

**RESEARCH PAPER****Development and shelf-life study of date-based product
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Abstract : The date palm (*Phoenix dactylifera* L.) has been known for as long as recorded history. The dates are vary in shape, size, weight and also in organoleptic, physical and chemical characteristics-based regions of its origin. The date palm has provided food to inhabitants of the hot dry regions of the world. The leading date producing countries are Iran, Egypt, Saudi Arabia, Pakistan, Iraq, Algeria, U.A.E, Sudan, Oman, Libya, Tunisia, China, Morocco, India etc. However, India imports a huge quantity of dates. Dates are one of the few foods having high potassium content and at a certain stage of development, have low sucrose content due to conversion of sucrose to fructose and glucose by the enzymatic action of invertase. Dates are rich in minerals and vitamins that help to enhance immunity. This study was carried out to investigate the possibility of producing date based spread and to evaluate the physico-chemical, nutritional and sensory properties. The shelf-life of the date spread was observed to be more than 12 months at room temperature.

Key Words : Shelf-life study, Date-based product

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INTRODUCTION

Date palm tree (*Phoenix dactylifera* L.) is considered as one of the oldest and ancient crops in Southwest Asia and North African and its cultivation goes as a back as 400 B.C. as per recorded history (FAO, 1993). Apart from its importance as a food source for man and animals, all parts of the plant have their uses in medicine, pharmacognosy, chemistry, religious occasion and in the fishing, horticulture and construction purpose (Encyclopedia of food science and nutrition, 2003).

Date palms thrive under the rigorous climate of sub-

tropical desert. Huge quantity of various dates varieties are produced in countries like Algeria, China, Egypt, Iran, Iraq, Pakistan, Saudi Arabia, Sudan, India and United Arab Emirates (Ismail *et al.*, 2006). In India, cultivation of dates is mainly in south-western Punjab, northern Rajasthan and Kachch region of Gujarat.

Date processing enjoys a high economic importance in the world. The idea of date spread originated in Libya in the sixties, when after having initial date syrup production on a pilot scale and planning for a commercial factory, it was felt that increasing the product range would benefit the economics of the commercial date syrup

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factory as well as would give some more scope for creating outlets. A large number of date based products have been developed in USA, Europe and Gulf. There is a good hope for setting up date processing industries in these regions and other parts of the world. The processed products of dates are Jam, Jelly, Chutney and Spread. Dates are also used in Bakery products. However, the date based products are rarely available in the market of India.

Dates are used to a large extent in the bakery and confectionery industry and a common supplement in several sauces, chutneys, jams, preserves and cereal products. Efforts will be made in the future to collaborate with industry for further refinement, research and production of such date based products.

Dates-stages of development of fruits:

The development of the date through basically 4 stages named by their Arabic denominations: kimri, khalaal, rutab and tamr.

– At the kimri stage, the colour of fruits is green and there is rapid increase in size, weight and reducing sugars; it is the period of highest acid activity and moisture content (upto 85%). All factors level off at the end of this stage when the fruit starts to turn yellow (or red according to variety). At this point the date seed could already germinate and the fruit is botanically mature.

– At the khalaal stage weight gain is slow but sucrose content increases, moisture content goes down, and tannins starts to precipitate and lose their astringency. In some varieties this latter process evolves rapidly, which makes them already palatable at the khalaal stage and one could speak of commercial maturity for this type of fruit at this stage.

– The rutab with (normally) the tips of the fruit starting to turn brown, stage sets in and is characterized by a decrease in weight due to moisture loss, a partial (the degree depending on the variety) inversion of sucrose into invert sugar and a browning of the skin and softening of the tissues. The moisture content goes down to about 35% and the dates at this stage are sold as fresh fruit.

– At the tamr stage, when the dates are left to ripen further on the palm, they turn into tamr, climatic conditions permitting, characterized by a moisture content at which the date is self-preserving. The upper limit for the date to be self-preserving lies at around 24-25%. (Barrevel, 1993).

Nutritional and medicinal values of dates:

– Dates are good source of energy as they consist of 70% carbohydrates, most of which are in the form of sugars; and dietary fibre, as 100 g of dates supplies 32% of the advisable daily allowance of dietary fiber (Vanita and Punia, 2016).

– It contains mainly monosaccharide carbohydrates like glucose-48% and fructose 35.5% and high quantity of minerals like potassium, calcium, magnesium, phosphorus and iron. It has calorific value of about 3000 calories/kg are very high in comparison to banana (970 calories/kg), apricot (570 calories/kg) and orange (480 calories/kg) etc.

– The fruit, because of its tannin content, has used medicinal use as an astringent in intestinal troubles. In the form of decoction, syrup or paste it is administered as a treatment for sore throat, colds, bronchial catarrh. It is useful in relieving from fever, cystitis, gonorrhoea, edema, liver, and abdominal troubles and it is said to counteract alcohol intoxication (Julia, 1987).

– Sufficient quantities of minerals and vitamins present in date, helps in prevention of disorders related to deficiencies of these nutrients. Researchers found that the consumption of dates might be of benefit in glycaemic and lipid control of diabetic patients (Miller *et al.*, 2003). Dates have also been identified as having antioxidant, antimutagenic properties (Vayalil, 2002) and have also found to reduce heart diseases (Lambiotte, 1982). The fruit has been recommended in folk remedies for the treatment of various disease and cancer (Duke, 1992). Despite having high nutritional and medicinal values, the date does not find much importance in Indian diets. The objective of the present study was to enhance the consumption of date through manufactured foods.

– Tang *et al.* (2013) also explained dates provide antioxidant, anti-inflammatory, gastrointestinal-protection, and anticancer properties that are vital for human health.

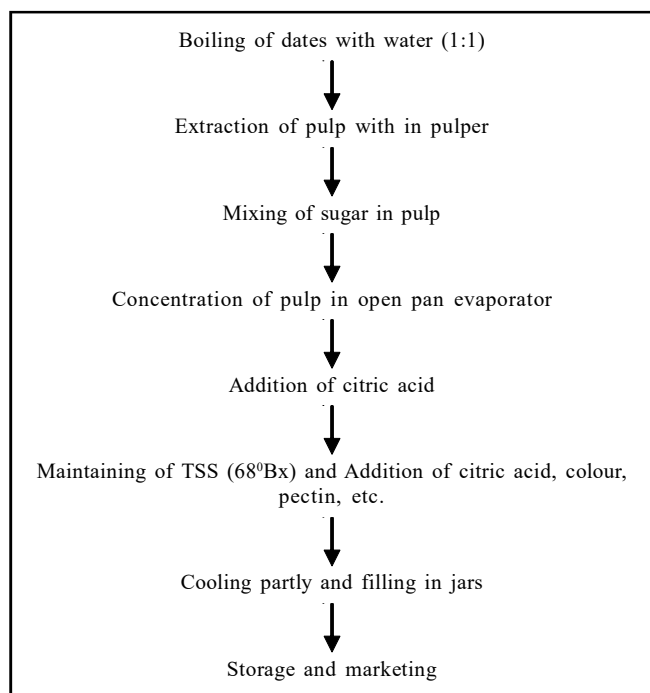
MATERIAL AND METHODS

Jam is a product made by boiling fruit pulp with sufficient sugar to a reasonably thick consistency, firm enough to hold the fruit tissues in position. It can be prepared from one or more kinds of fruits. Jam contains 0.5-0.6 per cent acid and invert sugar should not be more than 40%. According to F.P.O. specifications, jam should

not have less than 68% of total soluble solids in final product. The date jam was prepared by concentrating pulp and addition of sugar, citric acid and preservatives and maintaining its TSS to 68^o Bx.

The date fruits were procured from the local market with the brand name fresh excellent date from I.R. Iran

For each 1 kg of date pulp 500g sugar, 4g citric acid, 10g pectin were found as optimum and sodium benzoate 500mg. Dates were boiled with water and its pulp was extracted in a pulper. Appropriate quantity of sugar was mixed with the pulp. The pulp was concentrated in an open pan evaporator at temperature 100^oC to 140^oC with constant stirring until the TSS reached 68^o Bx, followed by the gradual reduction of temperature to around 60^oC. Citric acid, colour, essence, etc. were added along with the required quantities of pectin to allow gel formation. The resulting product was filled in jars and closed with the airtight lids. The process flow chart is given below:



Evaluation of physico-chemical properties:

The moisture content was determined according to AOAC (1995) method. Ash content was determined by heating at 550^oC for 8hr in a muffle furnace (Spectralab, Mumbai) for 8 h. The total ash was expressed as per cent of dry weight (AOAC, 1995). The pH of the date jam was determined with a pH meter (Labindia, Mumbai) by dipping into electrode in filtered solution prepared by

homogenizing 10g of sample in 100 ml distilled water. Sugars were estimated by lane and eynon method. Total soluble solids (TSS) were determined by measuring the degree Brix at 20^oC using refractometer (ERMA, Hand refractometer, Japan).

Sensory evaluation:

For evaluation of several organoleptic characteristics such as colour, flavour, taste and overall acceptability of date jam, a 9-point hedonic scale rating was conducted. This test was conducted to evaluate the consumer's acceptability for the date jam. For this purpose, a panel of 10 persons including representatives of staff and student was constituted and trained. The jam samples were served to this panel and the panelists were asked to rate their individual's acceptability of the product through the sense of their organs on a scale of 9 points ranging from like extremely to dislike extremely.

RESULTS AND DISCUSSION

The present study was undertaken for the development, quality evaluation and shelf-life studies of date based jam. The quality of fresh and stored date jam was evaluated on the basis of physico-chemical characteristics, namely pH, moisture content, TSS, sugars and sensory qualities, namely, colour, flavour, taste and over all acceptability.

The proximate composition of fresh date jam has been presented in Table 1. It had moisture 34.43%, pH 4.05, ash content 1.24%, TSS 66.83^o Brix, total sugar 51.13% and sucrose 13.6%.

It is evident from one-year storage study (Table 1) that the moisture content and TSS (Brix) values of the date jam did not change significantly. Initially (at 0 days of storage) the moisture content and TSS values were 34.43% and 66.83^o Bx, respectively while after 12 months of storage, the values were 33.17% and 65.43^o Bx, respectively. On the other hand, the pH, total sugar, sucrose content and sensory properties of date jams were affected by the storage period. A slight decrease (from 4.05 to 3.85 for jam) was noticed in the pH values of the date jam. Total sugars were not affected by the storage conditions upto 09 months but tended to decrease as a function of storage period upto 12 months. Sucrose decreased continuously as a function of storage period. These results may be explained on the basis of sucrose inversion due to relatively higher storage temperature (25±5^oC) and acidic environment. Total sugars were not

Table 1 : Effect of storage on physico-chemical and sensory properties of date jam

Composition	00 Months	03 Months	06 Months	09 Months	12 Months
Moisture	34.43±0.557	33.74±1.002	33.63±0.551	33.43±0.643	33.17±0.115
pH	4.05±0.040	3.75±0.035	3.62±0.056	3.71±0.06	03.85±0.06
Brix	66.83±0.603	66.56±0.503	65.83±0.651	65.67±1.457	65.43±0.777
Total sugar	51.13±0.153	50.87±0.863	50.47±0.352	49.60±0.265	44.17±0.208
Sucrose	13.6±1.054	12.7±0.819	10.77±0.930	9.50±0.6245	7.366±1.172

Table 2 : Sensory characteristics of date jam during storage

No. of months	Colour	Flavour	Taste	Acidity	OAA
0	8.2±0.45	8.4±0.55	8.2±0.45	8.0±0.00	8.2±0.45
3	8.2±0.45	8.2±0.45	8.2±0.45	7.8±0.45	7.8±0.84
6	8.2±0.45	8.0±0.71	7.8±0.45	7.6±0.55	7.6±0.55
9	7.8±0.84	7.6±0.55	7.2±0.45	7.2±0.45	7.4±0.55
12	7.0±0.55	7.2±0.84	7.0±0.71	7.0±0.71	7.2±0.45



affected by the storage conditions upto 09 months of storage.

Sensory evaluation:

The results of sensory evaluation of date jam rated by panel of judges are shown in Table 2. All the attributes (*i.e.*, colour, flavour, taste, acidity and OAA) were within the acceptable range. It is apparent from the storage study results (Table 2) that the colour values of the stored date jams were not consistent. Visual examination revealed that this parameter was highly affected by storage period since the darkness intensity was markedly increased as a function of storage time. Score rated for colour of the date jam was in between 8.2 to 7.0 during one year of storage. As far as the sensory properties of

the stored date jams are concerned, the results revealed that this parameter was moderately affected. The flavor perceived the score in between 8.4 and 7.2. The taste rated the minimum score of 7.0 and the maximum 8.2. The acidity of date jam was acceptable and perceived the score in between 8.0 and 7.0 from a total score of 9. The overall acceptability profile stood minimum score of 7.2 and the maximum 8.2 from a total score of 9.

Conclusion:

Dates based jam has instinct characteristics of date, as no other ingredient is added except pectin, preservative, and citric acid. Shelf-life of jam was more than one year. Slight changes were observed in colour and increased in acidity after 30 days of storage period.

Considering the consumer response date based products seems to have potential of commercialization. Technology of commercial production of nutritive and low cost spread, jam, jelly, chutney and bakery products is required to be developed.

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