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Development and nutritional evaluation of red dragon fruit jam sweetened with fructooligosaccharide

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Abstract

The study aims to investigate 3 types of red dragon fruit jam with pulp and evaluate the final product's sensorial, microbiological and proximal analysis. The fruit was selected, sanitized, and pulp and cut were developed and evaluated. Three types of red dragon fruit jam were prepared and names T1, T2, and T3 increased according to red dragon fruit jam pulp and fructooligosaccharide. After the completion of the experiment, it was found that T2 results were better in comparison to other jams. As elucidated from proximal analysis, the control sample shows less acceptance compared to fortified jam.

Keywords: Red dragon fruit; Fructooligosaccharide; Nutritional evaluation; Gujarat

1. Introduction

Dragon fruit is a vine cactus species belonging to the family Cactaceae (Patwary et al., 2013) [1]. Its plant is attractive due to its exotic appearance (Liaotrakoon, 2013). Dragon fruits are gaining popularity for their nutritional and medicinal properties [2]. This fruit is considered an important economic fruit species worldwide due to its nutritional value (Rifat et al., 2019) [3]. The cultivar, season, climate, cultural practices, water availability, transport, handling and storage may affect the bioactive compounds of Dragon fruit (Franke et al., 2004; Wall, 2006) [4]. Dragon fruit has great potential as a new crop for Mediterranean growers due to the requirement of little water and well adaption to high temperatures (Trivellini et al., 2020) [5]. The color of red-fleshed Dragon fruits became pigmented during the ripening process (Rahim et al., 2009) [6]. The fruit is rich in sugars and antioxidants having good taste and crispy properties [7]. Dragon fruit is an edible fruit with water-soluble fiber and contains high levels of vitamin C and antioxidants like Betalains, Hydroxycinnamates and Flavonoids (Moshfeghi et al., 2013) [8]. It has several health benefits including its ability to aid in weight loss, improve digestion, reduce LDL cholesterol in the blood and strengthen the immune system. Hydroxycinnamates help to prevent cancer and Flavonoids act on brain cells and blood vessels to reduce the risk of heart diseases. It also guards against bacteria and fungi and helps in the overall functioning of the body (Verma et al., 2017) [9].

Logjams are a type of food with intermediate humidity content, and it's prepared by cooking fruit with the addition of sucrose, pectin, acid and other constituents which will characterize the product. It finds its origin in the practice of food preservation for consumption throughout time. Logjams must have an acceptable thickness, and when they're stored at high temperatures or not stored duly, there's a significant loss in terms of nutritive values and sensational parcels (Touati et al., 2014; Rababah et al. ; Panchal, Gaikwad, Dhemre & UD, 2018). [10, 11, 12]

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Another important factor for jam expression is pectin – pectic substances – which is responsible for gelation due to hydrophobic relations and hydrogen bonds in acid conditions(pH<,5), and low water exertion(Javanmard, Chin, Mirhosseni, & Endan, 2013). As a point of a well commercially accepted product, logjams must have a content of 60 °Brix (Holzwarth, Korhummel, Siekmann, Carle & Kammerer, 2013).

Oligosaccharides called fructooligosaccharides(FOS) are set up naturally in a variety of shops, including artichoke, asparagus, onion, chicory, garlic, and banana [13]. The small intestinal glycosidases don't hydrolyze salutary FOS, thus it enters the cecum completely. The intestinal bacteria there reuse them to produce short-chain carboxylic acids, L-lactate, CO₂, hydrogen, and other metabolites. FOS has a variety of interesting characteristics, similar to a low agreeableness intensity, as well as being calorie-free, non-cariogenic, and classified as answerable salutary fiber.

2. Material and methods

2.1. Samples

Red dragon fruit was picked during the 2022 harvest, in Vadodara, state of Gujarat, India. The fruit was selected and sanitized in 1% sodium hypochlorite.

2.2. Jam preparation

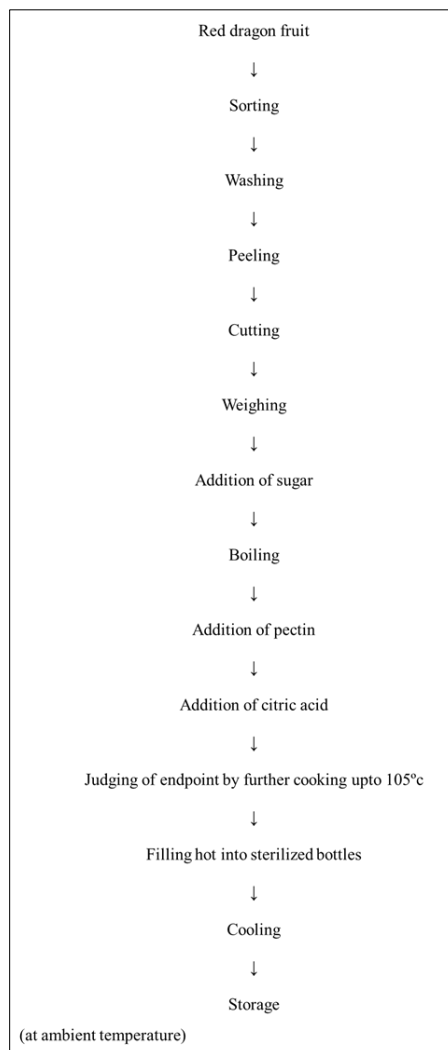


Figure 1 Red dragon fruit jam processing

The jam formulation was prepared by following the composition stated by Touati et al. (2014) [14] which contains fruit pulp, pectin, and citric acid added as much as needed, following the rules by RDC (Technical Regulation of Good Practices for Food Services), from march 6th, 2013.

The fundamental ingredients of red dragon fruit jam are red dragon fruit pulp, fructooligosaccharide, pectin and citric acid. Red dragon fruit jam s1 40% dragon fruit pulp: 60% fructooligosaccharide, s2 60% dragon fruit pulp: 40% fructooligosaccharide, s3 50% dragon fruit pulp: 50% fructooligosaccharide.

For jam production, the ingredients were placed into a stainless steel container and exposed to cooking until the concentration of soluble solids reached 60 to 68°Brix. Citric acid was added until pH 3.5. After that procedure, the jam is still at a temperature higher than 85°C, was placed into glass jars previously sterilized, closed with metal buffers, and inverted for 5 minutes. After cooling, the jars were labelled and stored at room temperature.

2.3. Proximate analysis

Proximate analysis was conducted on the most well-accepted jam formulation. The moisture content was determined by drying two grams of samples in the oven heated to 105°C until constant weight. Loss on drying was taken as moisture content [15]. Ash was estimated using a method where two grams of sample were incinerated in a muffle oven at 550°C for 12 hours [15]. The crude fiber was determined by successive treatment with sulphuric acid and sodium hydroxide. The residue remaining after this treatment was dried and weighed and taken to be the weight of crude fiber [15]. Redox titration was carried out to determine vitamin C [16].

2.4. Sensory Evaluation of Standardized Jam

Sensory analysis was carried out by applying the 9-point hedonic scale test (9= like extremely; 1= dislike extremely). The global appearance, taste, texture and purchase intention.

Using a 9- point Hedonic scale, fifteen panelists assessed the control sample and samples of jams made with fructooligosaccharides for their sensory aspects of color, taste, texture, scent, and overall acceptability. Samples were graded from 1 for the least acceptable to 9 for the most acceptable. The scores from the fifteen panelists were then averaged to determine the mean value.

2.5. Microbiological Analysis

Total fungal count: All the samples were kept at room temperature for some days and analyzed for the total fungal count method, described by Diliello [17].

3. Results and discussion

3.1. Sensory evaluation of jam

The mean scores for sensory of T1, T2, and T3 samples are shown in table 3. Sample T2 containing 40% fructooligosaccharide had the highest scores for color, texture, aroma, flavor and overall acceptability. The decrease in the quantity of fructooligosaccharide seems to have contributed to improvements in color, aroma, and taste. The addition of fructooligosaccharide play important role in higher overall acceptability of the finished product.

Jam texture, flavor, and aroma all have an impact on the jam quality, which ultimately determines whether or not consumers would accept it. A slightly low acceptable taste was observed in samples T1 and T3 respectively. The score for these samples for texture and taste was lower than sample T2 containing 40% fructooligosaccharide. Sample T3 which was more acceptable than the other two samples was then compared with the control sample for its physical and chemical composition.

3.2. Proximate analysis of jam

The sample was analyzed for the contents of moisture, ash, fiber, and vitamin c by the method of oven drying, muffle oven, successive treatment and redox titration. The results of the analysis are shown in table 3. The sample found moisture content was 18.53%. The ash content was found to have 0.69%. The vitamin c content found have 148.94 mg/100 gm. The crude fiber content found have 2.31%.

Table 1 Different formulations of the jam by various percentages of fructooligosaccharide

Treatment	T1	T2	T3
Red dragon fruit pulp	40 gm	60 gm	50 gm
Fructooligosaccharide	60 gm	40 gm	50 gm
Citric acid	3 gm	3 gm	3 gm
pectin	1 gm	1 gm	1 gm

3.3. Microbiological analysis

The total plate count of the microbial population is considered an index of the quality of food products. The sample found Total fungal count is acceptable it was 86 cfu/gm.

Table 2 Mean score for the sensory evaluation of jam

Sensory qualities	T1	T2	T3
Colour	7	9	9
Texture	8	9	8
Taste	8	9	7
Aroma	7	8	8
Overall acceptance	8	9	8

Note 9. Like extremely 8. Like very much 7. Like moderately 6. Like slightly 5. Neither like nor dislike 4. Dislike slightly 3. Dislike moderately 2. Dislike very much 1. Dislike extremely

Table 3 The nutritional composition of the jam was analyzed using different methods

Parameters	Results
Moisture	18.53%
Ash	0.69%
fibre	2.31%
Vitamin c	148.94 mg/100 gm

4. Conclusion

These results indicate that jam made from red dragon fruit pulp using Fructooligosaccharide has more health benefits than the common jam available in the market which is made from ground sugar. It is evident from the chemical properties that the jam can be enjoyed by diabetic people as these jams are made from Fructooligosaccharide.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare that there is no conflict of interest.

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