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The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(2): 292-297

www.thepharmajournal.com
Received: 28-12-2022
Accepted: 30-01-2023

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Selection of variety of *Piper betel* to be used in the shrikhand preparation

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DOI: https://doi.org/10.22271/tpi.2023.v12.i2d.18446

Abstract
The Present investigation was conducted in the laboratories of Dairy Science, Department of Animal Husbandry and Dairy Science, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar (MS), India during the year 2020-2021. The main objective of present research work was to optimize the level of addition of *Piper betel* in shrikhand. Initially, pre-experimental trials were conducted to decide the variety of betel vine leaves, form of betel vine leaves and levels of addition of betel vine extract to prepare acceptable shrikhand. On the basis of results of preliminary trials, the most acceptable four levels of betel vine extract were chosen for experimental trials (2%, 4%, 6% and 8%). Considering the sensory quality and sensory score allotted by panelist the Calcutta variety is chosen to use for preparation of shrikhand. On the basis of sensory evaluation by the panelist, the use of betel vine leaves extract in the preparation of shrikhand was found most acceptable. The experimental shrikhand prepared with betel vine extract were (control) (T_0), 2% (T_1), 4% (T_2), 6% (T_3), 8% (T_4) and 40 percent sugar.

Keywords: *Sensory evaluation*, Shrikhand chakka and betel vine

Introduction
India is the largest milk producing country in the world. Total milk production of India is increased by 6.6 percent from 198.4 million tonnes (2019-20) to 209.96 million tonnes during the year 2020-21 (NDDB, Annual report 2020-2021). Out of this total milk, 46 percent milk is consumed as fluid milk and remaining 54 percent milk is converted into various milk products. India's market potential and current growth rate of traditional dairy products is unparalleled and all set to boom further under the technology of mass production. An estimated 50 to 55% of the milk produced in India is converted into a variety of traditional milk products using processes such as coagulation, desiccation and fermentation. Indian fermented milk products utilize 7% of total milk produced which mainly includes *dahi*, shrikhand and *lassi* which may be considered to be equivalent to western milk product *yogurt*, *quarg cheese* and *stirred yogurt*, respectively. Fermented milk products constitute a vital component of the human diet. They are popular in view of organoleptic and other properties such as the characteristic flavour, refreshing taste and improved digestibility.
Fermentation is metabolic process that converts sugar to acids, gases or alcohol and fermentation process which increases the shelf life of the product by enhancing the taste and improving the digestibility of milk. Fermented milk is rich in proteins, vitamins and minerals. They are reported to be effective in treatment of many diseases like constipation, diarrhea, gastro-enteritis, tumor genesis, hypercholesterolemia, *etc*. (Patel and Ranz-Scheven, 2007) [12].
Fermented milk products also known as cultured dairy foods, cultured dairy products that have been fermented with lactic acid bacteria such as *Lactobacillus*, *Lactococcus* and *Leuconostoc* and these are well recognized to have therapeutic, anticholesterolemic and anticarcinogenic properties (Gardiner *et al.* 2002) [5].
Shrikhand is one of the important fermented milk products which derive its name from the Sanskrit word "*shrikharini*" meaning curd preparation with added sugar, flavoring agent, fruits and nuts. It is popular in western part of India especially in Maharashtra, Gujarat and Karnataka. It is known for its high nutritive, characteristic flavor, taste, palatable nature and possible therapeutic value. (Karche *et al*. 2015) [8].
Typically, shrikhand constitutes 39.0 percent moisture and 61 percent of total solids of which 10.0 percent is fat, 11.5 percent proteins, 78.0 percent carbohydrates and 0.5 percent ash, on a dry matter basis. It has a pH of about 4.2-4.4 (Boghra and Mathur, 2000) [2].
Value added shrikhand is being prepared by mixing fruits like mango, jamun, papaya, banana, dragon fruit, sapota, pineapple, strawberry and some other ingredients like soy milk, turmeric,

Tulsi, cocoa, carrot, ashwagandha, gulkand, rose petal. These are being added in the form of pulp, powder or extract. Thus, the nutritional and therapeutic values of such products like shrikhand are being improved.

Betel vine (*Piper betel Linn*) is a natural herb which is valued for its medicinal and therapeutic properties. Its leaves are widely used as a post meal mouth freshener. The crop is extensively grown in India, Sri Lanka, Malaysia, Thailand, Taiwan and other Southeast Asian countries. Due to strong pungent aromatic flavor, betel leaves are used as masticatory by the Asian people. Its common names are betel (in English), paan (in India), phlu (in Thai) and sirih (in Bahasa Indonesia). It is grown abundantly in many parts of India that needs warm and moist conditions for its growth. Leaves of betel vine are used with various condiments such as areca nut (kattha), cloves, cardamom, candied rose and fennel for chewing purposes. Indian system of medicine and health has adopted the use of betel leaves in various ways.

The medicinal properties of pan were recognized during 600 A D, when Ayurvedic system of medicine came into practice. Betel leaves are beneficial to the throat and remove viscidity in human beings. Leaves help in digestion and tend to remove the bad smell of the mouth. The juice of betel leaves is used as an adjunct to pills administered in the Ayurvedic medicines. It is also good for the respiratory system and is used in treatment of bronchitis, cough and cold (Chopra *et al*., 1958) [3].

The leaves of the pan plant have been traditionally used for chewing. Pan chewing is considered as a good and cheap source of dietary calcium. It increases digestive capacity when used with lime. Besides, it neutralizes the acidity and acts as blood purifier. Main constituents of betel leaves are vitamin B and C, carotene and other elements. The oldest authentic Ayurvedic therapy books describe betel vine, honey and Tulsi as nectar (Amrit). In short, betel leaf is one of the grandmother's remedies, prescribed as traditional medicine, by experienced, older members of the family.

Fresh juice of betel leaves is also used in many ayurvedic preparations. Betel leaves have long been studied for their diverse pharma logical actions. The leaves are commonly used as masticatory as it is rich nutritionally and is known medicinally as a stimulant and carminative, an antiseptic and an expectorant. Its chlorophyll is beneficial in maintaining healthy teeth, clearing the mouth and helping in a digestion by encouraging salivation and neutralizing excess acid. It is composed of essential oils (0.7- 2.6 percent) and other constituents *viz*., carbohydrate (0.5-6.1 percent), fat (0.4 -1.0 percent) protein (3.0-3.5 percent), fiber (2.3 percent), minerals (2.3-3.3 percent), water (80-90 percent) with good source of water and oil soluble vitamins (Guha, 2006).The betel leaves have starch, sugars, diastases and an essential oil composing of terpinen-4-ol, safrole, allyl pyrocatechol monoacetate, eugenol, eugenyl acetate, hydroxylchavicol, eugenol, Piper betol and the betel oil contains cadinene carvacrol, allyl catechol, chavicol, p-cymene, caryophyllene, chavibetol, cineole, estragol, *etc*. as the key components. The chief component of the leaves is a volatile oil, called betel oil and contains 2 phenols, betel phenol like chavibetol and chavicol (Dwivedi and Tripathi, 2014) [4].

Materials and Methods

The investigation was undertaken in the laboratories of Dairy Science, Animal Husbandry, Food Science and Technology, Biochemistry and Agril. Process Engineering, Post Graduate Institute Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar (MS), India. The material used and methods employed for conducting the experiments are as follows.

Materials

Following materials and method were used while performing the experiment. The fresh clean composite samples of crossbred cow's milk was procured from Research Cum-Development Project (RCDP) on Cattle, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar, and Maharashtra. The shrikhand culture LF-40 was obtained from National Collection of Dairy Culture (NCDC), Dairy Microbiology Division, NDRI Karnal (Haryana). Clean crystalline cane sugar was procured from local market. Clean, suitable size muslin cloth piece was used for drainage of whey. Fresh available betel vine kapuri leaves cultivar was obtained from All India Co-Ordinated Research Project on betel vine (AICRP) M.P.K.V., Rahuri. Fresh Calcutta and Banarasi betel vine cultivars were procured from local market. All chemicals used for analytical purposes were of the Analytical Reagent (AR) or Guaranteed Reagent (GR) grade. Borosil and corning branded glasswares were used for analytical work. A digital pH Meter manufactured by systronics (India) Limited. Ahmadabad was used to measure pH. Laboratory thermometer was used for recording the temperature during study. Blender was used for mixing *chakka* and other ingredient. Stainless steel utensils was used during preparation of shrikhand. An electronic "Anamade Precision Balance" manufactured by M/s Schimadzu, Mumbai (Maharashtra) was used for weighment purpose. An instrument manufactured by M/S. Media Instrument Company, Bomby was used for autoclaving purpose. The digital temperature controlled B.O.D. incubator manufactured by M/S. Neutronic, Mumbai (MS) was used for incubation purpose. The colony counter with magnifying lens manufactured by VSI electronics Pvt. Ltd., Mohali (Chandigarh) was used for counting the developed colonies by microorganisms. Spectronic-20 D^+, manufactured by M/S. Raut scientific pvt. Ltd., Pune was used for spectrophotometric measurement of bioactive components. An instrument manufactured by Kirloskar Electrodyne Ltd. Pune, (Maharashtra) was used for microbiological work.For microbiological work, M/S Hi-media Laboratory Pvt. Ltd., Mumbai (India) dehydrated media such as Tryptone glucose yeast extract agar (M-014) and Potato dextrose agar (M-016) as well as Violet red bile agar were used. Madhur Engineering Ltd. Kolhapur (MS) make cream separator was used for separation of milk.

Tempo makes, Nashik (India) muffle furnace was used for ashing purpose. Lab HOSP make hot air oven Mumabi (India) was used for determination of moisture and drying purpose. Whatman No.41 type filter papers were used for filtration.

Following packaging material were used for storage study of shrikhand.

Polypropylene (PP)

It has better mechanical strength and is less prone to stress cracking than PE and its thickness about 0.35 to 2 mm the size of this container is length 10 cm and width 7.5 cm.

Polystyrene (PS)

It has high water vapour and gas transmission rate hence also called as breathing film and its thickness about 0.50 to 2 mm the size of this container is length 10 cm and width 7.5 cm.

Aluminium pouch
It has good barrier properties, odurless, tasteless and non-toxic common thickness of aluminium pouch used for food product 0.012-0.015 the size of this pouch is length 10 inch and width 6 inch.

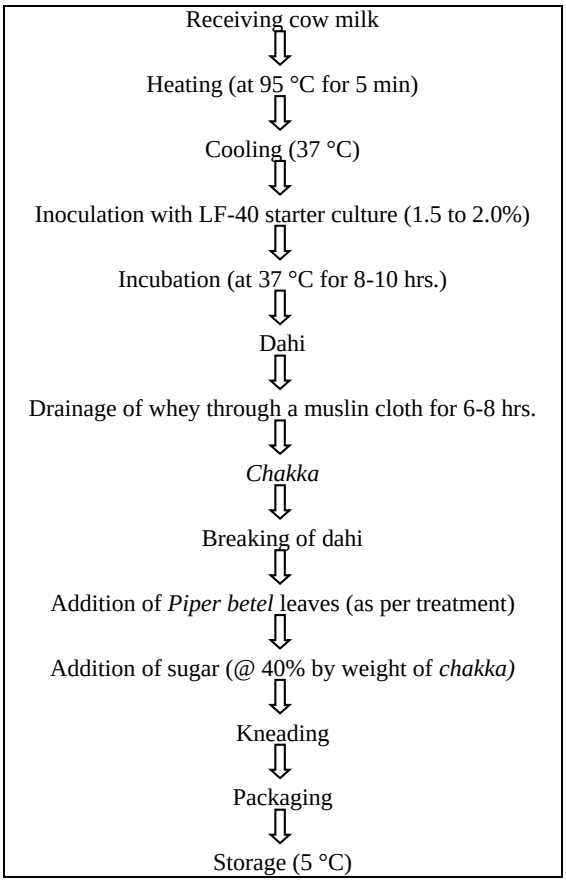
Polyethylene terephthalate (PET)
PET is a clear, strong, and light weight plastic that is widely used for packaging food and beverages. The size of this container is length 8 cm and width 5.5 cm.

Methods
Standardization of milk
Milk samples were standardized to 4.0% milk fat as per Pearson's method.

Preparation of *Piper betel* leaves extract (PBLE)
Fresh *Piper betel* leaves were washed under running tap water and 10 gm PBL leaves weighted in stainless steel plate. The leaves were crushed and ground properly by mixing 100 ml of distilled water for 2-3 min. After the content was filtered through four folded muslin cloth. The PBLE was used for experimentation.

Preparation of PBL Paste
Fresh *Piper betel* leaves were washed under running tap water weighed and crushed in grinder with water (1:0.1) for 30 sec. at medium speed. The content was used as paste for experimentation.

Preparation of PBL Pieces
Fresh PBL were washed under running tap water, weighed and cut into fine pieces (2 mm^2) with the help of sharp knife.



Flow chart for preparation of shrikhand by using betel vine leaves (Aneja *et al.* 2002) [1]

Selection of variety of PBL
Locally available Calcutta, Banaras and Kapuri varieties of PBL were taken for study. The leaves were converted into extract for preliminary varietal study. The concentration of PBL was kept constant @ 2 percent of chakka for all the varieties. The treatments were as follows:
V_o: *Chakka* without PBL *i.e.* control
V_1: *Chakka* + 2% extract of PBL of Banarasi cultivar.
V_2: *Chakka* + 2% extract of PBL of Calcutta cultivar.
V_3: *Chakka* + 2% extract of PBL of kapuri cultivar.

Selection of form of PBL
Calcutta cultivar was used to finalize the form of betel vine.
PBF_0: *Chakka* without PBL *i.e.* control
PBF_1: *Chakka* + 2% PBL paste
PBF_2: *Chakka* + 2% PBL pieces
PBF_3: *Chakka* + 2% PBL extract

Optimization of levels of PBL extract in shrikhand
Initially extract of Calcutta PBL was prepared. Following treatments (level of Calcutta PBL extract) were used to conduct pre-experimental trials the treatment details were as follows.
P_0: *Chakka* without PBL extract *i.e*. control
P_1: *Chakka* + PBL extract 2%
P_2: *Chakka* + PBL extract 4%
P_3: *Chakka* + PBL extract 6%
P_4: *Chakka* + PBL extract 8%
P_5: *Chakka* + PBL extract 10%
P_6: *Chakka* +PBL extract 10%

Optimization of Sugar level in shrikhand
The shrikhand samples were prepared using 36, 38, 40 and 42% sugar in the *chakka.*
S_1: *Chakka* + sugar 36%
S_2: *Chakka* + sugar 38%
S_3: *Chakka* + sugar 40%
S_4: *Chakka* + sugar 42%

Sensory Evaluation
The samples of shrikhand under pre-experimental and experimental trails were subjected to the organoleptic evaluation by adopting 9-point hedonic scale as per IS: 6273 Part I and Part II (1971). A panel of five semi-trained judges was formulated for this purpose. The samples were coded every time to conceal their identity and offered to the judges for evaluation of the quality attributes.

Results and discussion
The results of the present investigation are presented and discussed here under following headings.

Pre-Experimental Trials
Pre-experimental trials were conducted to choose the variety of betel vine to be used to finalize the form of betel vine, optimization of level of cane sugar and to optimize the levels of *Piper betel* leaves extract to be used in the preparation of shrikhand.

To choose variety of *Piper betel* to be used in the shrikhand preparation
The sensory evaluation data regarding finalization of variety of *Piper betel* to be used to prepare Shrikhand.

Sensory quality of shrikhand

The sensory score of shrikhand prepared using different varieties of betel vine *i.e.* V_0 (Shrikhand without betel vine), V_1 (*Kapuri)*, V_2 (*Banaras*) and V_3 (Calcutta*)* is presented in Table 1.

Table 1: Sensory quality of shrikhand (sensory score out of 9)

Treatment	Colour and appearance	Body and texture	Flavour	Overall acceptability
V_0	7.52^{bcd}	7.64^{bcd}	7.66^{b}	7.64^{d}
V_1	7.66^{a}	7.66^{abc}	7.04^{d}	7.74^{c}
V_2	7.60^{abc}	7.68^{a}	7.38^{c}	7.84^{b}
V_3	7.61^{ab}	7.66^{ab}	8.23^{a}	8.17^{a}
SE±	0.11	0.02	0.04	0.04
CD at 5%	0.33	0.07	0.14	0.12

Colour and appearance

The colour and appearance score of shrikhand prepared using different varieties of betel vine is depicted in Table 1. The colour and appearance of shrikhand prepared using different varieties of betel vine significantly (p<0.05) changed due to use of different varieties of betel vine leaves in shrikhand. The colour and appearance of shrikhand prepared using V_3 (Calcutta betel vine leaves) had most acceptable colour and appearance as compared to other varieties used in the study. It might be due to colour variation of varieties of *Piper betel*.

Body and texture

The body and texture score of shrikhand prepared using different varieties is depicted in Table 1. The body and texture of shrikhand prepared using different varieties of betel vine significantly (p<0.05) affected due to use of different varieties of betel vine leaves in shrikhand. As per the opinion of panelist, the body and texture of shrikhand prepared using V_2 (Banaras betel vine leaves) variety had most acceptable body and texture as compared to other varieties in the study.

Flavour

The flavour of any product is one of the important attributes as for as acceptability is considered. The flavour score of shrikhand prepared using different varieties of betel vine is presented in Table 1. The flavour of shrikhand prepared using different varieties of betel vine significantly (p<0.05) influenced due to use of betel vine varieties in the preparation of shrikhand. All the treatments significantly (p<0.05) differed among themselves. The treatment V_3 (Calcutta) had maximum flavor score *i.e.,* 8.23, as compared to other two varieties of betel vine used for preparation of shrikhand. The leaves of different varieties of *Piper betel* vary in the taste and aroma due to pungent to mild (Kumar, 1999) [9]. Patange *et al.* (2017) [11] prepared flavoured milk and observed acceptable flavour of flavoured milk manufactured with Calcutta variety.

Overall acceptability

The overall acceptability score of shrikhand prepared using different varieties of betel vine is summarized in Table 1. The overall acceptability of shrikhand prepared using different varieties of betel vine significantly (p<0.05) influenced due to use of betel vine varieties in the preparation of shrikhand. The treatment V_3 (Calcutta variety) had significantly higher overall acceptability score as compared to other varieties used for preparation of shrikhand.

Considering the above sensory quality and sensory score allotted by panelist the Calcutta variety is chosen to use for preparation of shrikhand.

To choose the form of betel vine to be used for preparation of shrikhand

Following forms of betel vine were used in the preparation of shrikhand.

PBF_0: Shrikhand prepared without betel vine leaves.

PBF_1: Shrikhand prepared with paste of betel vine leaves.

PBF_2: Shrikhand prepared with small pieces of betel vine leaves.

PBF_3: Shrikhand prepared with extract of betel vine leaves.

The shrikhand samples were prepared using above forms @ 2% of each and 40% cane sugar. The sensory quality score are summarized in Table 2.

Table 2: Sensory quality of *shrikhad* (sensory score out of 9)

Treatment	Colour and appearance	Body and texture	Flavour	Overall acceptability
PBF_0	7.6^{b}	7.72^{b}	7.58^{d}	7.33^{d}
PBF_1	7.0^{cd}	6.96^{d}	7.64^{b}	7.76^{b}
PBF_2	7.02^{c}	7.04^{c}	7.62^{bc}	7.73^{c}
PBF_3	8.11^{a}	8.16^{a}	8.28^{a}	8.24^{a}
SE±	0.31	0.03	0.03	0.02
CD at 5%	0.094	0.10	0.10	0.06

Colour and appearance

The colour and appearance score for different forms of betel vine leaves used for preparation of shrikhand is presented in Table 2. The colour and appearance score significantly (p<0.05) differed due to use of different forms of betel vine leaves in the preparation of shrikhand. The use of betel vine leaves extract was found most acceptable as compared to use of paste and small pieces forms.

Body and texture

The body and texture score for the shrikhand prepared using different forms presented in Table 2. The body and texture score for the shrikhand prepared using different forms significantly (p<0.05) influenced. The body and texture score for the shrikhand prepared using betel vine extract found more acceptable as compared to other forms used for preparation of shrikhand.

Flavour

The flavour of shrikhand samples prepared using different forms is presented in Table 2. The flavour score of shrikhand samples prepared using different forms significantly (p<0.05) influenced due to use of different forms of betel vine leaves in shrikhand. The flavour of shrikhand prepared using betel vine leaves extract found more acceptable as compared to paste and small pieces forms used in the preparation of shrikhand.

Overall acceptability

The overall acceptability of shrikhand prepared using different forms of betel vine is summarized in Table 2. The overall acceptability of shrikhand samples prepared using different forms was significant (p<0.05) due to addition of different forms of betel vine in shrikhand. The overall acceptability of shrikhand prepared using betel vine leaves extract was most acceptable as compared to paste and small pieces forms of betel vine leaves used in the preparation of shrikhand.

On the basis of above sensory evaluation by the panelist, the use of betel vine leaves extract in the preparation of shrikhand was found most acceptable. Hence, it is finalized to choose betel vine leaves extract in preparation of shrikhand for experimental trials.

Optimization of sugar level

Following levels of sugar were used for preparation of shrikhand.

S_1: Shrikhand prepared using 36% sugar in *chakka*.
S_2: Shrikhand prepared using 38% sugar in *chakka*.
S_3: Shrikhand prepared using 40% sugar in *chakka.*
S_4: Shrikhand prepared using 42% sugar in *chakka.*

Table 3: Sensory quality of shrikhand (Sensory score out of 9)

Sugar levels	Flavour	Colour and appearance	Body and Texture	Overall acceptability
S_1 (36%)	7.22^{d}	7.18^{d}	7.32^{d}	7.52^{c}
S_2 (38%)	7.55^{b}	7.52^{b}	7.38^{c}	7.61^{b}
S_3 (40%)	8.22^{a}	8.32^{a}	8.26^{a}	8.56^{a}
S_4 (42%)	7.34^{c}	7.34^{c}	7.52^{b}	7.34^{d}
SE±	0.02	0.01	0.01	0.01
CD at 5%	0.08	0.03	0.03	0.04

The shrikhand samples prepared using different levels of cane sugar is illustrated in Table 3. From the Table 3, it is seen that the shrikhand prepared using 40% cane sugar found most acceptable in terms of sensory attributes *i.e.*, colour and appearance than flavour body and texture and overall acceptability.

Hence, 40% cane sugar level is finalized for preparation of shrikhand during experimental trials.

Optimization of levels of *Piper betel* leaves extract for preparation of shrikhand

The data regarding optimization of levels of *Piper betel* leaves extract in shrikhand is highlighted in Table 4.

Table 4: Sensory quality of shrikhand (sensory score out of 9)

Treatment	Colour and appearance	Body and texture	Flavour	Overall Acceptability
P_0	7.42^{d}	7.55^{b}	7.37^{cd}	7.47^{d}
P_1	7.70^{b}	7.52^{bc}	7.62^{bc}	7.75^{bc}
P_2	7.65^{bc}	7.52^{cd}	7.80^{b}	7.75^{b}
P_3	8.35^{a}	7.60^{a}	8.34^{a}	8.35^{a}
P_4	7.30^{de}	7.27^{e}	$7.30d^{e}$	7.20^{e}
P_5	7.05^{f}	6.97^{f}	$7.07e^{f}$	6.95^{f}
P_6	6.90^{fg}	6.75^{g}	6.70^{g}	6.75^{g}
SE±	0.06	0.03	0.10	0.02
CD at 5%	0.18	0.09	0.31	0.08

Colour and appearance

Colour and appearance for shrikhand prepared using different levels of betel vine extract and 40% sugar is presented in Table 4. The colour and appearance of shrikhand prepare different levels of *Piper betel* leaves extract significantly ($P<0.05$) influenced due to addition of different levels of *Piper betel* leaves extract. The colour and appearance score of shrikhand samples prepared using different levels of *Piper betel* leaves extract were 7.42, 7.70, 7.65, 8.35, 7.30, 7.05 and 6.90 for the treatment P_0, P_1, P_2, P_3, P_4, P_5 and P_6, respectively. The colour and appearance score for the treatments P_3 (6%), P_1 (2%) and P_2 (4%) was significantly higher than P_0, P_5 and P_6. The colour and appearance of P_1, P_2 and P_3 was more pistachio greenish than other treatments. The colour and appearance of other treatments was dull and not much attractive as compared P_1, P_2 and P_3 treatments.

Body and texture

The body and texture score of shrikhand samples prepared using different levels of betel vine extract is presented in Table 4. The body and texture of shrikhand samples significantly ($p<0.05$) influenced due to addition of different levels of betel vine extract. The body and texture score was highest for the shrikhand sample prepared using 6% (P_3) *i.e.*, 7.60 as compared to other levels of betel vine leaves extract.

Flavour

The flavour of shrikhand prepared using different levels of betel vine leaves extract is presented in Table 4. The flavour score of shrikhand samples prepared using different levels of betel vine extract significantly ($p<0.05$) influenced due to addition of different levels of betel vine leaves extract in the shrikhand. The flavour score for the treatments P_0, P_1, P_2, P_3, P_4, P_5 and P_6 was 7.37, 7.62, 7.80, 8.34, 7.30, 7.07 and 6.70, respectively. The shrikhand sample prepared using 6% betel vine leaves extract had maximum (8.34) score as compared to other levels of betel vine leaves extract. The treatments P_1, P_2, P_3 and P_4 had acceptable flavour as compared to P_5 (8%) and P_6 (10%) levels.

Overall acceptability

The overall acceptability of shrikhand samples prepared using different levels of betel vine leaves extract is summarized in Table 4. The overall acceptability score for the shrikhand samples prepared using different levels of betel vine leaves extract is significantly ($p<0.05$) influenced due to addition of different levels of betel vine leaves extract. The P_1 (2%), P_2(4%), P_3(6%) and P_4(8%) levels of betel vine leaves extract had better overall acceptability as compared to P_5 (8%) and P_6 (10%) levels. All these treatments were significant.

Considering the results of sensory evaluation *i.e.*, colour and appearance, body and texture, flavour and overall acceptability, it is finalized to choose the following levels of betel vine leaves extract to use in the preparation of shrikhand for experimental trials.

T_0: Control (Shrikhand without betel vine leaves extract + 40% sugar)
T_1: 2% betel vine leaves extract on weight basis of *chakka* + 40% sugar
T_2: 4% betel vine leaves extract on weight basis of *chakka* + 40% sugar
T_3: 6% betel vine leaves extract on weight basis of *chakka* + 40% sugar
T_4: 8% betel vine leaves extract on weight basis of *chakka* + 40% sugar

Conclusions

The results of this investigation would lead to conclusions as under:

From results of the present study it was concluded that, the betel vine could successfully be utilized for preparation of shrikhand. Addition of betel vine in shrikhand improved sensory quality and acceptability of the product. Such replacement did not affect appreciably the composition of shrikhand. Considering the sensory quality and sensory score

allotted by panelist the Calcutta variety is chosen to use for preparation of shrikhand. On the basis of sensory evaluation by the panelist, the use of betel vine leaves extract in the preparation of shrikhand was found most acceptable. The experimental shrikhand prepared with betel vine extract were (control) (T_0), 2% (T_1), 4% (T_2), 6% (T_3), 8% (T_4), and 40 percent sugar.

Acknowledgements
The authors are thankful to Department of Animal Husbandry and Dairy Science, PGI, MPKV, Rahuri for their support all through.

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