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Process standardization for preparation of green chickpea (*Cicer arietinum* L.) Burfi

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Abstract

Burfi is most popular *khoa* based sweet all over India and likely to attain global status. A number of ingredients, such as nuts, fruits, pulses etc. incorporated in *burfi* to enhance the acceptability of *burfi* to the masses as well as choosy classes. The Present investigation was aimed to incorporate desi green chickpea. It is observed that original plain *burfi* is also lacking in some nutrients and fiber. Considering the nutritional importance and health benefits of green chickpea, it was planned to standardize the process for preparation of green chickpea (*Cicer arietinum* L.) *burfi*, using desi green chickpea. In the optimization of compositional variables, green chickpea *burfi* samples prepared by adopting optimized processing steps using three levels of green chick pea viz., @2(H₁), 4(H₂) and 6(H₃) per cent and two levels of sugar viz., 25 (S₁) and 30 (S₂) per cent. The experiment was optimized as per Factorial Completely Randomized Design. The results showed that out of six treatment combinations, the colour and appearance, flavour, and overall acceptability score was recorded maximum for 4 per cent green chickpea and 25 per cent sugar of *khoa* (H₂S₁).

Keywords: Buffalo milk, *Burfi*, green chickpea, *Khoa*, Sensory evaluation

Introduction

India has emerged as the highest milk producing country in world. Milk has unique position in the diet of almost all people in the world. *Khoa* is one of the most important heat desiccated product, it is used as the base material for a large variety of sweet delicacies. *Burfi* is most popular *khoa* based sweet all over India and is preferred one as a premium sweet with a long shelf life of around 7 to 10 days at room temperature. It contains a considerable amount of milk solids. It is an item of choice in daily menu of children and adults. *Burfi* is popular milk-based confection in India and likely to attain global status.

The important steps involved in the preparation of *burfi* are desiccation of milk into *khoa* of different consistencies, incorporation of sugar and further desiccation to get the desired consistency and texture. The coloring and flavoring materials, if any are added in the initial or final stages of preparation. The product while still hot and possessing a semisolid consistency is poured into previously prepared molds and then cooled. After cooling, the mass is cut into pieces of required size and shape (BIS 1999). Various forms are made with varying types of additives depending upon regional preference. However, good quality *burfi* is characterized by moderately sweet taste, soft, and slightly greasy body and smooth texture with fine grains.

Burfi may be blended with varieties of nutritionally rich fruits to enhance its taste and aroma. There are many varieties of *burfi*, depending on the ingredients mixed with it viz., *kaaju burfi* (made with cashew nuts) and *pista burfi* (made with pistachio) etc. and fruits/ spices added to it, viz., *mango burfi*, *coconut burfi* and *cardamom burfi*, *fig burfi*, *sweet orange burfi*, *wood apple burfi* etc. In some parts of India cereal or pulse are mixed in *burfi* preparation, the most popular are *besan burfi*, *moong burfi*, *rava burfi*, *doda burfi*.

Pulses occupy a unique position in every known system of farming all over the world. Among pulses chickpea (*Cicer arietinum* L.), is the premier pulse crop of India and consumed all over the world. The origin of the chickpeas is thought to have been Levant and ancient Egypt, which is logical since the plant prefers temperate and semiarid regions. It is the member of family Leguminaceae and sub family Papilionaceae. India is the largest chickpea producing country with an approximately production of 6.38 MT during 2006-2009. Worldwide over 14.2 millions tons of chickpea were harvested in 2014 according to the Food and Agriculture Organization (FAO) of the United Nations. There are two distinct types of cultivated chickpea, Desi and Kabuli. Desi (*microsperma*) types have pink flowers,

anthocyanin pigmentation on stems, seeds are small, angular with rough brown color testas. The kabuli (*macrosperma*) types have white flowers, lack anthocyanin pigmentation on stem, seeds are relatively large, smooth and cream colored testas. The proximate composition of desi chickpea seed is: protein 16.7 to 30.57 per cent, fat 2.9 to 7.42 per cent, crude fiber 3.7 to 13 per cent, reducing sugar 2.61 to 4.77 per cent, non-reducing sugar 1.12 to 1.89 per cent and ash 2.04 to 4.2 per cent (Wood and Grusak 2007)^[62].

Chickpea is a good source of carbohydrates and protein, together constituting about 80% of the total dry seed mass in comparison to other pulses. The protein quality is considered to be better than other pulses. Chickpea has significant amounts of all the essential amino acids except sulfur containing types, which can be complemented by adding cereals to daily diet. Starch is the major storage carbohydrate followed by dietary fiber, oligosaccharides and simple sugars like glucose and sucrose. Lipids are present in low amounts but chickpea is rich in nutritionally important unsaturated fatty acids like linoleic and oleic acid. β -sitosterol, campesterol and stigmasterol are important sterols present in chickpea oil. Calcium, magnesium, phosphorus and especially potassium are also present in chickpea seeds. It is a good source of important vitamins such as riboflavin, niacin, thiamin, folate and the vitamin A precursor, β -carotene. Chickpea has several potential health benefits and, in combination with other pulses and cereals, it could have beneficial effects on some of the important human diseases like cardiovascular disease, type 2 diabetes, digestive diseases and some cancers. Overall, chickpea is an important pulse crop with a diverse array of potential nutritional and health benefits (Jukanti *et al.*, 2012)^[18].

There is a growing demand for chickpea due to its nutritional value. Green chickpeas have a more flavorful taste than canned garbanzo beans. They are harvested early and frozen quickly before the natural sugars turn to starch. Green chickpeas are higher in beneficial nutritional categories than common canned blonde garbanzo bean. They are high in fiber, and naturally low in saturated fat, cholesterol and sodium, promoting a healthy heart. Green Chickpea beans contribute to satiety, helping to maintain a healthy weight. They are an excellent source of folate (Vitamin B9) and contain antioxidant vitamins A and C along with good-for-your phytonutrients. They are an all-natural non-allergenic fresh source of protein. The main protein found in chickpeas, similar to other legumes, are albumins and globulins. Smaller amounts of glutelins and prolamines are also present. Green chickpea are NON-GMO. Gluten free and allergen free. Green chickpeas are unique and flavorful taste, making them an exciting, versatile and convenient food product. Consuming green chickpeas in moderation may have additional benefits beyond improving nutrient profile of meals by delaying gastric emptying and slowing carbohydrate absorption.

Green chickpeas also contain dietary bioactives such as phytic acid, sterols, tannins, carotenoids and other polyphenols such

as isoflavones whose benefits may extend beyond basic nutrition requirements of human. Green chickpea has a low glycemic index. Diets high in fiber, low in energy density and glycemic load and moderate in protein are thought to be particularly important for weight control. Green chickpeas significantly improve insulin resistance and prevent postprandial hyperglycemia and hyperinsulinemia (Yang *et al.*, 2007)^[63]. Green chickpea is traditionally incorporated into many culinary creations because of their nut like flavor and versatile sensory application in food. Considering the nutritional importance of green chickpea, the effort has been made to preparation of *burfi* by using green chickpea.

Materials and Methods

The present investigation was carried out at the Division of Animal Husbandry and Dairy Science, Rajarshree Chhatrapati Shahu Maharaj College of Agriculture, Kolhapur. The whole fresh clean buffalo milk was obtained from the Dairy farm RSCM College of Agriculture, Kolhapur. Good quality cane sugar was procured in single lot from local market of Kolhapur city. Green chickpea (Desi) was procured in single lot from local market of Kolhapur city (M.S.) and stored under refrigeration temperature for better keeping quality.

Preparation of green chickpea paste

Green chickpea was procured in single lot from local market of Kolhapur city (M.S.) and stored under refrigeration temperature. Green chickpea seeds were removed from the chickpea pods and washed under running tap water. The chickpea seeds were dried in open air and required quantity of green chickpea was crushed in mortar and pestle to get fine paste form. This green chickpea paste was used for preparation of green chickpea *burfi*.

Preparation of green chickpea *burfi*

The green chickpea *burfi* was prepared as per the method suggested by Aneja *et al.* (2002)^[4] for preparation of plain *burfi* with certain modification. Initially buffalo milk was taken and filtered through muslin cloth, then the milk was standardized to 6 per cent fat.

The standardized milk was then transferred in open pan/*karahi* over a brisk fire. The milk was stirred continuously and side of *karahi* was also scrapped to avoid any scorching or charring of milk solids at the bottom of *karahi*. Vigorous stirring with the help of stirrer was accomplished by scrapping process till the product reached pasty consistency, then temperature was lowered. As the product reached pat formation stage (i.e. leaving the sides of *karahi*), the crushed green chickpea paste was added @ 2, 4 and 6 per cent and sugar @ 25 and 30 per cent of *Khoa*, respectively. The contents were properly mixed and worked on gentle heat for about 5 to 8 minutes to get desired consistency. The product was taken off the flame, transferred into a tray (30x30x1.5 cm) and was allowed to cool and set at room temperature in hygienic condition till it became slightly hard (Fig.1).

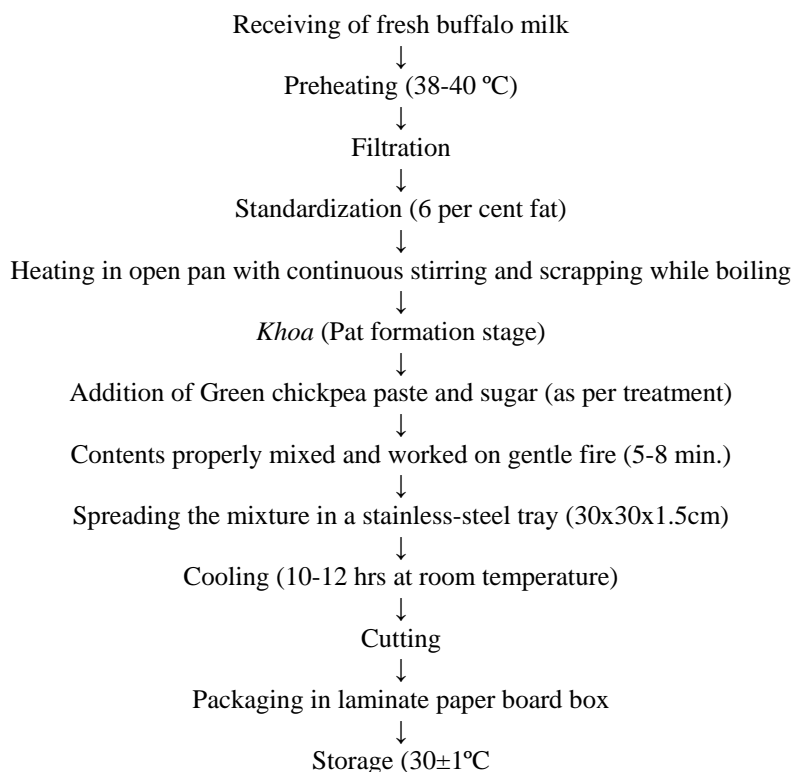


Fig 1: Flow diagram for preparation of Green chickpea *burfi*.

Optimization of Ingredients

For preparation of green chickpea *burfi*, initially three litre of standardized buffalo milk (6 per cent) was used. The quantity of *khoa* obtained from three litre of *khoa* was weighed and same weight will be considered every time to calculate the quantity of ingredients.

Optimization of green chickpea and sugar levels

For this purpose, green chickpea was added at 2, 4, 6 per cent of the *khoa*, while sugar was added at 25 and 30 per cent of the *khoa*. Thus, in all six treatment combinations indicated below were formed and studied.

H₁S₁ - Green chick pea 2 per cent and sugar 25 per cent

H₁S₂ - Green chickpea 2 per cent and sugar 30 per cent

H₂S₁ - Green chickpea 4 per cent and sugar 25 per cent

H₂S₂ - Green chickpea 4 per cent and sugar 30 per cent

H₃S₁ - Green chickpea 6 per cent and sugar 25 per cent

H₃S₂ - Green chickpea 6 per cent and sugar 30 per cent

All these six treatment combinations were analysed for sensory and chemical quality. The best product combination was selected on the basis of sensory quality of product.

Observation and assessment

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads:

Effect of level of green chickpea and sugar on sensory attributes of *burfi*

The sensory evaluation of green chickpea *burfi* is presented in Table 1.

Colour and appearance

The colour and appearance may be taken up as the first indication of perception of the the particular product. The colour of green chickpea *burfi* was combined effect of the

inherent colour of green chickpea and caramilization of sugar during the process of heating. Colour and appearance scores of green chickpea *burfi* as affected by the level of green chickpea and sugar are presented in Table 1.

The mean maximum score of colour and appearance was obtained to the treatment H₂S₁ (8.00) followed by H₂S₂ (7.95). Further, the statistical effect between the level of green chickpea, sugar and interaction was significant. From the data it is seen that, with increased or decreased level of green chickpea the colour of finished product either become dark or dull green which were not liked by the judges. Jadhav (2017)^[17] also reported that, the higher level of besan imparts dark unacceptable colour and uneven and low level imparts dull general appearance which decreases acceptability of *burfi*. Similarly, the increased level of sugar resulted in dark brown colour to the *burfi*. Such trend with respect to addition of wood apple pulp and for sugar was noticed by Sakate (2000)^[50] and Reddy *et al.* (1983)^[48], respectively.

Body and texture

It was also revealed that the effect of green chickpea and sugar level on body and texture are presented in Table 1 was found to be significant (P<0.05). The effect of interaction was non-significant. The average scores for body and texture attribute of green chickpea *burfi* prepared under each treatment were lowest in H₃S₂ (7.00) and highest in H₁S₁ (8.18). Thereafter, it decreased with increase in sugar and green chickpea level. It means that increasing the level of sugar and green chickpea adversely affected the quality of *burfi* in terms of body and texture.

The observed behavior of treatment could be explained in terms that the soft body of *burfi* was liked by the judges. Body and texture were observed to be smooth in *burfi* having 25 per cent sugar while, with 30 per cent sugar level *burfi* was slightly sticky. However, Reddy (1985)^[47] observed that addition of higher amount of sugar than 30 per cent resulted in slightly coarse texture probably due to decrease in fat and

serum solid contents which cumulatively contribute to smooth texture in dairy products. The higher level of green chickpea incorporation resulted in moist, sticky, loose body and grainy texture which was not appealing to the judges. Golande *et al.* (2012) [13] also reported that the increased the level of sweet orange juice, lower rating was observed due to, increased level of added sweet orange juice above certain level (10 parts of sweet orange) which formed granular texture in the *burfi* by increasing acidity which was disliked by the judges. Jadhav (2017) [17] observed that the higher level of besan showed moist, sticky, loose body and grainy texture which was not liked by evaluators.

Flavour

From Table 1, it is revealed that the mean score for flavour was 7.70, 7.63, 8.00, 7.80, 7.40 and 7.25 for the *burfi* samples prepared under H₁S₁, H₁S₂, H₂S₁, H₂S₂, H₃S₁ and H₃S₂, respectively. The flavour score was significantly (P<0.05) affected by green chickpea and sugar level. From the above results it seems that the product obtained using 4 per cent green chickpea paste and 25 per cent sugar was superior over other treatment combination. It is well known that the development of a typical nutty flavour to the *burfi* is by means of presence of fat and release of flavoring components due to cooking of protein. The combined effect of these components particularly on flavour of the *burfi* was most desirable when green chickpea at 4 per cent and sugar 25 per cent level were adjusted in the product. Further, the level of 2 and 6 percent chickpea in *burfi* was not liked and judges commented the 2 per cent chickpea level *burfi* had low flavour and 6 per cent chickpea level had slightly unpleasant flavour. Use of 30 per cent sugar gives more sweetness to *burfi* because green chickpea already contains total sugar 10.7 per cent so that 25 per cent sugar level selected. Jadhav (2015) [17] also reported that, the *khoa burfi* with higher level

of besan was rancid in taste, whereas, the low level did not render adequate flavour to *burfi*.

Overall acceptability

The overall acceptability score for green chickpea *burfi* H₁S₁, H₁S₂, H₂S₁, H₂S₂, H₃S₁ and H₃S₂ were 7.87, 7.72, 7.96, 7.79, 7.28 and 7.09 respectively. A minimum score was obtained for the formulation containing 6 per cent chickpea 30 per cent sugar and maximum score was observed for the formulation with 4 per cent chickpea and 25 per cent sugar. The effect of chickpea and sugar level on overall acceptability was significant (P<0.05). Effect of interaction was non-significant. Sample H₂S₁ had good blend of natural flavour of green chickpea, sweetness of sugar and richness of milk solids.

The specific behaviour of the treatment combinations with regard to this particular character could be understood with the fact that the overall acceptability is a sum of combination of colour and appearance, body and texture and flavour of the product. There seemed to have been a significant improvement in all the characters which might have enhanced the judge's preference for overall acceptability of all the six treatment combinations of green chickpea *burfi*. Moreover, it may be stressed that the treatment of H₂S₁ appeared to match well to govern the sensory attributes to most desired optimum level.

Hence, it could be inferred that the addition of 4 per cent chickpea and 25 per cent sugar to *khoa* were most optimum to prepare the best quality of green chickpea *burfi*. 4 per cent chickpea level found suitable in this study, however lower level as reported by Nikam (1996) [35] and Kadam (2008) [19] at 20 and 15 per cent mango pulp on the basis of *khoa* and milk for mango *burfi* respectively. Sugar level 25 per cent of *khoa* for preparation of *burfi*, it was lower than that reported by Nikam (1996) [36] and Khedkar *et al.* (2007) [24] reported 40 and 45 per cent sugar in *khoa* for preparation of fruit *burfi*, respectively.

Table 1: Effect of level of green chickpea and sugar on sensory (score*) attributes *burfi*

Treatment	Sensory attributes			
	Colour and appearance	Body and texture	Flavour	Overall acceptability
H ₁ S ₁	7.75±0.03	8.18±0.03	7.70±0.01	7.87±0.04
H ₁ S ₂	7.60±0.03	7.95±0.04	7.63±0.01	7.72±0.01
H ₂ S ₁	8.00±0.02	7.90±0.04	8.00±0.01	7.96±0.01
H ₂ S ₂	7.95±0.02	7.63±0.01	7.80±0.02	7.79±0.01
H ₃ S ₁	7.25±0.03	7.20±0.03	7.40±0.02	7.28±0.02
H ₃ S ₂	7.02±0.02	7.00±0.03	7.25±0.02	7.09±0.01

*Means ± SE of three replications

Table 2: ANOVA for Sensory attributes of *burfi* using different level of chickpea and sugar

Sensory Property	Sources of variation	d.f.	MSS	F value	CD
Colour and Appearance	Between chickpea level (H)	2	1.102	375.11	0.07*
	Between Sugar level (S)	1	0.091	29.50	0.05*
	Interaction (H×S)	2	0.013	4.11	0.10*
	Error	10	0.003	--	--
Body and Texture	Between chickpea level (H)	2	1.466	2687.00	0.03*
	Between Sugar level (S)	1	0.245	449.08	0.02*
	Interaction (H×S)	2	0.002	3.39	NS
	Error	10	0.001	--	--
Flavour	Between chickpea level (H)	2	0.501	344.24	0.04*
	Between Sugar level (S)	1	0.088	60.55	0.04*
	Interaction (H×S)	2	0.006	4.43	0.06*
	Error	10	0.001	--	--
Overall Acceptability	Between chickpea level (H)	2	0.859	2665.67	0.02*
	Between Sugar level (S)	1	0.125	387.93	0.01*
	Interaction (H×S)	2	0.001	2.22	NS
	Error	10	0.000	--	--

*P<0.05 NS= Non-significant

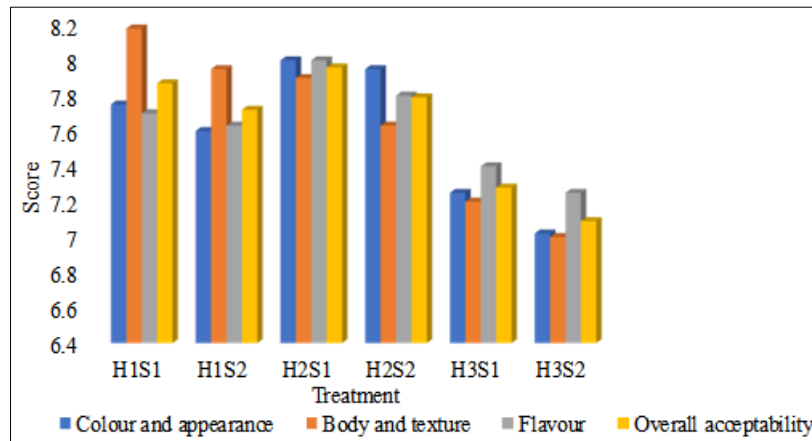


Fig 2: Effect of level of green chickpea and sugar on sensory attributes of burfi

Conclusion

From the present study it was concluded that, the most sensorial acceptable quality of green chickpea burfi can be prepared by using 6 per cent standardized buffalo milk, 4 per cent green chickpea and 25 per cent sugar of khoa with the highest rating of 8.00, 8.00 and 7.96 respectively, for colour and appearance, flavour and overall acceptability. Hence, it was concluded that the level of green chickpea addition could be done at the optimum level of 4 per cent at burfi.

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