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Assessment of *Shrikhand* supplemented with carrot powder

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Abstract
Present study was carried for assessment of *Shrikhand* prepared by supplementation of carrot powder. The *Shrikhand* was made from buffalo milk by supplementing with different levels of carrot powder with different treatment and the sensory evaluation was carried out. In present study, carrot powder was used as additive for preparation of *Shrikhand*. The carrot powder was added in different levels of 0%, 3%, 5%, 7% and 9% in T_0, T_1, T_2, T_3 and T_4 treatments respectively. The sensory evaluation of freshly prepared *Shrikhand* using carrot powder was carried out by 9 point headonic scale. The highest sensory score was obtained in *Shrikhand* from T_2 with 5% carrot powder.

Keywords: Carrot, *Shrikhand*, sensory

Introduction
Shrikhand is an aboriginal dairy product, which is prepared from the fermented product milk, *Chakka* it is broadly consumed as a sweet dish with as well as after meal. Various fermented dairy foods such as yoghurt, curd, *Shrikhand*, butter milk, etc. forms important part of human diet all over the globe. *Shrikhand* is generally served as a delicious meal course especially during celebrations, festivals and formal events. As per Patel and Schequen (1999) [10], consumption of fermented milk products such as *Shrikhand* was effective remedial and treatment measure of various ailments such as diarrhoea, acidity and other such gastro-intestinal disorders. Fermentation is blend of metabolic processes wherein enzymes secreted by certain micro-organisms brings about chemical changes on different organic substrates such as protein, fat, carbohydrates, etc. The fermentation alters flavour, taste, texture, body, etc of product and thereby changes the nutritional value as well as acceptability of the product. Moreover, products may undergo chemical changes as well as physical changes during storage which might alterations in the flavour, texture, body and overall acceptability as well as nutritional value of the product.
Fermented milk products are most popular dairy products owing to their high nutritive values, health benefits, taste, etc. Since, Indian subtropical environment makes milk and milk products more susceptible to deterioration and spoilage, it was of utmost importance to formulate and design own methods as well as modes of milk preservation. Subsequently different milk and dairy products were evolved including products developed using fermentation process. These fermented milk products were found suitable in local environment fulfilling the needs and tastes of residents. In due course of time, the fermented milk products forms essential part in meal and became the staple food consumed every day. One of the indigenous and most popular fermented milk products of India is *Shrikhand* (Aneja *et al*., 2002) [1]. Therefore, efforts were made by many researchers and producers for improvisation and value addition of the *Shrikhand.*
Efforts for improvement in the sensory as well as nutritive qualities of *Shrikhand* were carried out by various researchers by addition of fruit mash. Nigam *et al*., (2009) [9] evaluated the quality attributes of *Shrikhand* which was prepared using Papaya flesh.
Carrot (*Daucus carota* L.) is one of the vegetables, which are most commonly used by humans in their regular meals. Carrots are classified as vitaminized food since they are rich source of ascorbic acid, beta carotene, tocopherol and other such vital ingredients (Hashimoto and Nagayama, 2004) [4]. Carrots also holds some of the free sugars such as glucose, sucrose, xylose and fructose. The Carrots also renders various health benefits owing to its antioxidant, antiaggregatory, anti-inflammatory, diuretic as well as anti-atherosclerotic properties (Immerzeel, 2004) [5].

Thus, Carrots incorporates higher nutritional as well as medical values to the diet and provides appropriate health benefits. The processing and pulverisation of Carrots into fine powder with microstructure, significantly increases the surface area as well as porosity and thereby strengthens the dispersivity, solubility as well as functionality of the products, that eases its digestibility and absorption in the human bodies (Zheng and Xia, 2006; Ma *et al*., 2008; Gong *et al*., 2006) [11]. Improvements in the antioxidant as well as antimicrobial activity of probiotic cheese was achieved by addition of carrot powder, which promoted the growth of probiotic bacteria in cheese. Therefore, carrot powder can act as a potential prebiotic for improvement in the viability and growth of probiotic bacteria in various food products (Immerzeel, 2004) [5].

Materials and Methods

The current research work was performed in the research facility of Department of Dairy Science & Technology established in the Vivekanand Arts, Sardar Dalipsingh Commerce & Science College, Aurangabad

Buffalo milk, procured from the local market, was standardized to 9.0 percent Solid Not Fat (SNF) and 6.0 percent fat for preparation of *Chakka*. Carrot powder, manufacture by bhoom Industry LTD, was used as value added ingredient for preparation of *Shrikhand*.

Preparation of *Shrikhand* through addition of carrot powder

The process for preparation of *Shrikhand* through addition of carrot powder is depicted in flow chart given Fig No 1.

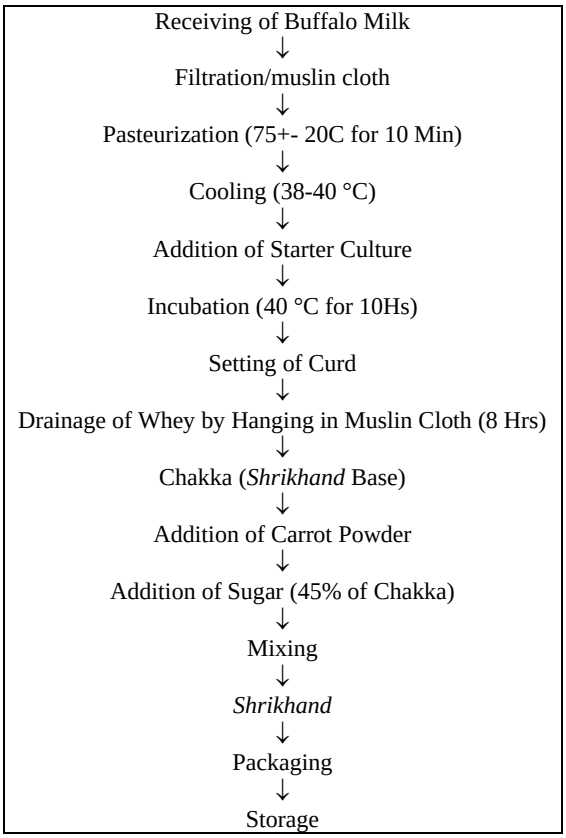

Fig 1: Manufacture of *Shrikhand* (flow chart)

Treatment details

A preliminary trial was conducted to decide the levels of Carrot powder on the basis of Chakka. It was found that, Carrot powder is acceptable at the level of 5 percent on the basis of *Chakka*. Therefore, five different *Shrikhand* were prepared as treatments by addition of different levels of Carrot powder to *Chakka* during preparation. The details of treatments are as below:

T_0: *Shrikhand* prepared without any additive to Chakka.
T_1: *Shrikhand* prepared by adding carrot powder at the rate of 3% of Chakka
T_2: *Shrikhand* prepared by adding carrot powder at the rate of 5% of Chakka
T_3: *Shrikhand* prepared by adding carrot powder at the rate of 7% of Chakka
T_4: *Shrikhand* prepared by adding carrot powder at the rate of 9% of Chakka

Sensory evaluation

Sensory assessment of *Shrikhand* prepared during current research work was carried out by applying nine point hedonic scale which was describe by Gupta 1976. The assessment of the *Shrikhand* was carried out by 10 judges panel from research center. The product assessment was carried out with respect to flavour, colour & appearance, body & texture, mouthfeel as well as overall acceptability.

Results and Discussion

Sensory evaluation of *Shrikhand* by using carrot powder is given below

Flavour: Flavour is one of the important part for deciding the quality of the product which determines the acceptability of products prepared. The sensory score of *Shrikhand* by using carrot powder for the flavour is presented in table no 1. The sensory score for flavour of *Shrikhand* was found in the range 6.26 and 8.26. The mean score for the flavour were 7.26, 7.16, 8.26, 6.94 & 6.26 for *Shrikhand* prepared under treatmentsT_0, T_1, T_2, T_3 & T_4 respectively. It is observe from the table that the highest flavour score was 8.26 in T_2. The flavour score of treatment T_2 was significantly higher than that of T_0, T_1, T_3 and T_4. It is also observed that the *Shrikhand* prepared with 5% carrot powder showed highest score as compare to other treatment. Dadarwal *et.al* (2005) [2] reported that scores for flavour were higher for *Shrikhand* prepared by direct addition of guava and sapota mash as well as banana and guava pulps compared to control.

Table 1: Flavour score of *Shrikhand* prepared by using carrot powder.

Treatment	Replication					Mean ± SE
	R_1	R_2	R_3	R_4	R_5	
T_0	7.6	7.4	6.7	7.3	7.3	7.26±0.15
T_1	6.9	7.6	7	7.3	7	7.16±0.13
T_2	7.9	8.9	7.9	8.2	8.4	8.26±0.19
T_3	6.6	7.2	7.4	6.6	6.9	6.94±0.16
T_4	6	6.5	6.2	6.2	6.4	6.26±0.09

Body and Texture

The details of sensory score with respect to Body and Texture of different *Shrikhand* treatments, prepared during present study by using different levels of carrot powder is given in table 2. The score for body and texture of various *Shrikhand* treatments varied from 6.26 to 8.26. The mean values of score for body and texture of *Shrikhand* prepared under treatments T_0, T_1, T_2, T_3 and T_4 were 7.26, 7.20, 8.26, 6.94 & 6.26 respectively. The study revealed that, Body and Texture of the

Shrikhand prepared under T_2 treatment (with 5% carrot powder) was superior with score of 8.26, which was significantly higher than T_0, T_1, T_3 and T_4. The lowest score of 6.26 was observed under T_4 with 9% of carrot powder level. Thus, it was found that, after certain levels, score for body and texture score decreases significantly with increase in the level of carrot powder. However, Mali *et al* (2010) [6] reported highest body and texture score for *Shrikhand* prepared with 20 percent papaya compared to other levels of papaya flesh with 0, 5 and 10 percent for preparation of *Shrikhand*.

Table 2: Body and texture score of *Shrikhand* prepared by using carrot powder

Treatment	Replication					Mean ± SE
	R_1	R_2	R_3	R_4	R_5	
T_0	7.6	7.4	6.7	7.3	7.3	7.26±0.15
T_1	6.9	7.6	7	7.4	7.1	7.2±0.13
T_2	7.9	8.9	7.9	8.2	8.4	8.26±0.19
T_3	6.6	7.2	7.4	6.6	6.9	6.94±0.16
T_4	6	6.5	6.2	6.3	6.3	6.26±0.08

Colour and appearance: The details of sensory assessment of colour and appearance of *Shrikhand* prepared by using different levels of carrot powder is summarised in table 3. The sensory score for colour and appearance of *Shrikhand* ranged between 6.44 and 8.36. The mean score for colour and appearance was 7.48, 7.28, 8.36, 7.04 & 6.44 for *Shrikhand* prepared under treatmentsT_0, T_1, T_2, T_3 and T_4 respectively. The study showed that the highest score of 8.36 for Colour and appearance was reported for *Shrikhand* prepared under treatment T_2 (5% carrot Powder). The score for colour and appearance of treatment T_2 was found significantly higher than that of T_0, T_1, T_3 and T_4. The lowest score of 6.44 was obtained under T_4 with 9% of carrot powder level. The study implied significant decrease in the score of colour and appearance with increase in the proportion of carrot powder in *Shrikhand*. Gavane *et al* (2010) [3] reported that the score for colour and appearance were highest with 2% supplementation of custard apple mash to *Shrikhand*.

Table 3: Colour and appearance score of *Shrikhand* prepared by using carrot powder.

Treatment	Replication					Mean ± SE
	R_1	R_2	R_3	R_4	R_5	
T_0	7.6	7.7	7.3	7.3	7.5	7.48±0.08
T_1	6.9	7.6	7.3	7.4	7.2	7.28±0.12
T_2	8	8.9	8.1	8.4	8.4	8.36±0.16
T_3	6.7	7.3	7.3	6.9	7	7.04±0.12
T_4	6.1	6.5	6.6	6.5	6.5	6.44±0.09

Mouthfeel: The details of sensory assessment of mouthfeel score of *Shrikhand* prepared from carrot powder under various treatment is given in table 4.The sensory score for mouthfeel of *Shrikhand* range from 6.64 to 8.46. The mean score for mouthfell was 7.58, 7.42, 8.46, 7.10 & 6.64 for *Shrikhand* prepared under treatmentsT_0, T_1, T_2, T_3 and T_4 respectively. It is observe from the table that the highest flavour score was 8.46 in T_2. The treatment T_2 was significantly higher than T_0, T_1, T_3 and T_4. It was observed from the table that the *Shrikhand* prepared with 5% adding carrot powder has highest score as compare to other treatment. As the level of carrot powder increases the mouthfeel score decreases. Narawade *et al* (2003) [7] prepared kheer from safflower milk mixed with buffalo milk He informed that there was decrease in taste score of kheer with increasing the proportion of safflower milk in the mix. This was due to little bitter taste of safflower milk.

Table 4: Mouthfeel score of *Shrikhand* prepared by using carrot powder.

Treatment	Replication					Mean ± SE
	R_1	R_2	R_3	R_4	R_5	
T_0	7.8	7.7	7.1	7.7	7.6	7.58±0.12
T_1	7.1	7.7	7.2	7.7	7.4	7.42±0.12
T_2	8	8.9	8.2	8.6	8.6	8.46±0.16
T_3	7.1	7.1	7.4	7	6.9	7.1±0.08
T_4	6.4	6.7	6.8	6.6	6.7	6.64±0.07

Overall Acceptability: The sensory score of overall acceptability for *Shrikhand* prepared using carrot powder ranged from 7.02 to 8.58. For mean overall acceptability score was 7.78, 7.62, 8.58, 7.32 & 7.02 for *Shrikhand* prepared under treatmentsT_0, T_1, T_2, T_3 and T_4 respectively. It is observe from the table that the highest overall acceptability score was 8.58 in T_2. The treatment T_2 was significantly higher than T_0, T_1, T_3 and T_4. It was also observed from the table that the *Shrikhand* prepared with 5% carrot powder has highest score as compare to other treatment. As the level of carrot powder increases the overall acceptability score decreases. Narayanan *et al* (2013) [8] study that the score for overall acceptability was Lowest in T_o (8.0) and highest in T_2 (8.6) and it was fundamentally impacted due to mixing of banana mash at 20 percent level.

Table 5: Overall score of *Shrikhand* prepared by using carrot powder.

Treatment	Replication					Mean ± SE
	R_1	R_2	R_3	R_4	R_5	
T_0	7.9	7.7	7.5	7.8	8	7.78±0.09
T_1	7.4	7.9	7.4	7.9	7.5	7.62±0.12
T_2	8.1	8.9	8.6	8.7	8.6	8.58±0.13
T_3	7.4	7.6	7.4	7.1	7.1	7.32±0.1
T_4	6.8	6.9	7.4	7.2	6.8	7.02±0.12

Conclusions

The current work concludes, that the *Shrikhand* prepared by addition of 5% carrot powder to *Chakka* had higher sensory evaluation propertied like flavour, body and texture, colour and appearance, mouthfell and overall acceptability compared to *Shrikhand* prepared under other treatment T_0, T_1, T_3 and T_4. It was also seen that the *Shrikhand* prepared from 5% carrot powder was good and most acceptable than the other treatment.

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