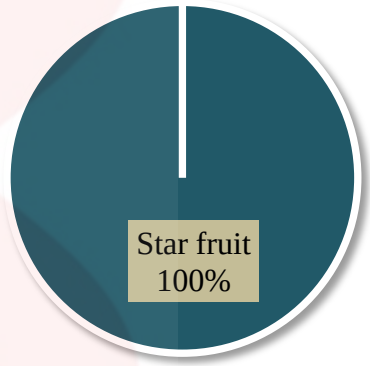

Figure 4.22: The star fruit has been selected

4.3.5 Part D: Cooking Experience

The figure 4.23, 4.24, and 4.25 shows the method being used for the food ingredient. The common method used is fry, boil, and steam. The frying method being used by respondents is 40% as 'yes' answer while 'no' answer is 60% (Figure 4.23). Next, the figure 4.24 shows boil has been selected, 100% have been chosen 'yes' answer by

respondents. Moreover, the method indicated with steam has been chosen ‘no’ answer with 91% while ‘yes’ answer is 9% (figure 4.25)

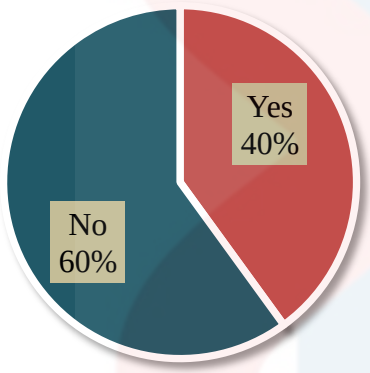

Figure 4.23: The fry method being used for the food ingredient

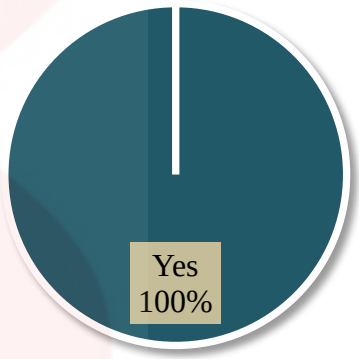

Figure 4.24: The boil method being used for the food ingredient

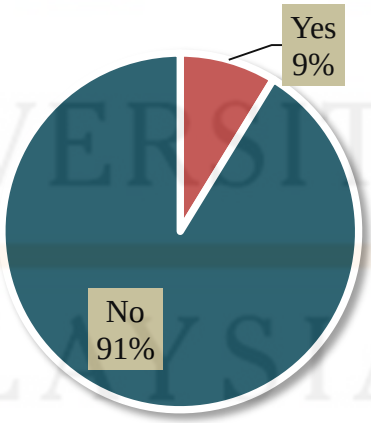

Figure 4.25: The steam method being used for the food ingredient

Figure 4.26 shows the experience of respondents in using food ingredient. The percentage is mostly answered ‘yes’ with 84% while 16% with ‘no’ as an answer.

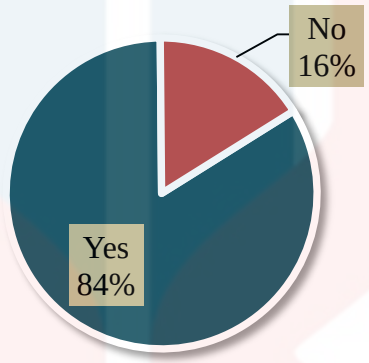

Figure 4.26: The experience used food ingredient

Figure 4.27 shows the type of dish can be made from food ingredient. The dishes have been selected by among respondent are included ‘Laksa’, ‘Asam pedas’, ‘Nasi kerabu’ and Mix vegetable (salad). Next, the dish indicated with ‘Laksa’ is 66% which is the highest value has been selected followed by ‘Asam pedas’ with 19%, ‘Nasi kerabu’ (14% and mix vegetable (salad) is 1%.

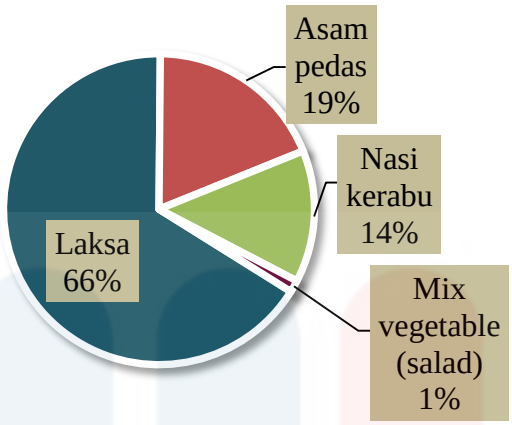

Figure 4.27: The type of dishes

Figure 4.28 shows the ways to handle food ingredient. This method is usually based on the experience by the respondents. The percentage of use immediately after buying is 59% followed by stored in a fridge is 41%.

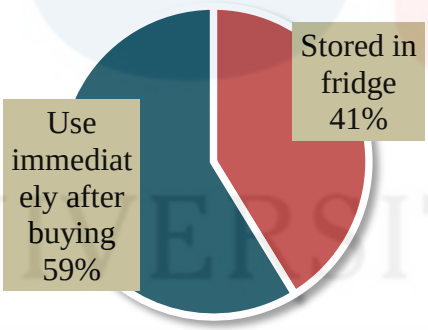

Figure 4.28: The ways to handle food ingredients

4.3.6 Part E: Customer Preference

Figure 4.29 shows the acceptability of respondents to buy food ingredient if available in the market. The 'yes' answer is mostly select by respondents with 62% followed by 38% with 'no' answer.

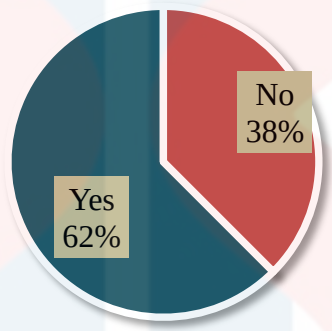

Figure 4.29: The acceptability to buy food ingredient

Figure 4.30 shows percentages of respondent prefer to purchase if food ingredient has exactly aroma with sample A (fresh). The highest value is 'yes' answer with 66% followed by 'no' answer with 34%

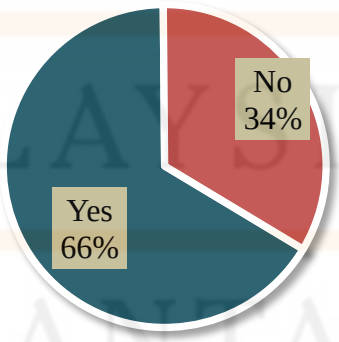

Figure 4.30: The preferable to purchase if food ingredient has exactly aroma with sample A (fresh)

Figure 4.31 shows the preferable of respondents to purchase at higher price if food ingredient able to kept in longer time. The highest value is 'yes' answer with 72% followed by 'no' answer is 28%.

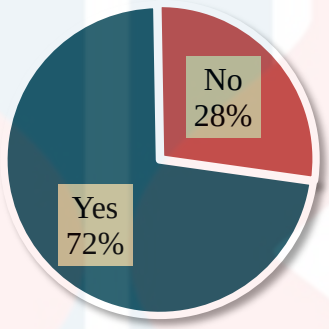

Figure 4.31: The preferable to purchase at higher price if food ingredient able to keep in longer time

Figure 4.32 shows the type of packaging suggested by respondents. Most of the respondent prefers to use sachet as packaging with 29% followed by glass container (25%), paper box (24%) and plastic (22%).

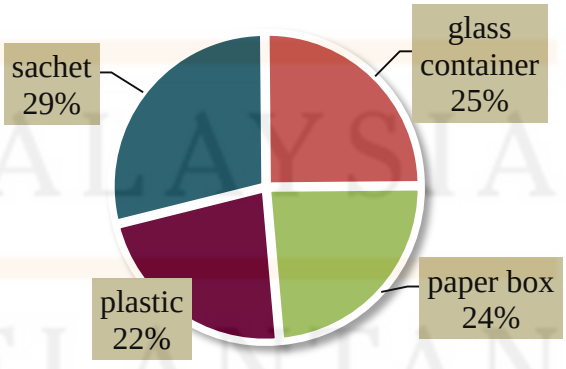

Figure 4.32: Type of packaging

Figure 4.33 shows the overall level of the likeness of dried torch ginger flower. The highest selected is ‘liked a lot’ it 51% followed by ‘very much liked’ (21%), ‘like’ (18%), ‘neither like nor dislike (6%), ‘much dislike’ (3%) and disliked (1%).

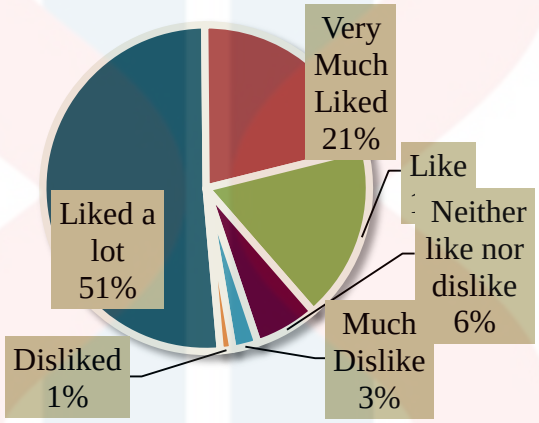

Figure 4.33: The overall level of a likeness

CHAPTER 5

DISCUSSION

5.1 Dried Torch Ginger Flower

The drying process is one method used to remove water contained inside the sample by using heat or vaporization. This method is used to increase the shelf life of plant sample and can keep for a long period of time. Next, drying also aimed to obtain the best processing conditions to avoid losses and keep product quality. This is due to moisture inside the plant sample can create a beneficial environment for microorganisms, resulting in spoilage and deterioration of freeze-dried food. Moreover, shelf life is significantly shortened when food is stored in a damp area ("The Shelf Life of Freeze-Dried Food," 2018). Therefore, the result presented that the highest temperature used which is at 70°C, contain a high percentage of moisture content, while the lower percentage of moisture content is at 40°C (Table 4.1). Thus, higher drying temperature resulted in higher moisture removal (Seifu, Tola, Mohammed, & Astatkie, 2018).

Furthermore, temperature used also effect the duration of the sample to dry completely. The sample is dried completely when the weight of the sample becomes

constant without any changes. Table 4.1, the lowest temperature at 40°C takes a long time which is 5 days to completely dry. Otherwise, the highest temperature at 70° takes only one day to completely dry. Drying time is shorter with increasing temperatures (Correia, Loro, Zanatta, Spoto, & Vieira, 2015).

In addition, color is also can be affected during the drying process. Color is one of the most important appearance attributes of food materials since it influences consumer acceptability (Akoy, 2014). Table 4.2 show that the dried torch ginger color has become pinkish brown and the highest temperature used at 70°C, the dried torch ginger become more darkness pinkish brown. Otherwise, the lowest temperature at 40°C (Table 4.2) become pale pink almost same as the fresh sample. However, it should be noted that the dried sample seemed to have a darker color at higher air temperature (Pornpraipech, Khusakul, Singklin, Sarabhorn, & Areeprasert, 2017).

Apart from that, the amount of dried torch ginger flower per-serving were calculated to know the weight of dried torch ginger flower necessary in order to prepare one serving. The drying process is required until the weight of dried torch ginger flower is constant. Table 4.3 shows after 3 days the weight constant determined. Hence, the dried torch ginger flower per-serving is 4.0 g.

5.2 Sensory Evaluation

5.2.1 Part A: Demographic

In this part, demographic data were collected. The purpose of this section is to identify statistical a characteristic of a human population such as gender, race, and others which used especially to identify markets. The gender of respondents is mostly answering by female. This is due to the majority of UMK committees is the female. In addition, the age among the respondents is mostly between 25 to 34 years old. Students and staff in UMK mostly are ages around 25 to 34 years old. Apart from that, the highest race in UMK is Malay followed by Chinese, Indian, and others. Moreover, the UMK committees are majority from rural area and the most of the respondents is among students.

5.2.2 Part B (I) and Part B (II): Sensory Evaluation of Dried and Water Sample Containing Torch Ginger Flower

The result of consumer preference test was conducted by 80 respondents to evaluate of dried torch ginger flower sample. In this section required to measure aroma and color of the dried torch ginger flower and also water sample containing dried torch ginger flower. Apart from that, the samples have been placed in the airtight container to prevent the quality of the sample to be separated. The airtight container was labeled as A, B, C, D and

E. Moreover, the sample as labeled to avoid respondents to find out the dried sample before answering the survey to prevent bias.

Thus, the result of the sensory analysis, presented in figure 4.6 shows the samples have the strongest aroma is sample E which is 42%, followed by sample D, B, and C which is 24%, 20%, and 14%. Besides, the water sample containing torch ginger flower shows that the sample has the strongest aroma is sample E with 45% (Figure 4.10). Besides, sample E used the higher temperature (70°C) and the shortest period of time to be dried. The higher temperature used give effect to the quality the dried torch ginger flower. From the previous research reported the use of high temperature is an effective way to accelerate the drying process and improve the sensory qualities of samples (Jiang, Xu, Zhao, Huang, & Zhou, 2016). Hence, the higher temperature used improves the quality of dried torch ginger flower resulting in selected of sample E as strongest aroma by respondents.

Moreover, the closest aroma to sample A (fresh) is sample B which is the lowest temperature (40°C) used (Figure 4.7). The aroma of dried food ingredient can be affected by several factors which are the temperatures used, and time consumed for the drying process. The lowest temperature used, the decrease aroma disappears. In addition to it, the drying process causes the aroma compound contained in the samples to have a lower intensity (Taufik, Widiantara, & Garnida, n.d.). Besides, comparing to the water sample containing dried torch ginger flower was shows the higher selected is sample B with 48% (Figure 4.11). Hence, for both results can be conclude that the temperature at 40°C is preferable to be used in order to keep the quality close to fresh torch ginger flower.

Furthermore, based on Figure 4.8 shows the majority of respondents choose sample E as the sample that they like to most with 43%. While, 42% (Figure 4.12) of sample B has been choose for water sample containing dried torch ginger flower. From both results shows different assessment by respondents. This is due to boiling process of water sample might affect the quality of dried torch ginger flower and next affect the respondents selection. Apart from that, the variation used in temperature can eliminate the volatile compounds. The vanished volatile compounds during the process reduce the aroma produced in the brewing process (boiling process) (Taufik et al., n.d.).

Figure 4.9 shows the percentage of sample D is the highest value of the colour of the sample like the most with 31% followed by sample B, C, and E. Furthermore, the colour of dried torch ginger flower which was dried at 60°C was preferable by respondents. Besides, sample B is almost same color with sample A (fresh) which pink color. Apart from that, oven drying at higher temperature resulted in a considerable decrease in the color quality of the samples (Rahimmalek & Goli, 2013). Besides, for the water sample containing dried torch ginger flower tend to sample C with 54% (Figure 4.13). The color is the important appearance for the product sample in order to attract consumer for the first expression. For both results have the different perspective and it might due to the boiling process affect the color appearance of dried sample. Apart from that, from the previous research reported investigation of the effect of boiling obtained in routine analysis using the Recommended Methods of the Institute of Brewing has indicated that an increase in colour of 50% may normally be expected (Bremner & Simpson, n.d.). Hence, the boiling process might increase the colour appearance of dried torch ginger flower.

5.2.4 Part C: Background Knowledge on Food Ingredients

In this kind of question will test the respondent's level of background knowledge of the dried torch ginger without showing the samples. Based on figure 4.14, it shows that most of the respondents selected 'yes' answer than 'no' answer with 94% and 6%. Therefore, the results determine most of the respondents familiar with the torch ginger flower while; certain of them consist of male respondents which are not familiar with the cooking experience. Next, the question is about the purpose of torch ginger flower. Figure 4.15 determine most of the respondent choose torch ginger flower as the aroma with 96% and 94% as flavor (Figure 4.16). The torch ginger flower is used in culinary purpose to act as aroma and flavor. Thus, most of the respondents have a high possibility to have experience in handle torch ginger. Besides, some of the respondents have selected torch ginger act as color with 19% (Figure 4.17). Torch ginger flower not really used as color but some dishes like salad, 'nasi kerabu' might use torch ginger not only as aroma and flavor also as a color. Therefore, the respondent answering torch ginger act as color is might have experience making salad and 'nasi kerabu'.

In addition, the respondents preferred supermarket as the place that can get the torch ginger flower easily with 91% (Figure 4.18) followed by grocery shop and night market with 89% (Figure 4.20) and 67 %(Figure 4.19). Thus, from the result can be concluding that torch ginger flower can easily acquire. Moreover, figure 4.21 show most of the respondents choose 'no' as the torch ginger flower can be replaced with other ingredients in cooking. Besides, there is 1 % (Figure 4.21) respondent prefer torch ginger can be replaced

with other food ingredients which is start fruit (Figure 4.22). This is due to the respondent preference think the same sour flavor both of food ingredients.

5.2.5 Part D: Cooking Experience

The question in this part will focus on the cooking experience of the evaluator. Figure 4.23 determine the fry method being used for the torch ginger with 40% and followed by boil method with 100% (Figure 4.24). Moreover, the steam method being used as much as 9% (Figure 4.25). However, all the respondents have select boil as the method to be used for the torch ginger. Even though, some of them does not have any cooking experience, they are knowledgeable about usability some of the ingredients. Next, the experience of using torch ginger as food ingredient determine most of the respondents selected ‘yes’ with 84% and 16% (Figure 4.26) choose never been use the torch ginger. This is due to some of respondents is consist of male and they might not ever have cooking experience so, they never use torch ginger as food ingredient even they notice the usability of it.

Furthermore, the kind of dish can be made from the torch ginger. The ‘laksa’ the most answers have been chosen by respondent followed by ‘asam pedas’, ‘nasi kerabu’ and salad. Torch ginger is a most important ingredient in making the ‘laksa’ because torch ginger completely affected the aroma and flavor. Thus, they notice the usability of torch ginger inside ‘laksa’. Other than that, only 1% (Figure 4.27) is select salad (mixing vegetable) as a dish because one from the respondent is from Sabah so, salad (mixing

vegetable) using torch ginger is popular in that area. In addition, the ways to handle the torch ginger is determine that uses immediately after buying is the most answers from respondents with 59% (Figure 4.28) followed by 41% choose stored in the fridge. The freshness of torch ginger is preferred by respondents to be used as ingredient compared to store in the fridge before use because it can reduce the freshness of torch ginger. However, freezing destroy some of the flavor and aroma ("Heavenly Fragrance and Think Simple: Ginger flower ~ Bunga Kantan," 2012).

5.2.6 Part E: Customer Preference

The main purpose of this section is to identify evaluator expectations, likes, dislikes, motivations, and inclinations that drive customer purchasing decisions. The complement customer needs in explaining customer behavior that allows the marketer to improve the product. Based on figure 4.29 show most of the respondents choose 'yes' to buy the dried torch ginger flower if available in the market with 62% and 38% will not buy it. This due to some of them preferred the fresh of torch ginger flower to be used as an ingredient. The result determines most of the respondents selected 'yes' to purchase if the dried torch ginger have exactly the same aroma with the fresh sample with 66% (Figure 4.30) and some of the respondents choose otherwise. Most of the respondents choose to buy it because of the dried one is more convenience than the fresh. But, it can also conclude some of them might think the fresh one is more preferable than the dried torch ginger if the aroma is only caused them to buy the dried one.

In addition, 72% (Figure 4.31) of respondents agreed to purchase dried torch ginger in higher price if the food ingredient able to kept in longer time while the remaining of them choose not to purchase. The convenience to keep the dried torch ginger in a long time compared to fresh can save their time to buy the torch ginger every time when they want to use it. The fresh torch ginger can only survive not more than 5 days in room temperature and less than 10 days in the fridge because freezing can reduce some of the flavour and aroma over time. Moreover, the longer shelf life of dried torch ginger can avoid wastage if it has excess from the cooking. Other than that, this is might due to the respondents mostly among students which not have much time to buy the fresh torch ginger if they want to use it and do not have a fridge to keep the fresh torch ginger.

Lastly, the survey is about the type of packaging suggestion. The figure 4.32 determines sachet has the highest selected as much as 29% followed by glass container, paper box, and plastic. The percentage show sachet is most conveniences compare to plastic. This is due to consumption of sachet can directly put inside the dishes like ‘sup bunjut’ style used in making a soup without giving side effect to the dishes. Besides, the glass container is the airtight container and can ensure the dried product can be safe from any contamination but might use high in price and fragile. Lastly, plastic and paper box is commonly used for the product in the market and it not very suitable to use for this kind of product. Moreover, plastic is not suggested by respondents because it can give bad effect to body health and also cause pollution. In addition, the respondents prefer something novelty and convenience.

Apart from that, figure 4.33 shows the overall level of likeness against dried torch ginger flower. Over half of the respondents were choosing ‘like a lot’ the dried torch ginger

flower with 51%. Otherwise, only a few respondents choosing ‘dislike’ to the dried torch ginger flower. However, the acceptance toward dried torch ginger flower was satisfying and the probability to market the product of dried torch ginger flower to be commercialized is good enough.

CHAPTER 6

CONCLUSION AND RECOMMENDATION

In conclusion, the increase of temperature used will increase moisture content inside the sample. Moreover, the higher temperature used will reduce time to be sample dried completely. The drying process is increasing the shelf life of the food product which can prevent from food wastage and save time to buy the food ingredient when required. Based on the result, a suitable temperature to be used for dried torch ginger flower is 70°C. This is due to the color appearing after drying does not really effect. The color of the dried torch ginger flower using 70°C is quite the same with fresh torch ginger flower. Apart from that, the aroma produces from the highest temperature is more preferable by respondents.

Furthermore, most of the consumers prefer the fresh torch ginger flower but they are willing to buy the dried torch ginger flower if it available in the market (Figure 4.27). In maintaining color and aroma of dried torch ginger flower might attract the consumer to use the dried one. Therefore, the drying process is recommended use in torch ginger flower to facilitate most of the people in making cooking process, especially among housewife. This is due to the usability of torch ginger very high in demand and it is an important ingredient in making the dish. Moreover, the dried torch ginger flower has longer shelf life compare to

the fresh. Hence, the commercials product of dried torch ginger might give profit beside help consumer to handle the storage of torch ginger flower.

Moreover, there are a number of gaps of knowledgeable around public involvement in research that follow from the findings, and would benefit for further research of drying process effect the quality of torch ginger flower in order to maintain or increase the quality of dried sample.

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APPENDICES

ANNEX A

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

   ☐ hinese ☐ hers:

4. Please state your residential area

   ☐ City ☐ Rural

5. What is your current job?

☐ Student

☐ Worker

☐ 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 and 7 hedonic scale.

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 and 7 hedonic scale.

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 use 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?

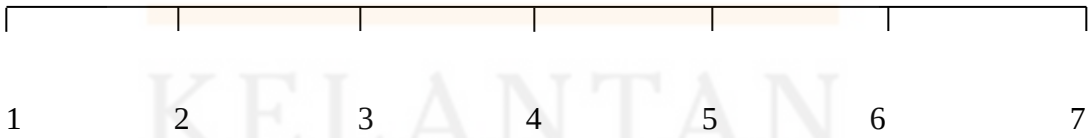
☐ Yes ☐ No

4. If this product exist 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) (Best)

ANNEX B

The frequency gender of respondents

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Male	18	21.7	21.7	25.3
	Female	62	74.7	74.7	100.0
	Total	80	100.0	100.0	

The frequency age of respondents

Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	15 - 24 year	60	75.0	75.0	75.0
	25 - 34 years	13	16.3	16.3	91.3
	35 - 44 years	5	6.3	6.3	97.5
	45 and above	2	2.5	2.5	100.0
	Total	80	100.0	100.0	

The frequency race of respondents

Race					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Malay	57	71.3	71.3	71.3
	Chinese	14	17.5	17.5	88.8
	Indian	8	10.0	10.0	98.8
	other	1	1.3	1.3	100.0
	Total	80	100.0	100.0	

The frequency area of respondents

Area					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	City	32	40.0	40.0	40.0
	Rural	48	60.0	60.0	100.0
	Total	80	100.0	100.0	

The frequency job of respondents

Job					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Student	64	80.0	80.0	80.0
	Worker	16	20.0	20.0	100.0
	Total	80	100.0	100.0	

The frequency of the sample has the strongest aroma

The Sample Have The Strongest Aroma					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	B	16	20.0	20.0	20.0
	C	11	13.8	13.8	33.8
	D	19	23.8	23.8	57.5
	E	34	42.5	42.5	100.0
	Total	80	100.0	100.0	

The frequency of the sample closest aroma to sample A

The Sample Have The Closest Aroma To Sample A (Fresh)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	B	25	31.3	31.3	31.3
	C	21	26.3	26.3	57.5
	D	17	21.3	21.3	78.8
	E	17	21.3	21.3	100.0
	Total	80	100.0	100.0	

The frequency of aroma of the sample like the most

Aroma Of The Sample Like The Most					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	B	23	28.8	28.8	28.8
	C	10	12.5	12.5	41.3
	D	13	16.3	16.3	57.5
	E	34	42.5	42.5	100.0
	Total	80	100.0	100.0	

The frequency of colour of the sample like

Colour Of The Sample Like The Most					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	B	21	26.3	26.3	26.3
	C	19	23.8	23.8	50.0
	D	25	31.3	31.3	81.3
	E	15	18.8	18.8	100.0
	Total	80	100.0	100.0	

The frequency of the strongest aroma

The Strongest Aroma					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	B	23	28.8	28.8	28.8
	C	13	16.3	16.3	45.0
	D	8	10.0	10.0	55.0
	E	36	45.0	45.0	100.0
	Total	80	100.0	100.0	

The frequency of the sample has the closest aroma to sample A (fresh)

Sample Have The Closest Aroma To Sample A (Fresh)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	B	38	47.5	47.5	47.5
	C	21	26.3	26.3	73.8
	D	13	16.3	16.3	90.0
	E	8	10.0	10.0	100.0
	Total	80	100.0	100.0	

The frequency of aroma of the sample like the most

Aroma Of The Sample Like The Most					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	B	34	42.5	42.5	42.5
	C	16	20.0	20.0	62.5
	D	23	28.8	28.8	91.3
	E	7	8.8	8.8	100.0
	Total	80	100.0	100.0	

The frequency of colour of the sample like the most

Color Of The Sample Like The Most					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	B	8	10.0	10.0	10.0
	C	43	53.8	53.8	63.8
	D	21	26.3	26.3	90.0
	E	8	10.0	10.0	100.0
	Total	80	100.0	100.0	

The frequency of familiar with this dried food ingredient

Familiar With This Food Ingredient					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	75	93.8	93.8	93.8
	No	5	6.3	6.3	100.0
	Total	80	100.0	100.0	

The frequency of aroma have been selected

Aroma					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	77	96.3	96.3	96.3
	No	3	3.8	3.8	100.0
	Total	80	100.0	100.0	

The frequency of flavour have been selected

Flavour					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	75	93.8	93.8	93.8
	No	5	6.3	6.3	100.0
	Total	80	100.0	100.0	

The frequency colour have been selected

Colour					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	15	18.8	18.8	18.8
	No	65	81.3	81.3	100.0
	Total	80	100.0	100.0	

The frequency of supermarket have been selected

Supermarket					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	73	91.3	91.3	91.3
	No	7	8.8	8.8	100.0
	Total	80	100.0	100.0	

The frequency of grocery shop have been selected

Grocery Shop					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	71	88.8	88.8	88.8
	No	9	11.3	11.3	100.0
	Total	80	100.0	100.0	

The frequency of nigh market have been selected

Night Market					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	54	67.5	67.5	67.5
	No	26	32.5	32.5	100.0
	Total	80	100.0	100.0	

The frequency of food ingredient either can be replaced with other ingredient

Food Ingredient Can Be Replaced With Other Ingredient					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	1	1.3	1.3	1.3
	no	79	98.8	98.8	100.0
	Total	80	100.0	100.0	

The frequency of star fruit have been selected

Please State					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		79	98.8	98.8	98.8
	Star fruit	1	1.3	1.3	100.0
	Total	80	100.0	100.0	

The frequency of fry have been selected

Fry					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Yes	32	40.0	40.0	40.0
Valid	No	48	60.0	60.0	100.0
	Total	80	100.0	100.0	

The frequency of boil have been selected

Boil					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	80	100.0	100.0	100.0

The frequency of steam have been selected

Steam					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Yes	7	8.8	8.8	8.8
Valid	No	73	91.3	91.3	100.0
	Total	80	100.0	100.0	

The frequency of experience respondent used the dried food ingredient

Experience Used Dried Food Ingredient					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	67	83.8	83.8	83.8
	no	13	16.3	16.3	100.0
	Total	80	100.0	100.0	

The frequency of respondent in ways to handle food ingredient

Handle In Food Ingredient					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Stored in fridge	33	41.3	41.3	41.3
	Use immediately after buying	47	58.8	58.8	100.0
	Total	80	100.0	100.0	

The frequency of type of dish made from food ingredient

Type Of Dishes					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	'Laksa'	53	66.3	66.3	66.3
	'Asam pedas'	15	18.8	18.8	85.0
	Mix vegetable (salad)	1	1.3	1.3	86.3
	'Nasi kerabu'	11	13.8	13.8	100.0
	Total	80	100.0	100.0	

The frequency of respondents will buy food ingredient if available in market

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	50	62.5	62.5	62.5
	No	30	37.5	37.5	100.0
	Total	80	100.0	100.0	

The frequency of respondent prefer to purchase if food ingredient have exactly aroma with fresh sample

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	53	66.3	66.3	66.3
	No	27	33.8	33.8	100.0
	Total	80	100.0	100.0	

The frequency of respondent willing to purchase in higher price if food ingredient able to kept in longer time

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	58	72.5	72.5	72.5
	No	22	27.5	27.5	100.0
	Total	80	100.0	100.0	

The frequency of type of packaging have been selected for food ingredient

Packaging					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	sachet	23	28.8	28.8	28.8
	plastic	18	22.5	22.5	51.3
	paper box	19	23.8	23.8	75.0
	glass container	20	25.0	25.0	100.0
	Total	80	100.0	100.0	

The frequency of the overall preference of dried food ingredient

Overall					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2.00	2	2.5	2.5	2.5
	3.00	1	1.3	1.3	3.8
	4 neither like nor dislike	5	6.3	6.3	10.0
	5.00	14	17.5	17.5	27.5
	6.00	41	51.3	51.3	78.8
	7 best	17	21.3	21.3	100.0
	Total	80	100.0	100.0	