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Organoleptic quality and cost of manufacturing of sweet orange *Burfi*

S.S. GOLANDE, S.S. RAMOD, A.A. CHOPADE **AND** S.P. POUL

ABSTRACT : Sweet orange *Burfi* with the combination T_2 (10 parts of sweet orange juice) resulted into a product of better choice and with the highest ratings of 8.27, 8.00, 8.05, 8.08 and 8.10, respectively for colour and appearance, body and texture, flavour, taste and overall acceptability. The cost of production of sweet orange *Burfi* was at Rs. 87.67 per kg, which was 5.01 per cent higher than the production of plain *Burfi*.

KEY WORDS : Milk, *Khoa*, Sweet orange, *Burfi*

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INTRODUCTION

Burfi is one of the highly nutritious *Khoa* based indigenous milk products prepared from cow or buffalo milk, as it contains a considerable amount of milk solids. Sugar is added in different proportions and other ingredients are incorporated according to the demand of consumers. Several varieties of *Burfi* are sold in the market, depending upon the additives present, *viz.*, Mawa *Burfi*, Pista *Burfi*, Chocolate *Burfi*, Coconut *Burfi* and Rava *Burfi*. Good quality *Burfi* is characterized by moderately sweet taste, soft and slightly greasy body and smooth texture with very fine grains (Pal, 2000). It retains its quality for a considerable long period at atmospheric storage temperature due to its low moisture content and higher concentration. The method of preparation also ensures the destruction of almost all micro-organisms present in the raw material. In post manufacturing contamination from undesirable micro-organisms during preparation, handling, packaging and storage of the final product is avoided.

MEMBERS OF RESEARCH FORUM

Address for correspondence :
S.S. Golande, Department of Animal Husbandry and Dairy Science, College of Agriculture, Marathwada Agricultural University, PARBHANI (M.S.) INDIA
Email : sandeepramod@rediffmail.com

Associated Authors' :
S.S. Ramod, A.A. Chopade and S.P. Poul, Department of Animal Husbandry and Dairy Science, College of Agriculture, Mahatma Phule Krishi Vidyapeeth, Rahuri, AHMEDNAGAR (M.S.) INDIA
Email : abhimanyu_chopade@rediffmail.com

In flush season, large quantity of milk is available for preparation of dairy based milk products including *Burfi*, with its increased palatability with various flavours and formulation. Moreover, *Burfi* can be made available in the milk deficient areas like high mountains of the Himalaya and the desert of Rajasthan etc. This would help to bridge the regional and seasonal gap.

The research and development of today aims to preserve valuable milk solids during flush season for tomorrow. In addition, it would create a suitable platform for the utilization of different fruits like orange, papaya, sapota, mango, wood apple, coconut, etc. Orange fruits have typical flavour accepted by large number of population. Preserving as a flavouring ingredient in the dairy product is the best way to overcome the perishable quality of these fruits. However, like plain *Burfi*, very meagre research has so far been traced on fruit flavoured *Burfi*. Sweet orange (*Citrus sinenssis*) is one of the nutritious fruits and commonly called as mosambi. Sweet oranges are cultivated in the state of Maharashtra, Punjab, Haryana, Andhra Pradesh and Tamil Nadu.

MATERIALS AND METHODS

The whole fresh clean buffalo milk was used during research and it was standardized to 6 per cent fat. Approximately the required amounts of fresh sweet orange fruits were taken from local market. Peels were removed by hand. Seeds also separated from segment and juice was extracted with the help of lime squeezer. Sugar was used as a sweetening agent for the

preparation of sweet orange *Burfi*. Method of preparation of *Burfi* suggested by De (1980) was used to prepare plain *Burfi*, however, slight modifications in this method was made to prepare sweet orange juice added *Burfi*.

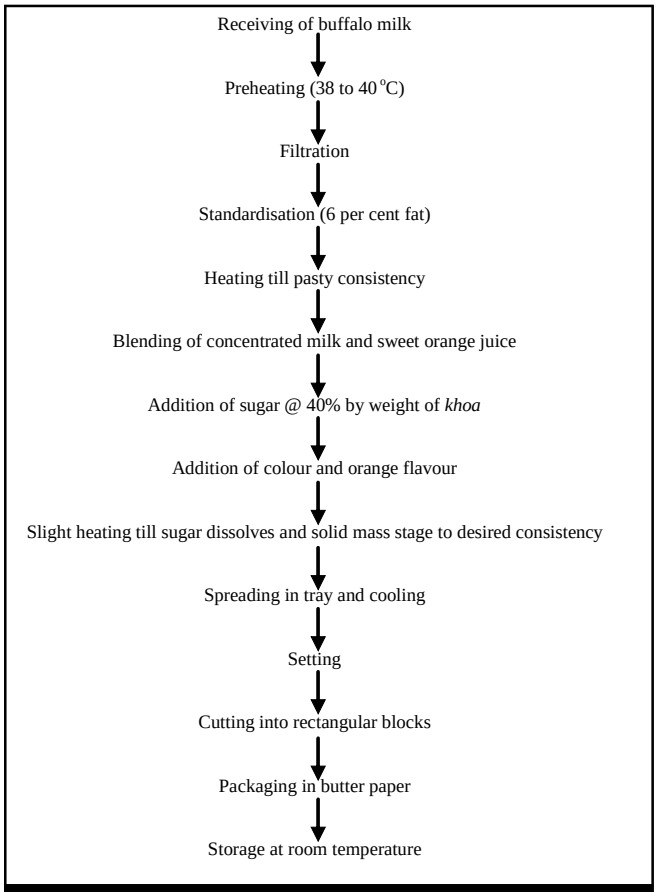

Fig. A : Flow diagram for manufacture of sweet orange *Burfi*

Sensory evaluation of sweet orange *Burfi* was carried out by a panel of six semi-trained judges so as to grade the product and to know the acceptability. It was judged for colour and appearance, flavour, taste, body and texture and overall acceptability attributes. The evaluation was done by adopting '9 point Hedonic scale' developed by Gutpa (1976). The material / ingredients needed for the preparation of sweet orange *Burfi* were rated as per the prevailing market rates and cost of production of sweet orange *Burfi* was worked out. The data were analysed statistically by using Completely Randomised Design (CRD) as per Panse and Sukhatme (1985). The significance was evaluated on the basis of critical difference. In all five trials were conducted.

For the preparation of milk sweet orange *Burfi* the treatment combinations were as follows.

T_0 Plain *Burfi*/Control-whole buffalo milk(standardized with 6.00% fat)

T_1 5 parts of sweet orange juice + 95 parts of *khoa*

T_2 10 pars of sweet orange juice + 90 parts of *khoa*

T_3 15 parts of sweet orange juice + 85 parts of *khoa*

RESULTS AND DISCUSSION

The experimental findings of the present study have been presented in the following sub heads:

Sensory evaluation of sweet orange *Burfi*:

Colour and appearance of sweet orange *Burfi*:

The colour and appearance of *Burfi* was significantly changed due to mixing of sweet orange juice while *Burfi* preparation (Table 1). The mean score of colour and appearance under the treatments T_0, T_1, T_2 and T_3 were 6.89, 6.90, 8.27 and 7.40, respectively. The highest score (8.27) was obtained by sweet orange *Burfi* with 10 parts of sweet orange juice. However, colour and appearance of *Burfi* was more or less similar in control (T_0) and 5 (T_1) parts of sweet orange juice *Burfi*. The colour and appearance may be taken up as the first indication of perception of the particular product which seemed to have been the best in the combination T_2 (10 parts of sweet orange juice). The present findings may be confirmed with Kathalkar (1995) who noted the average score for the colour parameters ranging between 6.51 to 7.36 in case of ber *Burfi* like product. However, the present findings are not in agreement with Wakchaure (1998), who indicated deterioration of colour due to addition of sapota pulp.

Body and texture of sweet orange *Burfi*:

It is worthwhile to observe from Table 2 that the body and texture character of sweet orange *Burfi* ranged between 7.15 to 8.00 respectively as in case of T_1 (5 parts of sweet orange juice) and T_2 (10 parts of sweet orange juice). It was

Table 1 : Colour and appearance of sweet orange *Burfi*

Treatments/ Replications	Colour and appearance score					
	R-I	R-II	R-III	R-IV	R-V	Mean
T_0	7.23	6.00	6.64	7.49	7.09	6.89
T_1	7.40	6.10	7.10	6.80	7.10	6.90
T_2	8.10	8.48	8.23	8.20	8.34	8.27
T_3	8.00	7.50	7.15	7.20	7.15	7.40

SE ± 0.19 C.D. (P=0.05) = 0.57

Table 2 : Body and texture of sweet orange *Burfi*

Treatments/ Replications	Body and texture score					
	R-I	R-II	R-III	R-IV	R-V	Mean
T_0	7.65	7.90	7.40	7.65	7.15	7.55
T_1	7.00	7.20	7.05	7.10	7.40	7.15
T_2	8.00	8.25	8.00	8.00	7.75	8.00
T_3	7.15	7.40	7.15	7.40	7.40	7.30

S.E. ± 0.08 C.D. (P=0.05) = 0.26

7.55, 7.15, 8.00 and 7.30 under T_0, T_1, T_2 and T_3 treatments, respectively. The score recorded for T_1 and T_3 were found to be at par, whereas value recorded for T_2 (10 parts of sweet orange juice) was significantly superior over the rest of the treatments followed by T_0 (control). This could indicate further that the addition of sweet orange juice to the final product of *Burfi* did alter the body and texture to the significant level only at the combination level of T_2. In rest of the combinations, there seemed to be slightly lower rating by the judges. The lower rating was observed due to the increased level of added sweet orange juice above certain level T_2 (10 parts of sweet orange juice) which formed granular texture in the product by increasing acidity which was disliked by the judges. Wakchaure (1998) recorded the mean score for body and texture of milk sapota pulp *Burfi* to be ranging between 6.05 to 7.19, indicated that the *Burfi* without adding sapota pulp had given the highest score as compared to rest of the treatments for the same attribute. It might be due to addition of sapota pulp directly proportional to deterioration of body and texture of *Burfi*.

Flavour of sweet orange *Burfi*:

It may be revealed from Table 3 that the values for flavour ranged significantly between 7.30 to 8.05, respectively for T_0 (control) and T_2 (10 parts of sweet orange juice). It was 7.30, 7.54, 8.05 and 7.80 for *Burfi* samples prepared under treatments T_0, T_1, T_2 and T_3, respectively. The flavour of *Burfi* was significantly affected due to addition of sweet orange juice. The significantly highest score (8.05) was received by sweet orange *Burfi* with 10 parts of sweet orange juice (T_2). Treatment T_2 was at par with T_3. It indicates that flavour of *Burfi* was more or less similar under 10 (T_2) and 15 (T_3) parts of sweet orange juice. The lowest score (7.30) as obtained uner T_0 (control). This seemed to have affected the flavour character desirably upto the level T_2 (10 parts of sweet orange juice) but further addition upto the level T_3 (15 parts of sweet orange juice) seemed to affect not to that extent the total flavour change. Hence, the level of T_2 (10 parts of sweet orange juice) could be taken as the positive indication for the flavour character. The present findings may be substantiated with Kathalkar (1995) who evaluated the concentrated milk ber pulp blend *Burfi* and recorded the score for flavour character to be ranging between 6.25 to 7.59.

Taste of sweet orange *Burfi*:

It may be apparent from Table 4 that the taste character of sweet orange *Burfi* ranged significantly between 7.25 to 8.08 as in case of T_0 (control) and T_2 (10 parts of sweet orange juice). It was 7.25, 7.70, 8.08 and 7.99 under T_0, T_1, T_2 and T_3 treatments, respectively. The treatment combinations were significantly superior over the control. However, within the

Table 3 : Flavour of sweet orange *Burfi*

Treatments/ Replications	Flavour score					
	R-I	R-II	R-III	R-IV	R-V	Mean
T_0	7.50	7.25	7.00	7.25	7.50	7.30
T_1	7.70	7.65	7.60	7.45	7.45	7.54
T_2	7.75	8.25	8.00	8.25	8.00	8.05
T_3	7.75	8.00	7.75	8.00	7.50	7.80

SE ± 0.09 C.D. (P=0.05) = 0.29

Table 4 : Taste of sweet orange *Burfi*

Treatments/ Replications	Taste score					
	R-I	R-II	R-III	R-IV	R-V	Mean
T_0	7.13	7.40	7.18	7.00	7.21	7.25
T_1	8.15	7.25	7.70	7.72	7.68	7.70
T_2	8.21	7.50	8.73	8.23	7.73	8.08
T_3	8.23	7.60	7.75	8.64	7.73	7.99

SE ± 0.16 C.D. (P=0.05) = 0.49

treatments, the combinations were at par with each other. The numerically highest value was recorded for the combination T_2 (10 parts of sweet orange juice). It is worthwhile to mention in conjunction with the data that the taste of the final product could be attributed to be slightly salty taste of *khoa*, the enhanced sweet taste due to non- reducing sugars of sucrose plus the reducing sugars from milk that is lactose and glucose, besides the enhancement of the taste due to the presence of enrichment of sugars from sweet orange source in the form of fruit sugar of fructose. All seem to have contributed their share in attaining the final taste character of sweet orange *Burfi*. Here again, it is worthwhile to add further that the specific level of T_2 (10 parts of sweet orange juice) was the most optimum and relished by the judges with regards the table character. Any further addition or lower addition seems to have receded the liking for the taste by the panel members. The present findings may be substantiated with Kathalkar (1995) who recorded the mean score as 6.54 to 7.39 for the taste character for milk ber pulp *Burfi* like product of varied combinations and Wakchaure (1998) reported the average score in the range of 7.27 to 8.10 for the taste character of milk sapota pulp *Burfi*.

Overall acceptability of sweet orange *Burfi*:

It may be indicated from Table 5 that the overall acceptability of sweet orange *Burfi* ranged significantly between 6.93 to 8.10 respectively as in case of T_0 (control) and T_2 (10 parts of sweet orange juice). It was 6.93, 7.60, 8.10 and 7.63 under T_0, T_1, T_2 and T_3 treatments, respectively. It may be noted further that the treatment combinations were significantly superior over that of the control. It is encouraging to note further that within the treatments the combinations were at par with each other and T_2 (10 parts of sweet orange juice) was accorded the highest preference for overall acceptability. The specific behaviour of the treatment combinations with regard to this particular character could be understood that the overall acceptability is a sum combination of colour and appearance and the general physical make up of the product. There seemed to have been significant improvement in all these characters which might have enhanced the consumer preference for overall acceptability of all the three treatment combinations of sweet orange *Burfi*. Moreover, it may be stressed that the particular level of T_2 (10 parts of sweet orange juice) seemed to match well to govern the sensory attributes to the most desired optimum level. Any deviation from this particular level seemed to hamper the overall acceptability in the opposite direction. Hence, it could be mentioned that the level of sweet orange juice addition could be done at the optimum level of 10 parts of sweet orange juice in *Burfi*. The product from the consumer point may be taken up as a novelty preparation to give desired, enriched colour, flavour and improved taste at a moderate cost.

Cost of manufacturing of sweet orange *Burfi*:

The cost of production of 1 kg sweet orange *Burfi* under various treatments was calculated by taking into consideration the prevailing retail market prices for the various ingredients *viz.*, sugar and sweet orange while the other charges such as

Table 5 : Overall acceptability of sweet orange *Burfi*

Treatments/ Replications	Overall acceptability score					
	R-I	R-II	R-III	R-IV	R-V	Mean
T_0	8.00	7.00	6.25	7.15	6.25	6.93
T_1	8.24	7.49	7.74	7.14	7.39	7.60
T_2	7.35	8.20	8.15	8.60	8.20	8.10
T_3	8.10	7.60	7.75	7.35	7.35	7.63

SE ± 0.22 C.D. (P=0.05) = 0.67

Table 6 : Cost structure of sweet orange *Burfi* (Rs/kg)

Sr. No	Particulars	Rate (Rs.)	T_0		T_1		T_2		T_3	
			Qty.	Amount (Rs.)	Qty.	Amount (Rs.)	Qty.	Amount (Rs.)	Qty.	Amount (Rs.)
1.	Buffalo milk (lit)	16/lit	2.85	45.60	2.75	44.00	2.66	42.56	2.58	41.28
2.	Sugar (g)	16/kg	285.71	4.57	275.86	4.41	266.66	4.26	258.06	4.12
3.	Sweet orange juice (g)	80/kg	--	--	34.48	2.75	66.66	5.33	96.77	7.74
4.	Miscellaneous – orange essence, lemon yellow colour, parchment paper, depreciation of utensils, etc.	--	--	4	--	7	--	7	--	7
5.	Fuel charges	--	--	16	--	15	--	15	--	15
6.	Labour time (min.)	50/8 hr	128	13.31	129	13.41	130	13.52	131	13.62
8.	Total	--	--	83.48	--	86.57	--	87.67	--	88.76

labour, fuel, etc. were worked out on the basis of actual hours of the work performed for the preparation of 1 kg of sweet orange *Burfi*. The costs may be still lowered when mechanized process for the large scale production carried out. The cost of production of 1 kg *Burfi* under various treatments T_0, T_1, T_2 and T_3 were Rs. 83.48, 86.57, 87.67 and 88.76, respectively which ranged from Rs. 83.48 (T_0) to Rs. 88.76 (T_3). The cost of production of plain *Burfi* was considerably less than sweet orange *Burfi* prepared. Increased level of added sweet orange juice showed the slightly increased in cost of production. These differences were mainly because of variable levels of sweet orange juice as well as requirement of labour, fuel charges, etc. Lowest cost of production (Rs. 83.48) was calculated in case of treatment T_0 (control). However, best treatment selected by judges was T_2 (10 parts of sweet orange juice and 40 per cent sugar) costing Rs. 87.67 per kg. The cost of *Burfi* in the best treatment was slightly higher by 5.01 per cent over control *Burfi*.

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