



# Body & Texture score of *Paneer* prepared from cow milk using herbal coagulants

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**Abstract** :The Paneer prepared from the combination by using different temperatures of coagulation (A), coagulants (B), fat percentages (C) and different storage periods (D) for Body & Texture score, the combination of A3xB2xC2xD1 got maximum score (8.380) whereas the least score (5.000) found in A1xB4xC1xD4, A2xB4xC1xD4 and A4xB4xC2xD4. The highest score found in the sample which was coagulated at the temperatures of 80<sup>0</sup> C by lemon juice with 4.0% of milk fat at 0 day, while lowest score found in sample which was coagulated at the temperatures of using 70<sup>0</sup> C by ginger extract with 4.0% of milk fat at 12 days in the respect of lactic acid (8.58) as a control treatment. In the results of present investigation, It was observed that the results were very close to them only in case of lactic acid and lemon extract coagulated Paneer. While, it was not recorded same, for the body and texture score obtained from ginger extract and aonla extract coagulated Paneer.

**Key Words:** Paneer, Body & Texture, Sensory Quality

**Introduction** : India has witnessed a remarkable growth in milk production during the last few decades due to the success of the Operation Flood programme, which is one of the world's largest and successful integrated dairy development programs initiated in 1970s. It has led India to emerge as the largest milk producer in the world, transcending a record level of 104.8 million metric tonnes (MMT) in 2008 accounting for 15% of the world's total milk production (Bhasin 2009). An estimated 5% of milk produced in India is converted to *paneer* (ICMR 2000;); production figure being 3,959 metric tonnes in the year 2002–03, which increased to 4,496 metric tonnes in the year 2003–04 (Joshi 2007; Shrivastava and Goyal 2007) exhibiting a growth of 13%.

*Paneer* is a South Asian variety of soft cheese obtained by acid and heat coagulation of milk and used in raw form or in preparation of several varieties of culinary dish and snacks. It is a non-fermentative, non-renneted, non-melting and un-ripened type of cheese. The production of *Paneer* is now spreading throughout the world. 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).

*Paneer* is a rich source of animal protein available at a comparatively lower cost and forms an important source of animal protein for vegetarian diet. Over and above its high protein content and digestibility, the biological value of protein in *paneer* is in the range of 80 to 86 (Shrivastava and Goyal, 2007). In addition, *Paneer* is a valuable source of fat, vitamins and minerals like calcium and phosphorus. It has a reasonably long shelf life under refrigeration. Good quality *Paneer* is characterized by a marble white colour, sweetish, mildly acidic taste, nutty flavour, spongy body and closely knit, smooth texture.

*Paneer* is a highly perishable product. It was reported that the freshness of *Paneer* remains intact only for 3 days at refrigeration temperature (Bhattacharya et al.1971). At room temperature *Paneer* does not keep good for more than one day. In order to increase the shelf life of *Paneer*, additives, modification in *Paneer* manufacturing process, surface treatments and packaging materials have been recommended by various workers. Singh et al. (1988) dipped *Paneer* blocks of 1.5 kg each in 5% brine, chilled water and acidified water (pH 5.0) to enhance their shelf life (up to 12 days at refrigeration temperature). Singh et al. (1989) found that addition of 0.15% sorbic acid to milk for *Paneer* preparation or wrapping the *Paneer* in sorbic acid-coated butter paper (2 g/m<sup>2</sup>) extended its shelf life to 30 days at ambient temperature.

Vishweshwaraiah (1986) observed that dehydration of *paneer* cubes (2 cm<sup>3</sup>) to 15% moisture by keeping them in hot air drier at 75 °C for 4 h and deep freezing at -9 and -15 °C led to shelf life of 2 months and 8 days respectively. A low shelf life of only 8 days on deep freezing (at -15 °C) was probably due to surface drying, which limited its usage, as samples were kept without packaging material. Reduced fat *paneer* (30–42% FDM) had higher shelf life than full fat (>50% FDM) *paneer* as *paneer* with lower fat content underwent less deteriorative changes due to lipolysis (Ghodekar 1989). Sachdeva and Singh (1990) found that dipping of *paneer* in 5% brine, acidified brine (5% NaCl, pH 5.5) and hydrogen peroxide solution (0.2%, v/v) with or without delvocid (0.5%, w/v) extended the shelf life of *paneer* cubes of small size

(1.0×0.25×0.5 inches) to 22, 20, 32 and 22 days respectively compared to 10 days for control at 8–10 °C; smaller *paneer* size helped in better diffusion of the solution and thus longer shelf life.

*Paneer* manufacture involves the coagulation of milk proteins to form curd. During this process large clumps of proteins are formed in which fat and other colloidal and dissolved solids get entrapped. The coagulation of milk occurs when pH of milk reaches 4.6 which is the iso-electric point of its major protein, casein. The type and concentration of the acid and the mode of delivery into the hot milk influence the moisture level and product yield.

**Materials and Methods:** These investigation were carried out in the department of Animal Husbandry and Dairying, C.S. Azad University of Agriculture and Technology, Kanpur. The standardized cow milk (3.5 % and 4.0% milk fat with SNF level of 8.5%) was subjected to four different heat treatments of 70<sup>0</sup>, 75<sup>0</sup>, 80<sup>0</sup> and 85<sup>0</sup>C by different coagulating agents, one of them coagulant used as chemical coagulant (lactic acid) as control in the experiment with other three Lemon, Aonla and Ginger extract were used as herbal coagulants for preparation of *Paneer*. The product was stored at refrigerated temperatures (5<sup>0</sup>C) for four different storage periods (0 day, 4 days, 8 days, and 12 days). The effects of various factors on Body & Texture quality of *Paneer* were examined on the basis of sensory evaluation.

## RESULTS & DISCUSSION :

**Body and texture :** The result in the respect of body and texture score on account of various treatment have been revealed the following results. The body and texture score of *Paneer* was affected significantly at 0.1% level of significance by different temperatures of coagulation.

The mean body and texture score of *Paneer* by four different temperatures of coagulation have been revealed the following results. The maximum (7.117) and the minimum (6.385) liking scores were noted in case of *Paneer* prepared at the temperatures of coagulation 80<sup>0</sup> C and 70<sup>0</sup> C, respectively. Relatively highest score was found in 80<sup>0</sup> C (A3) while it was observed least in samples of 70<sup>0</sup> C (A1) in respect of body and texture.

The body and texture score of *Paneer* was affected significantly at 0.1% level of significance by different coagulants. The mean body and texture score of *Paneer* prepared by four different coagulants used

for coagulation of Paneer have been showed as, the maximum score (7.186) was found in lemon juice coagulant, while the minimum (6.148) liking scores were observed in case of Paneer prepared by ginger coagulant used for coagulation. Relatively highest score was found in lemon juice (B2) while it was observed least in samples of ginger (B4) in respect of lactic acid (7.485) used as control treatment.

The mean body and texture score of Paneer prepared by two different fat percentages in milk have been given in Table 1. The mean maximum score (7.123) and the minimum (6.463) liking scores were observed in case of Paneer prepared 4.0% and 3.5 % fat, respectively. Relatively highest score was found in 4.0% (C2) while it was observed least in the samples of 3.5% (C1) in respect of body and texture.

The mean body and texture score of Paneer stored at the temperatures of refrigerated temperatures for four different storage periods have been given in Table 1. The mean maximum score (7.402) was found at 0 day, while the minimum (6.132) liking scores were observed in case of Paneer stored for 12 days at the temperatures of 5<sup>0</sup> C of refrigeration. Relatively highest score was found in 0 day (D1) while it was observed least in samples of 12 days stored (D4).

The combination of AXB means, it was observed that out of one combination of AxB, Paneer prepared from the combination by using different temperatures of coagulation (A) and different coagulants (B), the combination of A3xB2 found maximum score (8.030), whereas the least score (5.917) found in A1xB4. The highest score found in the sample which is coagulated at temperatures of 80<sup>0</sup> C by lemon coagulant used while lowest score found in sample prepared at temperatures of 70<sup>0</sup>C by using ginger coagulant.

In Case of AXC, it was observed that out of one combination of AxC, Paneer prepared from the combination by using different temperatures of coagulation (A) and different fat percentage (C), the combination of A3xC2 got maximum score (7.519) whereas the least score (6.107) found in A1xC1. The highest score found in the sample which is coagulated at temperatures of 80<sup>0</sup> C with 4.0% fat used while lowest score found in sample prepared at temperatures of 70<sup>0</sup> C with 3.5% fat in milk.

In AxD, it was observed that out of one combination of AxD, Paneer prepared from the combination by using different temperatures of coagulation (A) and different storage periods (D), the combination of A3xD1 got maximum score (7.751), whereas the least score (5.709) found in A1xD4. The highest score

found in the sample which is coagulated at temperatures of 80<sup>0</sup> C at 0 day of storage, while lowest score found in sample prepared at temperatures of 70<sup>0</sup> C at 12 days of storage.

The Combination of BxC, it was observed that out of one combination of BXC, Paneer prepared from the combination by using different coagulants (B) and different fat percentages (C) used for coagulation of Paneer preparation, the combination of B2xC2 got maximum score (7.387) whereas the least score (5.678) found in B4xC1. The highest score found in the sample which is coagulated by using lemon juice with 4.0% milk fat while lowest score found in sample prepared by using ginger as coagulant with 3.5% fat in milk.

In BXD, it was observed that out of one combination of BxD, Paneer prepared from the combination by using different coagulants (B) and different storage periods (D) used for Paneer preparation, the combination of B2xD1 got maximum score (7.820), whereas the least score (5.518) found in B4xD4. The highest score found in the sample which is coagulated by using lemon juice at 0 day, while lowest score found in sample prepared by using ginger as coagulant at 12 days of storage in the respect of lactic acid (8.054) as a coagulants.

In CxD Combination, it was observed that Paneer prepared from the combination by using different fat percentages (C) and different storage periods (D) used for Paneer preparation and storage, the combination of C2xD1 got maximum score (7.767) whereas the least score (6.769) found in C1xD4. The highest score found in the sample which is prepared by using 4.0% of milk fat at 0 day while lowest score found in sample prepared by using 3.5% of milk fat at 12 days of storage.

The body and texture score of Paneer was affected significantly at 1% level of significance by different temperatures of coagulation (A), coagulants (B), fat percentages (C) and different storage periods (D) used for preparation and storage of Paneer (Table 2).

In the combination of AxBxCxD for Body and Texture score of Paneer , it was observed that Paneer prepared from the combination by using different temperatures of coagulation (A), coagulant used (B), fat percentages (C) and different storage periods (D) used for preparation and storage of Paneer, the

combination of A3xB2xC2xD1 got maximum score (8.380) whereas the least score (5.000) found in A1xB4xC1xD4, A2xB4xC1xD4 and A4xB4xC2xD4. The highest score found in the sample which was coagulated at the temperatures of 80<sup>0</sup> C by lemon juice with 4.0% of milk fat at 0 day, while lowest score found in sample which was coagulated at the temperatures of using 70<sup>0</sup> C by ginger extract with 4.0% of milk fat at 12 days in the respect of lactic acid (8.58) as a control treatment. The body and texture score of Paneer was reported 7.60 by **chawla et. al.(1985)**. It was also observed that the results were very close to them only in case of lactic acid and lemon extract coagulated Paneer, while it was not recorded same for the body and texture score obtained from ginger extract and aonla extract coagulated Paneer.

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Table - 1 Average score for body & texture of Paneer on accounts of various coagulant and temperatures.

COMBINATION	B1	B2	B3	B4	C1	C2	D1	D2	D3	D4	MEAN
A1	6.700	6.781	6.140	5.917	6.107	6.663	7.036	6.693	6.101	5.709	6.385
A2	7.090	7.278	6.280	5.904	6.283	6.993	7.263	6.837	6.399	6.053	6.638
A3	7.623	8.030	6.467	6.346	6.714	7.519	7.751	6.465	6.875	6.375	7.117
A4	7.333	7.853	6.517	6.426	6.748	7.317	7.560	7.278	6.901	6.390	7.032
B1					7.278	7.693	8.054	7.730	7.268	6.890	7.485
B2					6.986	7.387	7.820	7.503	6.869	6.554	7.186
B3					5.909	6.794	7.019	6.714	6.108	5.565	6.351
B4					5.678	6.619	6.718	6.326	6.033	5.518	6.148
C1							7.038	6.754	6.290	6.769	6.463
C2							7.767	7.382	6.848	6.494	7.123
MEAN							7.402	7.068	6.569	6.132	

Table -2 Average score for body &amp; texture of Paneer on accounts of various Combinations.

combinations		A1				A2				A3				A4			
		B1	B2	B3	B4												
C1	D1	7.58	7.22	6.85	6.02	7.92	7.22	7.12	6.18	8.55	8.15	7.84	6.18	8.00	7.92	7.31	6.24
	D2	7.00	6.95	6.71	5.82	7.56	7.02	6.65	5.32	8.18	7.83	7.00	6.00	7.54	7.94	7.00	6.11
	D3	6.54	6.18	6.12	5.42	7.02	6.85	6.03	5.08	8.00	7.42	6.85	5.85	7.32	6.62	6.62	6.00
	D4	6.13	6.00	5.40	5.00	7.00	6.13	5.85	5.00	7.85	7.00	5.94	5.11	7.00	6.32	6.32	5.52
C2	D1	7.90	7.42	7.12	6.18	8.12	7.54	7.48	6.52	8.58	8.38	7.98	6.35	8.38	8.11	7.54	6.98
	D2	7.07	6.98	7.03	5.98	7.82	7.18	7.03	6.12	8.50	8.18	7.92	6.11	8.11	8.00	7.00	6.92
	D3	6.82	6.00	6.25	5.48	7.18	6.98	6.21	5.84	8.16	7.56	6.24	5.92	7.92	7.52	7.00	5.92
	D4	6.08	5.98	6.00	5.08	6.98	6.42	5.92	5.12	7.92	6.96	5.80	5.42	7.54	7.24	6.18	5.00

