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Textural properties of herbal paneer incorporated with turmeric and black pepper powder

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Abstract
India is the largest producer of milk in the world. As a result, the dairy business has emerged as one of the most important option available to Indian farmers. *Paneer* is an indigenous dairy product prepared by the cow or buffalo or combination of both precipitated by citric acid or vinegar or acetic acid. Herbal *paneer* was prepared by incorporating the black pepper and turmeric powder as per treatment combination as T_0 (Control), T_1 (0.1% black pepper and 0.1% turmeric powder), T_2 (0.2% black pepper and 0.1% turmeric powder) and T_3 (0.3% black pepper and 0.1% turmeric powder. *Paneer* sample was evaluated for textural qualities viz., hardness, cohesiveness, adhesiveness, springiness, and chewiness for treatments T_0, T_1, T_2 and T_3. Hardness ranged from 3.290, 3.321, 3.043 and 2.746 kg for treatments T_0, T_1, T_2 and T_3, respectively. Cohesiveness observed for treatments T_0, T_1, T_2 and T_3 were 1.021, 1.019, 1.024 and 1.026, respectively. Adhesiveness ranged from 0.005, 0.0072, 0.002 and 0.0016 kg for treatments T_0, T_1, T_2 and T_3, respectively. Springiness observed for treatments T_0, T_1, T_2 and T_3 were 1.037, 1.013, 1.043 and 1.020, respectively and Chewiness 3.502, 3.419, 3.236 and 2.874 for treatments T_0, T_1, T_2 and T_3, respectively.

Keywords: *Paneer*, acid coagulation, turmeric powder, cohesiveness, adhesiveness, springiness,

Introduction
Paneer is an indigenous dairy product prepared by the heat and acid coagulation. According to FSSAI, *paneer* is the product obtained from cow or buffalo milk or combination thereof by precipitation with sour milk, lactic acid or citric acid. It shall not contain more than 70% moisture and milk fat shall not be less than 50% on the dry matter basis. *Paneer* is made up of protein and fat, insoluble salts and colloidal materials, as well as part of the moisture of the original milk, which contains lactose, whey protein, soluble salts, vitamins and other milk components (Kanawjia and sing, 1996) [5].
Turmeric (*Curcumalonga* L.) is a medicinal plant widely used in medicine as home medicine for various diseases. *Curcumin*, Black pepper is known as the 'king of spices' due to its pungent quality. Black pepper (*Pipernigrum* L.) is a member of the family Piperaceae. This plant helps to stimulate the digestive enzymes of pancreas and intestines and also increases biliary bile acid secretion when orally administrated. Piperine helps to prevent and diminish diarrhea produced by various oils and chemicals (Ahmad *et al*., 2012) [1]. Black pepper is known as the 'king of spices' due to its pungent quality. Black pepper (*Pipernigrum* L.) is a member of the family Piperaceae. The genus piper has more than 1000 species, but the well-known species are *Pipernigrum*, *Piperlongum* and *Piperbetle*. Black pepper can be used for different purposes such as human dietaries, as medicine, as preservatives, as bio-control agents (Ahmad *et al*., 2012) [1].

Materials and Methods
The research study was carried out on "Studies on the preparation of herbal *paneer* with incorporation black pepper and turmeric powder" taken at department of Animal Husbandry and Dairy Science, College of Agriculture, VNMKV, Parbhani and College Food Technology Parbhani.

Materials
The whole fresh buffalo milk was procured from Dairy unit of college of Agriculture, VNMKV, Parbhani. Turmeric powder, black pepper powder, citric acid and muslin cloth purchased from the local market. Texture analyzer used from the food technology laboratory.

Treatments

For preparation of *paneer* by using black pepper and turmeric powder, the treatment combinations were finalized on basis of volume of milk are as follows

T_0 = Buffalo milk + without Black pepper and Turmeric powder.
T_1 = Buffalo milk + 0.1% Black pepper + 0.1% Turmeric powder.
T_2 = Buffalo milk + 0.2% Black pepper + 0.1% Turmeric powder.
T_3 = Buffalo milk + 0.3% Black pepper + 0.1% Turmeric powder.

Procedure for preparation of *paneer*

Paneer was prepared as per the method described by Aneja, *et al.,* (2002) [2] with slight modification. Buffalo milk was first filtered through muslin cloth to remove dust and dirt particles. Milk was separated by using centrifugal cream separator for standardization purpose. Buffalo milk having 6 per cent fat was heated at 90° C for 5 min. Then turmeric and black pepper powder mixed after heating the milk and cooled to 70° C. It was coagulated with 1 per cent citric acid with slowly continuous stirring until a curd and clear whey separated out. This mixture was allowed to settle down for 10 min.

The whey and coagulant were separated by draining with the help of muslin cloth. The hot coagulant was collected and transferred into a rectangular hoop. The hoop has a rectangular frame with small holes at the bottom. The frame was made from stainless steel plank. Pressing was done by applying the weight of 3.0 kg/cm^2 for 20 minutes for proper texturization of coagulated mass. Cut the coagulated mass into pieces and immersed in chilled water at 5° C for 2 to 3 hours, the chilled *paneer* was then drained out. Finally, the *paneer* blocks were wrapped in parchment paper and stored in refrigerator.

Methods for textural analysis of *paneer*

The textural profile analysis (TPA) of *paneer* sample was evaluated using Stable Micro System TAXT *plus* Texture analyzer. A P75R cylindrical probe with 2 mm/sec. of pretest speed and posttest speed 10 mm/sec and 80 % compression was taken for TPA analysis. TPA is "two bite test, which includes the first and second compression cycles. The parameters recorded were hardness, adhesiveness, cohesiveness, springiness, gumminess and chewiness. The textural properties of *paneer* were determined with following settings.

Table 1: Show the table Caption and Value/unit

Caption	Value/unit
Test mode	Compression
Pre- test speed	2 mm/sec.
Test speed	1.00 mm/sec.
Posttest speed	10.00 mm/sec.
Target mode distance	5.00 mm
Trigger type	Auto force
Trigger force	5.0 g
Advanced options	Off
Count	2

The data obtained in the compression test were used for determination of the following textural parameters.

1. Hardness

It is the amount of maximum force, *i.e.*, exerted on the *paneer* sample. The height (H) of the first bite compression corresponds to the hardness and its unit is in kg / N (Newton).
Hardness, (H) = maximum force of first compression (F1)

2. Cohesiveness

Cohesiveness is the ratio of areas under the first and second bite *i.e.*, A2/ A1; being ratio-it is unit less.
Cohesiveness= A2/ A1

3. Springiness

The amount that a product physically springs back after being deformed during the first compression.
Springiness (S) = L2/L1

4. Chewiness

Chewiness is defined as the product of hardness, Cohesiveness and springiness. Its unit is in kg-cm/kg-mm.
Chewiness = Hardness x Cohesiveness x springiness.

5. Adhesiveness

Force necessary to remove the material that adheres to the mouth when eating food.
Adhesiveness, g, mm (A) = Negative area in the graph
Were,

F1 Positive peak force (cycle 1)
A1 Positive area (cycle 1)
A2 Positive area (cycle 2)
A3 Peak negative area in graph
L1 Peak positive distance (cycle 1)
L2 Peak positive distance (cycle 2)

Results and Discussion

It was observed from the given table, that the hardness of the *paneer* prepared with different combinations ranged between 2.746 to 3.321 kg *i.e.*, for T_3 and T_1. The cohesiveness parameter ranged in between 1.019 to 1.026 for T_1 and T_3. The adhesiveness ranged in between 0.0072 to 0.0016 for T_1 and T_3. The springiness ranged from 1.013 to 1.043 for T_1 and T_2. The chewiness was in the range of 3.502 to 2.874 kg-cm for T_0 to T_3 treatment combinations of turmeric and black pepper. In all the textural parameters *i.e.*, hardness, cohesiveness, adhesiveness, springiness and chewiness have maximum values for T_1 combination of the herbal *paneer*. In hardness, T_3 was significantly differing over the rest of the treatment, whereas in cohesiveness T_1 was significantly differing from all the treatments. Statistical significance observed in adhesiveness for treatment T_1 which differs from other treatments. For springiness and chewiness, all the treatment significantly differs with each other.

Table 2: Textural properties of *paneer*

Sample No.	Hardness (kg)	Cohesiveness	Adhesiveness	Springiness (cm)	Chewiness (kg-cm)
T_0	3.290^a	1.021^b	0.0050^b	1.037^b	3.502^a
T_1	3.321^a	1.019^c	0.0072^a	1.013^d	3.419^b
T_2	3.043^b	1.024^{ab}	0.002^c	1.043^a	3.236^c
T_3	2.746^c	1.026^a	0.0016^c	1.020^c	2.874^d
SE±	0.0144	0.0019	0.00041	0.0020	0.0092
CD	0.0444	0.0059	0.001	0.006	0.0283

It means the addition of turmeric powder at the rate 0.1 per cent and black pepper powder 0.1 per cent has definite effect on textural qualities and which was desired characteristics as

far as consumer acceptability was concerned.

It was also found that the addition of increased proportion of different combinations of turmeric and black pepper powder for different treatments has decreasing values of all the textural parameters and it can be stated that the addition of 0.1 per cent turmeric powder and 0.1per cent black pepper powder in preparation herbal *paneer* was found to be an optimum level as far as the textural qualities viz., hardness, cohesiveness, adhesiveness, springiness and chewiness, were concerned.

The hardness of the herbal *paneer* decreased from 3.321 to 2.746 *i.e.*, for T_1 to T_3 due to the increased level of turmeric and black pepper powder combinations.

The finding of present investigation quietly similar with Babje (1989) who prepared the *paneer* from soymilk and buffalo milk blend and concluded that increase in proportion of soymilk decreases the hardness in *paneer* from 1.74 to 1.63 kg. Panchbhai (1994) [6] also found that on the effect of hydrocolloids on the yield and quality of *chhana* and found that the increase in proportion of sago starch at 90 °C in *chhana* decreases the hardness of *chhana* from T_0 (3.400) kg in control to T_1 (2.500 kg), T_2 (1.800 kg) and T_3 (1.050 kg), respectively.

The cohesiveness parameter for *paneer* prepared with turmeric and black pepper powder ranged in between 1.019 to 1.026 for treatment T_1 to T_3. The values of cohesiveness increased due to the increased level of different combinations of turmeric and black pepper powder.

The findings of present work more or less similar with Babje (1989) [3] who reported that *paner* prepared from soymilk and buffalo milk blend and stated that increase in the proportion of soymilk increase the cohesiveness for 0.24 to 0.25.

The adhesiveness of herbal *paneer* ranged in between 0.0072 to 0.0016 for T_1 and T_3. The values of adhesiveness increased due to the addition of different combinations of turmeric and black pepper powder.

The springiness of herbal *paneer* was in range of 1.013 to 1.043 for T_1 and T_2. The value of springiness increased due to the addition of different combinations of turmeric and black pepper powder.

The chewiness for herbal *paneer* was in the range of 3.502 to 2.874 kg-cm for T_1 to T_3 treatment. Chewiness was decreased due to increased different levels of combinations of turmeric and black pepper powder.

The finding of present investigation similar with more or less with Chitra (2009) [4] prepared the *paneer* with mint, alovera and clove@ 2% levels. The chewiness of control, alovera, mint and clove paneer were 3.319, 1.9889, 2.095 and 2.139N.

Conclusion

Herbal *paneer* can be successfully prepared by using incorporation of black pepper and turmeric powder. *Paneer* prepared from combination of 0.1 per cent black pepper and 0.1 per cent turmeric powder get highest score for overall acceptability attribute. From the textural profile analysis, it was concluded that as the combination of turmeric and black pepper powder increases, textural characteristics such as hardness, chewiness decreases whereas cohesiveness, adhesiveness and springiness increases.

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