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Evaluation of sensory and textural profile of lemongrass flavoured paneer during storage and its utilization in preparation of dairy products

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Abstract
The present research was intended to evaluate the effect of the lemongrass addition on the sensory and textural quality of paneer during storage at refrigerated temperatures (7±2 °C). Also, the possibility of use of lemongrass incorporated paneer in preparation of food products were also studied. The paneer samples were packed in LDPE pouches and analyzed for sensory quality (Colour and appearance, flavour, body and texture, overall acceptability) and textural attributes (Hardness, Cohesiveness, Springiness, Chewiness) at a temperature of 7±2 °C on 0th, 3rd, 6th, 9th, 12th, 15th, 18th, 21st and 23rd days of storage. During storage, it was observed that sensory scores of the paneer samples diminished with the progress in storage. Also, the textural attributes such as Hardness, Cohesiveness, Springiness and Chewiness reduced as the storage period progressed. Thus, it was observed that the addition of lemongrass was highly significant ($p \leq 0.05$) with regard to changes in sensory and textural parameters, as the optimized product maintained its sensory and textural quality upto 23 days of storage at refrigerated temperature. The optimized sample of lemongrass was used as fried paneer for direct consumption and also in the preparation of products such as Lemongrass flavoured paneer pickle, curry and pizza.

Keywords: Paneer, lemongrass, sensory quality, textural attributes, utilization

Introduction
India has emerged as the largest milk producer with a total milk production of 221.06 million metric tonne and accounting to 24% of world's total milk production (Basic Animal Husbandry Statistics, India, 2022). About 55 percent of the milk produced in the country is being utilized for preparation of various dairy products. Out of this, an estimated 5% of milk produced in India is converted to paneer (Chandan, 2007b) [3].

Paneer represents a variety of Indian soft cheese, which is used as a base material for the preparation of a large number of culinary dishes and is highly nutritious and wholesome. Paneer consists of the protein and usually all the fat, insoluble salts and colloidal materials, together with part of the moisture serum of the original milk, which contained lactose, whey proteins, soluble salts, vitamins and other milk components (Kanawjia *et al.*, 1990) [7].

Raw paneer is characterized by marble white to creamy white colour, firm soft chewy body, close knit texture and sweetish acidic nutty flavour (Khan and Pal, 2011; Patel and Rao, 2012) [8, 13]. Sometimes, the bland taste of paneer is a major concern affecting its consumer acceptability. This can possibly be resolved by the incorporation of natural extracts from herbs, spices and grasses during the preparation of paneer. In recent years, consistent efforts have been made for the manufacture of different types of paneer by adopting advanced technology and by the addition of novel additives incuding vegetables, herbs and spices.

Lemongrass is a tropical grass native to southern parts of India and Sri Lanka. There are two main species, East Indian, *Cymbopogon flexuosus* and West Indian, *Cymbopogon citratus*. Lemongrass is widely used as an essential ingredient in Asian cuisines because of its sharp lemon flavour. Herbal tea of lemongrass is used as sedative as well as immunostimulant in India. Lemongrass was usually known only for its aromatic properties. However, now it is being realized that it also possesses numerous health benefits which make it an invaluable herb which was rightly termed by our ancients as a "sacred herb". Lemongrass contains a volatile oil whose yield is about 0.5% from fresh grass. Lemongrass oil contains normally citral as its major component in a 70–85% concentration. The oil also contains geranial, methyleugenol, myrcene, nerol, limonene, and linalool and beta-caryophyllene.

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Saponins, tannins, alkaloids and flavonoids are present in lemongrass extracts and are known to be bactericidal, pesticidal or fungicidal in nature thus conferring the anti-microbial property to plant (Rios *et al.*, 2005) [16]. The bactericidal and anti-fungal properties of Lemongrass oil are possesses bactericidal and anti-fungal properties, comparable to penicillin in its effectiveness (Lutterodt *et al.*, 1999) [10]. Lemongrass oil and citral have a potent *in vitro* activity against *Candida* spp. (*C. albicans, C. glabrata, C. krusei, C. parapsilosis* and *C. tropicalis*) (Silva *et al*., 2008) [19]. Lemon grass also has high antioxidant capacity, and free radical scavenging effect of hydro-alcoholic extract of *Cymbopogon citratus* was established (Rao *et al.,* 2009) [14].

Essential oil of lemongrass is mainly comprised of citral which exhibited a broad antifungal spectrum (Schaneberg and Khan, 2002) [17]. The oil has been found to possess bactericidal and antifungal properties, which are comparable to penicillin in its effectiveness (Lutterodt *et al.*, 1999) [10]. Isam and Mohd (2009) [6] studied the antimicrobial activity of lemongrass leaf extracts and demonstrated their broad-spectrum of activity against both gram-positive and gram-negative bacteria and fungi.

Lemongrass extracts (by direct boiling and distillate) have been successfully utilized in yoghurt, lassi, flavoured milk preparation and whey based mango beverage. Because of its sharp lemon aroma, lemongrass was utilized to suppress beany flavour in soy protein based ice cream. When used in West African soft cheese, shelf life benefits were obtained. Hence, lemongrass has the scope to be incorporated into various foods including dairy products.

Shelf life of paneer is reported to be only six days under refrigeration, though its freshness is lost within three days; while at room temperature, paneer did not keep well for more than one day (Bhattacharya *et al.,* 1971) [4]. Pal and Garg (1989) [12] reported that the shelf life of paneer was 7 days at 7 C, when made from sweet cream buttermilk, but the flavour, texture and appearance scores gradually declined, but still the paneer was acceptable up to 9 days with lower sensory scores. Incorporation of lemongrass extracts and oil may enhance the shelf life of paneer resulting in a new variety of paneer with extended storage properties. Hence, the evaluation of sensory and textural quality was performed during the storage study of the lemongrass incorporated paneer, conducted at refrigeration temperature of 7 ± 2 °C.

Materials and Methods
Raw materials
The work was carried out in the Department of Dairy Technology of Southern Regional Station of National Dairy Research Institute, Bengaluru. Fresh cow milk was procured from Livestock Research Centre of ICAR-National Dairy Research Institute, Bengaluru, filtered, standardized to approximately 3% fat and 8.5% SNF by mixing required quantity of skim milk and cream (De, 1980), pasteurized and then used for manufacture of paneer. Commercial grade citric acid was procured from M/s Hindustan Dehydrated Media (Hi-Media) Laboratories Ltd., Mumbai was used for coagulation of milk. Matured medium sized Fresh leaves of Lemongrass (*Cymbopogon flexuosus*) grown in the Institute garden were selected and used for flavour extraction for the research work.
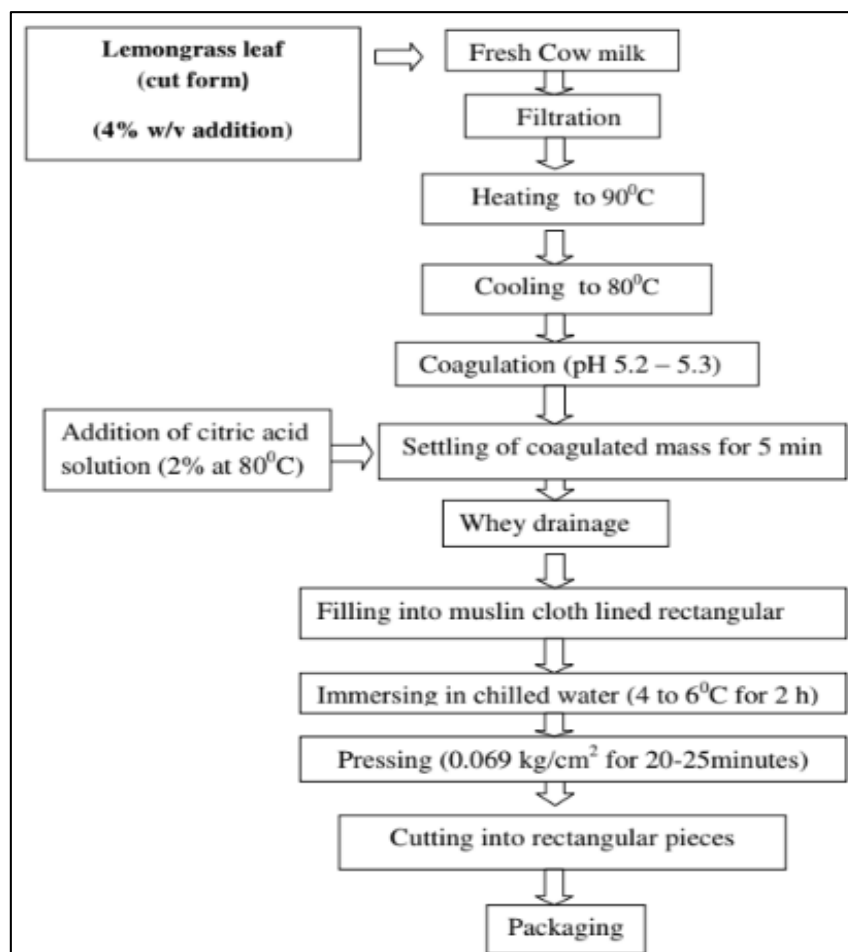
Fig 1: Optimized procedure for the manufacture of lemongrass flavoured paneer

Storage study
The control as well as optimized samples of lemongrass flavoured paneer were packed in LDPE pouches of thickness 60 microns and stored in an incubator maintained at refrigeration temperature (7±2 °C), which was analyzed on 0th, 3rd, 6th, 9th, 12th, 15th, 18th, 21st and 23rd day of storage .

Sensory evaluation
During the storage, changes in sensory characteristics such as colour and appearance, body and texture, flavour and overall acceptability of paneer samples were studied. Optimal levels of these attributes were determined using sensory evaluation. Each block of refrigerated paneer samples were cut into rectangular pieces of approximately 1cm x 2cm and evaluated for its sensory attributes like colour and appearance, body and texture, flavour and overall acceptability by a sensory panel (minimum of 6 members) on a 9-point hedonic scale (Amerine *et al.*, 1967) [1]. The sensory panel included faculty and some of the students.

Textural analysis
Texture profile analysis (TPA) parameters namely hardness, chewiness, springiness, gumminess and cohesiveness were determined using the Stable Micro-systems TA-XT plus Stable Micro System Texture Analyzer (UK) fitted with 5kg load cell by two-bite linear compression of paneer samples. The temperature of sample was kept at about 25 °C. A circular disc probe 75 mm (P/75) diameter was attached to the cross-head of the machine. The instrument test settings of TA.XT plus instrument were as follows:

Test mode: Compression
Pre-test speed: 1.0 mm/sec
Test speed: 5 mm/sec
Post-test speed: 5 mm/sec
Target mode: Distance
Distance: 10 mm
Time: 5.00 sec
Trigger type: Auto (Force)
Trigger Force: 2 g
Tare mode: Auto
Advanced options: On
Control oven: Disable

The probe was calibrated to a distance of 50 mm, from the base of the platform. The paneer samples were cut into 20 x 20 x 20 mm cubes and were tempered to 25 °C in a temperature-controlled cabinet for 1 – 2 hours and the tests were carried out at the same temperature. The probe was positioned centrally over the sample surface and allowed to compress the product. The probe travelled to a distance of 10 mm, compressing the product by 50% and returned to original position (1 st bite); after the time gap of 5 sec, the probe again compressed the sample and returned to original position (2nd bite), generating a force-time curve as shown in Fig 2.The texture profile parameters were determined from the force-time curve as reported by Koca and Metin (2004) [9] and (Mathare *et al*. 2009) [11]. The hardness is the maximum peak force (F) during the first compression cycle (first bite) and has often been substituted by the term firmness and the unit is Newton. The springiness (originally called elasticity) is related to the height that the food recovers during the time that elapses between the end of the first bite and the start of the second bite. It is the ratio of time difference of C:D to

time difference of a:b and there is no unit for this parameter. The cohesiveness is defined as the ratio of the area of positive peak during the second compression to that obtained during the first compression. It is the ratio of area of C:F to the area of a:e and carries no units. The gumminess is the product of hardness x cohesiveness and the unit is Newton. The chewiness is the product of hardness x springiness x cohesiveness and the unit is Newton.
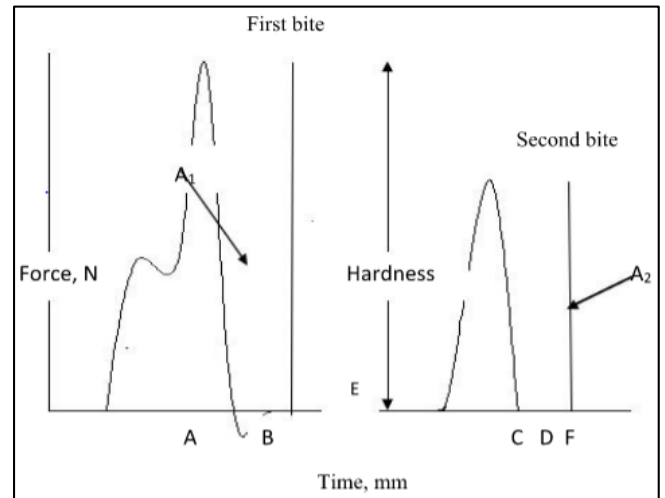

Fig 2: Typical texture profile analysis curve (Two bites)

Utilization of lemongrass flavoured paneer
a. Fried lemongrass flavoured paneer
The optimized sample of paneer added with lemongrass was subjected to shallow frying in a frying pan, until light golden brown in colour. Then the fried sample of paneer was given for sensory evaluation to judge the sensory characteristics.

b. Lemongrass flavoured paneer pickle
Lemongrass flavoured paneer was used for the preparation of pickle by the addition of spices mixtures and pickle powder to the fried paneer added with lemongrass. The prepared dish was also subjected to be evaluated by sensory panel.

c. Lemongrass flavoured paneer pizza
Pizza was prepared by using lemongrass added paneer as the base material in addition to shredded mozzarella cheese and vegetables on the pizza base followed by baking in oven at 230 °C for 15 minutes.

d. Lemongrass flavoured paneer curry
Paneer curry was made by lemongrass flavoured paneer by the addition of various ingredients such as vegetables, cream and suitable masala to the flavoured paneer.

Statistical analysis
Data obtained during the present project work were subjected to statistical analysis by one way ANOVA using SPSS Software 16.0. The comparison between treatment means was determined by Tukey's test. The ANOVA obtained have been placed in Appendix.

Results and Discussion
1. Effect of addition of lemongrass on sensory quality of paneer samples during storage at 7±2 °C
a. Colour and appearance
Colour and appearance of paneer should be uniform and of pleasing white colour with greenish tinge in case of buffalo

milk and light yellow for cow milk paneer. The effect of storage of paneer samples (control and optimized) stored under refrigeration temperature of 7±2 °C for stipulated period on the colour and appearance score is presented in Table 1. The experiments showed that the initial colour and appearance score of control sample was 8.27 against the optimized sample with the score of 8.03, but thereafter the score of control sample reduced as the storage period progressed and visible slime formation was observed by 21st day of storage. The same diminishing trend was noted for colour and appearance score of lemongrass flavoured sample, however, slime formation was noticed after a period of 23 days only. The comparatively low score obtained for the optimized sample was mainly due to slight dull green appearance contributed by lemongrass. The changes in colour and appearance score as presented revealed that addition of lemongrass as well as the storage period had significant effect on the colour and appearance score of the paneer. The incorporation of lemongrass into paneer delayed the formation of slime, in contrary to the control sample. The scores at the end of storage showed that the attribute remained acceptable. Statistical analysis of the data on colour and appearance score of the stored paneer samples revealed that the addition of lemongrass was highly significant ($p \leq 0.05$) with regard to changes in appearance score.

Table 1: Effect of addition of lemongrass on colour and appearance of paneer samples during storage at 7±2 °C

Samples	Score for colour and appearance								
	Storage period in day(s)								
	0th Day	3rd Day	6th Day	9th Day	12th Day	15th Day	18th Day	21st Day	23rd Day
Control sample	8.27±0.25[b]	8.00±0.10[ab]	7.87±0.15[ab]	7.75±0.22[ab]	7.62±0.20[ab]	7.57±0.49[a]	7.40±0.10[a]	NS	NS
Optimised sample	8.03±0.25[b]	7.90±0.17[b]	7.80±0.20[ab]	7.73±0.25[ab]	7.63±0.21[ab]	7.57±0.31[ab]	7.43±0.40[ab]	7.32±0.13	7.07±0.31[a]

Statistical analysis

Source	Degrees of freedom	Control sample score		Degrees of freedom	Optimised sample score	
		MSS	F-value		MSS	F-value
Between storage days	6	0.255	4.07*	8	0.274	4.06*
Error	14	0.063	-	18	0.067	-
Total	20		-	26		-

* Significant at 5% level

Note: Figures are mean ± standard deviation of three replications. Values with different superscripts in a row are significantly different ($p \leq 0.05$)

b. Flavour

Desai (2007) [5] explained the flavour of paneer as a characteristic blend of heated milk and acid i.e. pleasant, mildly acidic and sweet (nutty). It was observed that during storage the flavour score decreased irrespective of control or experimental sample. The data obtained for changes in flavour score of control paneer and experimental paneer samples during storage at 7 °C are presented in Table 2. The changes in flavour score revealed that concentration and storage period had significant effect on flavour score of the paneer.

However, flavour compounds keep changing because of continued bacterial growth and subsequent putrefaction taking place even at 7±2 °C which might have caused deviation from the normal flavour of paneer. However, the flavour scores reveal that none of the experimental samples have developed any off flavours which could have led to rejection of the samples. After 18 days of storage, control paneer developed yeasty smell and bitter flavour accompanied by slime formation and hence sensory evaluation was discontinued. The scores for flavour subjected to statistical analysis revealed that the addition of lemongrass had significant effect ($p \leq 0.05$) with regard to changes in flavour score.

Table 2: Effect of addition of lemongrass on flavour score of paneer samples during storage at 7±2 °C

Samples	Score for flavour								
	Storage period in day(s)								
	0th Day	3rd Day	6th Day	9th Day	12th Day	15th Day	18th Day	21st Day	23rd Day
Control sample	8.12±0.13[d]	7.90±0.10[d]	7.70±0.27[cd]	7.55±0.38[cd]	7.07±0.21[c]	5.93±0.4[b]	4.80±0.27[a]	NS	NS
Optimised sample	8.23±0.21[e]	8.00±0.25[de]	7.83±0.17[cde]	7.73±0.10[bcde]	7.60±0.16[bcde]	7.47±0.21[bcd]	7.18±0.13[abc]	7.03±0.27[ab]	6.47±0.13[a]

Statistical analysis

Source	Degrees of freedom	Control sample score		Degrees of freedom	Optimised sample score	
		MSS	F-value		MSS	F-value
Between storage days	6	4.416	60.017*	8	0.881	12.879*
Error	14	0.074	-	18	0.068	-
Total	20		-	26		-

*Significant at 5% level

Note: Figures are mean ± standard deviation of three replications. Values with different superscripts in a row are significantly different ($p \leq 0.05$)

c. Body and Texture

Body and texture of paneer should be sufficiently tender enough not to resist crushing during mastication, texture to be compact, smooth and velvety (Desai, 2007) [5]. The changes in body and texture score presented in Table 3. The body and texture scores during storage of paneer showed that the body and texture scores deceased during storage. In the optimized sample, the initial value of 8.07 decreased to 7.00 by the end of storage period. The changes in body and texture score revealed that storage period had significant effect on body and texture score of the paneer, whereas, effect of addition of lemongrass was non significant ($p \leq 0.05$).

Table 3: Effect of addition of lemongrass on body and texture scores of paneer samples during storage at 7±2 °C

Samples	Score for body and texture								
	Storage period in day(s)								
	0th Day	3rd Day	6th Day	9th Day	12th Day	15th Day	18th Day	21st Day	23rd Day
Control sample	8.00±0.20c	7.93±0.26c	7.73±0.15bc	7.42±0.10ab	7.35±0.13ab	7.22±0.13a	7.03±0.25a	NS	NS
Optimised sample	8.07±0.31c	7.90±0.20bc	7.83±0.31bc	7.70±0.4abc	7.60±0.20abc	7.47±0.21c	7.33±0.38abc	7.23±0.25ab	7.00±0.1a

Statistical analysis

Source	Degrees of freedom	Control sample score		Degrees of freedom	Optimised sample score	
		MSS	F-value		MSS	F-value
Between storage days	6	0.467	12.18*	8	0.355	4.46*
Error	14	0.033	-	18	0.000	-
Total	20		-	26		-

*Significant at 5% level

Note: Figures are mean ± standard deviation of three replications. Values with different superscripts in a row are significantly different ($p \leq 0.05$)

d. Overall acceptability

Overall acceptability is how a judge perceives the overall quality of the product taking into account colour and appearance, body and texture and flavour quality. The data obtained for changes in overall acceptability score of paneer during storage at 7 °C are presented in Table 4. The Overall acceptability scores of lemongrass added paneer sample ranged from 8.23 on zero day which then slowly decreased to 6.0 at the end of 23 days of storage, in comparison to control paneer, where the Overall acceptability score ranged from 8.07-4.10. These scores reflected the trend of flavour scores and further revealed that the lemongrass added sample of paneer remained in acceptable limits, while the control samples were rejected. After 18 days, the control sample showed slime formation and yeasty smell, hence sensory evaluation was discontinued, against the optimized lemongrass added sample where it continued to be acceptable up to 23 days. The scores for overall acceptability were subjected to statistical analysis using one way ANOVA, which revealed that the addition of lemongrass had a highly significant effect ($p \leq 0.05$) on the overall acceptability of paneer.

Table 4: Effect of addition of lemongrass on overall acceptability scores of paneer samples during storage at 7±2 °C

Samples	Score for overall acceptability								
	Storage period in day(s)								
	0th Day	3rd Day	6th Day	9th Day	12th Day	15th Day	18th Day	21st Day	23rd Day
Control sample	8.07±0.40c	7.82±0.20c	7.73±0.25c	7.43±0.40c	6.00±0.50b	5.77±0.25b	4.10±0.66a	NS	NS
Optimised sample	8.23±0.25d	7.80±0.20cd	7.73±0.25cd	7.65±0.4cd	7.53±0.35cd	7.27±0.25bc	7.03±0.25bc	6.47±0.45ab	6.00±0.44a

Statistical analysis

Source	Degrees of freedom	Control sample score		Degrees of freedom	Optimised sample score	
		MSS	F-value		MSS	F-value
Between storage days	6	6.421	38.28*	8	1.478	13.61*
Error	14	0.168	-	18	0.109	-
Total	20		-	26		-

Significant at 5% level

Note: Figures are mean ± standard deviation of three replications. Values with different superscripts in a row are significantly different ($p \leq 0.05$)

In sensory evaluation, samples of lemongrass added paneer were slightly better for most of the sensory attributes compared to control paneer, initially as well as during refrigeration. On 18th day of storage, development of off flavour and/or slime formation was noticed in the control samples of paneer, whereas the paneer containing lemongrass remained acceptable up to 23rd day of storage.

2. Effect of addition of lemongrass on instrumentally measured textural characteristics of paneer samples during storage at 7±2 °C

Textural properties play an important role in the quality of paneer. The texture of paneer depends upon the status of components and the temperature of storage. The changes in value of textural attributes such as hardness, cohesiveness, springiness and chewiness is summarized in Table 5. The values for Hardness, Cohesiveness, Springiness and Chewiness indicates that all these parameters reduced as the storage period progressed, for both control as well as lemongrass added sample. These findings are in good resemblance with the findings of Shrivastava and Goyal (2007) who observed a decrease in hardness value from 1120 g to 1020 g, cohesiveness from 0.34 to 0.30, springiness from 0.61 to 0.52 and chewiness from 230.12 g.mm to 120 g.mm. Rao and Patil (2001) observed that there was a decrease in hardness of paneer portion of ready-to-eat canned paneer curry stored at 15, 30 and 45 °C.

Table 5: Effect of addition of lemongrass on instrumentally measured textural characteristics of paneer samples during storage at 7±2 °C

Storage period (days)	Hardness (N)	Cohesiveness	Springiness	Chewiness (N)
0	21.30±0.23[f]	0.47±0.07[b]	0.78±0.03[a]	7.88±1.36[d]
3	20.88±0.23[f]	0.44±0.07[b,a]	0.76±0.03[a]	7.06±1.47[c,d]
6	20.66±0.28[f]	0.42±0.03[b,a]	0.75±0.04[a]	6.63±0.9[b,c,d]
9	19.66±0.29[e]	0.40±0.04[b,a]	0.74±0.04[a]	5.93±1.06[a,b,c,d]
12	18.88±0.14[d]	0.39±0.03[b,a]	0.73±0.04[a]	5.45±0.09[a,b,c]
15	18.40±0.38[c,d]	0.38±0.02[b,a]	0.72±0.01[a]	5.16±0.26[a,b,c]
18	17.93±0.11[b,c]	0.37±0.02[b,a]	0.70±0.03[a]	4.67±0.05[ab]
21	17.44±0.25[a,b]	0.36±0.01[b,a]	0.69±0.03[a]	4.41±0.19[ab]
23	16.78±0.21[a]	0.35±0.01[a]	0.66±0.05[a]	4.00±0.4[a]

Note: Figures are mean ± standard deviation of three replications. Values with different superscripts in a row are significantly different ($p \le 0.05$)

3. Utilization of lemongrass flavoured paneer
The optimized sample of lemongrass was used in the preparation of various products and from the sensory scores tabulated in the table 5. It is clear that the fried lemongrass flavoured paneer was well accepted among the judges. It was observed that the lemongrass flavour remained after frying and it contributed to better sensory appeal. Lemongrass flavoured paneer pickle gained good acceptance. It was observed that the addition of excess spices in the pickle might mask the lemongrass flavour. The pizza was highly accepted among the sensory panelists and it was recommended that the lemongrass paneer could be added in excess, so as to result in higher sensory appeal of the product. The paneer curry was accepted among the judges. It was recommended that addition of more gravy would enhance the body and texture of the product, which could result in better sensory scores.

Table 5: Sensory acceptance score of products prepared using Lemongrass flavoured paneer

Sensory attributes	Lemongrass based paneer products			
	Fried lemongrass flavoured paneer	Lemongrass flavoured paneer pickle	Lemongrass flavoured paneer pizza	Lemongrass flavoured paneer curry
Colour and appearance	8.01±0.27	7.91±0.59	7.91±0.63	8.19±0.59
Flavour	8.05±0.42	7.88±0.71	8.09±0.57	8.01±0.64
Body and Texture	7.94±0.77	7.72±0.65	7.91±0.50	8.01±0.48
Overall acceptability	8.01±0.55	7.80±0.60	8.42±0.84	8.08±0.47

Note: Figures are mean ± standard deviation of three replications.

Conclusion
The demand of paneer is increasing in recent years, as it is a rich source of high quality animal protein, fat, minerals and vitamins. The utilization of lemongrass in paneer will be of great importance due to its flavouring property as well as nutritional and therapeutic values. During storage at 7±2 °C, it was observed that sensory and textural characteristics of the paneer samples changed with the progress in storage. The sensory score of the stored paneer samples revealed that the addition of lemongrass was highly significant ($p \le 0.05$). The textural attributes such as Hardness, Cohesiveness, Springiness and Chewiness reduced as the storage period progressed, for lemongrass added sample. The lemongrass flavoured paneer showed good acceptability upto 23 days of storage at 7±2 °C. Lemongrass flavoured paneer was used as fried paneer for direct consumption as well as for addition to pickles and other culinary dishes including paneer curry. It was also used as toppings in pizza. It may be stated that production of paneer incorporated with lemongrass has broader scope for commercialization.

References
1. Amerine MA, Berg HW, Cruess WV *et al*. The technology of winemaking. Edn 2, The AVI Publishing Company, Inc., Connecticut; c1967.
2. Basic Animal Husbandry Statistics. Ministry of Fisheries, Animal Husbandry and Dairying, Government of India, 2022, 28.
3. Chandan RC. Cheese varieties made by direct acidification of hot milk. In "Handbook of food products manufacturing Vol-I." (Ed. Hui, Y.H) Wiley-Inter Science, John Eiley and Sons Inc; c2007b. p. 645-650.
4. Bhattacharya DC, Mathur ON, Srinivasan M, Samilk D *et al*. Studies on the method of production and shelf-life of paneer (cooking type acid coagulated cottage cheese). Journal of Food Science and Technology. 1971;8:117-121.
5. Desai HK. Sensory profiles of traditional dairy products. In: Dairy India Yearbook. Edn 6, (Ed. Gupta, S.), Published by Dairy India Yearbook, New Delhi, 2007, 408-412.
6. Isam SH, Mohd N *et al*. Study on the antimicrobial activity of Lemon grass leaf extracts. Iraq Journal of Market Research and Consumer Protection. 2009;1(2):198-211.
7. Kanawjia SK, Roy SK, Singh S *et al*. Paneer technology and its diversification. Indian Dairyman. 1990;42:390-393.
8. Khan SU, Pal MA *et al*. Paneer production: A review. Journal of Food Science and Technology. 2011;48(6):645-660.
9. Koca N, Metin M *et al*. Textural, melting and sensory properties of low-fat fresh Kashar cheeses produced by using fat replacers. International Dairy Journal 2004;14(4):365-373.
10. Lutterodt GD, Ismail A, Basheer RH, Baharudin HM *et al*. Antimicrobial effects of Psidium guajava extracts as one mechanism of its antidiarrhoeal action. Malaysian Journal of Medical Sciences. 1999;6(2):17-20.
11. Mathare SS, Bakal SB, Dissanayake TMR, Jain SK *et al*. Effects of coagulation temperature on the texture and yield of soy paneer (tofu).Journal of the National Science Foundation of Sri Lanka. 2009;37(4):263-267.
12. Pal MA, Garg FC *et al*. Studies on utilization of Sweet-Cream Butter Milk in Manufacturing of Paneer. Journal of Food Science and Technology. 1989;26:259-264.

13. Patel DH, Rao JK *et al*. Rheology of Paneer-A Review. Indian Journal of Dairy Science. 2012;65(2):95-105.
14. Rao BSS, Shanbhoge R, Rao BN, Adiga SK, Upadhya D, Aithal BK, *et al*. Alcoholic extract of *Cymbopogon citratus* against radiation induced DNA damage on V79 cells and free radical scavenging ability against radicals generated *in vitro*. Human Experimental Toxicology. 2009;28(4):195-202.
15. Rao KJ, Patil GR *et al*. Development of Ready-to Eat paneer curry by hurdle technology. Journal of Food Science and Technology. 2001;36(10):37-41.
16. Rios JL, Recio MC *et al*. Medicinal plants and antimicrobial activity. Journal of Ethnopharmacology 2005;100:80-84.
17. Schaneberg BT, Khan IA *et al*. Comparison of extraction methods for marker compounds in the essential oil of lemongrass by GC. Journal of Agricultural and Food Chemistry. 2002;50:1345-1349.
18. Shrivastava S, Goyal GK *et al*. Preparation of paneer: A Review. Indian Journal of Dairy Science. 2007;60(6):377–388.
19. Silva CdeB, Guterres SS, Weisheimer V, Schapoval EE *et al*. Antifungal activity of the lemongrass oil and citral against Candida spp. Brazilian Journal of Infectious Diseases. 2008;12(1):63-66.