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RESEARCH PAPER

Effect of *Tikhur* (*Curcuma angustifolia roxb.)* Flour on physico-chemical and sensory qualities of G*ulabjamun*

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ABSTRACT

Efforts were made to develop *Tikhur* based *Gulabjamun* with the addition of *Tikhur* flour viz, 10% (T_2), 20% (T_3) and 30% (T_4) by replacing 10% *maida* (T_1) especially to consume during fastening and it has been reported that *Gulabjamun* prepared with the addition of 30% *Tikhur* flour obtained highest acceptability (score 9.0 on 9-point Hedonic scale). *Tikhur* flour used for *Gulabjamun* preparation contains 15.0 % moisture, 0.20% fat, 1.60% protein, 82.30 % carbohydrate and 0.90% ash. The fresh product T_4 (30%) had 26.14% moisture, 23.52 % fat, 16.98 % protein, 47.82 % carbohydrate, 6.10 % ash and 73.86% total solids. During the storage period at room temperature, there was a consistent increase in free fatty acid and peroxide value in all the samples due to hydrolytic and oxidative rancidity while though these changes were slower in T_4 sample compared to T_2 and T_3. It is also concluded that *Tikhur* flour based *Gulabjamun* of treatment T_4 (30% *Tikhur* flour) was the best having the cost of ₹ 15,680/- /100 Kg which is lower than control (T_1).

Keywords: *Tikhur,* medicinal plants, free fatty acids, food products, storage quality, acceptability

India has emerged as the largest milk producing country in the world and the increased availability of milk during the flush season coupled with inadequate facilities to keep liquid milk fresh during transit from rural production areas to urban market has led to the conversion of milk into traditional milk products. These products are integral part of Indian heritage and have great social, religious, cultural, medicinal and economic importance and have been developed over a long period with the culinary skills of homemakers and *Halwais* (Tiwari *et al*., 2012). *Gulabjamun* is one of those products which is popular and favorite sweet dish or dessert comprised of *Khoa* rounds deep fried in ghee and soaked in hot saffron or cardamom seeds or rosewater flavored sugar syrup. Frying is done on sufficiently low flame that the *Gulabjamuns* get cooked till the inside of the balls, become golden brown colour. They are served warm or at room temperature.

Medicinal plants are rich in secondary metabolites that include alkaloids, glycosides, coumarins, flavonoids, steroids, etc. Generally, the whole plant, roots, stem, bark, leaves, flowers, fruits, gums and oleoresins, etc. are used as medicine. About 12.5% of the 4,22,000 plant species documented worldwide are reported to have medicinal values (Sen, 2004). Food products developed by adding herbal ingredient (only edible medicinal and aromatic plants) are important from nutritional and therapeutic point of view. Some

edible medicinal plants like lemon grass, *tulsi*, ginger, *meethi neem* (curry leaves), *pudina*, cardamom, etc. have been used to manufacture herbal based milk and milk products (Choudhary *et al.,* 2006). These type of products are more economical and profitable in the interest of healthcare.

Curcuma angustifoli, is a medicinal plant though native to central India, is distributed in the west Bihar, north Bengal extending to Maharashtra and south India (Bhandari, 1992). It also possesses viz. aphrodisiac, emollient, expectorant, diuretic, nutritive, sweet and astringent (http://www.herbalcureindia.com). Acharya Vagbhata has mentioned it as a remedy for raktapitta, tuberculosis, asthma, cough, burning sensation of the body, distate and as an alleviator of pittadosha. It is an excellent diet in the form of conjee in cases of dysentery, dysuria, gonorrhoea etc. (http://crdd.osdd.net/indipedia/index.php/). *Tikhur* is very popular in tribal areas of Chhattisgarh and finds many applications in the daily diet of tribal people due to its nutritional and medicinal properties.. This most popular edible medicinal plant *Tikhur* which is grown in Chhattisgarh and is used in the preparation of products such as *burfi, milk shake, jalebi* and *halwa* at domestic level especially during *vratas* and fast. *Tikhur* plant is available in tribal areas and can be utilized to prepare new value added products. Therefore, keeping this in the view, study was conducted to standardize the process for preparation of *Gulabjamun* using *Tikhur* flour by replacing *maida*.

MATERIALS AND METHODS

Raw Materials

Fresh cow milk from the selected herd was collected from Dairy farm of the Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh) to prevent the variation in composition in the preparation of k*hoa.* Ghee of commercial grade brand name 'AMUL' manufactured by Anand Milk Union Ltd. was used. Good Quality *Tikhur* flour was collected from the 'Sanjeevini' NWFP, Chhattisgarh forest department was used as the major ingredient in the developed product. Sugar and sodium-bi-carbonate of brand name "Weikfield" (New Delhi), used in the study was of commercial grade and was purchased from the local market of Raipur.

Method of preparation of gulabjamun

Good quality *Tikhur* flour, was collected from the local market of Raipur. It was stirred with clean water and allowed to settle. Supernatant was removed by decanting the wash water and process was repeated 5-6 times to remove impurities and bitter taste of *Tikhur* flour, it was strain through a muslin cloth. The mass of cleaned *Tikhur* flour in muslin cloth was collected and sundried. *Tikhur* based *Gulabjamun* by taking differented proportions of *Khoa* (90.0, 90.0,80.0 and 70.0%), *Tikhur* flour (0,10,20 and 30%) and 0.5% sodium-bi-carbonate with four different treatments T_1, T_2, T_3 and T_4. The respective mixture were added to form dough and made into balls of approximately 4 gms. The flow diagram for the preparation of *Tikhur Gulabjamun* is presented in Fig. 1.

Chemical Analysis

The raw material *Khoa*, *Tikhur* flour, Maida and fresh *Gulabjamun* samples were analyzed for moisture, fat, protein, carbohydrates and ash. The moisture content of *Khoa*, *Tikhur* flour, *Maida* and fresh *Gulabjamun* samples were determined by gravimetric method (A.O.A.C. 1995). Protein content of *Khoa, Tikhur* flour, *Maida* and fresh *Gulabjamun* samples were estimated using Microkjeldahl distillation apparatus as per the method of AOAC (2000).

The fat content of *Khoa*, *Tikhur* flour, *Maida* and fresh *Gulabjamun* samples were estimated by extraction method A.O.A.C. (2000). The total carbohydrate content of *Khoa*, *Tikhur* flour, *Maida* and fresh *Gulabjamun* samples were obtained by subtracting the estimated amount of protein, fat, ash and moisture from 100.The ash content of *Khoa*, *Tikhur* flour, *Maida* and *Gulabjamun* samples were determined according to A.O.A.C (2000). The Total solid content of *Khoa*, *Tikhur* flour, *Maida* and *Gulabjamun* samples were determined by gravimetric method according to Laboratory manual, MIF, 1959).

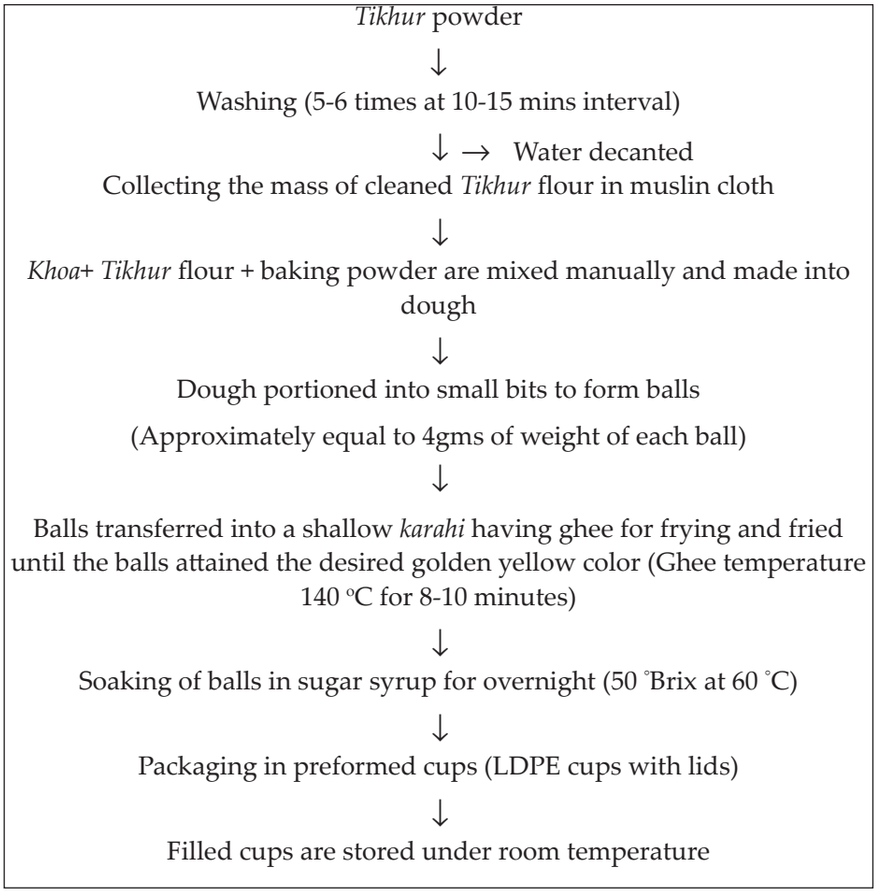

Fig. 1

Storage study of *Gulabjamun*

Storage study of *Gulabjamun* is evaluated by analyzing Free fatty acid value and Peroxide value. These values are the primary most important methods of assessing storage quality of fat rich products. These chemical tests are used to measure the degree of deterioration of the product during storage.

Free fatty acid value

The FFA content of gulabjamun was estimated by the method described by Narasimhamurthy and Ramamurthy (1983). Peroxide value of gulabjamun was estimated as per the procedure outlined in IS: 3508(1966).

Sensory analysis of product

The sensory evaluation of fresh as well as stored product (room temperature) of every treatment at an interval of 2 days was carried out by a panel of judges using standard score card on a 9-point hedonic scale as suggested by Amerine *et al.* (1965) and replicated three times.

Statistical analysis

The chemical composition data in per cent units, do not follow normal distribution, therefore to validate the test, the percentage data of chemical composition were subjected to "Arcsine Transformation" and subsequently analysis of variance (ANOVA) was preformed as suggested by Snedecor and Cochran

(1967). For statistical analysis of sensory data, factorial completely randomized design was applied (Steel and Torrie, 1981). The experiment was replicated three times and the data generated under various heads were subjected to statistical analysis.

Techno-economic feasibility of the product

The cost analysis of the product was worked out by considering the variable cost of different commodities used in preparation of *Tikhur Gulabjamun*. The variable cost includes raw material cost, packaging cost and labour cost. Assuming processing cost (frying and cleaning) as 10 and 15% respectively of raw material cost, the total manufacturing cost of the product was calculated. On this basis, techno-economic feasibility of the product was estimated in terms of total manufacturing cost.

RESULTS AND DISCUSSION

The chemical composition of raw materials like *khoa*, *Tikhur* flour and *maida* used in the preparation of product is given in the Table 1.

Table 1: Chemical composition of *Khoa*, *Tikhur* flour and *Maida*

Components	*Khoa*	*Tikhur* flour	*Maida*
Moisture (%)	30.15	15.00	14.95
Protein (%)	19.00	1.60	13.05
Fat (%)	20.50	0.20	0.01
Total Carbohydrate (%)	26.85	82.3	71. 29
Ash (%)	3.50	0.90	0.70

Effect of levels of incorporation of Tikhur flour on chemical composition of fresh Tikhur Gulabjamun

The Effect of levels of incorporation of *Tikhur* flour in tikhur gulabjamun was analyzed for chemical composition and the results are presented in Table 2.

The replacement of khoa with tikhur effect moisture, protein, fat, carbohydrate, ash and total solids of the samples. The moisture content of the *Tikhur Gulabjamun* samples gradually decreased as *Tikhur* flour was increased. The replacement of *Maida* by *Tikhur* flour may be responsible for the decreasing trend in moisture content of *Gulabjamun* samples and present findings is in agreement with those of Singh *et al.* (2009) who reported that the fortification of defatted soy flour replacing *maida* in control sample at different levels affected the moisture retention in the *Gulabjamun*. Table 2 showed that protein content of the *Tikhur Gulabjamun* samples gradually decreased as *Tikhur* flour was increased. The significant decrease in the protein content of the samples T_2, T_3 and T_4 could be associated with the base material *khoa*. *Khoa* being a concentrated form of protein is responsible for the higher amount of protein content in T_1 sample (control). During deep frying of *Gulabjamun* balls, starch is known to gelatinise and protein denaturation occurs which results in formation of protein–starch network leading to reduced protein content. Adhikari (1993) who documented, changes in microstructure and texture of *Khoa* and *Gulabjamun* made from Cow's milk: as a result of heat induced changes during processing and frying.

The result showed that the fat content of the *Tikhur Gulabjamun* samples gradually decreased as *Tikhur* flour was increased. It could be because of the base material i.e. *Khoa* (90 per cent) which has higher fat content of 20.50 per cent where as *maida* and *Tikhur* flour contains lower fat content as is the case of tikhur. As the *Tikhur* flour level was increased, the fat content decreased because it might have affected the moisture retention which simultaneously affected the fat uptake resulting in the decrease in fat content. The results obtained are in agreement with those of Gupta (2010).

The carbohydrate content of the *Tikhur Gulabjamun* samples gradually increased as *Tikhur* flour concentration was increased. This may be because of the replacement of *maida* with *Tikhur* flour. *Tikhur* being carbohydrate rich flour contributed to higher carbohydrate content. The results obtained are in agreement with the observations made by Gupta (2010) who reported that when *Gulabjamun* was prepared by partially replacing milk fat with vegetable oil, increasing the levels of *maida,* the

Table 2: Average chemical composition of fresh *Tikhur Gulabjamun*

Treatment	Moisture (%)	Protein (%)	Fat (%)	Carbohydrate (%)	Ash (%)	Total solids (%)
T1	28.03	21.24	25.50	41.38	5.56	71.97
T2	27.89	19.52	26.52	42.68	5.65	72.11
T3	26.84	18.40	25.56	44.95	5.81	73.16
T4	26.14	16.98	23.52	47.82	6.10	73.86
F-Values	6628.687**	33463.738**	1861.339**	205.700**	4930.759**	5201.392**
SEm ±	0.0110	0.0098	0.0333	0.0165	0.0402	0.0511
CD (%)	0.04	0.03	0.11	0.05	0.13	0.15

T_1 – 90 % *Khoa*+10 % *Maida*, T_2 - 90 % *Khoa* +10 % *Tikhur* flour, T_3 - 80 % *Khoa* +20 % *Tikhur* flour and T_4 – 70 % *Khoa* + 30 % *Tikhur* flour, ** Highly significant

total solid content increased which simultaneously increased the total sugar content also.

The ash content of the *Tikhur Gulabjamun* samples gradually increased as *Tikhur* flour concentration was increased. The increasing trend in the ash content of the samples could be associated with the levels of *Tikhur* flour. The results are in accordance with observations made by Gupta (2010), who documented that the *Gulabjamun* prepared by partially replacing milk fat with vegetable oil and on increasing the levels of *maida,* the total solid content increased which simultaneously increased the ash content. Similarly, results have also been reported by Dewani (2002) on *Gulabjamun* using different levels of whey protein concentrate. Total solid content of the *Tikhur Gulabjamun* samples gradually increased as *Tikhur* flour concentration was increased because of decreased trend in moisture content. The results obtained are in agreement with those of Ghosh *et al.* (1984) who prepared *Gulabjamun* using wheat flour and *suji* in varied proportions and the total solids content increased due to the levels of wheat flour and *suji*.

Free fatty acid value and Peroxide value of Tikhur Gulabjamun during storage period

During storage free fatty acid value and peroxide value was estimated and data obtained after 10 days storage at room temperature and samples were acceptable which gives an indication about storage characteristics of the *Tikhur Gulabjamun*, where as *Gulabjamun* prepared from traditional method having lower storage life.

Effect on Free Fatty acid value

The effect of *Tikhur* flour concentration and storage period on free fatty acid value of *Tikhur Gulabjamun* is presented in Table 3. As could be seen from the results, it is clear that, during the course of storage there was a constant increase in the free fatty acid value of stored sample irrespective of the treatments of sample. The deterioration of mixed ingredient (*Tikhur* flour) having longer storage stability at room temperature as compared to *maida* mix *Gulabjamun*. This may be presence of ar-curcumene in *Tikhur* flour which have antimicrobial property and prevent spoilage of the product.

Table 3: Effect of Tikhur flour concentration and storage period on Free fatty acid value of *Tikhur Gulabjamun*

Tikhur flour concentration (%)	Storage period (Days)					
	Fresh	2	4	6	8	10
0.0 (T1)	2.40	3.41	4.42	—	—	—
10.0 (T2)	2.32	2.92	3.72	4.41	—	—
20.0 (T3)	2.30	2.62	3.54	4.26	4.78	—
30.0 (T4)	2.29	2.54	3.32	4.14	4.62	5.08

During storage period there was a consistent increase in free fatty acid in all the samples and it may be attributed to hydrolytic rancidity of the triglycerides present in the sample. The data clearly indicates that

there was gradual change in free fatty acid value of different samples during the storage at room temperature.

T_1 (control) sample (increase of free fatty acids from 2.40 to 4.42% Oleic acid in 4 days) deteriorated fast compared to others T_2 (2.32 to 4.41% Oleic acid in 6 days), T_3 (2.30 to 4.78% Oleic acid in 8 days) and T_4 (2.29 to 5.08 % Oleic acid in 10 days). While comparing the results among the treatments, it was observed that T_4 sample slowly deteriorated compared to T_2 and T_3. This may be because of the antimicrobial property of *Tikhur* flour which was added in higher amount (30% *Tikhur* flour). The results are in agreement with the findings reported by Vani Rai (2000) who prepared the *Gulabjamun* mix from the admixture of WPC and SMDM at 40:60 ratio had free fatty acid content of 14.93 % at the time of storage (0 day) which progressively increased to 18.03, 20.40 and 24.17 %, respectively after 1, 2 and 3 months of storage in PE packaging material. But when the same product was stored in MP packaging material, it had free fatty acid content of 15.96, 16.70 and 18.50%, respectively for 1, 2 and 3 months of storage at room temperature.

Effect on Peroxide value

The effect of *Tikhur* flour concentration and storage period on peroxide value of *Tikhur Gulabjamun* (Table 4), results shows that during course of storage there was a constant increase in the peroxide value of stored sample irrespective of the treatments of sample and packaging material.

Table 4: Effect of *Tikhur* flour concentration and storage period on Peroxide value of *Tikhur Gulabjamun*

Tikhur flour concentration (%)	Storage period (Days)					
	Fresh	2	4	6	8	10
0.0 (T1)	3.92	4.33	12.3	—	—	—
10.0 (T2)	3.62	5.5	9.8	11.77	—	—
20.0 (T3)	3.27	6.6	8.36	9.2	11.37	—
30.0 (T4)	3.08	8.21	8.21	8.81	10.64	12.02

The increase in peroxide value on storage may be attributed to oxidative rancidity due to the oxygen present in dissolved air in the sample. T_1 (control) sample (3.92 to 12.30 milli moles/ kg of fat in 4 days) deteriorated fast compared to T_2 (3.62 to 11.77 milli moles/ kg of fat in 6 days), T_3 (3.27 to 11.37 milli moles/ kg of fat in 8 days) & T_4 (3.08 to 12.02 milli moles/ kg of fat in 10 days). While comparing the results among the treatments, it was observed that T_4 sample slowly deteriorated compared to T_2 & T_3. This may be because of antimicrobial property of *Tikhur* flour which was added in higher amount (30% *Tikhur* flour). The results are in agreement with the findings reported by Devaraja (2005) who prepared *Gulabjamun* by incorporating WPC from 0 to 20% which showed an increase in peroxide value from 0.00 milli moles/kg of fat (0 day) to 1.20, 1.60, 1.90 and 2.4 milli moles/kg of fat respectively after 1, 2, 3 and 4 weeks of storage in PE packaging material and PET packaging material at refrigeration temperature.

Effect of level of incorporation of Tikhur flour and storage period on Overall acceptability

The level of incorporation of *Tikhur* flour had considerable effect on the overall acceptability scores of *Tikhur Gulabjamun* as indicated in the Table 5. The T_4 sample had the highest score of 9.0 and differed significantly from rest of the samples. The T_1 sample had the lowest overall acceptance score of 8.0.

Table 5: Effect of *Tikhur* flour concentration and storage period on Overall acceptability of *Tikhur Gulabjamun*

Tikhur flour concentration (%)	Storage period (Days)					
	Fresh	2	4	6	8	10
0.0 (T1)	8.0	8.0	7.9	—	—	—
10.0 (T2)	8.3	8.3	8.1	7.93	—	—
20.0 (T3)	8.6	8.6	8.5	8.48	8.3	—
30.0 (T4)	9.0	9.0	8.8	8.75	8.6	8.4

The table showed gradual decrease in overall acceptability scores for all the treatments prepared with different concentration of *Tikhur* flour with increase in storage period. This comes due to moisture gain in the product during storage due to increase in viscosity of sugar syrup and darkening of the colour,

Table 6: Production cost of *Tikhur Gulabjamun*

Heads	Yield of product – T_1 : 242.0g, T_2 : 248.0g, T_3 : 254.0g and T_4 : 257.0g								
	₹/Kg	Qty used (g)				Total (₹)			
I. Expenditure		T_1	T_2	T_3	T_4	T_1	T_2	T_3	T_4
(a) Raw Material cost									
Milk	20.00	1.048 lt	1.048 lt	0.932 lt	0.815 lt	20.96	20.96	18.64	16.30
Tikhur flour	120.00	—	15.00	30.00	45.00	—	1.80	3.60	5.40
Maida	25.00	15.00	—	—	—	0.37	—	—	—
Sugar	40.00	125.00	125.00	125.00	125.00	5.00	5.00	5.00	5.00
Ghee	280.00	50	50	50	50	14	14	14	14
Sodium bi-carbonate	80.00	0.50	0.50	0.50	0.50	0.04	0.04	0.04	0.04
Sub-total		150g	150g	150g	150g	***40.37***	***41.80***	***41.28***	***40.74***
(b) Processing cost @ 15% of raw materials cost						8.89	9.12	9.04	8.96
Sub-total						49.26	50.92	50.32	49.70
II. Packaging cost/Gulabjamun						0.50	0.50	0.50	0.50
III. Fuel cost (310/16 Kg)		0.311	0.311	0.311	0.311	6.80	6.80	6.80	6.80
IV. Salary/Wages (₹ 115/8 h)						4.31	4.31	4.31	4.31
Total yield (150gms)		242gm	248gm	254gm	257gm	65.18	62.53	61.93	61.31
Cost of product quantity						65.18	62.53	61.93	61.31
Cost of product quantity(250 gms)						41.78	40.02	39.62	39. 20

Note: T_1: 90% *Khoa* + 10% *Maida*, T_2: 90% *Khoa* + 10%*Tikhur* flour, T_3: 80% *Khoa* + 20% *Tikhur* flour and T_4: 70% *Khoa* + 30% *Tikhur* flour

age gelation, softening of the product due to protein denaturation and rancid in taste. These results are in agreement with those Ghosh *et al.* (1984), Saxena *et al.* (1996) and Dewani, (2002) in case of SMP and WMP enriched *Gulabjamun* mix powder, defatted soya flour based and WPC based *Gulabjamun.*

Techno–economic feasibility of the developed product

The economics involved in the manufacture of *Tikhur Gulabjamun* was calculated and is presented in the Table 6. The total production cost of *Gulabjamun* based on the yield of samples was estimated to be ₹ 65.18, ₹ 62.53, ₹ 61.93 and ₹ 61.31 respectively for T_1, T_2, T_3 and T_4. The production cost per 250g of *Gulabjamun* was further calculated to be ₹ 41.78 (T_1), 40.02 (T_2), 39.62 (T_3) and 39.20 (T_4). The higher cost of production of T_2 sample was attributed to highest proportion of *khoa* which basically had the higher price. On comparing, the total cost of production per 250 g of Gulabjamun, T_4 had the lowest production cost. This was due to the presence of highest quantity of *Tikhur* flour which has good swelling properties with its therapeutic and medicinal value and also due to the less quantity of *khoa* in the sample.

CONCLUSION

Apart from imparting nutritional and therapeutic value to the product, *Tikhur* flour also improved the shelf-life and overall acceptability of the *Gulabjamun* compared to the control sample. *Gulabjamun* prepared from 70% *Khoa* and 30% *Tikhur* flour was found quite acceptable. Quality of the product was well and acceptable up to 10 days of storage at room temperature. The product can be used as dietic food

product and can be consumed by all age group people. It is also concluded that storage life of the product was more as compared to control sample. Techno-economic feasibility was determined and found that *Gulabjamun* prepared from T_4 (30% *Tikhur* flour) having the cost of ₹ 100 kg basis which is lower than that of (control) T_1 sample (₹ 100 kg basis).

REFERENCES

A.O.A.C. 1995. Official methods of analysis. Association of official analytical chemists, Washington, DC.

A.O.A.C. 2000. Official methods of analysis. 17th ed. Association of official analytical chemists, Washington, DC.

Adhikari, A.K. 1993. Microstructure and Texture of Khoa & Gulabjamun made from cow's milk: Heat induced changes during processing and frying. *Journal of the Science of Food &Agriculture*, **61**(1): 7-15.

Ambasta S.P. 1986. The useful plants of India. Publications and Information Directorate, CSIR, New Delhi, India.

Amerine, M.A., Pangborn, R.M. and Roessler, E.B. 1965. Principles of sensory evaluation of food. *In*: Food Science and Technology Monographs. pp. 338-339. Academic Press, New York.

Bhandari, S.C. 1992. Vanaushadhi Chandrodaya. An Encyclopaedia of Indian Botanics and Herbs, Vol. 161, Chaukhanabha Sanskrit Sansthan, Varanasi, pp. 7-8.

Dewani, P. and Jaya Prakasha, H.M. 2002. Effect of addition of whey protein concentrate on physico-chemical, and sensory characteristics of khoa and khoa based sweets. *J. Food Sci. Technol*., **39**(5): 502- 506.

Gupta, S. 2010. Suitability of *khoa* prepared by partial replacement of milk fat by vegetable oil for making *Gulabjamun.* Ph.D. Thesis, Dept of Food, Nutrition and Dietetics, Halina school of Home Science, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad, pp. 34-39.

http://crdd.osdd.net/indipedia/index.php/East_Indian_Arrowroot

http://www.fnbnews.com/article/detarchive.asp/artidied=26737&sectionid=1.

http://www.herbalcureindia.com/herbs/curcuma-angustifolia.htm

IS: 3508. 1966. Methods of Sampling and Test for *Ghee* (Butter fat). Indian Standards Institution, Manak Bhava, New Delhi, p. 21.

Laboratory Manual 1959. Method of Analysis of Milk and its products. 3rd Ed., Milk Industry Foundation, Washington D.C.

Prajapati, P.S., Thakar, P.N., Miyani, R.V. and Upadhyay, K.G. 1991. Influence of use of *khoa* prepared from concentrated milk on quality of *gulabjamun*. *Indian J. Dairy Sci*., 44(6): 395-397.

Sen, N.L. 2004. Importance and scope of medicinal and aromatic plants. In: *Manual of winter school and commercial exploitation of underutilized* MAPs. pp. 1-6.

Singh, J., Sharma, R.B. and Singh, R. 1999. Improved cultural practices for cultivation of medicinal herb- Tikhur. In Health care and development of medicinal plants, pp. 319-324.

Snedecor, G.W. and Cochran W.G. 1967. Statistical methods, 6th ed. Oxford and IBH Publishing Co. New Delhi, p. 593.

Tiwari, Soumitra and Patel, S. 2013. A Comparative Study of Tikhur Traditional and Partial Mechanical Processing and Cost Economics. *International Journal of Agricultural Engineering,* **6**(1): 213–215.