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Processing technology of carrot (*Daucus carota* L.) and fig (*Ficus carica* L.) powder enriched burfi

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Abstract
The present article was designed with the aim to develop processing technology for preparation of carrot (*Daucus carota* L.) and fig (*Ficus carica* L.) powder and the prepared powder subsequently utilized in burfi in different proportions (5%, 10%, 15% carrot powder and 9%, 12%, 15% fig powder). The products prepared by processing of carrot and fig *viz.* powder and burfi were chemically and sensorial assessed. Addition of carrot powder increased the level of β-carotene, fiber and calcium contents. With increase in concentration of fig powder, the level of ascorbic acid, sugar and potassium in the burfies was observed higher. Carrot and Fig powder incorporated burfi was nutritionally rich in terms of fiber (5.1 g), potassium (427 mg), β-carotene (81 µg), calcium (19 mg) and ascorbic acid (8.27 mg). However, the combination of 10% carrot powder and 12% fig powder recorded highest score in sensory attributes revealing better consumer acceptability.

Keywords: Carrot powder, fig powder, cabinet dryer and burfi

Introduction

Carrot (*Daucus carota* L.) is a root vegetable which is cultivated and consumed throughout the world. World production of carrot during 2012-13 is 35,762,080 Tonnes. Total area under carrot cultivation in India is 62,220 Ha and production is 1,150 Tonnes (FAO, 2014) [4]. Carrot is rich in functional food components such as vitamins (A, C and K) and minerals (calcium, phosphorus and iron) (Knockaert *et al.*, 2012) [6]. Among the various root crops grown in India, carrot is one of the most popular among the common masses but the main disadvantage associated with the carrot is that it is seasonal, requires a long growing season and its harvesting period is limited.

In recent years, the consumption of carrot and its related products has increased steadily due to the recognition of antioxidant and anticancer activities of β-carotene in carrot. Carrots are processed into products such as dehydrated carrots, powder, juice, beverages, candy, preserves and halwa.

Fig (*Ficus carica* L.) belongs to the family moraceae. The fig is a native of southern Arabia. In India, its commercial production is limited to a few centers in Maharashtra and south India. In Maharashtra, it is cultivated on commercial scale in adjoining areas of Pune and Aurangabad (Anonymous, 2012) [2]. As per the annual report of year 2013 given by Department of Agriculture, Maharashtra state assert that, the area under cultivation of fig fruits was 300 hectares up to 1990, which increased to 3715 hectares in 2013. Fig fruit is a rich source of nutrients such as dietary fiber and minerals like calcium and potassium. The edible fig is a powerhouse of nutrients and is known since the prehistoric times (Venu *et al.*, 2005) [10].

The fig, one of the most important fruit species in the Mediterranean area, bears fruits that are highly perishable, even in refrigerated conditions (Piga *et al.*, 1995) [8] and thus nearly all the world production is preserved in the dried form. Cabinet drying being considered the generic drying method followed for preparation of various food powders.

Among the confectionery, burfi is one of the most popular khoa-based sweet in all over the country. The generic nomenclature "burfi" covers a wide range of product variations that include plain, danedar, dudh, chocolate, fruit and coconut burfi. (Varma *et al.*, 2013). The carrot and fig powder prepared by Cabinet drying method was utilized as a novel ingredient in for enrichment of Burfi (Khapre *et al.*, 2011) [5].

The development of carrot and fig powder incorporated burfi as a nutritious indigenous sweet is an attempt to popularize the Indian sweet, which is now in demand for export to the western countries where a sizable Indian population.

Materials and Methods

Preparation of carrot and fig powder

Fresh carrots were purchased from local Parbhani market and the fig fruits of variety *Deanna* were obtained from the farmer's (Aurangabad district) fields. The carrots and figs were washed, cleaned and used for the experiment. The technology for preparation of powder by using Cabinet dryer has been standardized. In case of fig fruit because of high sugar content (TSS), more period of drying is required. The procedure followed during the cabinet drying is summarized in following flow sheet (Fig. 1 and Fig. 2).

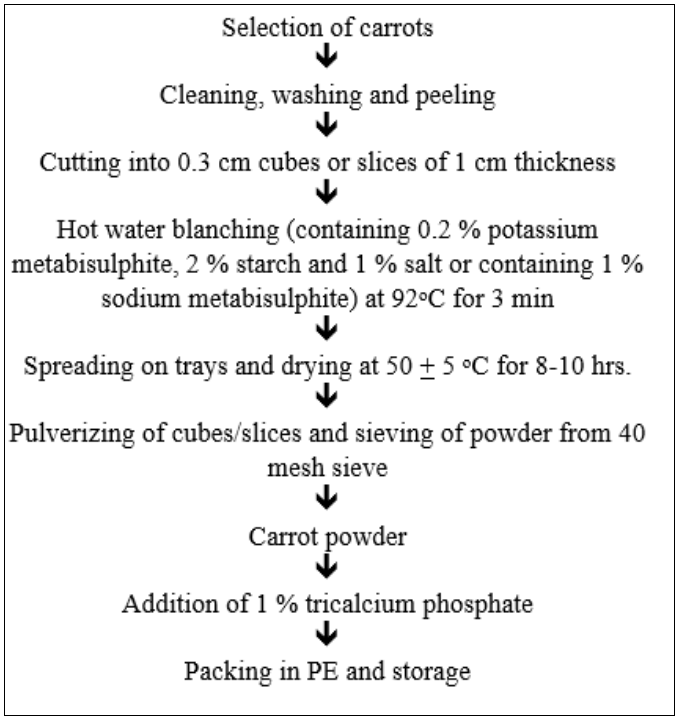

Fig. 1: Flow sheet for preparation of carrot powder by cabinet drying

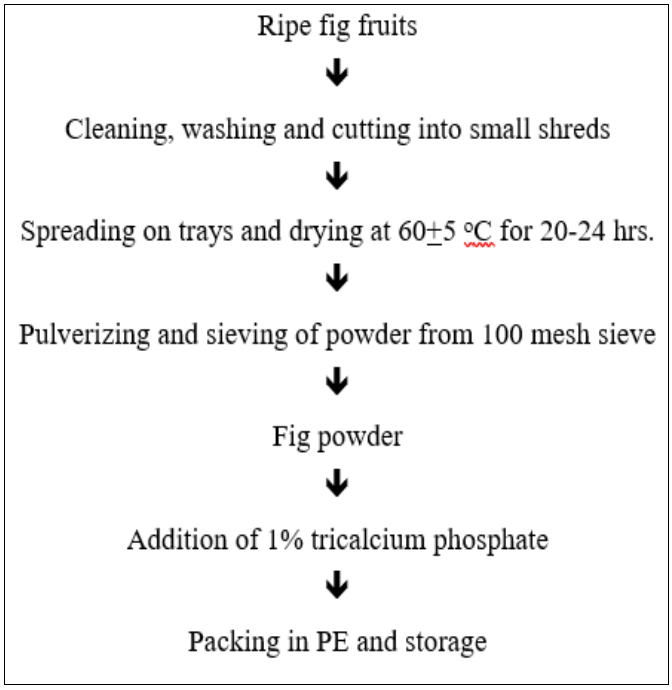

Fig 2: Flow sheet for preparation of fig fruit powder by cabinet drying

Preparation of carrot and fig powder enriched burfi

In preparation of burfi, sugar (at 30 per cent of milk *khoa*) and carrot and fig powder (varying in proportion of 5%, 10%, 15% of carrot powder and 9%, 12% and 15% of fig powder) added in stainless steel utensil or *Karhai*. Also added colour and flavor. Heated the mixture with stirring. Spread it in tray and cool. After setting, cut into rectangular pieces. The procedure followed for preparation of carrot and fig powder enriched burfi is summarized in following flow sheet (Fig. 3).

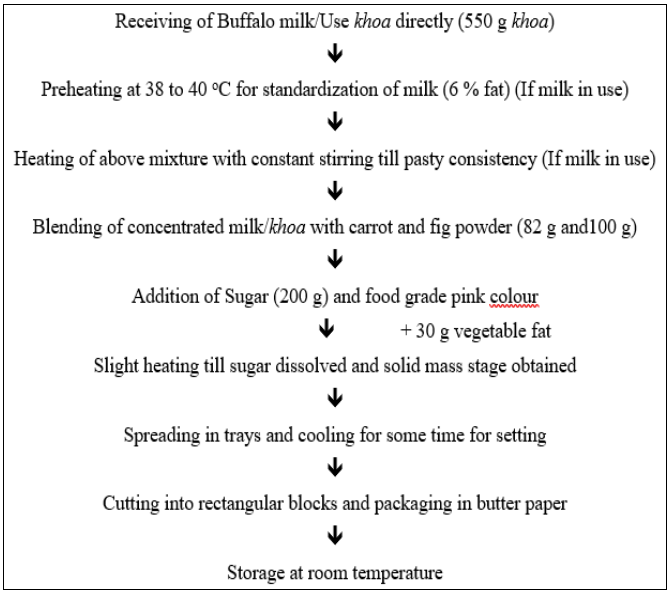

Fig 3: Flow sheet for preparation of carrot and fig burfi

Sensory Evaluation

The sensory evaluation of burfi samples was examined by trained/semi-trained judges on nine-point Hedonic scale for its color and appearance, taste, flavor, texture and overall acceptability (Amerine et *al.*, 1965) [1].

Chemical Analysis

The fresh carrot, fig, cabinet dried carrot and fig powder and burfies were analyzed for moisture, ash, sugar, protein, fat, fiber, β-carotene, ascorbic acid, calcium and potassium by the methods given by A.O.A.C. (1990) and Ranganna (1995) [9].

Statistical Analysis

The data obtained on various parameters were recorded and statistically analyzed by Completely Randomized Design (CRD) as per the method proposed by Panse and Sukhatme in 1967 [7].

Results and Discussion

Sensory Evaluation

The burfies prepared from different levels of carrot and fig powder (00 per cent i.e. control sample and 5%, 10%, 15% of carrot powder and 9%, 12% and 15% of fig powder) were evaluated for their organoleptic properties. The sensory analysis of burfies shown that the best quality burfi with respect to sensorial parameter was obtained when the formulation contained 82 g carrot powder, 100 g fig powder, 550 g khoa, 200 g sugar and 30 g vegetable fat.

Table 1: Sensory score of burfi as affected by adding carrot and fig powder at varying level

Sample	Color & Appearance	Taste	Flavor	Texture	Overall Acceptability
S_0	7.7	7.66	7.38	7.62	7.48
S_1	7.86	7.66	7.36	7.68	7.92
S_2	8.14	8.22	8.12	8.08	8.26
S_3	7.96	7.76	7.54	7.74	7.94
SE ±	0.07	0.11	0.11	0.11	0.07
CD at 5% Level	0.21	0.35	0.33	0.34	0.23

Carrot and fig powder variations for preparation of burfi

Sample	Carrot powder (%)	Fig powder (%)
S_0	00	00
S_1	05	09
S_2	**10**	**12**
S_3	15	15

Chemical parameters of carrot and fig

The data pertaining to various chemical properties of carrot and fig is given in Table 2.

Table 2: Chemical composition of fresh carrot and fig

Sr. No.	Chemical Parameter	Measurement/Value	
		Carrot	Fig
1	Moisture (%)	86.4	75.3
2	Ash (%)	1.0	1.04
3	Total Sugar (%)	7.9	19.60
4	Reducing Sugar (%)	3.6	17.43
5	Non-reducing Sugar (%)	4.3	2.17
6	Protein (%)	1.2	1.75
7	Fat (%)	0.2	0.52
8	Dietary Fiber (%)	1.8	1.34
9	β-carotene (µg/100 g)	95	38
10	Ascorbic Acid (mg/100 g)	6.2	12.95
11	Calcium (mg/100 g)	48	0.6
12	Potassium (mg/100g)	190	370

Chemical parameters of carrot and fig powder

The data pertaining to various chemical properties of carrot and fig powder is depicted in Table 3.

Table 3: Chemical composition of carrot and fig powder

Sr. No.	Chemical Parameter	Measurement/Value	
		Carrot powder	Fig powder
1	Moisture (%)	10.2	9.63
2	Ash (%)	3.6	4.1
3	Total Sugar (%)	23.8	63.81
4	Reducing Sugar (%)	10.4	57.18
5	Non-reducing Sugar (%)	13.2	6.63
6	Protein (%)	6.3	6.51
7	Fat (%)	1.9	2.65
8	Dietary Fiber (%)	20.4	16.63
9	β-carotene (µg/100 g)	172	57
10	Ascorbic Acid (mg/100 g)	2.3	4.71
11	Calcium (mg/100g)	62	0.14
12	Potassium (mg/100g)	1300	2470

Chemical parameters of carrot and fig powder incorporated burfi

The mostly accepted sample of carrot and fig powder incorporated burfi was subjected to chemical analysis and the results obtained are presented in Table 4.

The data pertaining to chemical properties of burfi reported that it contained 22.9 per cent moisture and 3.9 per cent ash. β-carotene content of burfi was 81 µg/100g. It also reveals that the burfi contained reducing and non-reducing sugar 29.65 and 13.23 per cent respectively. Burfi was rich in protein and contained 11.19 per cent protein. Fat content of burfi was 19.18 per cent. The ascorbic acid decreased as compared to fresh produce and it was 8.27 mg/100 g. The value of calcium and potassium found in burfi were 19 mg/100g and 427 mg/100g respectively.

Table 4: Chemical composition of carrot and fig powder incorporated burfi

Sr. No.	Chemical Parameter	Measurement/Value
1	Moisture (%)	22.9
2	Ash (%)	3.9
3	Total Sugar (%)	42.88
4	Reducing Sugar (%)	29.65
5	Non-reducing Sugar (%)	13.23
6	Protein (%)	11.19
7	Fat (%)	19.18
8	Dietary Fiber (%)	5.1
9	β-carotene (µg/100 g)	81
10	Ascorbic Acid (mg/100 g)	8.27
11	Calcium (mg/100g)	19
12	Potassium (mg/100g)	427

Conclusion

The above study revealed that, the carrot and fig powder prepared by cabinet drying method was utilized as a novel food ingredient for enrichment of burfi. The value-added products prepared by processing of fresh carrot and fig *viz.* powder and burfi were assessed for their nutritional significance. Carrot and fig powder incorporated burfi were nutritionally rich in fiber, potassium, β-carotene, calcium and ascorbic acid.

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