Textural properties of paneer prepared from blends of raw turmeric extract and buffalo milk

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Abstract
In the present investigation the attempt was made to study textural properties of paneer made from buffalo milk and raw turmeric extract. The textural properties include hardness, cohesiveness, elasticity, gumminess and chewiness for the raw turmeric extract added paneer. The paneer was prepared by considering treatment combination of buffalo milk and raw turmeric extract the turmeric extract as 95%, 90% and 85% of buffalo milk and 5%, 10% and 15% of raw turmeric extract in treatments T3, T2 and T1 and treatment T4 taken as a control prepared from buffalo milk only.

Keywords: Buffalo milk, paneer, channa, turmeric, Curcuma longa

Introduction
Paneer is a popular Indian soft cheese variety and indigenous dairy products, which occupy a prominent place among traditional milk products. About 5% of milk produce in India is converted into paneer out of 176.35 million tonnes during 2017-2018 (Anonymous 2017-18) [1]. Good quality paneer is characterized by a marble white colour, sweetish, mildly acidic taste, nutty flavour, spongy body and closely knit, smooth texture. The ability of paneer to be deep fried is one feature that has led to its wider acceptance and a favourite for making snacks, pakoras or fried paneer chunks (Aneja, 2007) [1].

Turmeric is a golden spice derived from the rhizome of the plant curcuma longa. Turmeric has long been used as a spice, flavoring agent, and colorant. Traditionally, the spice has been used to treat numerous human ailments. Turmeric is a rich source of numerous biologically active constituents such as polyphenols, sesquiterpenes, diterpenes, triterpenoids, sterols, and alkaloids. Modern science has delineated the molecular basis for the pharmacological properties of turmeric against human diseases, and some clinical trials have unequivocally demonstrated the safety and efficacy of turmeric in human subjects. The absence of any significant toxicity associated with this spice has made it superior to other medications (Gupta et al. 2013) [8].

The present study was proposed to study effects of raw turmeric extract on textural properties of paneer prepared from blends of buffalo milk and raw turmeric extract.

Material and Methods
Buffalo Milk and Raw Turmeric
Already standardized fresh Buffalo milk was procured from local market of Latur city, of Natural Milk Pvt., Ltd., Latur having 6.0 per cent fat and 9 per cent SNF. The pure raw turmeric (Selam variety) required for preparation of paneer was obtained from local market of Latur city. Analytical (AR) or guaranteed grade (GR) reagents were used in the chemical analysis. Polythene bags (200 gauges) was obtained from local market and used for packaging the raw turmeric added paneer. Equipments and accessories include stainless steel vessels of requisite capacity, knives, fruit extractor/mixture, muslin cloth, standard weight balance, thermometer, gas shegdi, paneer press machine, etc. used for preparation of paneer. Before using this material, it was properly cleaned and washed with detergent solution and all the precautionary measures was considered during the conduct of trials to avoid contamination.

Preparation of Raw Turmeric Extract
The fresh raw turmeric was collected, washed, peeled and cut into small pieces. After cutting raw turmeric pieces were grinded in the mixer for homogenous fine mixture by adding 1:5 ratio of water for extract filtration through muslin cloth.

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Preparation Buffalo milk Paneer blended with Raw Turmeric extract
The buffalo milk (6% fat and 9% SNF) was taken in pan then raw turmeric extract was added before heating and mixed properly through glass rod. Milk was heated to 86°C and cooled up to temperature 76 °C. After cooling citric acid were added in milk @ 1-3% at 76°C with stirring. After complete coagulation the stirring was stopped and allow the curd to sink to the bottom. The whey was then drained through a stainless-steel strainer. The curd was collected and filled in stainless steel paneer hoop. The hoop used was circular blocks with holes on its side to facilitate the expulsion of whey. Paneer was pressed 10-15 minutes @ 3 kg/sq cm. The pressed block of curd was removed from the hoop, cut into pieces and immersed in chilled water (4 °C) for 2 to 3 hours. The chilled paneer was then removed from water to drain out and packed in polythene bag and finally storage in refrigerator (5 °C).

Analytical Method
Textural qualities of raw turmeric added paneer viz., hardness, elasticity, gumminess and chewiness were measured by using Instron Universal Testing Machine (Model, 1000).

Procedure
a) Calibration
The instrument was calibrated using 5 kg load transducer and tare weight of Anvil was balanced out.

b) Gage length
Gage length was set to 15 mm by driving the moving cross head up or down using push buttons. On cross head control panel and spacing between Anvil and specimen table was measured using a ruler.

c) Cross head limits
The upper and lower cross head limits were set accurately.

d) Test description type
Multiple bite texture test reserve after compressing to 3 mm thickness.
Sample: Paneer
Fixture: Compression Anvils.

e) Test parameters
1. By compression: Up to 80%
Sample size: 15 mm cube
Compressed to: 12 mm cube

Table 1: Effects of different levels of raw turmeric extract on textural qualities of raw turmeric extract added paneer.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Hardness (Kg)</th>
<th>Cohesiveness</th>
<th>Elasticity (cm)</th>
<th>Gumminess (Kg/N)</th>
<th>Chewiness (Kg-cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>6.97</td>
<td>0.15</td>
<td>1.02</td>
<td>1.04</td>
<td>1.06</td>
</tr>
<tr>
<td>T2</td>
<td>6.75</td>
<td>0.16</td>
<td>1.13</td>
<td>1.08</td>
<td>1.22</td>
</tr>
<tr>
<td>T3</td>
<td>6.65</td>
<td>0.17</td>
<td>1.27</td>
<td>1.13</td>
<td>1.43</td>
</tr>
<tr>
<td>T4</td>
<td>6.59</td>
<td>0.18</td>
<td>1.35</td>
<td>1.18</td>
<td>1.53</td>
</tr>
<tr>
<td>SE</td>
<td>0.011</td>
<td>0.003</td>
<td>0.006</td>
<td>0.015</td>
<td>0.011</td>
</tr>
<tr>
<td>CD at 5%</td>
<td>0.036</td>
<td>0.009</td>
<td>0.019</td>
<td>0.05</td>
<td>0.036</td>
</tr>
</tbody>
</table>

The values with different small letters superscripts row wise differ significantly at 5% level of significance.

In all the textural parameters i.e. hardness, cohesiveness, elasticity, gumminess and chewiness these values were found to be significantly differed over control and between each other also excluding gumminess. It is also noted that addition of increased proportion of raw turmeric extract from 5%, 10%, and 15% per cent in paneer had decreasing values of all the textural parameters. In other words, it can be stated that the addition of 5% percent raw turmeric extract in preparation paneer was found to be an optimum level as far as the textural qualities viz., hardness, elasticity, gumminess and chewiness, respectively. It indicates that turmeric has an effect on the textural parameters of paneer, it may be due to the impact of

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Cohesiveness is the ratio of areas under the first and second bite. It is defined as the extent to which a material can be deformed before its rupture and it mainly depends upon the strength of internal bonds. The cohesiveness parameter ranged in between 0.15 to 0.18 for T1 to T4. The values of cohesiveness increased due to the increased level of raw turmeric extract respectively Supported by: Chitra (2009) prepared alovera paneer, mint paneer and clove paneer @ 2% level of alovera, mint and clove extract. The cohesiveness of control, alovera paneer, mint paneer and clove paneer was 0.640, 0.452, 0.461 and 0.468. Lokhande (2013) studied storage studies on textural aspects of selected Indian dairy products. Cohesiveness of paneer 2 hr after preparation of product was 10.4710 ±042 which remained 0.449±0.041 16th day of storage. Singh et al. (2014) studied impact of turmeric addition on the properties of paneer, prepared from different types of milk. They used cow milk, buffalo milk and mixed milk. In research found that cohesiveness of paneer decreases with addition of turmeric powder in cow milk buffalo milk and mixed milk paneer from 0.23 (control) and 0.36 (0.6%) cow milk, 0.32 g (control) to 0.35 (0.6%) buffalo milk, 0.67 (control) and 0.68(0.6%) mixed milk. Prasad (2017) prepared anti-oxidative, physico-chemical and sensory attributes of burfi affected by incorporation of different herbs and its comparison with synthetic anti-oxidant (BHA). They used six different herbs, viz., turmeric, ginger, clove, curry leaves, basil leaves and small cardamom, were incorporated (@1% of kha) into burfi. Cohesiveness of developed burfi found that 0.12 (control), 0.13 (turmeric), 0.14 (cardamom), 0.12 (ginger), 0.12 (curry leaf), 0.04 (clove) and 0.12 (basil).

Elasticity of raw turmeric extract added paneer ranged from 1.02 to 1.35 cm. Elasticity of product increases from T1 to T4. The elasticity observed in all treatments vary significantly between each other itself a proof that the following researchers were different values for elasticity in their product developed by using different ingredients and prepared different products. Examples of Babje (1989) prepared paneer from soy milk and buffalo milk blend and stated that increase in proportion of soy milk increase the values of elasticity in paneer from 2.64 to 2.79. And Panchbhai (1994) studied on the effect of hydrocolloids on the yield and quality of chhana and stated that the increased in proportion of sago starch in chhana increases the values of elasticity of chhana from 3.6 cm to 4.2 cm.

The gumminess of raw turmeric added paneer ranged from 1.04 to 1.18 kg/N for T1 to T4. The values of gumminess of the raw turmeric extract added paneer increases due to the increased level of raw turmeric extract. Lokhande (2013) studied storage studies on textural aspects of selected Indian dairy products. Gumminess of paneer 2 hr after preparation of product was 8.917±100 which remained 9.0711±196 16th day of storage.

Chewiness is one of the most important textural properties of paneer. It is the energy required to masticate a solid food product to make it ready to swallowing. The chewiness was in the range of 1.06 to 1.53 kg-cm for T1 to T4 treatment combinations. The present result for chewiness compared with following researchers and found variation may be due to the different in products, raw material and preparation techniques. Lokhande (2013) studied storage studies on textural aspects of selected Indian dairy products. Chewiness of paneer 2 hr after preparation of product was 5.9750±769 which remained 6.5770±434 16th day of storage.
Poojitha (2017) prepared safflower milk blended paneer used different coagulants C1 (citric acid), C2 (lactic acid), C3 (acetic acid). Chewiness of safflower blended paneer recorded as 0.70 (control), 0.63 (C1), 0.89 (C2) and 0.96 (3).

Chitra (2019) prepared alovera paneer, mint paneer and clove paneer @ 2% level of alovera, mint and clove extract. The chewiness of control, alovera paneer, mint paneer and clove paneer was 3.319, 1.989, 2.095 and 2.139 N.

**Conclusion**

All the textural parameters i.e., hardness, cohesiveness, elasticity, gumminess and chewiness these values were found to be significantly differed over control and between each other also excluding gumminess. It is also noted that addition of increased proportion of raw turmeric extract from 5%, 10%, and 15% per cent in paneer had decreasing values of all the textural parameters. In other words, it can be stated that the addition of 5% percent raw turmeric extract in preparation paneer was found to be an optimum level as far as the textural qualities viz., hardness, elasticity, gumminess and chewiness, respectively.

**References**


Fig 1: Geographical Representation for Textural analysis of Raw Turmeric Extract Added paneer.