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## Studies on sensory analysis of preparation of goat milk Shrikhand blended with sapota pulp and betel leaf extract

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**Abstract**

Shrikhand is a semi-solid, sweetish-sour, wholesome indigenous fermented dairy product of western India. It is popular because of its characteristics flavour, taste, palatable nature and therapeutic value. The present study was made with an attempt to develop a Goat milk shrikhand blended with sapota pulp and betel leaf extract. Studied for its sensory properties such as color and appearance, flavour and taste, consistency and over all acceptability by trained panelist using 9 point hedonic scale. In the present investigation treatment T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> were formulated in which goat milk shrikhand was prepared by using 30% sugar blended chakka, sapota pulp and betel leaf extract was in the ratio of (100:00:00, 93:5:2, 88:10:2 and 83:15:2) respectively. The sensory score for overall acceptability of goat milk shrikhand of treatments T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> were 7.50, 7.74, 7.88 and 8.47 respectively. It was found that among all treatments T<sub>3</sub> scored higher in sensory evaluation and was considered as optimized product of goat milk shrikhand. The overall acceptability score of goat milk shrikhand of treatment T<sub>3</sub> was (8.47) as compared to control T<sub>0</sub> (7.50).

**Keywords:** goat milk shrikhand, sapota fruit pulp, sugar, sensory evaluation, betel leaf extract

**Introduction**

The name Shrikhand is derived from the Sanskrit word "Shrikarini" meaning a curd preparation with the addition of sugar, flavouring materials, dried fruits etc. Dahi, shrikhand, lassi are well known fermented milk products consumed throughout India. It is produced from dahi (curd), whey is drained off from dahi (curd) to yield chakka. The basic ingredients sugar, flavor, colour and flavour are thoroughly mixed into chakka and to form a sort homogenous mass called shrikhand. Shrikhand is a semi-solid, sweetish-sour, wholesome, indigenous fermented milk product of western India (Desai and Gupta, 1986) [6]. Shrikhand is one of the popular dahi based delicacy and forms part of a meal on festival occasions, particularly summer months. Shrikhand is popular in most parts of our country particularly in the states of Gujarat, Rajasthan and Maharashtra. The popularity of this shrikhand is gradually spreading to some other parts of India as well as some neighboring countries like Nepal, Bangladesh and Shri Lanka. Popularity of the Shrikhand is ascribed to its uniqueness with respect to taste, flavour, richness, diversity, cooling effect and method of its manufacture (Upadhyay and Dave, 1977) [19]. The type of milk and its quality and compositional affect the quality of the chakka and the resultant shrikhand. These products vary considerably in composition, flavour and texture according to the nature of fermenting organisms, the type of milk used and the manufacturing process (Kosikowski, 1977) [11]. Milk is fermented with Lactic Acid Bacteria, then whey from the curd is removed, and sugar, flavouring, and spices are added to create the final mixture (Patel and Chakraborty, 1988) [13]. Use of a mixed culture containing *Lactococcus lactis subsp. lactis*, *Lactococcus lactis subsp. diactylactis*, *leuconostoc Lactococcus lactis subsp. cremoris* in the ratio of 1:1:1 for the production of good quality Shrikhand (Aneja *et.al.* 2002). The best quality of shrikhand was considered to have been made from cow milk and buffalo milk in a ratio of 1:1 (% w/w), which imparted a smooth texture and a firm, soft body (Ghatak and Dutta, 1998) [10]. The development of sufficient amount of desirable flavour and aroma is also important in the manufacture of fermented milk products. Goat milk

Goats are important components of livestock industry having adaptability to harsh climates which make them suitable for landless and marginal farmers. Goat contributes about 3 per cent in total milk production of the country. Goats are reported to play a special role in the life of smallholder farmers. Their small size makes it possible for farmers to keep a large herd in

small area (Boylan *et al.*, 1996) [4]. Goat milk has great contribution to the health and nutrition of the landless and rural poor so they have been referred to as the “poor man’s cow” (Dresch 1988) [8].  $\alpha_{s1}$ -casein and  $\beta$ -lactoglobulin are important milk allergens in cow’s milk allergy and the major differences in protein content and composition between cow and goat milk have emphasized goat milk as an alternative to people suffering from cow’s milk allergy. Goat milk contains a lesser amount of  $\alpha_{s1}$ -casein than cow milk. Many people including children have with milk allergies, are more able to tolerate goat milk than that of cows (Wilson *et al.*, 1995) [22]. Goat milk is known to have better qualities like digestibility and longer shelf life when processed than cow milk. Despite these qualities, goats are kept mainly for meat in many countries (Ohiokpehai 2003) [12].

### Sapota

Sapota (*Achras sapota* Linn.) is one of the important tropical fruits belonging to the family *Sapotaceae*. At present it is cultivated in all the tropical countries of the world. Sapota (*Achras sapota*) is one of the most important fruits available throughout the year which is great for healthy besides being extremely delicious. Raw sapota fruits are astringent, while ripe fruits are sweet. The tasty flesh of this fruit is easily digestible and replenishes our body by providing energy due to its high content of digestible sugar (Shaikh, 2013) [16]. The various health benefits of sapota are beneficial for the eyes, source of energy, anti-viral, anti-bacterial, aids in weight loss, mental health, prevention of certain cancers, anti-inflammatory agent etc. (Arora, 2006) [3]. There are various products are manufactured from sapota like sweet chutney, dried sapota pieces, sapota milk shake, blended sapota drinks, pickle, preserve and candy and wine can also be prepared with good sensory quality (Sawant, 1989, Gautam and Chundawat, 1998) [9].

### Betel leaf extract

The betel (*Piper betel*) is the leaf of a vine belonging to the Piperaceae family. In India, Betel leaves are considered auspicious and extensively used during religious functions in Asia. Piper betel leaf were grown abundantly in many parts of India, betel is an evergreen herb that needs warm and moist

growth conditions for its growth (Arani Datta *et al.*, 2011) [2]. In India, it is found in Bihar, Bengal, Orrisa and Karnataka. The betel plant is an evergreen and perennial creeper, with glossy heart-shaped leaves and white catkin (The Wealth of India, 1969). There are various types of betel leaves such as Calcutta, Banarasi and Magahi. Piper betel contains a wide variety of biologically active compounds and these concentrations depends on the variety of the plant, season and climate. Piper betel leaves extract contains large numbers of bioactive molecules (Devjani Chakraborty, 2011) [11]. Indian system of health and medicine has adopted the various use of betel leaves. It is popular as an antiseptic and is commonly applied on wounds and lesions for its healing effects. Piper betel leaves have various property and which have established paan extract to have antimicrobial and anti leshmian properties.

### Materials and Methods

#### Experimental site

The experiment “Studies on sensory analysis of preparation of Goat Milk Shrikhand Blended with Sapota pulp and Betel leaf extract” was carried out in research lab, Warner College of Dairy Technology, Sam Higginbottom University of Agriculture Technology and Sciences, Allahabad-211007, U.P. (India).

#### Procurement and collection of ingredients.

Milk was purchased from near village of Naini, Allahabad. Sapota was purchased from local market of Allahabad. Sugar was purchased from local market of Allahabad and Yoghurt culture (NCDC-144) was purchased from National Dairy Research Institute, Karnal (Haryana) India.

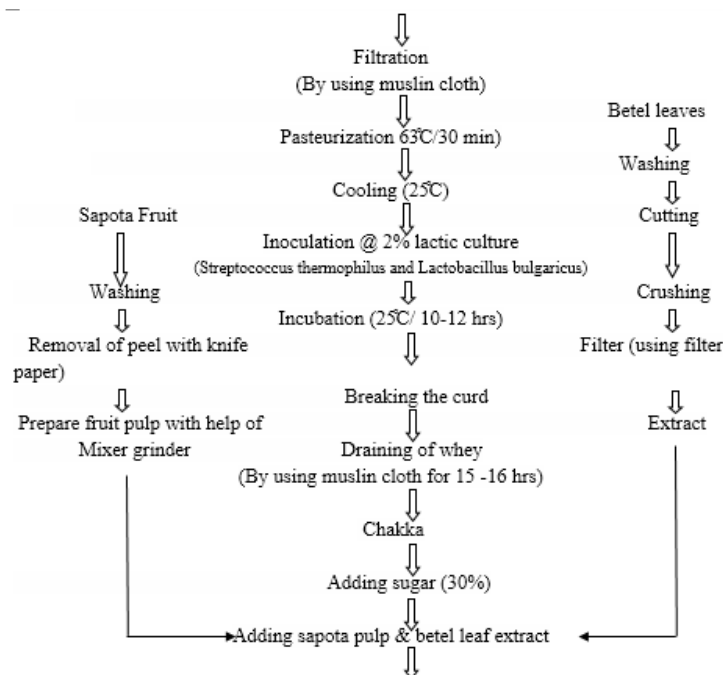
#### Treatment combination

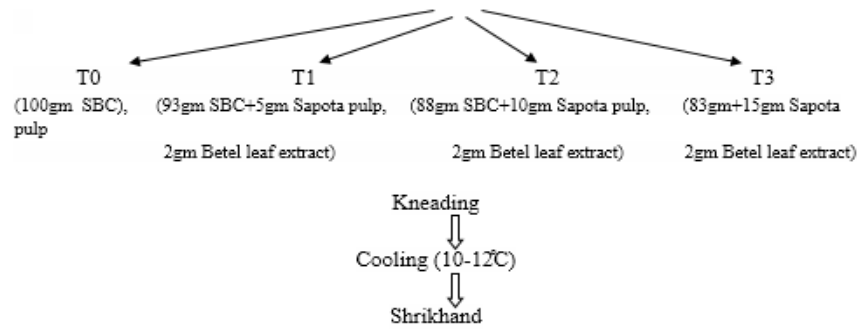
T0-Control prepared from 30% sugar blended chakka, sapota pulp and betel leaf extract (100:00:00)

T<sub>1</sub> –Experimental sample prepared from 30% sugar blended chakka, sapota pulp and betel leaf extract (93:5:2)

T<sub>2</sub> –Experimental sample prepared from 30% sugar blended chakka, sapota pulp and betel leaf extract (88:10:2)

T<sub>3</sub> –Experimental sample prepared from 30% sugar blended chakka, sapota pulp and betel leaf extract (83:15:2)





**Fig 1:** Flow diagram for manufacturing Goat Milk Shrikhand blended with sapota pulp and betel leaf Extract

### Organoleptic quality: (9 Point hedonic scale)

#### Sensory evaluation of goat milk shrikhand blended with sapota pulp and betel leaf extract

The sensory evaluation of goat milk shrikhand samples was done by a panel of judge using a 9 point hedonic scale. Five experienced Technical staff members of the Warner college of Dairy Technology, Sham Higginbottom University of Agriculture, Technology and Sciences, Allahabad served as a judging team and evaluated the samples of different treatment of Goat milk Shrikhand blended with sapota pulp and betel leaf extract. Numerical score were allocated for colour and appearances, flavour and taste, consistency and overall acceptability of Goat milk Shrikhand blended with sapota pulp and betel leaf extract. The numerical score was as an indication of the quality of goat milk shrikhand. The judges also identified qualities they considered to be satisfactory.

#### Statistical analysis

The data will be analyzed statically by Analysis of variance (ANOVA) at 5% level of significance and Critical Difference (C.D) in WASP software and excel software.

#### Results and Discussion

In the present study, treatment T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> were formulated in which goat milk shrikhand was prepared by using 30% sugar blended chakka, sapota pulp and betel leaf extract was in the ratio of (100:00:00, 93:5:2, 88:10:2 and 83:15:2) respectively. The results obtained from the analysis of goat milk shrikhand are presented on the sensory properties such as colour and appearances, flavour and taste, consistency and overall acceptability of Goat milk Shrikhand blended with sapota pulp and betel leaf extract. Vagdalkar *et al.* (2002) [20] studied the overall acceptability of consumers of Shrikhand prepared by cocoa powder and papaya pulp. Samples that contained 5% cocoa powder and 60% papaya pulp had the highest score on 5-point hedonic scale.

**Table 1:** Sensory parameters of control and experimental Goat milk Shrikhand blended with sapota pulp and betel leaf extract

Particulars	T0	T1	T2	T3
Organoleptic Score (9 point Hedonic scale)				
Colour and appearances	7.10	7.15	7.40	8.25
Flavour and taste	7.51	7.73	7.91	8.55
Consistency	7.39	7.70	7.87	8.10
Overall acceptability	7.50	7.74	7.88	8.47

Sensory evaluation of control and experimental Goat milk Shrikhand blended with sapota pulp and betel leaf extract (9 point Hedonic scale):

#### Colour and appearance in control and experimental Goat milk Shrikhand blended with sapota pulp and betel leaf extract

The mean value for colour and appearance score in control

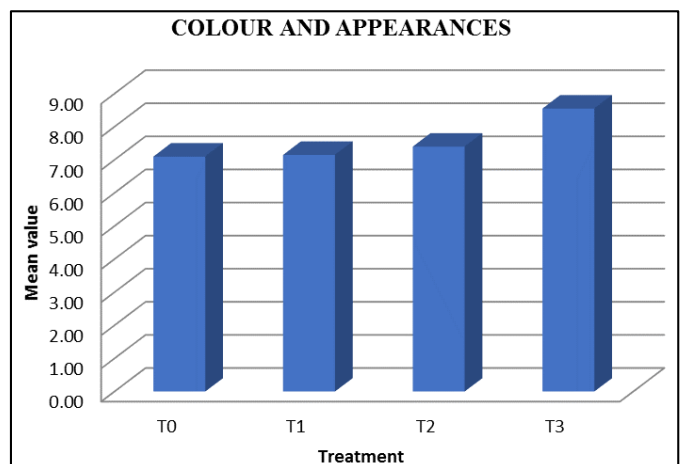
and experimental goat milk shrikhand blended with sapota pulp and betel leaf extract sample of different treatments are presented in table 2. It was statistically analyzed that mean score for colour and appearance of the goat milk shrikhand sample of T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, and T<sub>3</sub> was found to 7.10, 7.15, 7.40 and 8.25 respectively. The goat milk shrikhand prepared by blending with sapota pulp and betel leaf was ranked between like very much to like extremely. highest score was obtained in case of T<sub>3</sub> (8.25) followed by T<sub>2</sub> (7.40), T<sub>1</sub> (7.15) and T<sub>0</sub> (7.10). This indicates that, increased in proportion of sapota pulp and betel leaf extract in the blend increased the score for color and appearance of goat milk shrikhand.

**Table 2:** Mean value of colour and appearance score for control and experimental of Goat milk Shrikhand blended with sapota pulp and betel leaf extract

Replication	Treatments			
	T0	T1	T2	T3
R1	7.00	7.75	7.50	8.25
R2	7.25	6.75	6.50	8.75
R3	7.25	7.25	7.50	8.25
R4	6.50	6.75	7.75	8.50
R5	7.50	7.25	7.75	9.00
Mean	7.10	7.15	7.40	8.25

C.D. at 5% level 0.56

S.Ed.(±) 0.26



**Fig 2:** Graphical representation of color and appearance score for control and experimental of Goat milk Shrikhand blended with sapota pulp and betel leaf extract

#### Flavour & taste score in control and experimental Goat milk Shrikhand blended with sapota pulp and betel leaf extract

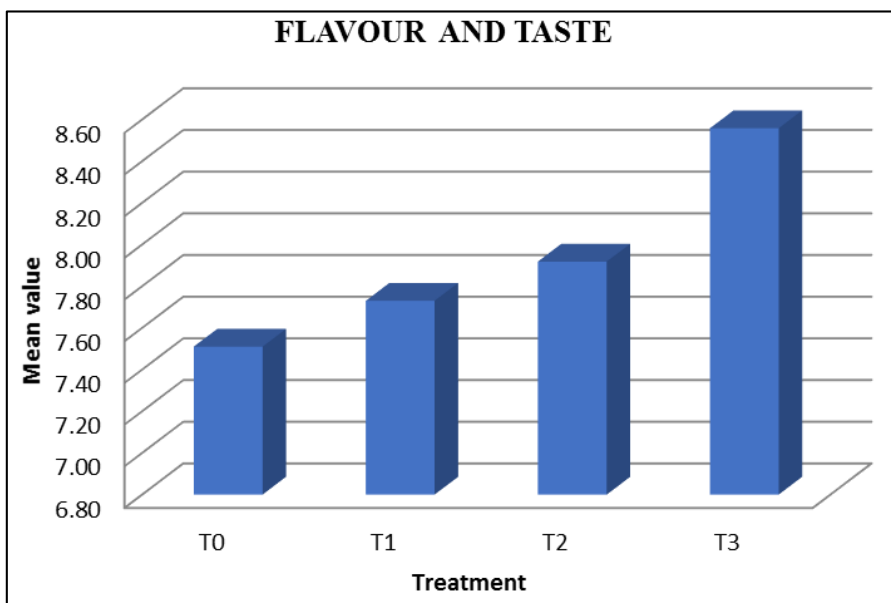
It is revealed from the Table 3 that mean score for flavour and taste of the goat milk shrikhand sample of T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, and T<sub>3</sub> was 7.51, 7.73, 7.91 and 8.55 respectively. It was observed

that the highest score was obtained in the case of T<sub>3</sub> (8.55) followed by T<sub>2</sub> (7.91), T<sub>1</sub> (7.73) and T<sub>0</sub> (7.51). This indicates that, increased in proportion of sapota pulp and betel leaf

extract in the blend increased the score for flavour and taste of goat milk shrikhand. These results are in harmony with Vidyasagar (2011).

**Table 3:** Mean value of flavour and taste score for control and experimental of Goat milk Shrikhand blended with sapota pulp and betel leaf extract

Replication	Treatments				
	T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	
R1	7.25	7.50	8.25	8.79	
R2	8.25	7.80	8.10	8.00	
R3	7.25	8.00	7.62	8.50	
R4	7.50	7.60	7.86	8.50	
R5	7.30	7.75	7.76	9.00	
	Mean	7.51	7.73	7.91	8.55
C.D. at 5% level 0.50					
S.Ed.(±) 0.23					



**Fig 3:** Graphical representation of flavour and taste score for control and experimental of Goat milk Shrikhand blended with sapota pulp and betel leaf extract

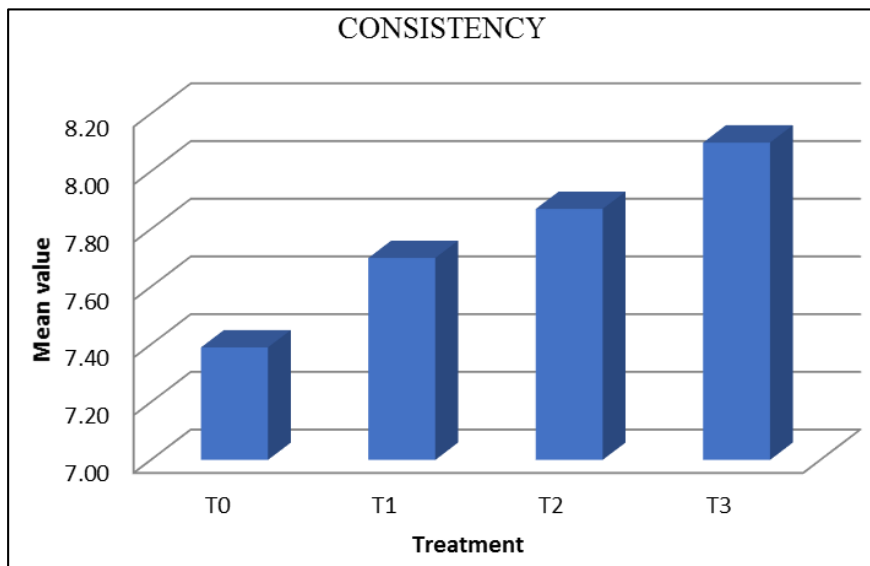
**Consistency score in control and experimental Goat milk Shrikhand blended with sapota pulp and betel leaf extract**

The data regarding consistency score in control and experimental goat milk shrikhand blended with sapota pulp and betel leaf extract sample of different treatments are presented in table 4. It was analyzed that mean score for consistency of the goat milk shrikhand sample of T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, and T<sub>3</sub> was found to be 7.39, 7.70, 7.87 and 8.10 respectively. It was observed that the highest score was obtained in the case

of T<sub>3</sub> (8.10) followed by T<sub>2</sub> (7.87), T<sub>1</sub> (7.70) and T<sub>0</sub> (7.39). This indicates that, increased in proportion of sapota pulp and betel leaf extract in the blend increased the score for consistency of goat milk shrikhand. There was significant differences for consistency score between the mean values of between T<sub>0</sub> and T<sub>3</sub>. This might be due to different types of protein and carbohydrate contain in goat milk shrikhand than sapota pulp.

**Table 4:** Mean value of consistency score for control and experimental of Goat milk Shrikhand blended with sapota pulp and betel leaf extract

Replication	Treatments				
	T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	
R1	7.50	8.25	8.00	8.20	
R2	7.25	7.75	7.60	8.00	
R3	7.00	7.75	7.50	8.25	
R4	7.50	6.75	8.25	7.75	
R5	7.70	8.00	8.00	8.10	
	Mean	7.39	7.70	7.87	8.10
C.D. at 5% level 0.48					
S.ED.(±) 0.22					



**Fig 4:** Graphical representation of consistency score for control and experimental of Goat milk Shrikhand blended with sapota pulp and betel leaf extract

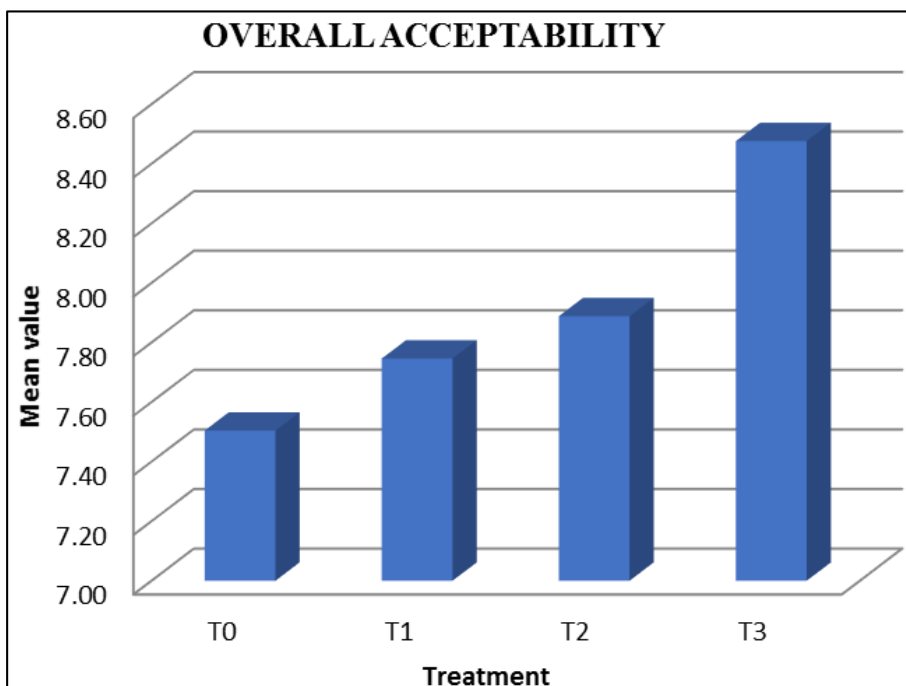
**Overall acceptability for control and experimental Goat milk Shrikhand blended with sapota pulp and betel leaf extract**

It is apparent from table 5 that mean score for overall acceptability of the goat milk shrikhand sample of T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, and T<sub>3</sub> was found to 7.50, 7.74, 7.88 and 8.47 respectively. It was observed that the highest score was obtain in the case of T<sub>3</sub> (8.47) followed by T<sub>2</sub> (7.88), T<sub>1</sub> (7.74) and T<sub>0</sub> (7.50). This indicates that, increased in proportion of sapota pulp and betel leaf extract in the blend increased the score for consistency of goat milk shrikhand. The difference between the mean values of T<sub>0</sub>-T<sub>3</sub>(1.04), T<sub>1</sub>-T<sub>3</sub>(0.82) and T<sub>2</sub>-T<sub>3</sub>(0.64) was greater than the C.D. value, 0.50. Therefore, the difference was significant. David (2015) [15] was also observed the same trend for preparation of herbal Shrikhand prepared with basil extract. Vagdalkar. *et al.* (2002) [20] studied the overall

acceptability of consumers of Shrikhand prepared by cocoa powder and papaya pulp

**Table 5:** Mean value of overall acceptability score for control and experimental of Goat milk Shrikhand blended with sapota pulp and betel leaf extract

Replication	Treatments			
	T0	T1	T2	T3
R1	7.31	7.87	8.10	8.58
R2	7.71	7.94	7.86	8.24
R3	7.41	7.49	7.92	8.41
R4	7.51	7.60	7.83	8.24
R5	7.58	7.83	7.73	8.91
Mean	7.50	7.74	7.88	8.47
C.D. at level 5% 0.28				
S.Ed.(±) 0.13				



**Fig 5:** Graphical representation for overall acceptability in control and experimental goat milk shrikhand blended with sapota pulp and betel leaf extract.

## Conclusion

The study indicated that sensory score of goat milk shrikhand blended with sapota pulp and betel leaf extract were increased significantly after various processing treatments. The highest mean value of color & appearance score was recorded in the sample of T<sub>3</sub> (8.25) and lowest was recorded in the sample of T<sub>0</sub> (7.10). All treatment was significant which may be ascribed to addition of sapota pulp and betel leaf extract in treatments. The highest mean value of flavor & taste score was recorded in the sample of T<sub>3</sub> (8.55) and lowest was recorded in the sample of T<sub>0</sub> (7.51). Similarly, the highest mean value of consistency score was recorded in the sample T<sub>3</sub> (8.10) and lowest was recorded in the sample of T<sub>0</sub> (7.39). Likewise, the highest mean value of overall acceptability score was recorded in the sample of T<sub>3</sub> (8.47) and lowest was recorded in the sample of T<sub>0</sub> (7.50). It may be concluded that the Goat milk shrikhand blended with sapota pulp and betel leaf extract can be successfully prepared by using standardized milk, sapota fruit pulp, sugar and betel leaf extract. Goat milk shrikhand made with sapota pulp and betel leaf extract in treatment T<sub>3</sub> was best in sensory evaluation and also received highest score in sensory evaluation (colour and appearance, flavour and taste, consistency and overall acceptability).

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