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FULL LENGTH ARTICLE

# The nutritional composition of fruit jams in the Malaysian market

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**Abstract** Fruit jams are preserved fruits and sugars normally canned or sealed for long-term storage. Jam making involves the disruption of the fruit tissue followed by heating with added water and sugar to activate its pectin before being put into containers. Processes that expose foods to high levels of heat may cause some nutrient loss. Hence, the objective of this study was to evaluate the nutritional composition of four commonly consumed fruit jams that are available in the Malaysian market. Different brands ($n$ = 6) of each type of fruit jams (grape, apricot, blueberry and strawberry) were sampled from supermarkets in Klang Valley, Malaysia. The sampling method used was stratified random sampling. The fruit jams were analyzed for the presence of 27 important nutrients using Association of Official Agricultural Chemists (AOAC) official methods of analysis. This study showed that fruit jams are a good source of energy and carbohydrate. The fruits jams have very low levels of fatty acids. Fruit jams may provide an affordable and convenient source of energy and carbohydrate. The data can be utilized to contribute to the enhancement of Malaysia Food Composition Database.


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## 1. Introduction

Several types of fruits have been reutilized in the production of value added food products such as jams. Jams are produced by the preservation of fruits which are canned or sealed to extend their shelf lives. Among American English, jams are considered to be a type of food preserve.

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However, among the British and Commonwealth English the term "jams" often refer to all types of food preserves. Normally, the jam preparations require the addition of commercial or natural pectin as a gelling agent (Madhav and Pushpalatha, 2002). The usage of ingredients and how the jams are prepared actually determine the type of preserves; jams, jellies and marmalades.

Jams are one of the most popular food products because of their low cost, all year long availability and organoleptic properties (Gakowska et al., 2010). Traditionally, jams were first produced as an effort to preserve fruit during off-season for consumption. Jams can be defined as a product with a total soluble solid content of 45° Brix and consist of at least 40% fruit content.

In jams manufacturing, the fruits and sugar are mixed in similar proportions. The mixed product is then cooked to produce a delicious substance that possesses sufficient storage capabilities. Using extreme thermal treatment, the mix is concentrated to acquire the necessary final total soluble solid content (Igual et al., 2013). The downside to this process is that it imparts unsavoury colour, flavour and nutritional values to the product. This is attributed to the extreme heat generated and lengthy duration of processing. There is a method that involves the usage of microwave energy that provides a faster heating procedure (Igual et al., 2010). Overall, by using other methods aside from conventional means, processing time can be shortened which may contribute to a better and more desirable product.

Nevertheless, processed products such as jams tend to have lower nutritional values when compared to fresh fruits. As an example, jams normally have lower vitamin C content compared to the fresh fruits due to exposure to the heat generated during processing (Jawaheer et al., 2003). Fruits such as lemons, cranberries, apples and apricots were commonly used in the production of jams (Burkill, 1997). Common fruit jams available in Malaysia are grape, apricot, blueberry and strawberry. To our knowledge the nutritional contents of fruit jams consumed in Malaysia are not yet reported. The objective of this study was to evaluate the nutritional composition of four common fruit jams available in Malaysian market. The data can be utilized to contribute to the enhancement of Malaysia Food Composition Database.

## 2. Materials and methods

### 2.1. Sample collection and preparation

Different brands ($n = 6$) of grape, blueberry, strawberry and apricot jams were stratified randomly sampled from local supermarkets in Klang Valley, Kuala Lumpur, Malaysia. The samples were confirmed to represent brands consumed and available nationwide. Each kilogram of the same brand of jams was mixed thoroughly and homogenized into fine form using a food grinder. The samples were transferred and stored into plastic airtight containers at room temperature (25 ± 2 °C) for up to two weeks. The replicate analysis of proximate, mineral, vitamin, sugar and fatty acids component of lipids was carried out for each of the six brands of fruit jams. One pooled set of data of mean for each reported nutrient was calculated based on the average of the six brands tested.

### 2.2. Proximate analysis

The energy content of each type of jams was calculated by summation of multiplication of protein, carbohydrate and fat by values of 4, 4 and 9 factors, respectively. The value is expressed as kilocalories (kcal). The moisture content was determined by drying of finely ground samples (10 g) in air-oven at 105 °C overnight until a constant weight was achieved (AOAC, 2008). Protein content was determined based on Kjeldahl method (AOAC, 2005). A conversion factor of 6.25 was used to convert the measured nitrogen content to protein content.

Fat content was determined by using a semicontinuous solvent extraction method (AOAC, 2006). Briefly, finely ground sample (1–3 g) was weighed into a hydrolyzing capsule for hydrolysis. The hydrolysis was done using an automated hydrolysing unit (Gerhardt, Germany). Fat was extracted using petroleum ether between 40 °C and 60 °C using automated fat extraction system (Gerhardt, Germany). The extract was then dried for 3 h. The product was then cooled in a standard desiccator (desiccant = silica gel beads) for 1 h before being weighed to measure the fat content.

The carbohydrate content was calculated by subtracting the sum of protein, fat, moisture, ash and total dietary fibres (TDF) from 100% (Menezes et al., 2004). TDF were determined using an enzymatic–gravimetric method (AOAC, 2005). Briefly, finely ground sample (1 g) was subjected to a sequential enzymatic digestion. For estimation of TDF, the enzyme digestate was treated with ethanol to precipitate the soluble dietary fibre (SDF). The TDF residue was filtered before washing with ethanol as well as acetone. The residue was dried before being weighed. The TDF values were calculated after subtraction of protein, ash and reagent blank [TDF = weight of residue – weight (protein + ash)].

The ash content was estimated using dry ashing method (AOAC, 2005). Briefly, a clean silica crucible was placed into a muffle furnace for 5 h. The crucible was cooled for 1 h in a desiccator before being weighed until constant weight is achieved. Finely ground sample (3–5 g) was weighed into crucible. The sample was pre-ashed by heating the crucible on a hot plate. The crucible was then transferred to a muffle furnace for 6–8 h. After the ashing process is completed, the crucible was cooled before being weighed to compute the ash content.

### 2.3. Mineral analysis

Calcium (Ca), iron (Fe), magnesium (Mg), sodium (Na), zinc (Zn) and copper (Cu) were analyzed using Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES) (Perkin Elmer, USA). Finely ground sample (3 g) was digested using a dry ashing method (AOAC, 2005). The resulting ash was then dissolved in concentrated hydrochloric acid (7 ml) before being diluted to 100 ml with deionized water. The solution was filtered and the mineral content was determined using ICP-OES.

### 2.4. Vitamin analysis

Vitamin C was analyzed by using a reverse phase High Performance Liquid Chromatography (HPLC) coupled with

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