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EFFECT OF SAPOTA PULP AND SAPOTA POWDER ON SENSORY AND PHYSICO-CHEMICAL PROPERTIES OF BURFI

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ABSTRACT

Burfi is a popular khoa based confection and its contains considerable amount of milk solids. The manufacture of value added products by using sapota pulp and sapota powder. The present investigation shows that, sapota pulp and sapota powder @ 5 % and 30 % sugar by weight of khoa made from buffalo milk resulted in superior quality burfi and has highest acceptability. Sapota burfi with the Treatment combination T_1 and T_4 (5 per cent of sapota pulp & sapota powder) resulted in to a product of better choice and with the highest score rating of 8.25, 8.25, 8.75, 8.75 and 8.50 in treatment T_1, respectively for colour and appearance, body and texture, flavour, sweetness and overall acceptability, respectively. The Treatment combination T_1 results with the mean chemical composition as 24.12, 28.99, 16.83, 75.88, 5.60 ,28.23 and 0.26 per cent in respect, moisture, fat, protein, total solids, ash, sugar and Acidity content, respectively

Keyword: *Burfi, Buffalo milk, Khoa, Sapota pulp, Sapota powder Chemical and Sensory parameters*

1. INTRODUCTION

Milk is the traditional diet has varied greatly in different region of the world. Milk is regarded as a complete food in a human diet. Milk is provided all the nutrient essential for the nourishment of the human body. Milk is consume as a whole or by converting it into various milk products like concentrated milk product, coagulated, fermented, fat rich and frozen milk product. Milk sweets have been an inseparable part of the socio-cultural life in the Indian sub-contient. The reflect wealth and status of the people In India 50 to 55 per cent of total milk produced is converted into traditional milk products (Aneja, 1992). As far as traditional milk products are concerned, it has been estimated that 6.5 percent of total milk produced in India is converted into khoa and other condensed milk products (Shete *et al.*, 2012) . The value of khoa manufactured annually in India becomes almost double on its conversion into variety of popular indigenous khoa based sweets particularly burfi, peda, gulabjamun, kalakand etc. (Kadam *et al.*, 2010). Khoa prepared from buffalo milk can be adapted for preparing

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wide varieties of traditional sweets because of its appealing flavor, body and texture. Khoa bases sweets bear high commercial significance because of their popularity throughout the country and longer shelf life. In India, these milk sweets have been an indispensable part of the socio-cultural life (Kumar, 2013 , Amlepatil, 2015) .

Burfi has been flavoured as one of the most popular khoa based sweet all over India. The unique adaptability of khoa based sweet all over India. The unique adaptability of khoa in terms of its flavour, body and texture to blend with a wide range of food adjust had permitted development of an impressive array of burfi varieties. For the preparation of burfi there is different types of fruits are also used in Maharashtra such as wood-apple, orange, bear, fig, mango, papaya and sapota etc. Enhancement the acceptability of the burfi to the choosy classes as well as masses by these fruits (D.K.*et al.,2015 , Kusat, 2021).*

Sapota is one of the high-calorie fruits; 100 g provides 83 calories (almost same as that of calories in sweet potato, and banana). Additionally, it is an excellent source of dietary fiber (5.6 g/100g), which makes it a good bulk laxative. This fiber content helps relieve constipation episodes and help protect mucosa of the colon from cancer-causing toxins. The fruit is rich in antioxidant polyphenolic compound tannin. Sapota contains a good amount of antioxidant vitamins like vitamin-C (24.5% of recommended daily intake per 100 g of fruit) and vitamin A. Vitamin-A is essential for vision. It also required for maintaining healthy mucosa and skin. Consumption of natural fruits rich in vitamin-A has been known to offer protection from lung and oral cavity cancers. So also, consumption of foods containing vitamin-C helps the body develop resistance to combat infectious agents and help scavenge harmful free radicals from the human body. Fresh ripe sapodilla is a good source of minerals like potassium, copper, iron and vitamins like folate, niacin and pantothenic acid. These compounds are essential for optimal health as they involve in various metabolic processes in the body as cofactors for the enzymes

Under these circumstances, value addition through processing is important for economic utilization of increased production of sapota and conversion of fruits into suitable value added products.Moreover, there is need to develop some low-cost technologies to process fruits into value added products to reduce post-harvest losses which can help farmers in getting good returns for their produce and can improve acceptability in the market..

2. MATERIALS AND METHODS

2.1Preparation of sapota pulp

Approximately the required numbers of sapota fruits were taken. Peels or extraneous material were removed to separate the pulp of sapota fruits and ground it in mixer.

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2.2Preparation of sapota powder

Sample Preparation: The outer skin of the ripened fruit was peeled off manually using knife without damaging the pulp. The fruit was subjected to sulphitation before drying to prevent fungal infection and to maintain its colour. An appropriate number of 300 g samples aere weighted, dipped in a 1 % potassium metabisulphate (KMS) solution for 3 min and then drained.

Drying of sapota fruit: Pretreated peeled spota fruits cut into halves, quarters and 5 mm thick slices. Samples were dried in caninet drayer at 60 ^{0}C.

Powdering of dehydrated sapota: The dehydrated sapota samples obtained at 60 ^{0} C drying temperature were ground in a mixer grinder and further reduced in a ball mill to pass through 105 micron sieve.

2.3 Preparation of burfi

The process for small milk has been described by Sachdeva and Rajorhia (1982[a]). They reported that *burfi* was prepared by heating a mixture of milk solids (*khoa*) sugar to a homogenous consistency followed by cooling and cutting in to small cubes. Beating and whipping operations prior to cooling was practiced to obtained with smooth texture and closely knit body. While preparing sapota *burfi*, the buffalo milk standardized to 6 per cent fat was taken in an iron *karahi* and heated on gentle fire. At the time of boiling, milk was stirred with the help of a *khunti* in a circular manner @ 100 rpm. The stirring-cum-scrapping process was continued till a pasty consistency was reached. Then temperature was lowered up to 88-89 ^{0}C. At this stage, calculated amount of sapota pulp and sapota powder with sugar @ 30 per cent of *Khoa* were added. Finally this mixture was heated on a low fire with stirring till the desired texture was obtained. It was then spread in a tray and allowed to cool. After setting, sapota *burfi* was cut into rectangular blocks.

Preparation of Sapota *Burfi*

Receiving of Buffalo milk

↓

Preheating (38-40^{0}C)

↓

Filtration

↓

Standardization (6 per cent fat)

↓

Milk taken in iorn *karahi*

↓

Continuous heating and scrapping with *khunti*

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↓

Khoa

↓

Addition of sugar @ 30% (by weight of *khoa*)

↓

Addition of sapota pulp and Sapota powder (by weight of *khoa as per treatment combination*)

↓

Slight heating with scrapping

↓

Mixing

↓

Heating until it reaches to solid mass

↓

Spreading in Aluminium tray for cooling

↓

Setting

↓

Cutting into rectangular pieces

↓

Sapota *Burfi*

Fig 1: Flow diagram for manufacture of sapota *Burfi*.

2.4 Treatment details

For the preparation of milk sapota *burfi* the treatment combinations were as follows.

T_0 – Control, Whole buffalo milk (standardized with 6 per cent fat)

T_1 - 95 percent *Khoa* + 5 per cent Sapota pulp by weight of *khoa*.

T_2 - 90 percent *Khoa* + 10 per cent Sapota pulp by weight of *khoa* .

T_3 - 85 percent *Khoa* + 15 per cent Sapota pulp by weight of *khoa*.

T_4 - 95 percent *Khoa* + 5 per cent Sapota powder by weight of *khoa*.

T_5 - 90 percent *Khoa* + 10 per cent Sapota powder by weight of *khoa* .

T_6 - 85 percent *Khoa* + 15 per cent Sapota powder by weight of *khoa*.

These levels were tried and compared with control (T_0).

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2.5 Chemical analyis

Moisture content of sapota burfi was determined by standard procedure described in Anonymous (1959). Fat content of sapota burfii by method described in ISI : 1224 (Part II) 1977. Protein by microkjeldhal method as described in ISI (1981) , Ash by ISI: (1981), Acidity of sapota *Burfi* was determined as per the method described in ISI (1981), Total sugar content of sapota *burfi* was determined by the volumetric (lane-Eynon) method as a described in ISI (1981)and total solid by formula method.

2.6 Sensory evaluation

Sensory analysis carried outby panel of Judges in respect of color and appearance, Flavour body & texture. Sweetness and overall acceptability by **9** hedonic scale developed by Quarter master Food and Container Institute USA (Gupta 1976)

2.7 Statistical method

The data were analyzed statistically by using the completely randomized block design as per method described by Panse and Sukhatme (1967). The significance was evaluated on the basis of critical difference.

3.RESULTS AND DISCUSSION

The present investigation was aimed to incorporate sapota pulp and sapota powder in *khoa* to formulate a novel type of *burfi*. The results obtained during the course of investigation are presented in the following parameters.

3.1. Chemical analysis

3.1.1 Moisture

3.1.2 Fat

3.1.3 Protein

3.1.4 Ash

3.1.5 Total Sugar

3.1.6 Total solids

3.1.7 Acidity

3.2 Sensory evaluation

3.2.1 Colour and appearance

3.2.2 Body and texture

3.2.3 Flavour

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3.2.4 Taste

3.1.5 Overall acceptability

3.3 Cost of production of

Table 3.1: Physical properties of sapota fruit

Properties	**Range**	**Average**	**Standard Deviation**
Moisture content %	72.00-78.00	75.20	1.60
Length (mm)	44.08 to 60.19	50.29	4.15
Width (mm)	37.00 to 49.34	42.78	3.12
Thickness (mm)	41.06 to 52.91	46.53	3.13
Volume (cc)	20.00 to 70.00	43.20	15.19
Fruit weight (g)	41.15 to 74.99	52.19	7.909
Sphericity	0.842 to 0.990	0.908	0.052
Bulk density (g/cc)	0.341 to 0.414	0.384	0.0321
True density(g/cc)	0.952 to 2.1095	1.323	0.40
Porosity(g/cc)	16.62 to 42.22	31.492	8.45

Dimension

The length, width and thickness is sapota fruits was found to vary in the ranges from 44.08 to 60.19, 37.00 to 49.34 and 41.06 to 52.91 mm, respectively. The Average values of dimension in terms of length, width and thickness were found to be 50.29±4.15, 42.78±3.12 and 46.53±3.130 mm, respectively. The shape of sapota fruit may be classified as Eleptical as per classification given by Mohsenin [19]. The result were in general agreement with the result obtained for fresh sapota fruits by Gupta et al., 50.10 to 62.19, 31.90 to 42.16 and 27.40 to 41.42. And Athmaselviet al., 41.51, 42.16 and 40.3.

Fruit volume

The volume of the sapota fruits range is 20 to 70 cm3 and average volume are found of sapota is 43.2±15.19cm3.). The result was in general agreement with the result obtained for fresh sapota fruits by Gupta et al., is 408.3 to 587.7 (cc).

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Sphericity

The Sphericity of sapota fruits range is found to be 0.842 to 0.990 and average value is 0.908±0.052 .and the shape of sapota fruit may be classified as elliptical as per classification given by Mohsenin [19]. The results were in general agreement with the result obtained for fresh sapota fruits by Athmaselvi et al., is 0.957.

Fruits weight

The average weight of sapota fruits was 52.99±7.the weight of sapota fruits are recorded the range 41.15 to 74.99 (g). The result reported in literature for fresh sapota fruits by Gupta et al., range of 38.20 to 55.50 (g) verities in sapota kalipatti and Athmaselvi et al., was 48.42 kalipatti [20] reported average fruits weight of sapota was 55.6 verities cricket boll (g). And pawar et al., reported the sapota fruits weight range of 60.66 to 85.42 (g) for kalipatti.

Bulk density

Sapota fruits are bulk density was in the range of found0.341 to 0.414g/cc and the average value of the bulk density of sapota was 0.384±0.0321g/cc [21]. The result were in general agreement with the result obtained for fresh sapota fruits by Gupta et al., and Athmaselvi et al., range is 0.891 to 0.912 g/cc, 0.61 g/cm3.

True density

True density of sapota fruits was in the range of found 0.952 to 2.1095 g/cc. and average true density is sapota 1.323±0.40 g/cc [22]. The result were in general agreement with the result obtained for fresh sapota fruits by Gupta et al., for kalipatti and Athmaselvi et al., range is 1.013 to 1.055 g/cc and 1.12 g/cm3.

Porosity

The porosity is calculated by the sapota fruits was found in the range of 16.62 to 42.22 and average value of porosity is31.492±8.45 [23]. The result were in general agreement with the result obtained for fresh sapota fruits by Gupta et al., and Athmaselvi et al., range is 12.82 to 13.62. And 0.35 g/cm3.

Table 3. 2: Chemical properties of fresh sapota fruits.

Properties	**Range**	**Average**	**Standard Deviation**
Moisture content %	72.00-78.00	75.20	1.60
TSS °(B)	17- 23	19.45	1.40

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Acidity (%)	0.2 - 0.25	0.16	0.14
pH	5.5-6.0	5.72	0.14
Reducing sugar (%)	15-17.3	16.3	1.23
Total Sugar (%)	46-52.2	48.5	1.58
Protein% (%)	0.6-0.80	0.5	0.13
Fat% (%)	0.4-1.25	0.49	0.44
Carbohydrate (%)	14.3-28.31	19.50	3.47
Fibre (%)	0.42	2.50	0.92

Moisture content

Moisture content of sapota found to be in the range of 73.07% wet basis (280.283 % db). The result was in general agreement with the result obtained for fresh sapota fruits by pawar et al., which having range is 69.80% to 75.80 % (wb) for kalipatti and Athmaselvi et al., reported the moisture content of sapota verity kalipatti 77.93% (wb)**.**

TSS

The fresh sapota fruits the TSS range is found 17 to 23 and average value of sapota fruits is 19.45±1.40. The result were in general agreement with the result obtained for fresh sapota fruits by Pawar et al., which having range is 19.00°B to 23.60°B reported TSS of sapota average 24°B. Gupta et al., reported TSS of sapota average range 17°B to 22°B [20].

Titratable Acidity

The Titratable acidity of sapota fruits was in the of range 0.2 to 0.25, the average Titratable acidity is 0.16±0.14. The result were in general agreement with the result obtained for fresh sapota fruits by Pawar et al., which having range is 0.10 % to 0.23%.

pH

The pH of sapota fruits range was observed in the range 5.5 to 6.0 and average pH is 5.72 ± 0.14. The result were in general agreement with the result obtained for fresh sapota fruits by Pawar et al., which having range is 5.30 to 6.30. Gupta et al., range 5.2 to 5.7 [24].

Reducing sugar

Reducing sugar of fresh sapota fruits range was 15 to 17.3, average reducing sugar are 16.3±1.23. The reducing sugar reported for fresh sapota fruits by Pawar et al., was in the range of 8.90

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% to 11.08 %. And Take et al., average 8.91 %. Sawant reported the reducing sugar content of sapota at ripe stage was 8.28-13.86%.

Total sugar

Total sugars of fresh sapota are range between 46 to 52.2 and average total sugar of fresh sapota fruits 48.50±1.58. The result were in general agreement with the result obtained for fresh sapota fruits by Pawar et al., which having range is 14.40% to 18.20% verities kalipatti [20] reported average total sugar 17.57% evaluated ten cultivar of sapota and noticed variation from 7.0 to 12.3 per cent in total sugar [7]. Rao et al., observed that in sapota fruit contained 12.0 per cent total sugar.

Protein

The fresh Sapota fruit protein is range 0.6 to 0.80 and average value of protein is 0.48±0.13. The Protein content reported in literature for sapota fruits was 0.70 and 0.67. Ganjyal et al., 0.70 And Swaminathan is 0.70 average 0.6 [20].

Fat

The fat of Sapota fresh fruits range 0.4 to 1.25 and average fat value is 0.49±0.44. The fat content of sapota fruits reported in literature was 1.10, 1.13 and 1.25 (Ganjyal et al., Swaminathan) [20].

Carbohydrate

The carbohydrate of sapota fresh fruits range is 14.3 to 28.31 and average carbohydrate is 19.50±3.47. The result were ingeneral agreement with the result obtained for fresh sapota fruits by Ganjyal et al., 21.40. average 28.31 [20].

Fibre

Fibre of sapota was range of 0.42 to 28.31 and average fibre is 2.50±0.92. The result were in general agreement with the result obtained for fresh sapota fruits by Kumari et al., 2.60.

3.1 Proximate chemical analysis of sapota *burfi*

3.1.1 Moisture content of sapota *burfi*

The moisture content in sapota*burfi* varied due to incorporation of different levels of sapota pulp and sapota powder is presented in table 3.1.1.

Table 3.1.1.Moisture content of sapota *burfi.*

Treatment/ Days	Moisture content (percent)				
	0	**5**	**10**	**15**	**Mean**
T_0	16.25	16.28	16.22	16.30	16.26
T_1	24.14	24.12	24.15	24.08	24.12

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T_2	26.65	26.62	26.70	26.60	26.64
T_3	29.18	29.21	29.10	29.17	29.16
T_4	20.74	20.94	20.84	20.92	20.86
T_5	20.10	20.14	20.12	20.13	20.12
T_6	19.39	19.42	19.38	19.34	19.38
SE= 0.021			**CD at 5% =** 0.070		

The data presented in Table 3.1.1 indicate that the different levels of sapota pulp and sapota powder had influenced significantly on the moisture content in *burfi*.

It was observed that the average moisture content in T_0, T_1, T_2, T_3, T_4, T_5 and T_6 was 16.26, 24.12, 26.64, 29.16, 20.86, 20.12 and 19.38, respectively. Among these, the moisture content in treatment T_3 (29.16) was significantly highest than rest of the treatments. As sapota pulp increased in *burfi*, the moisture content in *burfi* was increased and as well as sapota powder increase in burfi thee moisture content decrease. This could be all about due to increased level of moisture content in sapota pulp and sapota powder (72.0 and 6.87per cent).

The similar trend of increase moisture content in products due to increased level of fruits pulps have been found by Kolhe (2003), Matkar (2006) and Golande (2007), reported moisture content in papaya *burfi*, fig *burfi* and sweet orange *burfi*, respectively.

The similar trend of decrease moisture content in products due to increased level of sapota powder have been found by Yadav *et al.*,(2018)

3.1.2 Fat content of sapota *burfi*

Fat is an important chemical constituent of *burfi* and treatments are presented in table 3.1.2.

Table 3.1.2. Fat content of sapota *burfi.*

Treatment/ Days	**Fat content (percent)**				
	0	**5**	**10**	**15**	**Mean**
T_0	22.10	22.08	22.12	22.16	22.11
T_1	28.90	29.10	28.93	29.03	28.99
T_2	27.54	27.52	27.45	27.50	27.50
T_3	25.94	26.07	25.90	26.05	25.99
T_4	29.20	29.12	29.15	29.09	29.14
T_5	27.85	27.70	27.82	27.79	27.79
T_6	26.40	26.42	26.44	26.46	26.43

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SE= 0.026	**CD at 5% =** 0.089

The data presented in Table 3.1.2 indicated that the average fat content in the *burfi* samples was significantly affected due to addition of sapota pulp. The observed fat content in T_0, T_1, T_2,T_3,T_4, T_5 and T_6 were 22.11, 28.99, 27.50, 25.99, 29.14, 27.79 and 26.43 per cent, respectively. The average fat percentage was significantly highest (29.14 per cent) in sapta powder *burfi* (T_4) which was prepared 5 percent sapota powder with khoa, while fat was lowest (22.11 per cent) i.e. control , plain burfi (T_1). Further it was noted that fat content was decreased as there was addition sapota pulp and sapota powder in the product. This might be attributed to the sapota pulp and sapota powder, which had only 0.50 and 3.4 percent fat content.

The decreased fat content due to increase level of fruit pulps observed in the study is also confirmed by the reports made by Patil *et al.* (1991), Kathalkar (1995), Wakchaure (1995) and Wadewale (2010), in preparation of soft and hard *burfi*, ber pulp *burfi*, sapota pulp *burfi* and mandarin orange *burfi*, respectively.

3. 1.3 Protein content of sapota *burfi*

The protein content in sapota *burfi* varied due to incorporation of different levels of sapota pulp and sapota powder is presented in table 3.1.3.

Table 3. 1.3 Protein content of sapota *burfi*

Treatment/ Days	**Protein content (percent)**				
	0	**5**	**10**	**15**	**Mean**
T_0	15.10	15.25	15.22	15.27	15.21
T_1	16.80	16.85	16.81	16.86	16.83
T_2	15.92	16.08	15.90	16.02	15.98
T_3	15.10	15.08	15.14	15.16	15.12
T_4	17.18	17.25	17.21	17.24	17.22
T_5	16.73	16.80	16.72	16.79	16.76
T_6	15.50	15.55	15.51	15.56	15.53
SE= 0.021			**CD at 5% =** 0.070		

A glance at Table 3.1.3 highlighted the average protein content of 15.21, 16.83,15.98,15.12,17.22,16.76 and 15.53 per cent in treatments T_0, T_1, T_2, T_3, T_4, T_5 and T_6, respectively, among these treatment T_4 had significantly highest protein content (17.22 per cent), while *burfi* prepared with 15 per cent of sapota pulp (T_3) had lowest (15.12 per cent) protein content.

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Whereas the treatment T_2 (5 per cent of sapota pulp) was at par with treatment T_2 (10 per cent of sapota pulp). Further it was noted that protein content was decreased as the proportion of increased sapota pulp and sapota powder in the product and vice-versa.

The results obtained in the present research work are in also agreement with. Gargade (2004), Matkar (2006), Golande (2007),Wadewale (2010), however, they used orange concentrate, fig pulp, sweet orange pulp and mandarin orange pulp and Yadav *et al.*,(2018) in peanut burfi, respectively in their study.

3.1.4. Ash content of sapota burfi

The Ash content in sapota *burfi* varied due to incorporation of different levels of sapota pulp and sapota powder is presented in table 3.1.4.

Table 3.1.4.Ash content of sapota *burfi.*

Treatment/ Days	Ash content (percent)				
	0	**5**	**10**	**15**	**Mean**
T_0	2.99	3.05	3.08	3.00	3.03
T_1	5.50	5.63	5.65	5.62	5.60
T_2	5.25	5.33	5.36	5.30	5.31
T_3	4.99	4.96	5.07	5.02	5.01
T_4	5.60	5.62	5.70	5.64	5.64
T_5	5.32	5.40	5.42	5.46	5.40
T_6	5.10	5.16	5.18	5.12	5.14
SE= 0.022			**CD at 5% =** 0.074		

The data presented in table 3.1.4 indicate that the ash content in treatment T_0, T_1, T_2. T_3, T_4, T_5, and T_6 were 3.03, 5.60,5.31, 5.01, 5.64, 5.40 and 5.14 per cent, respectively, which was significantly affected due to treatments. Ash content was maximum (5.64 per cent) in treatment T_4 (10 percent sapota powder), because there was more ash content (0.86 per cent) and minimum (3.03 per cent) in treatment T_0 (Control) were no addition of sapota pulp and sapota powder. It was noted that as the level of sapota pulp and sapota powder increased, ash content in *burfi* (T_1 and T_4) has increased then afterwards in all treatment decreased due to decreased percentage of khoa.

The results obtained in the present research work are in agreement with. Gargade (2004), Matkar (2006), Golande (2007), Wadewale (2010), where, they used orange concentrate, fig pulp, sweet orange pulp and mandarin orange pulp and Yadav *et al.*,(2018) in peanut burfi respectively in their study.

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3.1.5. Total Sugar content of sapota burfi

The Sugar content in sapota *burfi* varied due to incorporation of different levels of sapota pulp and sapota powder is presented in table 3.1.5.

Table 3.1.5. Total Sugar content of sapota *burfi.*

Treatment/ Days	Total Sugar content (percent)				
	0	**5**	**10**	**15**	**Mean**
T_0	33.00	25.00	30.00	32.00	30.00
T_1	28.20	28.30	28.18	28.24	28.23
T_2	27.41	27.51	27.48	27.44	27.46
T_3	26.74	26.60	26.72	26.70	26.69
T_4	29.44	29.48	29.42	29.46	29.45
T_5	30.00	29.85	29.90	29.85	29.90
T_6	30.40	30.38	30.30	30.32	30.35
SE= 0.062			**CD at 5% =** 1.980		

The data presented in Table 3.1.5 indicate that the different levels of sapota pulp and sapota powder had influenced on the sugar content in *burfi* significantly.

It was observed that the average sugar content T_0, T_1, T_2, T_3, T_4, T_5 and T_6 were 30.00, 28.23, 27.46, 26.69, 29.45, 29.90 and 30.35, respectively. The sugar content in treatment T_6 (30.35) was significantly highest than rest of the treatments. The sugar content in treatment T_3 (26.69) was lowest. This indicated that as sapota pulp increased in *burfi* sugar content also decreased, while sapota powder increased in burfi sugar content also increased due to more content of sugar percentage (38 per cent).

The decreased sugar content due to increased level of fruit pulp is also confirmed by Sakate (2000), who studied preparation of wood apple *burfi* and Yadav *et al.*,(2018) in peanut burfi.

3.1.6. Total solids content of sapota *Burfi*

The total solids content in sapota *burfi* varied due to incorporation of different levels of sapota pulp and sapota powder is presented in table 3.1.6.

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Table 3.1.6. Total solids content of sapota *burfi.*

Treatment/ Days	Total Solid content (percent)				
	0	**5**	**10**	**15**	**Mean**
T_0	83.20	83.26	83.22	83.28	83.24
T_1	75.88	75.92	75.82	75.90	75.88
T_2	73.37	73.40	73.32	73.35	73.36
T_3	70.80	70.86	70.82	70.88	70.84
T_4	79.08	79.18	79.14	79.16	79.14
T_5	79.82	79.86	79.90	79.94	79.88
T_6	80.59	80.56	80.61	80.63	80.62
SE= 0.016			**CD at 5% =** 0.059		

Table 3.1.6 reveals that the total solids content of *burfi* was significantly affected due to inclusion of sapota pulp and sapota powder in *burfi* preparation. The mean total solids content in *burfi* under treatment T_0, T_1, T_2 ,T_3 T_4, T_5 and T_6 were 83.24,75.88,73.36,70.84,79.14,79.88 and 80.62 per cent, respectively, with a range 70.84 to 83.24 per cent. Significantly highest total solids were noticed in T_0 (plain) treatment. It is indicated that as the sapota pulp and powder level increased, total solids content in *burfi* decreased. This was due to decreased in fat and proteins in *burfi*.

The decreased Total solids content due to increased level of fruit pulps observed in the study is also confirmed by the reports made by Kolhe (2003), Gargade (2004), Golande (2007), Wakchaure (1998), Wadewale (2010), in preparation of orange *burfi*, sweet orange *burfi*, sapota pulp *burfi*, papaya *burfi*, mandarin orange *burfi* and in powder concerns by the report by Goyal and Samsher (2015) in herbal burfi, respectively.

3.1.7. Acidity content of sapota *Burfi*

The acidity content in sapota *burfi* varied due to incorporation of different levels of sapota pulp and sapota powder is presented in table 3.1.7.

Table 3.1.7. Acidity content of sapota *burfi.*

Treatment/ Days	Acidity content (percent)				
	0	**5**	**10**	**15**	**Mean**
T_0	0.29	0.26	0.28	0.33	0.29
T_1	0.24	0.22	0.28	0.30	0.26

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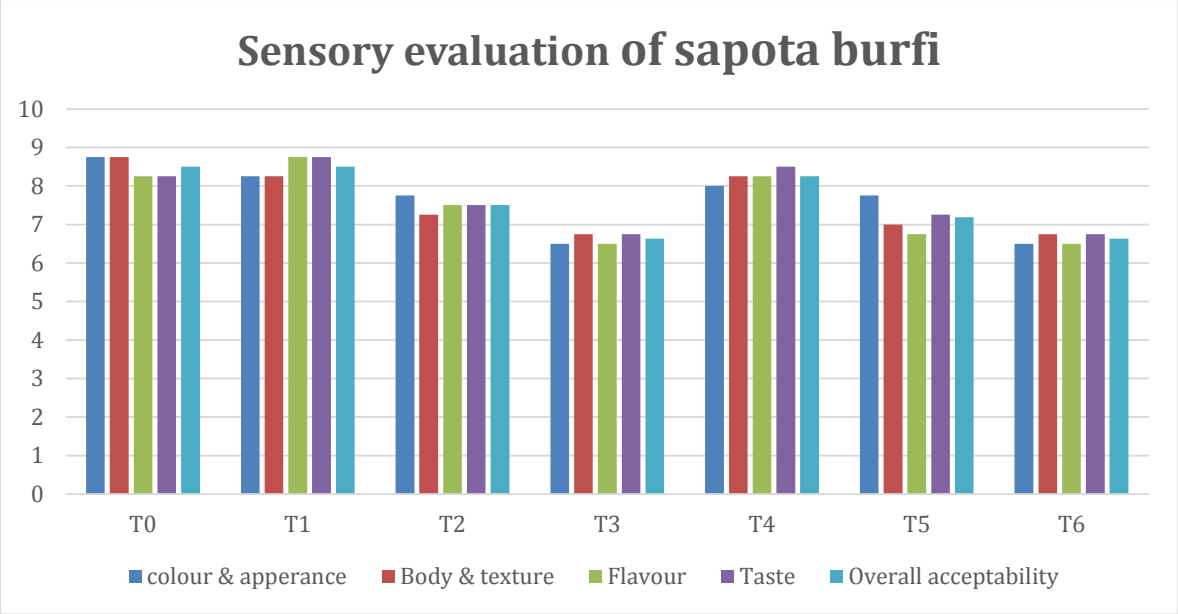
T_2	0.20	0.22	0.28	0.30	0.25
T_3	0.22	0.24	0.30	0.28	0.26
T_4	0.22	0.24	0.30	0.28	0.26
T_5	0.22	0.20	0.30	0.28	0.25
T_6	0.28	0.24	0.30	0.22	0.20
CV=25.712			**CD at 5% =**	Non significant	

It may be revealed from the Table 3.1.7 that the acidity content of *burfi* was no significantly affected due to addition of sapota pulp and sapota powder. Acidity in *burfi* in Treatments T_0, T_1, T_2, T_3, T_4, T_5 and T_6 was 0.29, 0.26,0.25,0.26,0.26,0.25 and 0.20 per cent, respectively with the range of 0.20 (T_6) to 0.29 (T_0) per cent. Minimum acidity (0.20 per cent) was in control treatment (T_6), and maximum acidity (0.29 per cent) was noticed in treatment T_0 (control). The data indicated that acidity decreased with increased level of sapota pulp and sapota powder added in the *burfi*. This was due to more total sugar content nature of sapota pulp and powder used in the *burfi* preparation.

The results obtained in the present research work are in agreement with Goyal and smasher (2015) in herbal burfi in their study.



3.2 Sensory evaluation of sapota *burfi*

Sapota burfi samples in which 5 per cent sapota pulp and sapota powder was blended with khoa scored the highest score (8.50 & 8.25). It was observed that increasing proportion of sapota pulp and sapota powder in the blended in the khoa decreased the score of colour and appearance of burfi. The

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score in respect of body and texture ranged between 6.75 to 8.75 forT6 and T1treatment combinations. The treatment T1 and T4 was significantly superior over the rest of treatments. In case of flavour, the score recorded was highest in T1 and T4 .In case of taste the mean score ranged from 6.75 to 8.75 .It was lowest in T3 and T6 and highest in T1 and T4. This might be due to addition of sapota pulp and powder and decreasing content of khoa. As far as overall acceptability concerns treatment T1 and T4 was most likely by the consumer for value added burfi. The results obtained in the finished products were agreement with Golande (2007) in sweet orange burfi and Yadav et al.,(2018) in peanut burfi.

3.3 Cost of production of sapota *burfi*

The effect of addition of sapota pulp and sapota powder on the cost structure of *burfi* prepared under various treatments was studied and presented in table 3.3.1

Table 4.3.1 Cost structure of sapota *Burfi*

Sr. No.	Particulars	Rate (Rs)	T_0		T_1		T_2		T_3		T_4		T_5		T_6	
			Qty.	Amount (Rs.)	Qty.	Amount (Rs.)	Qty.	Amount (Rs.)	Qty.	Amount (Rs.)	Qty.	Amount (Rs.)	Qty.	Amount (Rs.)	Qty	Amount (Rs.)
1	Buffalo milk (lit)	50 / lit	3	150.00	3	150.00	3	150.00	3	150.00	3	150.00	3	150.00	3	150.00
2	*Khoa* obtained (g)	--	700	--	700	--	700	--	700	--	700	--	700	--	700	--
3	Sugar (g)	40 / kg	210	8.40	210	8.40	210	8.40	210	8.40	210	8.40	210	8.40	210	8.40
4	Sapota pulp (g)	150.00/ kg	-	--	35	5.25	70	10.50	105	15.75	-	-	-	-	-	-
	Sapota powder (g)	340.00 / kg	-	-	-	-	-	-	-	-	35	11.90	70	23.80	105	35.70
5	Miscellaneous-depreciation @ 10% of electricity, utensils etc. in Rs.	--	--	7.0	--	7.0	--	7.0	--	7.0	--	7.0	--	7.0	--	7.0
6	Fuel charges	--	--	10.00	--	10.00	--	10.00	--	10.00	--	10.00	--	10.00	--	10.00
7	Cardboard boxes	--	--	3.50	--	3.50	--	3.50	--	3.50	--	3.50	--	3.50	--	3.50
8	Labour charges	250 / 8hr	--	25.00	--	25.00	--	25.00	--	25.00	--	25.00	--	25.00	--	25.00
9	Total expenditure (Rs.)			203.90		209.15		214.40		219.65		215.80		227.70		239.60

The cost of production of 1 kg sapota *burfi* under various treatments was calculated by taking into consideration the prevailing retail market prices for the various ingredients required for preparation sapota *burfi* viz., milk, sugar and Sapota, while the other charges such as labour, fuel, etc. were worked out on the basis of actual time requires to prepare the *burfi* of the work performed for the preparation of 1 kg of sapota *burfi*. The costs may be still lowered when mechanized process for the large scale production will be carried out. The data presented in Table 3.3.1., indicate that cost of production of 1 kg *burfi* under various treatments

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T_0, T_1, T_2, T_3, T_4, T_5 and T_6 were Rs. 203.90, 209.15, 214.40, 219.65, 215.80, 227.70 and 239.60, respectively, rating from Rs.203.90 (T_0) to Rs. 239.60 (T_6). The cost of production of plain *burfi* was considerably less than sapota *burfi* prepared. Increased level of added sapota pulp and sapota powder showed this slightly increased in the cost of production. These differences were mainly because of variable levels of sapota pulp and sapota powder as well as requirement of labour, fuel charges, etc.

Lowest cost of production (Rs. 203.90) was calculated in case of treatment T_0 (control). However, best treatment selected by judges was T_1 and T_4 (5 per cent of sapota pulp and 5 per cent of sapota powder) costing Rs. 209.15 per kg and 215.80 per kg. However, from marketing point of view, this *burfi* will definitely get more price over plain or rest of experimental *burfi*. The addition of sapota pulp was helpful to obtain value added product.

Hence, it is concluded that with addition of 5 per cent of sapota pulp and sapota powder in *burfi* preparation will be of superior quality, but this will be received at comparatively higher price in the market.

4.CONCLUSION

It may be concluded that the superior, nutritional and medicinal quality elephant sapota burfi can be prepared by addition of 5 percent sapota pulp and sapota powder with 95 parts of khoa by weight basis with addition of 30 per cent sugar and also 10 percent sapota pulp and sapota powder with 90 parts of khoa by weight basis with addition of 30 per cent sugar was best for consumer point of view.

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