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Development of novel fruit bars by utilizing date paste

Ong Joo Parn[a], Rajeev Bhat[a,*], T.K. Yeoh[b], A.A. Al-Hassan[c]

[a]Food Technology Division, School of Industrial Technology, Universiti Sains Malaysia, Penang 11800, Malaysia
[b]School of Hospitality, Tourism and Culinary Arts, Taylor's University, Lakeside Campus, Subang Jaya 47500, Selangor, Malaysia
[c]Food Science and Human Nutrition Department, College of Agriculture and Veterinary Medicine, Qassim University, Buraydah, Saudi Arabia

ARTICLE INFO

Article history:
Received 5 March 2014
Received in revised form
27 October 2014
Accepted 3 November 2014
Available online 12 November 2014

Keywords:
Fruit bars
Dates
Texture
Colour
Sensory analysis
Consumers

ABSTRACT

In this study, we aimed to produce novel fruit bars by using two different types of popular date cultivars (Nabtat Ali and Sukkari). Standard procedures were adopted for preparing the fruit bar. However, in this study, products were devoid of any sweet additives, as dates are rich in natural sugars. Various analysis (proximate composition, total phenolics content, antioxidant activity, colour, textural profile, and sensory quality evaluation) were performed to evaluate the overall virtues of date based fruit bar. Results showed date fruit bars to be rich in protein, fat and carbohydrates with good energy values. However, decrease in total phenolics and inhibition of DPPH$^{\bullet}$ radical was observed in fruit bars compared to raw dates. Texture wise, products had high fracturability, indicating easy to bite and chew nature, thus rendering it suitable for elderly people and small children. Results of sensory quality evaluation indicated dates to have excellent potential to be converted into fruit bars. Results generated in this study suggest date-based fruit bars may be expected to fulfill the requirements of health conscious consumers. It is anticipated that this novel food product will attract better marketability at the international level.

1. Introduction

Since time immemorial, humans have habitually consumed assortments of fruit and fruit products as a part of their regular diet. Owing to available databases on health promoting values, fresh fruits are considered as priority choice over snack foods. Today, consumers tend to prefer fresh fruits over their processed products such as: jams, jellies, juice, confectionaries, etc. The need of the hour is responding to the demands by health conscious consumers for new fruit based products that can retain the original flavor and nutrition values and fulfil the needs of an individual's taste bud. In this regard, it is worthy to encourage people to consume more fruits on regular basis by introducing them to fruit bars. Reports available have indicated successful development of fruit-bars from apple, guava, jackfruit and mango (Owen, Tung, & Durance, 1991; Che Man, 1995; Vijayanand, Yadav, Balasubramanyam, & Narasimham, 2000).

Fruit bar is a concentrated fruit product that has superior nutritive and energy values. In addition, compared to fresh fruits, fruit bars tend to possess extended shelf life. Fruit bars can be a wholesome nutritious food for all age groups,

*Corresponding author. Tel.: +60 4653 5212; fax: +60 4657 3678.
E-mail addresses: rajeevbhat1304@gmail.com, rajeevbhat@usm.my (R. Bhat).

http://dx.doi.org/10.1016/j.fbio.2014.11.002
2212-4292/

including elderly people. In addition, fruit bars can be an exceptional instant food that can deliver the required dietary fiber and other bioactive compounds, required to meet the daily requirements in humans (Sun-Waterhouse, Teoh, Massarotto, Wibisono, & Wadhwa, 2010). Normally, 'dried fruit bars' are more popular than 'iced fruit bars'. This is because iced fruit bars may result in easy melting, lose original texture and 'mouth feel' attributes; thus compromise the overall organoleptic qualities. A dried fruit bar can be prepared either from fresh fruits or from semi-dried fruits. Besides, preparation of nutritionally rich fruit bars by using dried fruit can be relatively much easier and convenient when compared to other fruit based products. In this study, we used date fruits for preparing novel fruit bars. The sweet tasting 'date fruits' are harvested from palm tree (date palm tree: *Phoenix dactylifera* L.). The date fruits are deemed to be originated from the Middle-Eastern countries, like that of Iraq and later cultivated in Egypt, India and North Africa (Janick & Paull, 2008; Jain, Al-Khayri, & Johnson, 2011). Consumption of date fruits is associated with providing rich nutritional and therapeutic values. The fruits are either consumed directly (fresh or in dried form) or are converted into products such as jam, wine, juice, vinegar, etc (Tang, Shi, & Aleid, 2013). Though date fruits have high economical value, one of the major concerns for growers is the loss of freshly harvested dates during picking, storage, and processing stages (Besbes et al., 2005; Moawad & Al-Ghamdi, 2013). These damaged date fruits do not posses any demand or market value owing to their non-desirable texture (either they are too soft or too hard). Hence, in majority of the cases, the damaged fruits are preferred mainly as a livestock feed. Fruit bars can be a better alternative to direct consumption of dates, especially during off-seasons. In addition, date based fruit bars can meet the increased demands of local and international consumers where this fruit is not grown. Processing of fresh dates to develop new food products might be useful in generating good income to the growing region. With this background, the main aim to undertake this study was to produce novel dates based fruit bar by utilizing two different types of cultivars namely: Nabtat Ali and Sukkari (meaning sweet). Results of this study are expected to benefit not only the dependent industry, but are also envisaged to fulfil the growing needs of consumers.

2. Materials and methods

2.1. Materials

Fresh dates (without any damage) belonging to Nabtat Ali and Sukkari cultivar were purchased from a local supermarket from Al-Qassim province in Saudi Arabia. Nabtat Ali and Sukkari are the two popular cultivars grown in Iraq and Saudi Arabia owing to their commercial importance (Anonymous, 1984; El-Kassas, 1986; Al-Humaid, Mousa, El-Mergawi & Abdel-Salam, 2010; Moawad & Al-Ghamdi, 2013). However, reports indicate that there are over 400 fruit yielding date palm cultivars of economic importance available in the market (Bokhary, 2010).

2.2. Preparation of date fruit bar

Preparation of fruit bar was based on the method reported by Vidhya and Narain (2011) with slight modifications. Briefly, selected fresh dates without any physical damage were peeled, and cut into halves with manual removal of seeds. The pulp obtained (500 g) was pounded into paste using a sterile mortar and pestle. Further, this paste was boiled with continuous stirring (for up to 10 min.) without addition of any sugar. After this, milk powder (100 g), margarine (50 g), citric acid (1 tablespoon; weight of stainless steel spoon = 35.4 g) and one pinch of common salt was added. Margarine (refined vegetable oil) was used as it is free of cholesterol and contains high level of polyunsaturated and monounsaturated fats. The pulp mixture obtained was boiled (50 mL of water), and continuously stirred until a required °Brix (of 75) was attained (determined using a refractometer). Since we used water as a medium to obtain a paste form, it was a necessity to ensure that the end-product of total soluble solids (TSS or °Brix) reaches around 65–75. This range will not only provide the product with minimal moisture level, but also can be efficiently handled in a soft bar form. In addition, as TSS restricts the amount of freely available water in a product; it can also enhance the product's shelf life.

Further, the cooked pulp was transferred into greased, non-sticking trays. This was cooled to room temperature (25 ± 1 °C). Based on the requirements to perform each analysis, fresh bar samples were prepared for each analysis or kept refrigerated at 4 °C.

2.3. Physicochemical and colour analysis

Proximate analysis (moisture, ash, crude lipid, protein and crude fiber) were determined based on the method described by AOAC (1990). Crude carbohydrate (or the nitrogen free extracts) and gross energy values were calculated by difference (Bhat & Sridhar, 2008) using the following equations:

$$\text{Total crude carbohydrate } (\%) = 100 - [\text{Moisture } (\%) + \text{crude protein } (\%) + \text{crude lipid } (\%) + \text{crude fiber } (\%) + \text{total ash } (\%)]$$

$$\text{Gross energy}(\text{kJ}/100\ \text{g}) = (\text{protein} \times 16.7) + (\text{fat} \times 37.7) + (\text{carbohydrate} \times 16.7)$$

Texture analysis was performed using texture analyzer (single arm texture analyzer TA-XT Plus, Stable Micro Systems, Surrey, UK) with a load cell of 2 kg weight. A force versus time curve for a two-cycle compression was measured, with a disk probe (of 35 mm diameter) and at a displacement speed of 10 mm/min. Inbuilt software of the texture analyzer was used for analyzing the data generated.

The colour analysis was performed using colourimeter (Minolta Spectrophotometer model CM-3500d, USA). Prior to analysis, the colourimeter was calibrated using the zero and white calibration plates, respectively. The lightness value ranged from 0 (black) to 100 (white). Samples were analyzed for L^*, a^* and b^* values which represented brightness, redness (when positive and greenness for negative) and yellowness (when positive and blueness when negative), respectively. Samples were also analyzed to find out their hue and chroma values.