DEVELOPMENT OF DATE JAM WITH BLACK SEED (*Nigella Sativa*) AND HONEY

NURUL FAHNIM BINTI MOHD RAZUMI

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Nurul Fahnim Binti Mohd Razumi

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3 June 2013

NURUL FAHNM BT MOHD RAZUMI
( BN09110132)
CERTIFICATION

NAME : NURUL FAHNUM BT MOHD RAZUMI
MATRIC NO. : BN09110132
TITLE : DEVELOPMENT OF DATE JAM WITH BLACK SEED AND HONEY
DEGREE : BACHELOR OF FOOD SCIENCE WITH HONOURS (FOOD TECHNOLOGY AND BIOPROCESS)
VIVA DATE : 27 JUNE 2013

DECLARED BY

1. SUPERVISOR
   (DR. MUHAMMAD IQBAL HASHMI)

2. EXAMINER 1
   (DR. AFSANEH BT FARHADIAN)

3. EXAMINER 2
   (DR. SIEW CHEE KIONG)

4. DEAN
   (PROF. MADYA DR. SHARIFUDIN MD SHAARANI)
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ABSTRACT

DEVELOPMENT OF DATE JAM WITH BLACK SEED AND HONEY

This study was developing a new flavour of fruit jam which was date fruit with Black Seed (Nigella Sativa) and honey. The best formulation achieved from the Hedonic test was formulation F3. Physicochemical properties, proximate composition and shelf life of the best formulation were determined. Formulation F3 (35% of date Puree, 0.09% citric acid, 1.0% of pectin, 42% of sugar, 8% of honey, 0.1% of Black Seed and 13.81% of water) was selected as the best formulation. Formulation F3 consists of 27.0±1.01% of moisture content, 0.70±1.05% of ash content, 0.80±0.29% of protein, almost 0% free-fat which is 0.00±0.11 of fat content, 13.23±0.15% of crude fiber content and lastly 58.27±0.50% of carbohydrate content. Physicochemical test showed that 4.06±0.05 of pH value, 68.0±0.00 of total soluble solid and titrable acidity of sample was 0.48±0.02% respectively. Texture analysis reported that the firmness of sample was 568.98±0.98g and the stickiness value was 394.56±1.02g. Shelf life study was carried out for eight weeks through physicochemical test, microbiology test and sensory test. The results concluded that the best formulation of date jams with Black Seed (Nigella Sativa) and honey was successfully produced. In overall, storage study showed that the storage jam still pose the same intensity level with fresh made jam. It is one of the good sign that this product can be sell and market in the food industry.
ABSTRAK

PEMBANGUNAN JEM KURMA DENGAN HABBATUS SAUDA (NIGELLA SATIVA) DAN MADU.

Kajian ini adalah untuk membangunkan jem buah-buahan berperisa baru iaitu daripada buah kunna dengan Habbatus Sauda (Nigella Sativa) dan madu. Formulasi terbaik dicapai daripada ujian hedonic Formulasi F3. Ciri-ciri fizikokimia, komposisi proksimat dan jangka hayat formulasi terbaik ditentukan melalui kajian ini. Formulasi F3 (35% puri kunna, 0.09% asid sitrik, 1.0 daripada pektin, 42% daripada gula, 8% daripada madu, 0.1% daripada Habatus Sauda dan 13.81% air) telah dipilih sebagai formulasi terbaik. Formulasi F3 terdiri daripada 27.0 ± 0.01% kandungan kelembapan, 0.70 ± 1.05% kandungan abu, 0.80 ± 0.29% protein, hampir 0% bebas lemak yang merupakan 0.00 ± 0.11 kandungan lemak, 13.23 ± 0.15% kandungan serat mentah dan akhir sekali 58.27±0.50% kandungan karbohidrat. Ujian fizikokimia menunjukkan 4.06 ± 0.05 nilai pH, 68.0 ± 0.00 Jumlah keasidan larut pepejal dan keasidan sampel jem adalah 0.48 ± 0.02%. Analisis tekstur melaporkan bahawa ketegasan sampel adalah 568.98 ± 0.98g dan nilai kelekitan adalah 394.56 ± 1.02g. Kajian jangka hayat bagi jem telah dijalankan selama lapan minggu melalui ujian fizikokimia, ujian mikrobiologi dan ujian deria. Melalui keputusan dapat di simpulkan bahawa jam buah kurma dengan Habatus Sauda (Nigella Sativa) dan madu Berjaya dihasilkan. Secara keseluruhannya, ujian penyimpanan menunjukkan jam yang disimpan masih mempunyai tahap kesegaran yang sama dengan jam yang baru dihasilkan. Ini menunjukkan salah satu ciri yang baik, bahawa produk ini boleh dijual dan dipasarkan di dalam industri makanan.
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<td>ANOVA</td>
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CHAPTER 1

INTRODUCTION

1.1 Introduction

Historically, jams may have originated as an alternative to preserve fruits for consumption in the off-season. Jam processing is one of the ways of fruits preservation that can be done at home or factory (Zainun, 1992). Hence, the preparation of jams was developed by the housewife, and served in order to preserving fruits, corresponding to the time, when the fruits being harvested.

Basically, the main purpose of producing jams is to prolong the shelf life and also to give many choices to consumer enjoying the food. In 1990, Malaysia exported RM830,000 worth of jam and jelly and imported RM1,858,700 jams and jelly (Abdullah & Cheng, 2001). Most of the jam processed in Malaysia uses imported fruits such as strawberry, gooseberry, blackcurrant and grape (Abdullah & Cheng, 2001). There are many examples of the tropical fruit that most widely used by local processors. Pineapples are one of the best fruit that often be used. Other local tropical fruits used are papaya, banana, mango, carambola, guava and roselle. These fruits are used either singly or in combination.

Jams are thick; sweet spreads made by cooking crushed or chopped fruits with sugar (Barbara, 2008). Hence, the presence of sugar will preserved the content of jams. The jams characteristics and quality will depend on the type of fruits, how it is prepared, the proportions of the ingredients in the mixtures and the cooking methods (Barbara, 2008). In this research, date jams with black seeds and honey were developed. In Malaysia, no date jam has been developing for the market. On the other hand, some studies have been performed on date jam characteristics (Al-Hooti et al., 1997; Besbes et al., 2009). Presently, very little use is made of this fruit and they are discarded or used in limited cases for animal feed.
(Besbeset et al., 2009). Plus, research into date by-products has not been a true reflection of the importance and potential of this crop.

Apart from that, *Nigella sativa* (*N. sativa*) seed, called as 'Black Seed' in English language, 'Al-Habba Al-Sauda' or 'Al-Habba Al-Barakah' in Arabic and 'Kalvanji' in Urdu and some local languages in the Indian Subcontinent, is well known in the Middle East, Middle Asia and Far East as a natural remedy for many ailments and as a flavouring agent in bread and prickles (Randhawa, 2008). Habbatus Sauda is a plant that has traditionally been used as an herb for centuries in many parts of the world. It has gained popularity due to its potential health benefits. In Arab folk and in South Asia, it is used for asthma, chronic headache, migraine, chest congestion, dysmenorrhea, infection; both fungal and bacteria, obesity, paralysis, hemiplegia, back pain, rheumatism, hypertension, anti-abortion and gastrointestinal problems such as dyspepsia, flatulence and diarrhoea.

Honey is a sweet viscous liquid produced by honey bees from nectar of plants. Local demand for honey is largely met by imports from Australia, China and the United States. Imports of honey increased yearly at an average of 33.2% from 1974-1978 (MIDA, 1980). The price of local honey is determined by the type, quality and supply and it is important that locally-produced honey is pure, clean and uniform in appearance in order to compete with imported honey (MIDA, 1980). Local honey competes also with artificial honey, syrup and jam.

World major producers of honey are the United States, Mexico and China. Currently a major issue of concern for the world honey market is contamination of honeys with the residues of medicines used to control bee diseases. The best way forward for the honey trade may be, rather than to attempt to define exactly what honey should be, to focus on defining only the non-permitted constituents of honey. The EU has the most stringent honey quality requirements: honey is not permitted to contain any trace of antibiotic. In the US, some trace levels of antibiotics are permitted.
1.2 Rationale of Research
The rationale to carry out this research was producing the new flavour of fruit jam. Date is one of the fruit that may possess high value components such as sugars and fibre that may be used in value-added applications. The lost dates, commonly named “date by-products”, are not consumed by humans because of inadequate texture; too soft or too hard, contamination with fungus and/or infestation by insects or simply due to their low quality (Besbeset al., 2009).

In order to diverse the usage of date fruit for something more beneficial, a date jam with black seeds and honey were developed. This research also were enhanced the beneficial properties of Black Seeds in food product, such as jams. In fact, the herb mostly applies in the medicinal properties but not in the food product form. According to Zainun (1992), jams usually contain about 62.75% of sugar. The date fruit itself high in sugar content. To provide balance sweetness and the nutritional properties in the jams, honey will be combining with the sugar as a sweetening agent in this research.

1.3 Objectives
The main objective of this project is to develop a new flavour of jam. Plus, there are several purposes on this research:

1. To produce the best formulation of date jam with black seeds and honey.
2. To identify the sensory acceptance of jams.
3. To determine the nutrient content of the jams produced based on the proximate analysis.
4. To examine the storage quality of jam through physicochemical, microbiology and sensory test.
CHAPTER 2

LITERATURE REVIEW

2.1 Jam

2.1.1 Definition of jam

Jam can be defined as a mixture of fruits and sweetening agents brought to a suitable gelled consistency, with or without other permitted ingredients. Jelly is similar to jam except that a clear fruit extract is used to obtain a transparent final product. Traditionally, jam is a self-preserved, cooked mixture of fruit and sugar and honey is often qualified as a sugar, with total soluble solids content of 68.5% or higher (Al-Hooti & Sidhu, 1997). A good jam can be prepared when the sugar content is 65%, the pectin is 1% and the pH is about 3.0 to 3.2. Citric acid is often added if fruit does not have enough of its own. The degree of preservation is related to the water activity of the product. Mainly the sugar and pectin present in jam are responsible for the water activity.

From the previous study, jam can be defined as an intermediate moisture food prepared by boiling fruit pulp with sucrose, pectin, acid, and other ingredients; preservative, coloring, and flavoring materials and is consumed widely in the world (Lal et al., 1998; Baker et al., 2005; Basu et al., 2012). Jam should contain more than 68.5% total soluble solids (TSS) and at least 45% fruit (PFA, 2004). Meanwhile, according to the European Union Council Directive 2004/84/EC, jams are mixtures of sugars, pulp and/or purée of one or more fruits and water brought to a suitable gelled consistency. As defined by UNE regulation (1974), jams are products formulated from a minimum fruit content of 40%; 30% for citric and a final soluble solid content of 45 °Brix. Moreover, some additives such as citric acid or gelling agents, commonly pectin, can be added.
2.1.2 History of jam

In Europe, industrial production of jams and spreads started about 100 years ago and developed to an industry of high economic significance with about 650,000 t of annual production (European Association of Food and Vegetable Processors PROFEL; Holzwarth et al., 2012). From the book of Anne Wilson (1999), the author stated the original homemade of jam or marmalade tradition was Scotland, and it reached the English from their Scottish neighbours. Meanwhile, from one of the article by anonymous writer, said that jam making probably began in the Middle-East cane sugar grew naturally. It is believed that the returning Crusaders first introduced jam and jelly to Europe. By the late Middle Ages, jams, jellies and fruit conserves were popular there. The use of sugar cane to make jam and jelly can be traced back to the 16th century when the Spanish came to the West Indies where they preserved fruit (ArmadilloPepper, 2013).

In Britain, jams origins are in Tudor times. The food historian Ann Wilson records that there was a wide range of jams available, for example, quince and medlar. A grape jam patent was first issued to Paul Welch in 1917 for the pureeing of grapes (ArmadilloPepper, 2013). He called the product Grapelade. The entire production was purchased by the U.S. Army and shipped to France for consumption by the troops during World War I (ArmadilloPepper, 2013). When the troops returned to the States after the war, they demanded more of this; Grapelade and as a result, it started to be produced in quantity. The Food and Drug Administration established Standards of Identity for what constitutes jam, jelly, preserves and fruit butters in 1940 (ArmadilloPepper, 2013).

2.1.3 Nutritional information of jam

Jams and jellies boast quick energy, delicious flavours and on a tablespoon for tablespoon basis, jams and jellies have about half the calories of butter or margarine. For instance, a tablespoon of butter is loaded with 102 calories, not to mention 12 grams of fat, 7 grams of saturated fat and 31 milligrams of cholesterol (International Jelly and Preserve Association, 2010). According to the USDA, nutritional information for a typical jelly is as shown in the Table 2.1.
Table 2.1: Nutritional information for a typical jam and jellies.

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>5.66g</td>
</tr>
<tr>
<td>Protein</td>
<td>0.03g</td>
</tr>
<tr>
<td>Calories</td>
<td>51</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>0.0g</td>
</tr>
<tr>
<td>Sugar, total</td>
<td>9.73g</td>
</tr>
<tr>
<td>Carbohydrates</td>
<td>13.29g</td>
</tr>
<tr>
<td>Fiber (Total dietary)</td>
<td>0.2g</td>
</tr>
<tr>
<td>Saturated fatty acid</td>
<td>0.001g</td>
</tr>
<tr>
<td>Monosaturated fatty acid</td>
<td>0.0g</td>
</tr>
<tr>
<td>Polysaturated fatty acid</td>
<td>0.001g</td>
</tr>
</tbody>
</table>

Source: USDA (2013)

2.1.4 Jam processing

In traditional jam manufacture, all the ingredients are mixed in adequate proportions and the mix is concentrated by applying thermal treatments at normal or reduced pressure to reach the required final soluble content. This process leads to a thickened or gelled consistency, ensures the destruction of fruit enzymes, extracts some of the pectin from the fruit and concentrates the product to a point where, as a result of its acidity and reduced water activity, it is self-preserving (May, 1997). There were several basic important steps in jam processing such as selection of fruit, boiling for setting, filling of the finished product, and packaging.

Fruits for jam making should be fully mature, possess a rich flavour and be of the most desirable texture. Fruits are washed thoroughly with water to remove any adhering dirt. If the fruit has been sprayed with lead or arsenical sprays, it should be washed in a warm solution of 1% hydrochloric acid and then rinsed in water (Giridhari Lal et al., 1986; Vibhakara et al., 2006). In fact, sorting usually was desirable to remove defective or insect infested fruit. Most fruits accumulate some
dust in the field or during transportation. They should thus be rinsed thoroughly by sprays of water before crushing (Smith, 2006). In the traditional production methods, most fruits are boiled to extract the juice. For most of fruits the shorter the period of boiling, the better the flavour of the resulting jam. The length of boiling varies according to the variety and texture of the fruit. The fruit should be heated long enough only to soften it sufficiently to permit thorough extraction of juice and not so long as to render it mushy (Smith, 2006).

Boiling is one of the most important steps in the jam making process, as it dissolves the sugar and causes union of the sugar, acid, and pectin to form a jam. It usually causes a coagulation of certain organic compounds that can be skimmed from the surface during boiling, and their removal renders the jam clearer (Vibhakara et al., 2006). The principal purpose of boiling is to increase the concentration of the sugar to the point where jelling occurs (Ashish Kumar, 1988; Vibhakara et al., 2006). In jam making, the fruits resistant to boiling are desirable to concentrate the product by evaporation of excess moisture. Last but not least, the filling process. After being filled, jam in jars must not be cooled too quickly. These jams should be cooled until they are near setting point, but great care must be taken not to exceed the limit, otherwise the set will break and the jam curdles, more so in the case of jellies (Rauch, 1965).

### 2.1.5 Importance of fruit jam

In order to preserve fruit for longer storage and shelf life, jam was produced. From the past, fruit preservation was done, so that the fruit still can be eaten even though the season already off. The preparation of fruit preserves today often involves adding commercial or natural pectin as a gelling agent, although sugar or honey may be used as well. The ingredients used and how they are prepared determine the type of preserves; jams, jellies and marmalades are all examples of different styles of fruit preserves that vary based upon the ingredients used. There were three important substances necessary for the preparation of fruit jam. The ingredients were; pectin, citric acid and sweetening agent.
2.2 Pectin

Usually the natural pectin in the fruit contained in the peel and the core of the fruit. According to the Regulation 250 of the Food Act 1983 and Food Regulations 1985, pectin shall be the product obtained by the dilute acid extraction of apples, citrus peel or other fruits. Meanwhile, Regulation 251 specifies jam setting compounds to be the result of pectin and sugar and citric acid, malic acid or lactic acid. Polysaccharides pectin belong to the group of metal complexes of poly-α-(1.4) - D - galacturonic acid comprising a number of polysaccharide polymer galacturonic acid, directions (polymer arabinose), galactan (galactose polymer) and polymer-xylosa D and L-arabinose (Sudhakar & Maini, 1995).

Pectin is stable in low pH and high temperature in the jam product (Zainun, 1992). Commercial pectin is extracted from apples cool and peel of citrus fruit in the form of powder and solution (Sudhakar & Maini, 1995). The key factor influencing the characteristic of commercial pectin is esterification rate by group metal. Most of pectin used in the food industry is a by-product of the fruit industry. Pectin found in the market can be divided into two groups, namely a high Methoxy (HM) and low Methoxy type (LM). High Methoxy Pectin containing a total of esterification acid exceeds 50% while pectin containing Methoxy low metal content of less than 50% (Salmah, 1995).

2.3 Citric acid

Acid is an essential ingredient in the formation of gels and flavour in a product jams or spreads. According to Jay (2000), the presence of acid lowered the pH to a level suitable for gel formation and as the retainer on bacteria or yeast growth. Acid also serves to add a sour taste in jam and balancing the sweet jam to produce a sweet-sour taste (Burdock, 1997). pH was instrumental in the solidification in the presence of sugar and pectin (Rauch, 1965). According Zainun pH that is too low will damage the gel network produced by hydrolysis of pectin, while when excessive pH will damage the structure of the jam with pectin hydrolysis and
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