Studies on quality attributes of herbal burfi

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Abstract

Herbal burfi was prepared with different levels of khoa (95, 90 and 85%, w/w), stevia powder (5, 10 and 15%, w/w), 2% safed musli powder and other minor ingredients based on sensory trials. The herbal burfi samples were compared with market burfi. The physico-chemical, microbial and sensory quality attributes of the products were evaluated just after preparation as well as during storage upto 10 days after interval of 2 days. Herbal burfi samples prepared with 90% khoa, 10% stevia powder and 2% safed musli powder ratio were found best and scored highest overall acceptability. Other physico-chemical qualities of this ratio were also found satisfactory. The values of optical density, acidity and TPC were increased significantly while, the values of protein content, fat content and sensory scores decreased significantly during 10 days of storage.

Keywords: Herbal burfi, stevia, safed musli, quality attributes, Total Plate Count

Herbal sweet preparation is a new concept in food industry. Herbal sweets are those sweets which are prepared with the herbs (including not only herbaceous plants but also bark, roots, leaves, seeds, flowers, fruits, shrubs, etc. Presently, herbal products either in the form of foods or cosmetics have become more popular in the international market. American dietetic association noted that consumption of herbal plants and other foods containing anti-oxidants can provide protection against certain diseases (Pazczola, 2001). Epidemiological data as well as in vitro studies strongly suggested that foods containing phytochemicals with intoxication potential have strong protective effects against major disease risks including cancer and cardiovascular diseases (Kaur and Kapoor, 2002).

Developments of dairy products supplemented with herbal ingredients are important from nutritional and therapeutic point of view. Now a day, the demand of milk and milk products are increasing day by day. The production of such herbal products are more economical and profitable in the interest of health care (Chen *et al.,* 2003). The main sources of herbal ingredients are only the edible medicinal plants. Therefore, there was a great need for preparation of some herbal products having more medicinal values.

Material and methods

Raw materials viz., stevia (*Stevia rebaudiana* Bertoni) and safed musli (*Chlorophytum borivilianum* Santapau and Fernades) plants were procured from the Herbal Garden of the University. Milk was procured from LRC, Department of Animal Science, S. V. B. Patel University of Agriculture & Technology, Meerut. Paper board boxes and other ingredients were procured from the local market for the present study.

Preparation of herbal burfi: The calculated amount of stevia powder, safed musli powder, cashew nut, almonds and cardamom were added with freshly prepared khoa (m.c. 20%, w.b. and fat 17%). The karahi was put up over the gas flame (temperature 80^0C) and stirring was done continuously. In place of sugar, only stevia powder was used as sweetener. After proper mixing the whole mixture was transferred in aluminum trays and spread upto 1.0 cm thick layer. The mixture was allowed to cool at room temperature for about six hours then after setting burfi was cut into

small pieces of size 3 x 4 cm and single wrapped with butter paper. The wrapped burfi pieces were packaged in paper board boxes of size 15 x 20 cm and stored in refrigerator under low temperature (10 ± 1 °C) for further studies. The khoa was prepared in the laboratory using the methodology as suggested by Banerjee (1968) given in Fig.1.

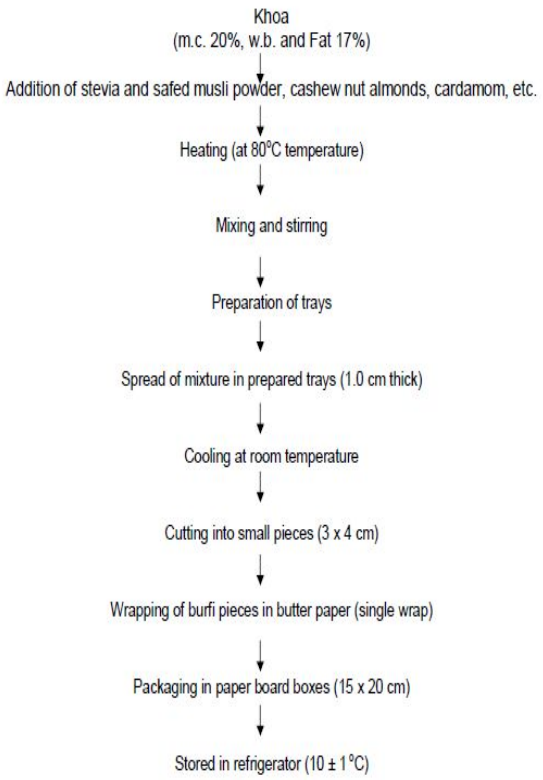

Fig. 1: Process chart for preparation of herbal burfi

Determination of physico-chemical properties of herbal burfi: Samples of herbal burfi and market burfi were evaluated for moisture content, total solids, acidity, optical density, fat (fat of milk, khoa and herbal burfi), protein, ash, microbial and sensory quality. Moisture content of khoa was determined as recommended by AOAC (1995).Total solids, acidity, protein content and ash content of herbal burfi samples were determined as recommended by AOAC (1995), standard methods for the examination of milk and milk products. Optical density of herbal burfi was determined by the method suggested by Ranganna (2001). For determination of fat content of milk, khoa and herbal burfi, method was used as per AOAC (1995). The total plate count of the samples was carried-out in Nutrient Agar (NA) medium for bacterial count as standard methods for the examination of dairy products recommended by Foster and Frazier (1960). Nine points Hedonic rating test method as recommended by Ranganna (2001) was used for the purpose of sensory evaluation.

The data obtained from the various experiments were recorded during the course of study and subjected to statistical analysis as per method of "Analysis of variance" by Factorial Randomized Block Design (factorial R.B.D.). The significance difference between the means was tested against the critical difference at 1% level of significance (Gomez and Gomez, 1984). STATPAC (OPSTAT) software was used for analyze the recorded data.

Results and Discussion

Effect on total solids: Total solids decreased with decrease in the level of khoa and increase in the level of stevia powder with 2% safed musli powder. The values of total solids for fresh samples prepared with khoa (95, 90 and 85%) and stevia powder (5, 10 and 15%) were measured as 75.420, 74.657 and 72.353%, respectively (Fig. 2). The total solids were found variable on account of composition and ranged from 72.353 to 75.420% for above ratio of khoa and stevia powder. However, the total solids of market burfi was found as high as 79.713% which was higher than that of compared with herbal burfi. Reasons may be attributed to addition of sugar and other ingredients in market burfi. Total solids of herbal burfi prepared with 95% level of khoa and 5% of stevia powder were found as 75.418, 75.419, 75.419, 75.420 and 75.420% after 2, 4, 6, 8 and 10 days of storage period, respectively (Fig. 2). The minimum total solids (72.353%) were observed for the samples having maximum level of stevia powder. However, the values of total solids for fresh samples were found to be maximum (75.420%) for those prepared with lowest level of stevia powder. Study revealed that, there was no significant difference in data obtained for total solids during storage periods. However, total solids were slightly increased for few samples during storage. A marginal and non-significant change in values of total solids for all the samples may be attributed to uncertainty. Total solids of herbal burfi were found to

be comparatively lower as compared to other khoa burfi. Sharma and Zariwala (1978); Sachdeva (1980) and Patil (2002) analyzed various types of khoa burfi and reported values of total solids in the range of 80.00 to 95.70%, 77.83 to 79.53% and 80.63 to 90.06%, 79.50 to 95.70%, respectively.

Effect on optical density:A significant marginal increase in optical density was observed with increase in the level of stevia powder and decrease in the level of khoa. Fresh samples prepared with 5, 10, and 15% stevia powder with 95, 90 and 85% khoa, the values of optical density were observed as 0.195, 0.202 and 0.220, respectively (Fig. 3). This may be attributed to addition of stevia powder which had a dark green colour and resulted higher values of optical density. However, the optical density of market burfi was found as 0.186, which was lower as compared to those of herbal burfi samples. The values of optical density were increased irrespective of storage period.

Increase in the optical density may be attributed to non-enzymatic browning (Maillard reaction) reaction amongst carbohydrates, amino acids and other organic acids. During storage, an increase in acidity, presence of carbohydrate and protein might have accelerated the browning reaction which resulted increase in optical density. It is explicit that the effect of composition and storage period were found significant of all the samples. The analysis also revealed the significant results for interaction between the composition and storage period. In general, optical density of the samples increased with increase in the levels of stevia powder irrespective of storage period (Fig. 3).

Effect on ash content (%): Ash content decreased with decrease in the level of khoa and increase in the level of stevia powder. The ash content of fresh samples prepared with 95, 90 and 85% of khoa and 5, 10 and 15% of stevia powder were found as 2.187, 2.027 and 1.953%, respectively (Fig. 4). The decrease in ash content may be attributed to lower ash content of khoa as compared to stevia powder. The ash content of market burfi was observed as high as 3.603% as compared to herbal burfi. The reasons may be attributed to addition of sugar and other ingredients during the preparation of market burfi. During storage, no change in ash content was recorded after 6 days of storage. Whereas, a slight change in the values of ash content were noticed after 8 days of storage period. Findings of herbal burfi under present investigation were fully agreed with the findings of Singh *et al.,* (2005). They reported the values of ash content in the range of 1.95 – 2.13% in doodh burfi. Present findings were also similar with the findings of Patil (2002). He reported ash content of khoa burfi in the range of 1.60 to 5.70%.

Effect on acidity: From Fig. 5, it can be seen that the acidity decreased with decrease in the level of khoa and increase in the level of stevia powder with 2% safed musli powder. The values of acidity for fresh samples were observed as 0.249, 0.245 and 0.240% for different compositions of khoa and stevia powder. Acidity values of herbal burfi were found to be lower than that of market burfi. The acidity of market burfi was measured as 0.486%. Reasons may be attributed to reduction of khoa and incorporation of stevia powder. Another possible reason may be addition of adulterated khoa in market burfi which in turn increased the acidity.

The effect of composition on acidity were found highly significant. The highest acidity was recorded for samples prepared with 95% khoa and 5% stevia powder followed by samples having 90% khoa and 10% stevia powder and 85% khoa and 15% stevia powder, respectively (Fig. 5). The analysis also revealed the significant results for interaction between the composition and storage period. In general, acidity decreased with decrease in the level of khoa and increase in the level of stevia powder irrespective of storage period.

Effect on protein: The protein content decreased significantly with decrease in level of khoa and increase in level of stevia powder. The protein content for the fresh samples prepared with 95, 90 and 85% levels of khoa and 5, 10 and 15% stevia powder were calculated as 14.777, 13.033 and 12.033%, respectively (Fig. 6). However, in case of market burfi it was found to be lower (11.233 %) as compared to samples of fresh herbal burfi (12.033 to 14.777%).

Protein content significantly decreased with increase in storage period. The samples prepared with 90% khoa and 10% stevia powder had initially 13.033% protein content, which further decreased to 12.867, 12.667, 12.467, 12.333 and 12.167% after 2, 4, 6, 8 and 10 days of storage, respectively. Samples having 90% khoa and 10% stevia powder, the protein content ranged from 13.033 to 12.167% during storage

of 10 days periods. Reasons for decrement of protein content may be attributed to denaturation and degradation of milk protein which resulted in breakdown of protein (such as casein) into amino acids. These findings are similar to the findings of Patil (2002) who reported 14.00 - 20.30% protein content in khoa burfi. Hemvathy and Prabhaker (1973); Singh *et al.,* (2005) also reported protein content in the range of 11.00 - 13.50% in doodh burfi. Alkanhal *et al.,* (2001) stored milk powder for 90 days and observed loss of protein content.

Effect on fat: Results of the study indicated that the fat content of herbal burfi decreased with decrease in the level of khoa and increase in the level of stevia powder. The fat content of fresh samples having 95, 90 and 85% khoa and 5, 10 and 15% stevia powder with 2% and 13.777%, respectively (Fig.7).

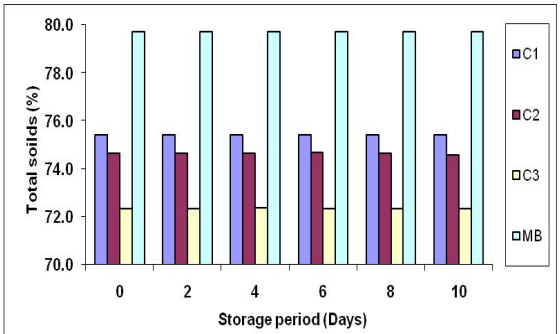

Fig. 2 Changes in total solids (%) of burfi samples during refrigerated storage condition

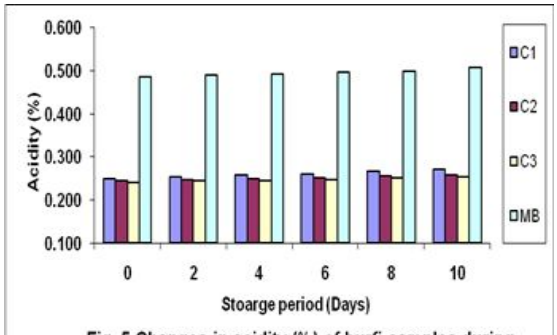

Fig. 5 Changes in acidity (%) of burfi samples during refrigerated storage condition

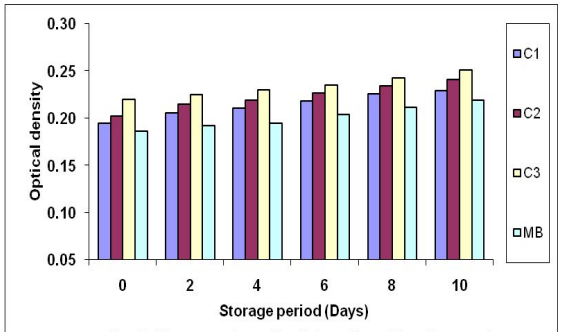

Fig. 3 Changes in optical density of burfi samples during refrigerated storage condition

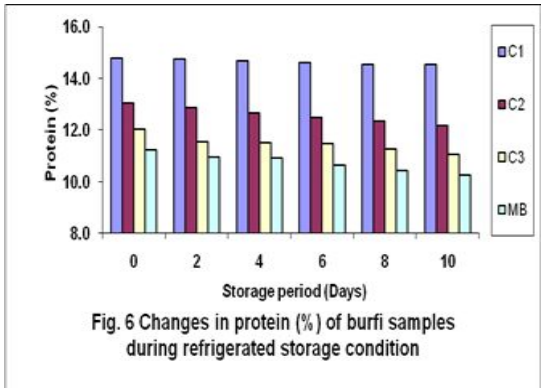

Fig. 6 Changes in protein (%) of burfi samples during refrigerated storage condition

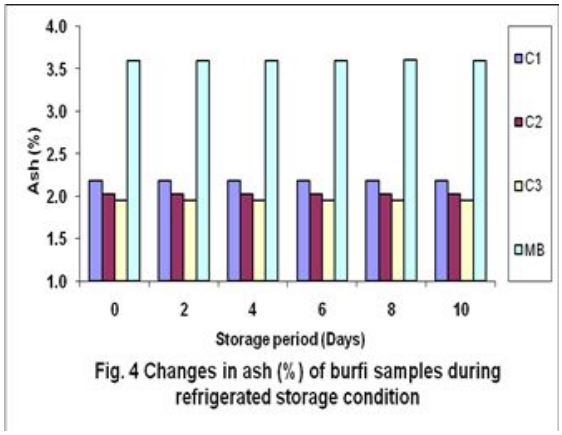

Fig. 4 Changes in ash (%) of burfi samples during refrigerated storage condition

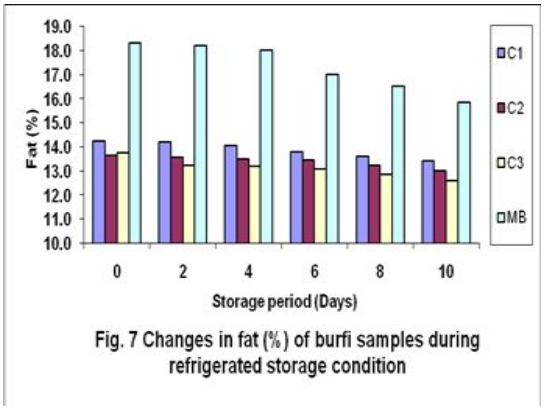

Fig. 7 Changes in fat (%) of burfi samples during refrigerated storage condition

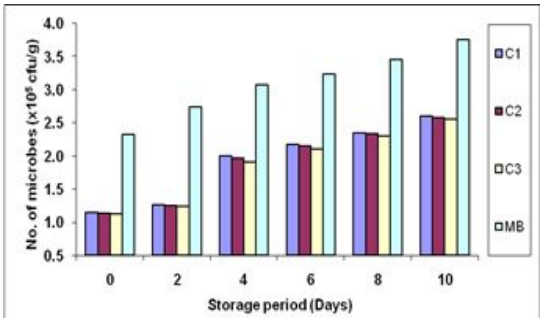

Fig. 8 Changes in microbial growth (x10 ^{5}cfu/g) of burfi samples during refrigerated storage condition

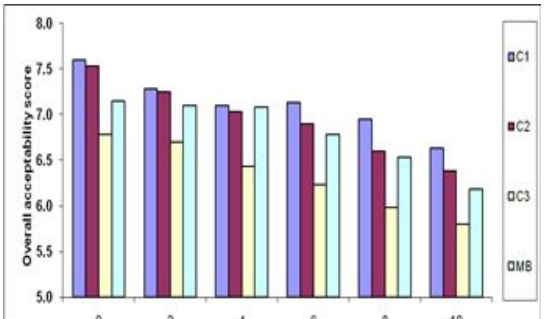

Fig. 9 Changes in overall acceptability score of burfi samples during refrigerated storage conditin

The decrease in fat content of samples may be attributed to the fact that khoa inherently had higher fat content as compared to stevia powder. It is well known fact that the burfi having higher percentage of khoa and lower percentage of stevia powder will have higher fat content and vice-versa. The fat content of market burfi was recorded as high as 18.317%. The probable reasons for higher values of fat content may be due to addition of fat (Ghee or vegetable oils) during preparation of market burfi.

The fat content of fresh samples having highest level of khoa (95%) with lowest level of stevia powder (5%) were observed as 14.247%, which further declined to safed musli powder were measured as 14.247, 13.650 14.220, 14.050, 13.793, 13.597 and 13.413% after 2, 4, 6, 8 and 10 days of storage, respectively. This decrement in fat content during storage may be attributed to decrease in ether extractable fats as a result of conversion of few parts of the fat, due to rancidity, into such compounds which are insoluble in ether. Other possible reasons may be moisture gain during storage period which might have caused microbial growth. The initial fat content of market burfi was recorded as 18.317% which further decreased to 15.867% during storage of 10 days. Suchdeva (1980) has found decrement in fat content from 20.47 to 12.17%. However, Patil (2002) reported decrement from 26.80 to 14.10 to% in case of burfi during storage.

Effect on Total Plate Count (TPC): The Total Plate Count (microbial growth) decreased significantly with decrease in the level of khoa and increase in the level of stevia powder. The TPC for fresh burfi samples prepared with 95, 90 and 85% khoa and 5, 10 and 15% stevia powder were recorded as $1.143x10^5$, $1.133x10^5$ and $1.127x10^5$ cfu/g, respectively (Fig. 8). The probable reasons may be attributed to reduction in level of khoa and incorporation of stevia powder, since stevia powder had anti-bacterial and anti-fungal properties (Tomita, 1997). Therefore, it acts as a preservative which resulted in less numbers of bacteria in the samples. The total bacterial counts ($2.323x10^5$ cfu/g) of market burfi were found higher than those of herbal burfi ($1.127x10^5$ to 1.143 $x10^5$cfu/g). Reasons may be attributed to unhygienic conditions prevailing the market at the time of preparation of burfi. They also might have used adulterated khoa.

Study depicted that the total plate count (TPC) increased significantly with increase in storage period for all samples. The initial value of TPC for samples prepared with 95% of khoa and 5% of stevia powder were observed as $1.143x10^5$ cfu/g, which further increased to $1.267x10^5$, $1.997x10^5$, $2.173x10^5$, $2.347x10^5$ and $2.607x10^5$ cfu/g after 2, 4, 6, 8 and 10 days after storage. In case of market burfi the initial value of TPC was observed as $2.323x10^5$ cfu/g, which further increased to $3.753x10^5$ cfu/g after 10 days of storage. In general, the TPC decreased with increase in the level of stevia powder and decrease in the level of khoa irrespective of storage period.

The results of present study were found in conformity with the findings of Anon. (1965) reported TPC values in the range of 3.0 x 10^5 cfu/g. Ghodekar *et al.* (1974) noticed TPC as $2.16x10^5$ cfu/g. They also examined market burfi and reported TPC as $2x10^3$ to $6.0x10^5$ cfu/g.

Effect on overall acceptability: The average scores awarded to all individual sensory quality attributes revealed that fresh samples prepared with highest khoa level (95%) and lowest level of stevia powder (5%) gave maximum acceptability with a average score of 7.60 followed by the samples having 90% khoa with 10%

stevia powder; 85% khoa with 15% stevia powder. The market burfi got overall acceptability score as 7.15 (Fig. 9). It was depicted that all the fresh samples were found in the category of 'like moderately' to 'like very much'. It was found that during storage, the overall acceptability scores decreased significantly. In case of all the samples, the classes of rating were changed as between 'like slightly' and 'like moderately'. A marginal decrement in sensory scores were observed probably due to increase in moisture content, deteriorative changes in physico-chemical and other quality attributes during storage. In general, it was observed that overall acceptability of herbal burfi decreased during storage period of 10 days irrespective of compositions of khoa and stevia powder.

Conclusion

Herbal burfi samples prepared with 90% khoa, 10% stevia powder and 2% safed musli powder ratio was found best. This ratio scored highest overall acceptability. Less microbial growth ($2.557x10^5$ cfu/g) was noticed those sample having 85% khoa and 15% stevia powder. Other physico-chemical qualities of this ratio were also found satisfactory. The values of optical density, acidity and TPC were increased significantly while, the values of protein content, fat content and sensory scores decreased significantly during 10 days of storage.

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