

# Studies on Effect of Different Coagulant on Paneer Texture Prepared from Buffalo Milk

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**Abstract:** Paneer is heat-cum-acid coagulation of casein component of milk. Paneer is used as base material for the preparation of a large number of culinary dishes and it is a popular food product at the household. In the present study, buffalo milk is standardized on the level of fat (6 percent milk fat, 9 percent SNF) using different coagulants, was used in manufacturing of Paneer. The method employed for the manufacturing of Paneer from buffalo milk by direct acidification process. Organoleptic test, Chemical analysis and texture profile was checked to know hardness, firmness and springiness of freshly paneer and During 8 days storage at 4-6°C. In case of ascorbic acid, the paneer prepared from 2% and 4 % ascorbic acid was found very good in terms of %yield, colour, flavor, taste, and even in terms of shelf life as compared to citric acid, lactic acid and tartaric acid. Similarly texture profile analysis shows that firmness and springiness of 2% ascorbic acid was more compatible for 8 days as compared to other coagulant used.

**Key Words:** Paneer, Coagulant, Texture.

## Introduction and Experimental

Paneer is the important nutritious and whole some indigenous, dairy products, which occupy a prominent place among traditional milk products and carry lot of market potential. These products are of high quality proteins, fat, minerals and vitamins. Paneer is used as base material for the preparation of a large number of culinary dishes and it is a popular food product at the household level as well as even its use is increasing in organized food chains. It is an excellent match of non-vegetarian food<sup>1,2</sup>.

Paneer is heat-cum-acid coagulation of casein component of standardized buffalo milk (6%-MF, 9%-MS.N.F.), entrapping through complex Physico-chemical interactions almost all the fat, a part of denatured whey proteins and colloidal salts, as well as

a part of the soluble milk solids (in proportion to the moisture content retained)<sup>3</sup>. Typically good quality Paneer is marble white in appearance, having a slight spongy body, close-knit texture and possessing a sweetish-acidic-nutty flavor (George prince, Prasad et al. 2007). Paneer contains approximately 53%-55% moisture, 23%-25% fat, 17%-18% proteins, 2%-2.5% lactose, and 1.5%-2.0% minerals (Kanawjia & Singh, 1996). It retains about 90% fat & proteins, 50% minerals & 10% lactose of original milk (Rao et al, 1992a)<sup>4</sup>.

Texture, which is an important fundamental sensory property of all foods, can be regarded as a manifestation of the rheological properties of foods. Texture is an important quality of attribute as it affects processing, handling & influence shelf life as well as

consumer acceptance as their food habits. The study of texture is important to establish mechanical behavior of a food when consumed. The characteristic of perceived "texture" is determined by different physical & Physico-chemical properties of food and by the unique as well as complex feature of human sensory system. In the Paneer, texture is an important property as the points of consumer's acceptance and satisfaction<sup>5</sup>.

Paneer, is one of the important dairy product which is used in various Indian culinary dishes, and the Paneer texture are the most sought after sensory attributes for the acceptability of Paneer by the consumer and also to established an efficient, economic and profitable system for their industrial scale production, a proper understanding of this product texture profile and sensory profile is essential<sup>6,7</sup>. So, in view of the facts stated above, the present study was under taken to study the yield of Paneer with variation of coagulants with acceptability of the products. To study the Texture profile analysis of Paneer and Sensory analysis of Paneer<sup>8</sup>.

Buffalo milk is standardized on the level of fat (6 percent milk fat, 9 percent SNF). The titratable acidity of milk is ranged from (0.125-0.165) percent of lactic acid having pH (6.6-6.8). Buffalo milk was preferred since it gives a soft body and smooth texture to the product. The different coagulant used in preparation of

paneer was citric acid, ascorbic acid, lactic acid and tartaric acid at the strength of 2% and 4% each. The method employed for the manufacturing of Paneer from buffalo milk by direct acidification process described by Ghodekar (1982)<sup>8,13</sup>. 1 liter Buffalo milk was taken in the steel bowl. During the heating of milk occasional stirring was done in order to prevent skin formation. The temperature of milk was raised to 85°C with holding. Then it was cooled to 75°C and 2% or 4% strength of coagulant was added with constant stirring till the completion of coagulation. The speed of stirring of milk during addition of the coagulant solution was maintained at 50-60 motion of the stirrer/min. The time taken for addition of the coagulation was approximately 40-50 sec., the pH of whey ranged from 5.32–5.70. The whey was drained and the coagulated mass collected and filled in rectangular hoops lined with muslin cloth. Pressure was applied on the top of the hoop by placing weight of 4-5 Kg. For about 15 minute. The pressed Paneer was then removed from the hoops and after cutting in 7–8 inches size pieces, it was immersed in chilled water (4°C–6°C) for two hrs. The pieces of chilled Paneer were then removed from water and placed on wooden planks for about 10–15 min. to allow loose water to drain<sup>9,10</sup>.

Prepared Paneer was then used for Organolaptic test, Chemical analysis and texture profile analysis<sup>11,12</sup>.

## Result and Discussion

**Table I) Chemical Analysis of Paneer**

**A) Chemical analysis of Paneer prepared from buffalo milk using 2% coagulants**

Parameters	Citric acid	Ascorbic acid	Lactic acid	Tartaric acid
Moisture	51.50	50.74	51.50	51.81
Total solid	48.19	48.40	46.92	47.70
Fats	25.88	28.88	24.08	24.87
Protein	20.75	22.80	19.81	19.81
Ash	1.33	1.607	1.074	1.42
Yield of paneer	20.52	20.91	20.16	20.27

**B) Chemical analysis of Paneer prepared from buffalo milk using 4% coagulants**

Parameters	Citric acid	Ascorbic acid	Lactic acid	Tartaric acid
Moisture	53.10	52.69	55.98	54.91
Total solid	45.25	47.89	42.19	45.19
Fats	23.69	25.16	22.63	22.69
Protein	18.71	19.39	17.69	17.69
Ash	1.15	1.35	1.012	1.049
Yield of paneer	18.69	19.10	18.19	19.10

**Table II) Textural analysis characterization of Paneer during storage**  
(Analysis was carried out on TA-XT Texture Analyzer installed in Department of Food Technology)

**A) Citric acid used as a coagulant**

Parameters	Fresh	3 <sup>rd</sup>	5 <sup>th</sup>	7 <sup>th</sup>
<b>2% Strength</b>				
Firmness	25784	5712	3069	9284
Springiness	38.67	21.06	50.23	23.59
<b>4% Strengths</b>				
Firmness	2412	2977	1427	1903
Springiness	36.11	42.11	33.86	38.95

**B) Ascorbic acid used as a coagulant**

Parameters	Fresh	3 <sup>rd</sup>	5 <sup>th</sup>	7 <sup>th</sup>
<b>2% Strength</b>				
Firmness	7253	5475	8211	5321
Springiness	43.52	40.19	40	40.12
<b>4% Strengths</b>				
Firmness	5576.5	7229	7303	5977
Springiness	44	42	40.03	41

**C) Lactic acid used as a coagulant**

Parameters	Fresh	3 <sup>rd</sup>	5 <sup>th</sup>	7 <sup>th</sup>
<b>2% Strength</b>				
Firmness	4790	4131	3719.2	3071.16
Springiness	36.83	39.6	39	38
<b>4% Strengths</b>				
Firmness	5882	2816.2	2552	3438
Springiness	32.17	37.66	37.5	38

**D) Tartaric acid used as a coagulant**

Parameters	Fresh	3 <sup>rd</sup>	5 <sup>th</sup>	7 <sup>th</sup>
<b>2% Strength</b>				
Firmness	1813	3074	2122	1741
Springiness	32	32.56	35.07	38
<b>4% Strengths</b>				
Firmness	3684	4035	14471.2	4613.2
Springiness	40.5	38	39.29	36

The study was conducted in 2 phases in a systematic approach to know the characterization of paneer. The first approach in terms of their chemical analysis of the fresh paneer made by buffalo milk using different coagulant which evaluate overall acceptability, yield of paneer. Where as the second approach in terms of texture profile in which the springiness, firmness of fresh paneer and during the 8 day's storage at 4<sup>0</sup>C- 6<sup>0</sup>C temperature made from buffalo milk was noted. By chemical analysis, the higher fat content in the paneer prepared by using 2% coagulant was Ascorbic acid (28.88%) sample followed by Citric acid

(25.88%), Tartaric acid (24.87%) and Lactic acid (24.08). Similarly paneer prepared by using 4% coagulant was Ascorbic acid(25.16), Citric acid(23.69), Tartaric acid(22.69) and Lactic acid having (22.63).

By using 2% coagulant the higher moisture content in Tartaric acid (51.81%) and lower in Ascorbic acid (50.74%) By using 4% coagulant the higher moisture content in Lactic acid(55.98) and lower in Ascorbic acid. It was also noted that using 2% coagulant the higher yield in Ascorbic acid (20.91%) and lower in

Lactic acid (19.16%) sample. The same result was obtained by using 4% coagulant, the higher yield in ascorbic acid(19.10) and lower in Lactic acid(18.19). The textural study had been carried out for the paneer prepared from different coagulants at different percentage. The paneer was stored for 8 days and alternately its texture was checked to know its firmness and springiness.

In case of citric acid the paneer prepared from 2% and 4% coagulant was stored for 8 day and its texture was analyzed on TA-XT ANALYZER for alternate days which shows different texture for different days. The paneer prepared from 2% coagulant having firmness (2578) and its springiness was (38.672). On third day the firmness was (5712) similarly on fifth and seventh day it was (3069) and (9280). The graph shows on first, third and fifth day the force required were same. Till 5 days the firmness, hardness, and springiness remains same whereas on eight day the firmness was decreased. The paneer prepared from 4% coagulant having firmness (2412) and springiness (36.11). ON fifth day and seventh day the firmness gets decreased to (1903) and (38.95) respectively. It shows graphically that on first, third and fifth day the firmness, hardness, and springiness of the paneer remains same whereas on eight day it was decreased. This study shows that the paneer can be consumed or acceptable for five days and its texture remains good.

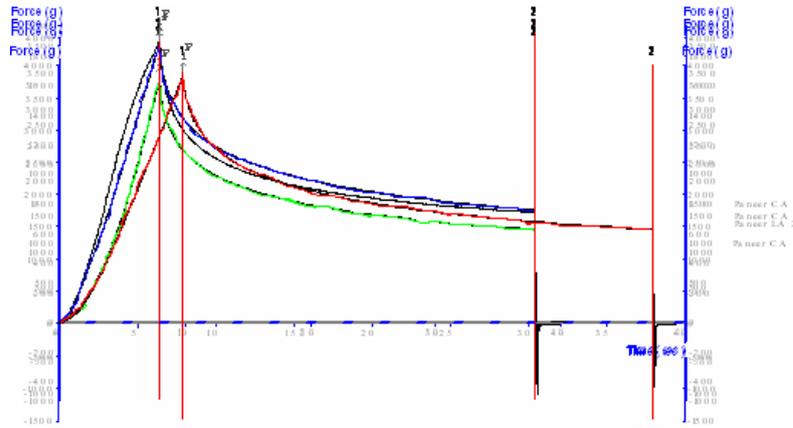
In case of ascorbic acid the paneer prepared from 2% and 4% coagulant was stored for 8 days and its texture was analysed for alternate days which shows different texture for different days. The paneer prepared from 2% coagulant the firmness and springiness of fresh paneer was (7253) and (43.52). On fifth day the firmness was increased and springiness gets decreased. It shows graphically that on first day and third day the force was more and it remain same whereas on fifth and eight day the force was decreased. This study shows for three days the texture of paneer was same and can be acceptable but for fifth and eight day the texture was reduced. The paneer prepared from 4% coagulant having firmness (7229) and springiness (42). On seventh day the firmness and springiness both gets decrease. It shows graphically that for all eight days the firmness, springiness and hardness of the paneer was same. It shows its texture was very good and exceptable to the market.

In case of lactic acid the paneer prepared from 2% and 4% coagulant was stored for 8 days and its texture was analysed for alternate days which shows different texture for different days. The paneer prepared from 2% coagulant having firmness (4790) and springiness (36.83). On seventh day the firmness gets reduced to (3071). It shows graphically that on first day the force was more means the firmness of paneer was good whereas on third and fifth day the texture remains same but on eight day it was reduced and the quality of paneer was decreased. The paneer prepared from 4% coagulant having firmness on third day (2816) and springiness (37.66). Till seventh day it was reduced to (3438) and (38).It graphically refers that on first day the force required by texture analyzer was more compared to third and fifth day. On eight day the force required was reduced. Its firmness hardness and gumminess was not acceptable.

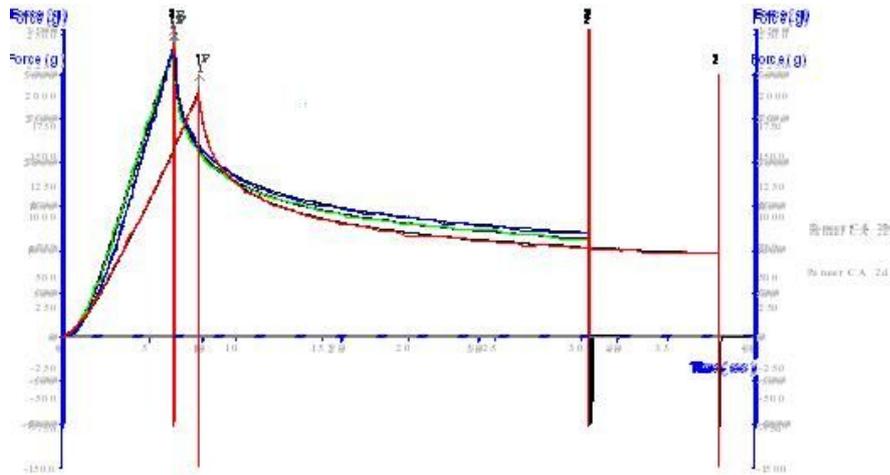
In case of tartaric acid the paneer prepared form 2% and 4% coagulant was stored for 8 days and its texture was analysed on the texture analyzer for alternate day. The paneer prepared from 2% coagulant having firmness on third day was (3074) and springiness (32.56). On fifth and seventh day it gets reduced to (2122) and (1741) resp. It shows graphically that on first day the force required by paneer was more compared to third, fifth and eight day. As the days increases the textural characteristics of the paneer gets reduced whereas the paneer prepared from 4% coagulant having firmness on third day (4035) and springiness to (38). On fifth and seventh day it was getting increased to (4613) and (4472). Where as, the springiness gets reduced to (36). It graphically refers that on first day and third day the force required by paneer was more but on fifth day and eight day the force was reduced. It shows the firmness and hardness was reduced on last days and it was not acceptable.

So Paneer are significantly affected by different coagulant used, therefore the fat, moisture and yield content was significantly affected on the texture, taste and overall acceptability also. The textural properties of panner vary significantly with the level of fat, moisture and yield content as well as difference in coagulants.

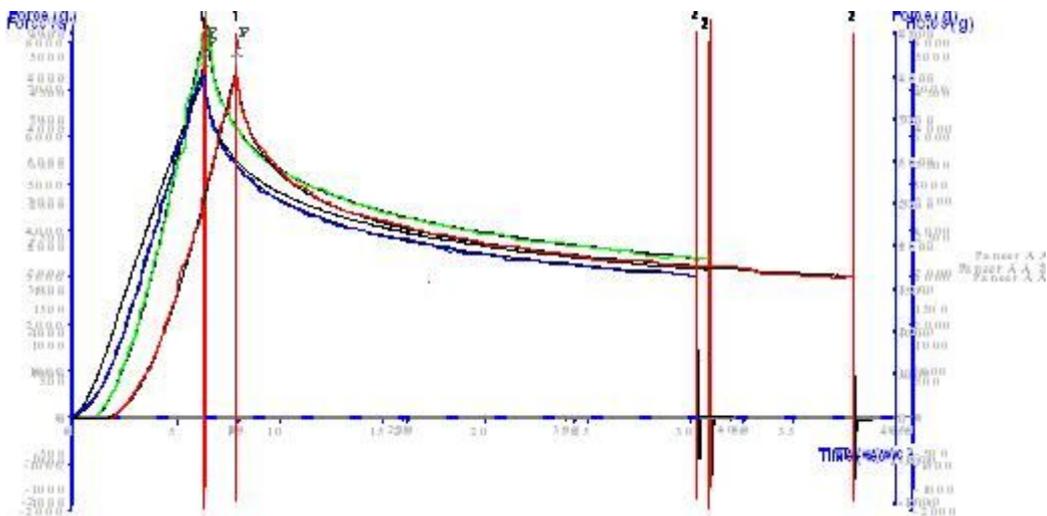
So from the present it can concluded that among four sample using different coagulants for the preparation of Paneer by buffalo milk, ascorbic acid is the best coagulant for providing best texture properties as well as chemical and organolaptic test.



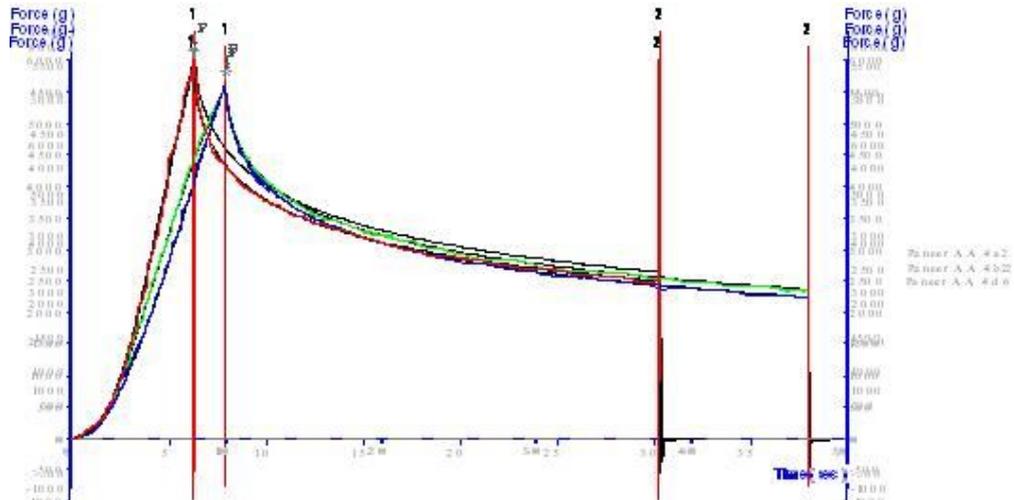
Graph1) showing Eight days storage studies of Paneer prepared from 2% citric acid.



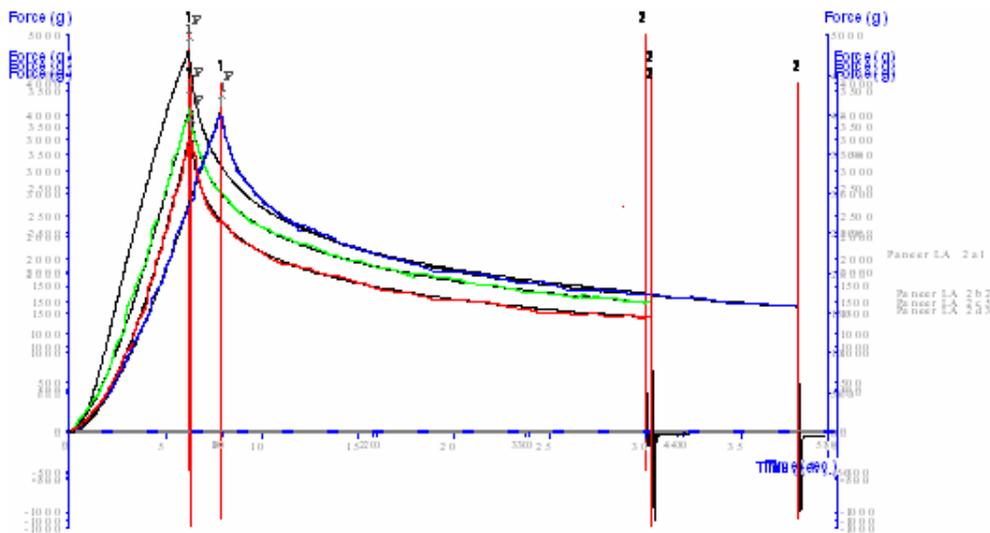
Graph 2) showing Eight days storage studies of Paneer prepared from 4% citric acid



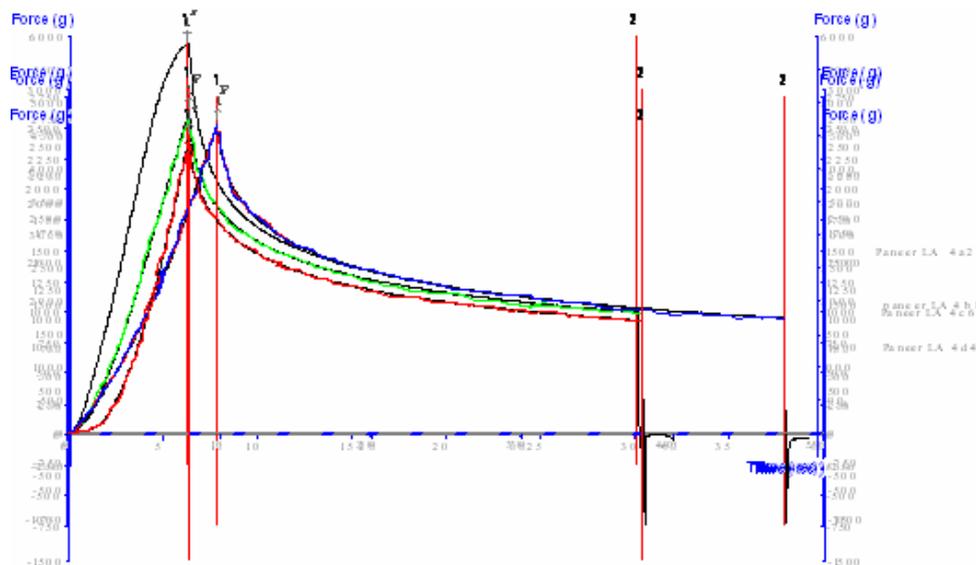
Graph 3) showing Eight days storage studies of Paneer prepared from 2% ascorbic acid

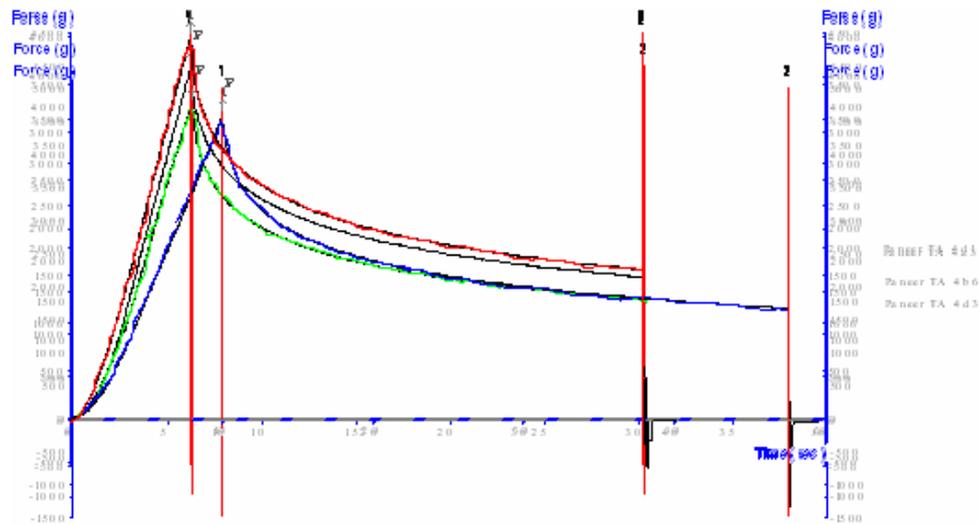
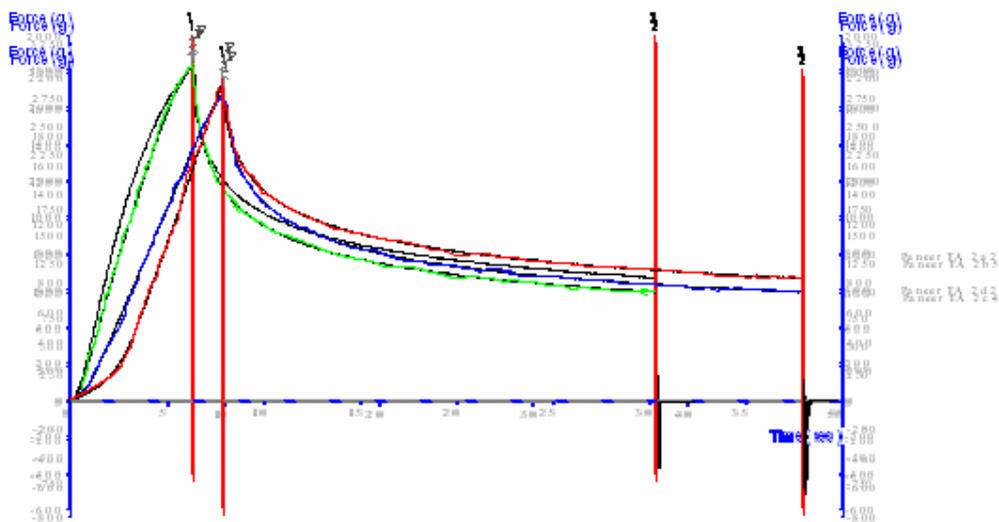


Graph 4) showing Eight days storage studies of Paneer prepared from 4% ascorbic acid



Graph 5) showing Eight days storage studies of Paneer prepared from 2% lactic acid



**Graph 6) showing Eight days storage studies of Paneer prepared from 4% lactic acid****Graph 7) showing Eight days storage studies of Paneer prepared from 2% tartaric acid****Graph 8) showing Eight days storage studies of Paneer prepared from 4% tartaric acid**

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