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Development of Fig *Chikki* using Fig powder (*Ficus Carica*) and its storage stability studies

Vidhya Lakshmi A.[1], Karuna Ashok Appugol[1], Irengbam Barun Mangang[1], Jagan Mohan R.[2] and Loganathan M.[1]*
[1]*Storage Entomology Laboratory, Department of Academics and HRD, (Tamilnadu), India.*
[2] *School of Sensory Sciences, Department of Food Product Development,*
National Institute of Food Technology, Entrepreneurship and Management (NIFTEM-T), Thanjavur (Tamilnadu), India.

(Corresponding author: Loganathan M.)*
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ABSTRACT: ***Fig (Ficus carica*) is a nutritionally rich fruit traditionally grown and commercially available as dried preserved fruit. It is an important fruit for health based on its nutritional composition. It is commercially available only in dried form which makes it an underutilized fruit. But considering the high nutritional aspects it should be made available in consumer preferred form which can be marketed easily. Thus the fig was made as powder by drying of figs using method of Low Temperature Low Humidity (LTLH) drying and then grinding. The fig powder was incorporated to produce value added product of Fig *chikki*. The prepared product was analyzed for various physiochemical parameters and the changes in physio chemical parameters upon storage of 30 days was noted and it was compared to control samples. The fig *chikkis* was found to have 2.1 % of moisture, 17.8 % of protein, 21 % of fat, 5.6 % of crude fiber, 3.3 % of ash, 0.04 % acidity, 26 % reducing sugar, 5.1 mg of ascorbic acid, 107 mg of total phenolic content, 36 % of antioxidant activity with 0.5 water activity, pH value of 6.4 and color difference (ΔE) of only 10.6 at the end of 30 days of storage. Upon storage, although the values were significantly different from control it was with only slight differences except protein content, crude fiber, ascorbic acid, total phenolic content which was majorly higher in fig *chikkis*. Upon sensory evaluation, the fig *chikkis* had better flavor, hardness, sweetness than the control, while other parameters were slightly lesser to control. The value added product of *chikkis* can be prepared using fig powder which had improved nutritional properties than normal ones and it was found to have desirable sensory quality on 30 days of storage.**

Keywords: Fig powder, Value added product, Dried figs powder, Storage, Physico Chemical qualities.

INTRODUCTION

Fig (*Ficus carica*) belongs to the family Moraceae has been growing since 4000 B.C. Figs are syconia, multiple druplet fruits with a distinctive "inside-out" structure (Mawa *et al.,* 2013). Fig can be harvested twice a year and its regarded as a seasonal fruit. Depending on the cultivar, it is harvested either in the spring or in the early or late summer (Ouchemoukh *et al.,* 2012). Fig is a commercially valuable crop (Kitajima *et al.,* 2018). A mature fresh fig has a pulp content of 84 % and a skin content of 16 % (Hiwale, 2015). The fresh figs contain moisture (89.8%), carbohydrate (17.1%), protein (1.3%), fat (0.2%), mineral matter (0.6%), phosphorus (0.03%), calcium (0.06%), and iron (12 mg). It also has carotene (162 µg), thiamine (60 µg), riboflavin (50 µg), and niacin (600 µg) per 100 g (Cheema and Bhatt, 1954). While the dried figs contained water (15.7%), reducing sugar (62.84%), protein (3.39%), ash (2.10%), crude fiber (5.80%), acid (0.42%) (Hiwale *et al.,* 2015). Because of the large amount of dietary fiber, vitamins, and minerals in dried figs, they have a better nutrition profile than all other dried fruits (Badgujar *et al.,* 2014).

There are many varieties (about 1,000 varieties) under cultivation which may have common characteristics. Turkey is the highest leading producer of figs (Hiwale, 2015) followed by Egypt, Moracco, Greece, Iran, and Algeria that account for 70 % of global annual fig production (FAOSTAT, 2022). Mineral amounts differed significantly amongst the sample groups grown in Italy, Greece and Turkey (Lo Turco *et al.,* 2020). Figs are also a source of a number of bioactive compounds that are found in the peel, pulp, and leaves includes cyanidin 3-rutinoside, epicatechin, and caftaric acid, respectively (Teruel-Andreu *et al.,* 2021).

The traditional medicine field has been using fig products to treat a variety of diseases, primarily in the treatment of skin (Zhang *et al.,* 2020). The fig plant's leaves, roots, and latex are recognized for the health benefits, including antihelminthic, antifungal, acetyl cholinesterase inhibition and anticarcinogenic effects (Arvaniti *et al.,* 2019). It was reported that fig is used to treat a variety of ailments including gastric problems, inflammation and cancer. (Mawa *et al.,* 2013).

Fresh figs are extremely susceptible to decay and the post-harvest life is very short (Kong *et al.,* 2013). So the fresh figs are processed, dried, stored, and consumed as a dried fruit for enhanced shelf life and safer storage. Previous studies have reported that the analysis of various physicochemical parameters of fig powder revealed that it is rich source of sugars, fiber, potassium (Khapre *et al.,* 2014) which can be incorporated in various value added products like milk shake, ice cream, toffee and burfi (Khapre, 2011) .

Value added products can be prepared using fig pulp, dried fig and also by incorporating fig powder. The products like fig jam having 0.7 %pectin and 0.3 % (Kumari *et al.,* 2018), fruit bar with 20 % fig puree and 80 % mango puree (Pawase *et al.,* 2018), fresh rabri, with 150g of fig pulp for every 1 liter of sweetened condensed milk (Dhemre *et al.,* 2018) was prepared using fig pulp.

The dried figs were crushed and filtered to prepare a microbial biotechnological product like wine from dried fig using *Saccharomyces cerevisiae,* the wine had 4 % alcohol (Kadam and Upadhye 2011), also wine was made from sliced figs (Jeong *et al.,* 2005). The fig powder was found to be better in terms of ease of processing and yield, in contrast to fig pulp and dried figs. Fig powder was also incorporated to prepare burfi (Khapre *et al.,* 2015), goat's yogurt (Mahmoudi *et al.,* 2021) and cookies Khapre *et al.* (2015).

Chikki, also known as peanut brittle, is a famous Indian sweet snack enjoyed by a greater portion of population. *Chikki* is a hard crunchy product which is golden brown colored, that contains peanut pieces and has a distinct peanut flavour (Pallavi & Chetana 2014). There are various types of *chikki* based on the added ingredients, such as groundnut *chikki*, roasted bengal gram *chikki*, sesame *chikki*, and so on. The peanut *chikki* can be done using incorporation of various raw materials like sesame seed, ragi flour, flaxseed (Chetana & Sunkireddy, 2011), pomegranate juice (Devhare *et al.,* 2021), even various nutraceuticals was used to enrich the *chikki* (Ramakrishna & Pamisetty 2014). Multigrain flour is now used in the preparation for maximum health benefits (Abhirami & Karpagapandi 2018).

Based upon this research, this study aims at preparation of value of added product of Fig *Chikki* by incorporating fig powder and to study their effects upon storage for 30 days on various physico chemical parameters.

MATERIALS AND METHODS

A. Preparation of Fig Powder

The fresh figs of Deanna variety were purchased from orchards of Namakkal district of Tamil Nadu, India, dried and powdered. The figs were cleaned, washed and cut into round shaped slices of 0.5 ± 1.0 mm thickness. The slices were pretreated with 0.2% KMS solution. It was observed that the fresh fig slices had a mean diameter of 31.28 ± 3.66 mm and weighed 3.79 ± 0.24 g. The fresh figs were stored in a refrigerated condition of 4 ± 1°C until subjecting them to drying. The figs were subjected to drying by using a novel method of Low Temperature Low Humidity (LTLH) drying. The fresh fig slices were placed in the drying chamber and dried in the set condition of 30°C and 10 % RH until the moisture is reduced to 5 %. The dried fig samples were cooled in a desiccator and stored in polyethylene zip lock pouches in ambient temperature. The LTLH dried figs were grinded to get fig powder which was sieved using two sieves of mesh sizes 707 and 505 µm. The sieved fig powder was added with 1 % of tri-calcium phosphate as an anticaking agent as described by Khapre *et al.* (2015). The prepared fresh fig powder had an average particle size of 465nm.

Ingredients. The ingredients needed for the *chikki* preparation includes peanuts and jaggery along with above items. All the ingredients were purchased from local markets of Thanjavur, Tamil Nadu and stored in ambient conditions.

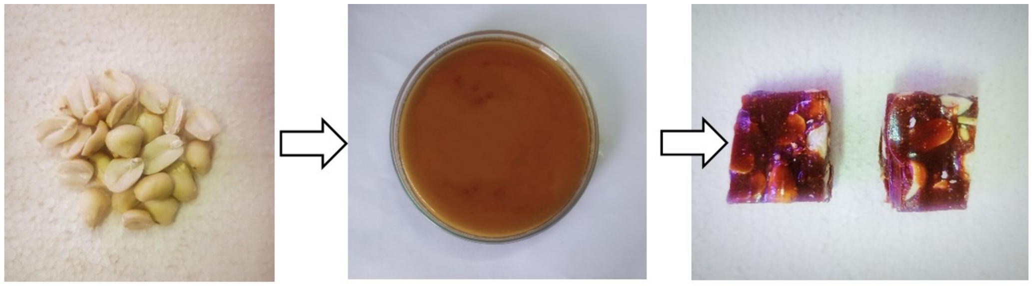
B. Fig Chikki Preparation

Fig *chikki* was prepared using the method described by Ramakrishna & Pamisetty (2014) with required modifications (Fig. 1). The process (Fig. 2) involves roasting of peanuts at a temperature of 120 to 140 °C for 20 minutes. The outer peanut skin was removed and the nuts were broken into two pieces. The ratio of ingredients followed were 3:1:1 indicating the roasted peanuts, peanut fines and fig powder (Table 1). The ingredients were weighed accordingly. The jaggery was added with half ratio of water to prepare syrup and heated to 145°C for 20 minutes. Once the syrup is thickened with desired consistency, it was added with roasted peanuts, peanut fines and fig powder and mixed well. It was spread in a greased tray and the *chikkis* were cut into small square pieces. Similarly, the control *chikkis* were prepared without the fig powder.

Storage of prepared products. The value added product was prepared and stored for storage studies. The *chikkis* was stored in polyethylene zip lock pouches at ambient room temperature conditions for 30 days.

Table 1: Formulation for *Chikki.*

Sr. No.	Sample	Peanut (g)	Peanut Fines (g)	Fig Powder (g)	Jaggery (g)	Water (ml)
1.	Fig Peanut *Chikki*	30	10	10	60	30
2.	Peanut *Chikki*	30	10	-	60	30



Roasted Peanuts *Jaggery syrup* *Fig chikki*

Fig. 1. Preparation of Fig *Chikkis.*

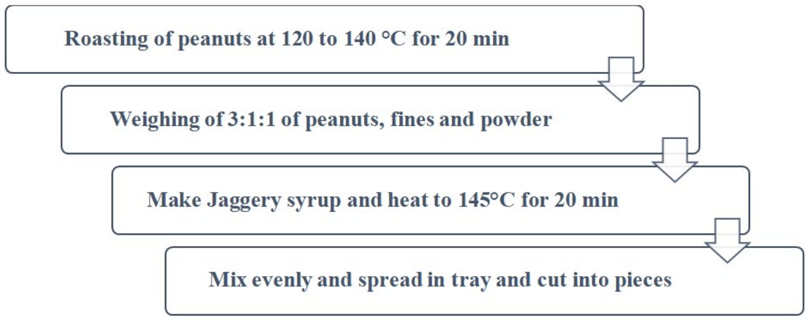


Fig. 2. Process Flow chart for *Chikkis* preparation.

C. Physicochemical analysis of product

The prepared product was analyzed for various physico chemical parameters for 0, 15 and 30 days and the changes were noted. The moisture, protein, fat, crude fiber, ash, titratable acidity, reducing sugar, and ascorbic acid content of fig products and control products were determined using the methods described by AOAC (2021) and Ranganna, (1995).

Water activity and Ph. The water activity of samples was recorded using a water activity meter (Aqua lab dew point, Water activity meter 4TE). The temperature during measurement was recorded and it was kept constant at 27 ± 1°C. The pH of samples was recorded using the pH meter (Horiba- PH1100, Model: 9615S, Japan).

Color and ΔE. The color of the product was assessed with a colorimeter (Hunter lab color flex EZ, Model: CFEZ0925,Hunter Associate Laboratory, Inc., Reston, Virginia, USA) by measuring opposite sides of the products. In CIE color coordinates, measurements were recorded as L* (lightness to darkness), a* (greenness to redness), and b* (blueness to yellowness). The colorimeter had a viewing area of 64 mm diameter and it was calibrated using the standard black and white tile provided (X-80.06, Y- 85.06, Z-89.63) before taking every sample reading. The change in color (ΔE) of the products was assessed using the method described by Monisha & Loganathan (2021) and Ruangchakpet a& Sajjaanantakul (2007).

$$\Delta E = \sqrt{(L_c * - L)^2 + (a_c * - a *)^2 + (b_c * - b *)^2}$$

Total phenolic Content. The phenolic content of the product were analyzed using the Folin-Ciocalteau method for total phenolic content assay as described by Singleton *et al.*(1999) using catechol standards. The absorbance was read in a UV spectrophotometer (Make: Shimadzu; Model: UV-1800) and it was expressed as mg Gallic acid equivalents per 100g of sample.

Antioxidant Assay. The antioxidant activity of the product was quantified using the DPPH method as described by Williams *et al.*(1995) using methanolic extracts of the samples and the DPPH inhibition activity (%) was recorded.

C. Statistical analysis

The experimental assays were performed in triplicates and data of these various physicochemical parameters were statistically analyzed to find the significance of the results. The results of physicochemical data were expressed as means ± standard deviations and it was compared with control samples. One-way analysis of variance (ANOVA) was computed using Minitab (Version 17.3.1). Turkey test was done at a 5% level of significance and when $p < 0.05$ the data were considered significant.

Sensory Evaluation. The sensory evaluation of the prepared product was carried out with a panel of 25 semi-trained judges by using the 9-point hedonic scale. The various parameters analyzed for *chikkis* includes appearance, color, hardness, crunchiness, flavor, mouth feel, taste, sweetness, overall acceptability. The data obtained was analyzed by following the method of Descriptive analysis as described by Ramakrishna & Pamisetty (2014) using the Fizz WEB by Biosystems Sensory Software.

RESULTS AND DISCUSSIONS

A. Analysis of various physicochemical parameters of product and its effect of storage

Moisture. The moisture content of fig peanut *chikki* was in range of 0.7 (F_0) to 2.1 % (F_{30}) while in control, it was 1.7 (C_0) to 2.1 % (C_{30}) (Table 2). The control samples had a higher moisture than fig peanut *chikki* initially. The moisture was found to be increasing during storage. But after 15 days, the moisture was not found to be significantly different between control and fig sample. Both samples had a lesser moisture of 2.1 % at the end of storage of 30 days. The fig peanut *chikki* was found to have a very less moisture content ranging from 0.7 to 2.1 % (Table 2) which was comparatively less than a similar product of peanut *chikki* made from pomegranate peel powder (Devhare *et al.,* 2021), pumpkin peanut *chikki* and also commercial *chikki* samples (Mala *et al.,* 2015). Thus the storage stability may be better with a lesser moisture content. Thus it is concluded that fig powder had no influence on moisture content of the product upon 30 days of storage.

Protein. It was reported that the amount of protein in the dried figs was found to increase than in fresh figs during the drying and dehydration of figs (Hiwale, 2015). The fig product had a greater storage stability in protein levels in all 4 samples as the values were not significantly different upon storage of 30 days. When fig peanut *chikki* is considered, it had a very high protein levels because of peanuts ranging from 17.5(F_0) to 17.9 % (F_{15}) which was comparatively higher than in control *chikki* samples ranging from 14.9(C_{30}) to 15.1 %(C_0) (Table 2). This protein content of fig *chikkis* concurred with the nutra *chikki* prepared by Pallavi & Chetana (2014). Both the control and fig *chikkis* were rich in protein which was higher than other common peanut *chikki* (Hirdyani & Charak 2015; Mala *et al.,* 2015; Tidke *et al.,* 2017). All the fig incorporated samples had a higher protein content than their respective control samples even upon storage showing the significance of value addition.

Fat. The figs naturally had a lower fat content (Gopalan *et al.,* 1989) and it was also reported that figs are fat and cholesterol-free (Solomon *et al.,* 2006). The fig *chikkis* were found to have fat content of 21 % (F_{30}) and the control had 23 percent (C_{30}) after 30 days of storage (Table 2). Upon storage the fat content was decreasing which showed the significant difference among the samples. On comparing, the fig *chikkis* had lesser fat content than control *chikkis* for respective storage day sample.

Crude Fiber. Fig is a combination of fiber and minerals naturally (Venu *et al.,* 2005). The fresh figs had a crude fiber content of 6.5 % which was found to be increased upon drying. Even fig powder was considered to be a rich source of fiber and it had a dietary fiber of 15.4 % (Khapre, 2011). The fig peanut *chikki* had crude fiber of 5.7 % (F_{30}) while control samples had 4 % (C_0) at end of 30 days (Table 2). It was observed that there was slight reduction in control *chikki* on storage, while in fig peanut *chikki* did not showing significant difference during storage. All the *chikki* samples had a higher crude fiber content when compared with their respective control samples. The crude fiber content was higher than in other reported *chikki* products using pomegranate peel powder (Devhare *et al.,* 2021), pumpkin peanut *chikki* and also commercial *chikki* samples (Hirdyani & Charak, 2015; Mala *et al.,* 2015). These results revealed that all fig products had good crude fiber content.

Ash. The ash of the *chikkis*was found to be 3.3% (F_{30}) and the control had 3.4 percent (C_{30}) after 30 days of storage (Table 2). The ash content of both control and fig *chikki* samples were reducing upon storage and thus the significant difference was noted. But all the samples were having same range of values as control revealing no negative effect of fig product.

Titratable Acidity. The titratable acidity is proportional to the amount of organic acids present in the fruits (Kays, 1991). The titratable acidity of fig *chikki* was found to be reducing upon storage and ranged from 0.04 (F_{30}) to 0.08 % in fig sample(F_0) and 0.03(C_{30}) to 0.05 % in control (C_0) (Table 2). The acidity of control *chikki* samples was found to be significantly different from respective fig sample of same storage day. All the control samples had a lesser acidity than their respective fig samples. Upon storage, the acidity of *chikki* samples was found to be decreasing. The findings indicated that acidity of fig incorporated products were reducing upon storage.

Reducing Sugars. The fig fruits are recorded to be dominant in glucose and fructose (Fateh & Ferchich, 2009). Sugars and organic acid content in fresh figs were lower than in dried figs (Slatnar *et al.,* 2011). It was ranged from 26.0 (F_{30}) to 29.5 % in fig *chikki* (F_0) while in control *chikki,* it was 26.0 (C_{30}) to 27.0 % (C_0) (Table 2). The product was found to have reducing sugars ranged from 26 to 29.5 which was found to be slightly decreasing upon storage. The results of the storage analysis showed that the reducing sugars in *chikki* samples, were different for initial 15 days but both control and fig *chikki* had same quantity of 26 % at end of 30 days (Table 2). It was found that fig samples had not much higher difference from that of control samples even upon storage.

Ascorbic Acid. Vitamin C also known as ascorbic acid is highly susceptible to oxygen and heat. It can be degraded even by oxidation even upon drying under low oxygen circumstances (Kaya *et al.,* 2010). Upon heat treatments like drying or dehydration, loss of vitamin C has been widely reported (Piga *et al.,* 2004; Ryley & Kajda, 1994; Lund, 1988). The amount of ascorbic acid found in the sample was expressed as mg/ 100ml of sample extract. Initially, the control *chikki* (C_0) had a very less amount (0.9) of ascorbic acid on comparing to fig *chikki* (F_0) which had ascorbic acid of 5.6 mg. It was observed that all *chikki* samples showed no significant losses of ascorbic acid upon storage (Table 2).

Table 2: Effect of Storage on Physico chemical parameters of *Chikki.*

Sr. No.	*Chikki* Sample	Storage days	Sample Name	Moisture (%)	Protein (%)	Fat (%)	Crude fiber (%)	Ash (%)	Titratable Acidity (%)	Reducing Sugar (%)	Ascorbic Acid (mg/100g)	a_W	pH	Phenolic Content (mg/100g)	Antioxidant Activity (%)
1.	Control-Peanut *Chikki*	0	C_0	1.1 ± 0.00^{bc}	15.1 ± 0.01^{b}	25.0 ± 0.00^{a}	4.9 ± 0.00^{b}	3.5 ± 0.00^{b}	0.05 ± 0.00^{bc}	27.0 ± 0.00^{c}	0.9 ± 0.00^{b}	0.47 ± 0.00^{c}	6.5 ± 0.00^{b}	71.0 ± 0.00^{b}	35.8 ± 0.00^{c}
2.		15	C_{15}	1.5 ± 0.00^{ab}	15.0 ± 0.00^{b}	24.0 ± 0.00^{b}	4.8 ± 0.00^{b}	3.5 ± 0.00^{a}	0.04 ± 0.00^{cd}	27.1 ± 0.00^{c}	0.8 ± 0.00^{b}	0.48 ± 0.00^{bc}	6.4 ± 0.00^{c}	70.0 ± 0.00^{b}	35.4 ± 0.00^{d}
3.		30	C_{30}	2.1 ± 0.00^{a}	14.9 ± 0.01^{b}	23.0 ± 0.00^{c}	4.0 ± 0.00^{c}	3.4 ± 0.00^{d}	0.03 ± 0.00^{d}	26.0 ± 0.00^{d}	0.7 ± 0.00^{b}	0.49 ± 0.00^{a}	6.4 ± 0.00^{d}	69.0 ± 0.00^{b}	35.0 ± 0.00^{e}
4.	Fig Peanut *Chikki*	0	F_0	0.7 ± 0.56^{c}	17.5 ± 1.37^{a}	21.0 ± 0.02^{e}	5.7 ± 0.23^{a}	3.4 ± 0.01^{c}	0.08 ± 0.01^{a}	29.5 ± 0.05^{a}	5.6 ± 0.77^{a}	0.48 ± 0.07^{b}	6.7 ± 0.02^{a}	107.7 ± 2.52^{a}	36.9 ± 0.15^{a}
5.		15	F_{15}	1.9 ± 0.01^{a}	17.9 ± 0.00^{a}	20.0 ± 0.01^{f}	5.7 ± 0.00^{a}	3.3 ± 0.00^{f}	0.06 ± 0.00^{b}	28.0 ± 0.00^{b}	5.1 ± 0.00^{a}	0.49 ± 0.00^{a}	6.5 ± 0.00^{b}	105.0 ± 0.00^{a}	36.5 ± 0.00^{a}
6.		30	F_{30}	2.1 ± 0.00^{a}	17.8 ± 0.00^{a}	21.0 ± 0.00^{d}	5.6 ± 0.00^{a}	3.3 ± 0.00^{e}	0.04 ± 0.00^{cd}	26.0 ± 0.00^{d}	5.1 ± 0.00^{a}	0.50 ± 0.00^{a}	6.4 ± 0.00^{c}	107.0 ± 0.00^{a}	36.0 ± 0.00^{b}

Values with different letters in the same column differ significantly ($p<0.05$)
The control samples stored for 0, 15, 30 days were indicated as C_0, C_{15}, C_{30} respectively
Chikkis stored for 0, 15, 30 days were indicated as F_0, F_{15}, F_{30} respectively.

Table 3: Effect of Storage on color of *Chikkis.*

Sr. No.	Chikki Samples	Storage days	Sample Name	L*	a*	b*	ΔE
1	Control-Peanut Chikki	0	C_0	49.0 ± 1.03^{b}	12.4 ± 1.00^{b}	35.8 ± 0.00^{c}	-
		15	C_{15}	50.4 ± 1.00^{a}	14.0 ± 0.00^{a}	35.6 ± 0.00^{c}	-
		30	C_{30}	49.4 ± 0.00^{b}	13.6 ± 0.06^{a}	36.6 ± 0.00^{bc}	-
2	Fig Peanut Chikki	0	F_0	50.6 ± 0.05^{a}	13.7 ± 0.45^{a}	38.2 ± 1.03^{a}	3.1 ± 1.44^{b}
		15	F_{15}	50.4 ± 1.03^{a}	12.6 ± 0.00^{b}	37.4 ± 0.00^{ab}	2.4 ± 0.00^{b}
		30	F_{30}	38.9 ± 0.00^{c}	13.6 ± 1.20^{a}	38.0 ± 0.00^{ab}	10.6 ± 0.00^{a}

Values with different letters in the same column differ significantly ($p<0.05$)
The control samples stored for 0, 15, 30 days were indicated as C_0, C_{15}, C_{30} respectively
Chikkis stored for 0, 15, 30 days were indicated as F_0, F_{15}, F_{30} respectively.

After a storage period of 30 days, the fig samples had higher content of ascorbic acid than control samples. Hence it is reported that fig product had better retention of ascorbic acid or Vitamin C.

Water activity, pH. The water activity of fig *chikki,*was from 0.48 (F_0) to 0.50 (F_{30}) (Table 2) and upon storage there was significant difference observed between the samples. The water activity of samples was found to be increasing upon storage. Molds were identified in dried figs, which can grow in low water activity environments and cause microbial spoilage such as undesirable flavors, discoloration, putrefaction, and toxin production(Abellana *et al.,* 1999). Thus water activity has to be monitored for safer storage of figs.

The pH of the samples can be related to acidity of the figs. The present results of pH in *chikki* samples revealed that there is significant decrease upon storage and ranged from 6.5(C_0) to 6.4in control (C_{30}) and 6.7 (F_0) to 6.4 in fig samples (F_{30}) (Table 2). It was found that fig sample had a slightly higher pH than the control sample for each respective storage sample. Therefore, on comparison, it is evident that the products had not much difference on the water activity and pH from that of control.

Total Phenolic Content. Figs are naturally an excellent source of phenolic compounds which contained a higher concentration of total phenolic in the skin than in flesh (Vallejo *et al.,* 2012). But, there was more phenolic content of 105 (F_{15}) to 107 (F_0 and F_{30}) mg in fig *chikki* due to heat processing while control *chikki* had 69 (C_{30}) to 71 (C_0) mg (Table 2). Each individual control sample of specific storage day was significantly different from that of fig sample. All fig incorporated samples had a higher phenolic content than control revealing the significance of value addition. Upon storage of 30 days, both in control and treated samples there was no significant difference. Thus it is concluded that value addition using figs had increased the total phenolic content of products and storage had no negative effect.

Antioxidant Activity. The antioxidant activities of figs are positively associated with their phenolic compound content (Arvaniti *et al.,* 2019) and anthocyanin content (Solomon *et al.,* 2006; Çalişkan & Aytekin Polat 2011). In *chikki*, the antioxidant property of the product has lesser due to phenolic compounds degradation upon heat processing. There was significant decreasing effect upon 30 days of storage of *chikki* (Table 2). On comparing the control and fig samples, the control had lowest of 35 % (C_{30}) while the fig *chikki* had higher of 36 % (F_{30}). Thus, the present results supported the addition of fig which increased the antioxidant activity of products better than the control even upon storage.

Color. Color is a crucial feature because it is often the first thing a customer notices (Saenz *et al.,* 1993). The heat treatment of food is linked to a change in hue. Food color retention following thermal processing can be used to forecast the degree to which food quality deteriorates as a result of heat exposure (Shin & Bhowrnik, 1995). The fig *chikki* had L* values ranged from38.9 (F_{30}) to 50.6 (F_0), a* value was from 12.6(F_{15}) to 13.7(F_0) and b* value was from 37.4(F_{15}) to 38.2(F_0) (Table 3). The *chikkis* had significant difference in ΔE values upon storage only after 15 days and thus its concluded that storage had changed the color of *chikki*. These results indicate that color change was observed in fig *chikki* upon storage.

B. Analysis of Sensory Attributes of Prepared Products

The Sensory parameters were analyzed using descriptive analysis and was compared to control of respective products (Fig. 3). The fig *chikkis* had an overall sensory score of 8.48, while the control *chikkis* had 8.09 (Table 4). The parameters like appearance, color, crunchiness, mouthfeel, taste of fig *chikki* were slightly lesser than control. But it was noted that the parameters like hardness, flavor, sweetness of fig *chikki* was found to have a higher score than the control (Table 4). Thus it is concluded that the fig *chikki* had better flavor and hardness than the control.

Table 4: Mean Sensory Scores of *Chikkis.*

Sr. No.	Attributes	Control	Fig *Chikki*
1	Appearance	8.30 ± 0.72	8.14 ±1.23
2	Color	8.16 ± 0.90	8.07 ± 1.38
3	Hardness	7.72 ± 0.92	8.30 ± 1.27
4	Crunchiness	8.11 ± 0.79	7.78 ± 1.46
5	Flavor	8.06 ± 0.77	8.36 ± 1.31
6	Mouthfeel	7.88 ± 0.79	7.36 ± 1.07
7	Taste	8.04 ± 1.00	7.43 ± 1.12
8	Sweetness	7.66 ± 0.97	8.52 ± 1.12
9	Overall Acceptability	8.09 ± 0.71	8.48 ± 1.07

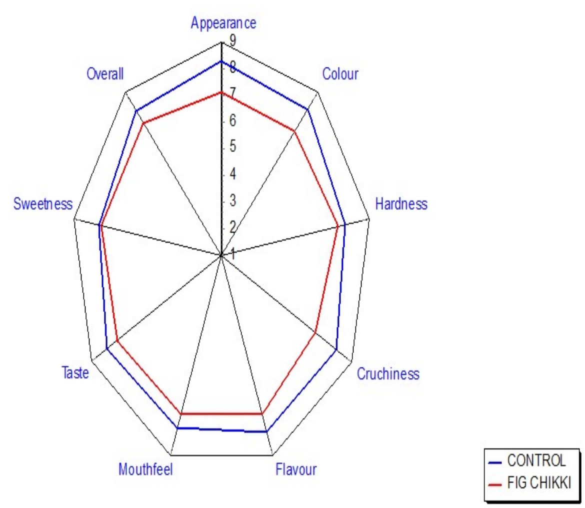


Fig. 3. Sensory Score of *Chikkis.*

CONCLUSION

The LTLH dried figs was used to obtain fig powder and it was incorporated into value added product of fig *chikkis.* The various physio chemical parameters of the product were analyzed and the storage stability and sensory analysis were done. The fig *chikkis* was found to have 2.1 % of moisture, 17.8 % of protein, 21 % of fat, 5.6 % of crude fiber, 3.3 % of ash, 0.04 % acidity, 26 % reducing sugar, 5.1 mg of ascorbic acid, 107 mg of total phenolic content, 36 % of antioxidant activity with 0.5 water activity, pH value of 6.4 and color difference (ΔE) of only 10.6 at the end of 30 days of storage which was similar to control except change in color. The advantage of incorporating figs is that a higher protein content, crude fiber, ascorbic acid and total phenolic content was recorded than control. The fig *chikki* had better flavor, hardness, sweetness than the control, while other parameters were slightly lesser to control. Thus, the value added product of *chikki* prepared using fig powder had improved nutritional properties than control product. Hence, it is concluded that the fig product had improved physio chemical properties and desirable sensory qualities even on 30 days of storage.

FUTURE SCOPE

The commercialization of fig *chikkis* as a product in market which favors the availability of nutritionally rich fig all throughout the year despite the fruits seasonal availability.

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