International Journal of Veterinary Sciences and Animal Husbandry

ISSN: 2456-2912
VET 2024; SP-9(1): 189-192

www.veterinarypaper.com
Received: 26-10-2023
Accepted: 30-11-2023

Lokendra Singh
Department of Livestock Products Technology, College of Veterinary and Animal Science, Navania, Vallabhnagar, Udaipur, Rajasthan, India

Umesh S Suradkar
Department of Livestock Products Technology, College of Veterinary and Animal Science, Navania, Vallabhnagar, Udaipur, Rajasthan, India

Gajendra Mathur
Department of Livestock Products Technology, College of Veterinary and Animal Science, Navania, Vallabhnagar, Udaipur, Rajasthan, India

Surendra Kumar Yadav
Department of Livestock Products Technology, College of Veterinary and Animal Science, Navania, Vallabhnagar, Udaipur, Rajasthan, India

Karishma Rathore
Department of Veterinary Microbiology, College of Veterinary and Animal Science, Navania, Vallabhnagar, Udaipur, Rajasthan, India

Corresponding Author:
Lokendra Singh
Department of Livestock Products Technology, College of Veterinary and Animal Science, Navania, Vallabhnagar, Udaipur, Rajasthan, India

Studies of the shelf life of goat milk paneer at ambient temperature

Lokendra Singh, Umesh S Suradkar, Gajendra Mathur, Surendra Kumar Yadav and Karishma Rathore

Abstract
The present study was conducted on goat milk paneer to estimate the effect of storage period in term of acidity, pH, sensory quality, microbial quality (Total plate count, Yeast and mould count) of goat milk paneer. The goat milk paneer was stored at ambient temperature (25±2 °C) to analyze it`s acidity, pH, sensory quality, microbial quality (acidity, pH,) at every 3rd day of storage. The mean value of acidity, Total plate count, Yeast and mould count increase significant (p<0.05) while pH and sensory quality decrease with increasing storage period. On the basis of above study it is observed that based on pH, acidity, sensory quality and microbial quality the shelf life of goat milk paneer at ambient temperature (25±2 °C) may be 2 days.

Keywords: Goat milk, paneer, ambient temperature, storage period

1. Introduction
Livestock sector plays an important role in India economy. Total milk production in India is 230.58 million tone and goat milk contribution is 3.30 percent of total milk production in India (Basic Animal Husbandry Statistics, 2023) [9]. Goat milk has been recommended as an ideal substitute for cow and human milk (Zenebe *et al.*, 2014) [15].Goat milk can be used to prepare a wide variety of dairy products as paneer, cheese, butter, ice-cream, butter milk, condensed milk, yoghurt, flavoured milk, sweets and candy (Fazilah *et al*., 2018) [5]. The growing consumer interest in goat's milk and its dairy products is related to the nutritional benefits offered by these products (Clark & Gacia, 2017) [4]. Good quality paneer is characterized by a marble white color, sweetish, mildly acidic taste, nutty flavour, spongy body and closely knit smooth texture (Patel, 1991) [12]. The storage period have a significant effect on the acidity, pH, sensory quality, microbial quality (Total plate count, Yeast and mould count) of goat milk paneer. The present research work was carried out as an attempt to utilize goat milk for the preparation of paneer, a value added product. In order to estimate the effect of storage at ambient temperature (25±2 °C) in term of acidity, pH, sensory quality, microbial quality (Total plate count, Yeast and mould count) of goat milk paneer.

2. Materials and Methods
2.1. Preparation of paneer: Fresh goat milk was procured from livestock research station, Bojunda, Chittorgarh and standardized to 5 percent fat for preparation of paneer. The product was prepared by the process suggested by *Sachadeva and Singh* (1988) [13] with slight modification. The standardized goat milk was added with 0.10 percent calcium chloride and heated to 90 °C without holding then subsequently cooled to 85 °C and at this temperatute 1 percent citric acid solution as coagulant were added slowly with continuous agitation till clear whey separated out. The coagulum was left for 5-10 minutes in the whey and then it drained through muslin cloth and pressed in a hoof at 2-3 kg/cm^2 pressure. Paneer block was dipped in chilled water for 5-10 minute and packaged in pre-sterilized LDPE pouches and stored at (25±2 °C).

2.2. pH: The pH of product was determined by the Potentiometric Method using table top model of (SANCO, India). The method described by *Franklin and Sharpe* (1963) [6] for cheese was used.

2.3. Titrable acidity: The titrable acidity of goat milk paneer was determined as per the method specified in IS 1479 (Part - 1) (1960) [11].

2.4. Sensory quality: The goat milk paneer was subjected to the sensory evaluation by a panel of five judges from the Department of Livestock Products Technology and Department of Veterinary Public Health by using the procedure described in IS 6273 (Part II) (1971) [10]. The product was judged for different quality attributes by 9 point Hedonic scale (*Amerine et al*., 1967) [1].

2.5. Microbiological analysis: Total plate count, Yeast and mould count of paneer was determined as per the standard method given in APHA (1992) [2].

2.5 Statistical analysis: Data were statistically analyzed by using the method described by Snedecor and Cochran (1989) [14].

3. Results and Discussion:

The Fresh and stored paneer was analyzed for their acidity, pH, sensory quality and microbial quality (Total plate count, Yeast and mound count) to know the storage stability of goat milk paneer at ambient temperature (25±2 °C).

3.1. Changes in acidity of paneer during storage at ambient temperature (25±2 °C)

The results obtained for acidity of paneer at ambient temperature are delineated in Table 1. It is observed that there is a progressive increase in acidity of paneer. Fresh paneer had the acidity of 0.337±0.00 percent LA which increased significantly ($p \leq 0.05$) to 0.55±0.01 on 3rd day.

Goel (2000) [8] reported that the acidity of the laboratory made paneer stored at ambient temperature (22±1 °C) which increased from initial average value of 0.51 to 0.79 percent on the 4th day. On 3rd day of storage at ambient temperature the product was found unacceptable by the sensory panel of judges. According to FSSAI (2011) [7] titrable acidity of paneer within acceptable limit should be 0.50. Thus on ambient temperature goat milk paneer acceptable may be up to 2 days.

3.2. Changes in pH of paneer during storage at ambient temperature (25±2 °C): Influence of period of storage at ambient temperature on pH of paneer is presented in Table 1. The initial value of 5.89±0.01 pH decreased significantly ($p \leq 0.05$) to 5.32±0.01 on 3rd day. On 3rd day of storage at ambient temperature the product was found unacceptable by the sensory panel of judges. Thus, it can be observed from the present study of storage of paneer at ambient temperature (25±2 °C) that paneer prepared from goat milk can well be stored up to 2 days thereafter it becomes unacceptable with respect to its acidity and pH properties.

Table 1: Changes in acidity and pH of paneer during storage at ambient temperature (25±2 °C)

Attributes	Storage period (Days)	
	0	3
Acidity (% LA)	0.34^{a}±0.00	0.55^{b}±0.02
pH	5.89^{a}±0.02	5.32^{b}±0.01

Each observation is a mean ± SE of three replicate experiment (n=3)
Mean in row bearing a common superscripts do not differ significantly ($p<0.05$).

3.3. Changes in sensory quality of paneer during storage at ambient temperature (25±2 °C)

The fate of any food product has always rested on the acceptance of the product by consumers. All of the dairy products have a tendency to develop certain specific and non-specific organoleptic short comings during storage and paneer is no exception to it. The data on the sensory quality of paneer referring to general appearance, taste and flavor, body and texture, and overall acceptability after a storage period at ambient temperature (25±2 °C) are depicted in Table 2.

3.3.1. General appearance: The general appearance of paneer plays a vital role in its acceptance by consumer. As is the case with all of the dairy products during storage, paneer undergoes various Physico-chemical and microbial changes, which affects the general appearance of the product. The results obtained are delineated in Table 2 for storage at ambient temperature (25±2 °C). Fresh paneer had a General appearance score of 8.03±0.05 which was found to decrease significantly ($p \leq 0.05$) to 4.33±0.05 on 3rd day of storage. The paneer was unacceptable on 3rd days of storage with respect to general appearance.

3.3.2. Taste and flavor

During storage, paneer undergoes various physico-chemical and microbial changes which tends to affect the flavor of the product. Taste and flavor is the most important parameter of sensory profile as it along with other attributes decides the acceptability of paneer. The results obtained are delineated in Table 2 for ambient storage. Fresh paneer had a taste and flavour score of 7.93±0.04 which was found to decrease significantly ($p \leq 0.05$) to 2.46±0.14 on storage period of 3rd day. The product was not acceptable on 3rd day with respect to taste and flavor. During storage of paneer, decrease in flavour score might be a result of changes in physico-chemical and microbial properties.

3.3.3. Body and texture

Various sensory attributes collectively determine the acceptability of paneer and one such attribute is body and texture score. The results obtained are declined in Table 2 for ambient temperature storage. It is evident from tabulated values that the paneer had an initial body and texture score of 8.10±0.03 which decreased significantly ($p \leq 0.05$) to 5.66±0.01 on 3rd day. The body and texture of the product was not well acceptable on 3rd day of storage.

3.3.4. Overall acceptability

As a whole, the acceptability of paneer exclusively depends on its organoleptic characteristics, which are based on the compositional, physico-chemical as well as microbiological characteristics. The overall acceptability score which describes the overall quality of the product is the collective score of body and texture, taste and smell i.e. flavour and general appearance. Consequently, it follows the trend noticed with the individual organoleptic parameter studied. These attributes of paneer which govern the organoleptic characteristics of the product, in turn are dependent on the strength and type of package as well as the temperature of storage. The results obtained are declined in Table 2 for ambient temperature storage. Fresh paneer had an overall

acceptability score of 8.20±0.03 which decreased significantly ($p \leq 0.05$) to 3.33±0.01 on 3rd day. The product was unacceptable on 3rd day.

Thus, on the basis of sensory properties, it can be concluded that paneer can give a shelf life may be up to 2 days at ambient temperature. Thus, it can be observed from the present study of storage of paneer ambient temperature (25±2 °C) that paneer prepared from goat milk well acceptable up to 2 days of storage. The observed decline in overall acceptability of paneer could partly attributed to the development of change in flavour owing to development of bitter after taste and dull general appearance to some extent. Therefore it can be concluded that total score or in turn the organoleptic attributes of the product follows the trend that was evident in individual attributes of paneer.

The findings of all sensory attributes (general appearance, taste and flavor, body and texture and overall acceptability) of present investigation are in close agreement with those of Choudhary (2014) [3] who reported that score for overall acceptability of paneer at room temperature this acceptable period was reduced to 3days.

Table 2: Changes in sensory quality of paneer during storage at ambient temperature (25±2 °C)

Sensory Quality	Storage period (Days)	
	0	3
General appearance	8.03^{a}±0.05	4.33^{b}±0.05
Taste and Flavour	7.93^{a}±0.04	2.46^{b}±0.14
Body and Texture	8.13^{a}±0.03	5.66^{b}±0.01
Overall acceptability	8.26^{a}±0.03	3.33^{b}±0.01

Each observation is a mean ± SE of three replicate experiment (n=3) Mean in row bearing a common superscripts do not differ significantly ($p<0.05$).

3.4. Changes in microbial quality of paneer at ambient temperature (25±2 °C)

Most of the milk products have a highly perishable nature. This perishability of dairy products is mostly ruled by microbiological quality of that product. The microbiological quality of dairy products like paneer becomes more important owing to the sole dependence of product shelf life on the growth of microorganisms in product during storage. Most of the physico- chemical changes like change in pH, acidity etc. which in turn decides the fate of paneer during storage are profoundly affected by the presence and growth of various microorganisms. Taking these facts into consideration, paneer packed in low density polyethylene pouches was judged for its microbiological quality during storage at ambient temperature (25±2 °C). The microbiological status (*viz*., Standard Plate Count, Yeast and Mould Count) is presented in Table 3 for storage at ambient temperature.

3.4.1. Total Plate Count: Total Plate Count is the collective enumeration of the overall microbiological quality of the product, after production and during its storage period. It gives an overall idea about the status of paneer in terms of its overall microbiological quality during storage. The results obtained are declined in Table 3 for ambient temperature storage. Fresh paneer sample had total plate count of 4.2±0.02 $\log_{10}$ cfu/g which increased significantly ($p \leq 0.05$) to 5.65±0.10 log10 cfu/g on 3rd day. The value of total plate count is within limit so paneer give shelf life up to 3 days at ambient temperature (25±2 °C). Similar finding were made by Choudhary (2014) [3] who reported that the initial total plate count of paneer at room temperature on 0 day was 3.5×10^{2} cfu/g end of 2nd it was 4.6×10^{3} cfu/g and et the end of 3rd it was 5.2×10^{3} cfu/g and paneer can be give shelf life up to 2 days at room temperature (30±5 °C).

3.4.2. The yeast and mold count: The Yeast and Mold Count of paneer stored at ambient temperature (25±2 °C) are presented in Table 2. Fresh paneer sample had a yeast and mold count of 1.47±0.12 $\log_{10}$ cfu/g which increased significantly ($p \leq 0.05$) to 2.40±0.00 log10 cfu/g on 3rd day. On 3rd day it was found that Yeast and Mould count just crosses permissible limit because according to FSSAI (2011) [7] permissible limit of Yeast and Mould count is 250 cfu/g *i.e.* 2.39 $\log_{10}$ cfu/g so paneer give shelf life up to 2 days. Thus on the basis of microbial study of paneer at ambient temperature it is found that goat milk paneer is acceptable may be up to 2 days at ambient temperature (25±2 °C).

Table 3: Changes in microbial quality of paneer during storage at ambient temperature (25±2 °C).

Microbial Quality	Storage period (Days)	
	0	3
Total plate count ($\log_{10}$ cfu/g)	4.20^{a}±0.02	5.65^{b}±0.10
Yeast and mould count ($\log_{10}$ cfu/g)	1.47^{a}±0.12	2.40^{b}±0.00

Each observation is a mean ± SD of three replicate experiment (n=3) Mean in row bearing a common superscripts do not differ significantly ($p<0.05$).

4. Conclusion

Based on the results obtained in this study it can be concluded that paneer gave an acceptable product till the storage period may be up to 2 days at ambient temperature (25±2 ºC).

5. References

1. Amerine MA, Pongborn RM, Roessler EM. A Principle of sensory evaluation of foods. Academic Press, New York; c1967.
2. APHA. Recommended methods for the microbiological examination of foods. American public health association, Inc. New York; c1992.
3. Choudhary N. Blending of soymilk with cow milk and buffalo milk to prepare paneer. Ph.D. Thesis submitted to Jiwaji University Gwalior; c2014. p. 1-95
4. Clark S, García MB. A 100-year review: Advances in goat milk research. Journal of Dairy Science. 2017;100(12):10026-10044.
5. Fazilah NF, Ariff AB, Khayat ME, Rios-solis, Halim M. Influence of probiotics, prebiotics, synbiotics and bioactive phytochemicals on the formulation of functional yoghurt. J of functional foods. 2018;48:387-399.
6. Franklin JG, Sharpe ME. The incidence of bacteria in cheese milk and Cheddar cheese and their association with flavour. J Dairy Res. 1963;30(1):87-99.
7. FSSAI. Food Safety and Standards (Food Products Standards and Food Additives) Regulations, New Delhi; c2011, p. 293.
8. Goel BK. Reduction in the level of air borne contamination by the use of air washing and UV rays and its effect on shelf life of Paneer. Ph.D. Thesis submitted to Gujarat Agricultural University, Anand Campus, Anand, Gujarat; c2000.
9. http://www.dahd.nic.in. 20 Jun, 2023.
10. IS. Guide for sensory evaluation of foods Part II. Methods and evaluation cards. Indian Standards Institution, Manak Bhavan, New Delhi 6273; 1971.

11. IS. Methods of test for dairy industry Part I. Rapid examination of milk. Indian Standards Institution, Manak Bhavan, New Delhi 1479; c1960.
12. Patel RK. Indigenous milk products of India. Indian dairym. 1991;43:120-125.
13. Sachdeva S, Singh S. Optimization of processin parameters in the manufacture of paneer. J Fd. Sci. Technol. 1988;25(3):142-145.
14. Snedecor GW, Cochran WJ. Statistical methods, 8th ed. Lowa state university press, Amer, lowa, US; c1989.
15. Zenebe T, Ahmed N, Kabeta T, Kebede G. Review on medicinal and nutritional values of goat milk. Acad. J Nutr. 2014;3(3):30-39.