

Original Research Article

<https://doi.org/10.20546/ijcmas.2019.803.089>

## Changes in Sensory and Microbiological Parameters of Paneer Nuggets Prepared by Steam Cooking Method under Storage Conditions

Rajender Kumar<sup>1</sup>, S. Sivakumar<sup>2\*</sup>, Rekha Chawla<sup>2</sup> and S.K. Mishra<sup>2</sup>

<sup>1</sup>NDRI Karnal, Haryana, India

<sup>2</sup>College of Dairy Science and Technology, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, India

\*Corresponding author

### ABSTRACT

#### Keywords

Paneer nuggets,  
Steam cooking,  
Sensory,  
Microbiological,  
Storage, Aerobic  
packaging

#### Article Info

Accepted:  
07 February 2019  
Available Online:  
10 March 2019

Starting with the paneer as a base material, paneer nugget was prepared by the addition of food additives such as spices mix, condiments, refined wheat flour, skim milk powder and sodium caseinate by steam cooking method. Keeping in view of the health benefits, the steam cooking method was used for preparation of paneer nuggets as compared to deep fat frying. The present study was envisaged to evaluate the changes occurred in sensory and microbiological parameters of paneer nugget under storage conditions. The shelf-life of paneer nuggets with aerobic packaging was found to be 2 and 9 days respectively at ambient and refrigeration temperature. Nine-point hedonic scale was employed to carry out the evaluation of samples for sensory attributes such as colour and appearance, texture, sweetness, flavour and overall acceptability.

### Introduction

The ever-increasing demand for the ready to eat snack foods leads to the emergence of innovative dairy products like paneer nuggets which was prepared by steam cooking method. The main reasons for the demand of ready to eat snack foods are due to increase in disposable incomes, changes in consumer concerns, perceptions on nutritional quality and safety of food. With the status of largest milk producer in the world, it is expected that the India's milk production will reach 185

million tonnes by the year 2020 (NDDB 2018).

Milk is considered to be complete food and about half the milk produced is consumed in the liquid form and the remaining half is used to prepare dairy products. Keeping in view of the importance of value addition of milk and milk products, the variety of traditional and value-added dairy products has been manufactured by converting the surplus milk during the flush season of milk production as a means of preservation with longer shelf life

which adds value to milk and also creates employment opportunities to large number of small producers especially women and poor, milk vendors and milk processors (Chandel and Chauhan, 2010; Patil, 2011). These traditional dairy products have made a great impact in the social, cultural and economic prospects of Indian heritage and are gradually becoming popular all over the world (Bandyopadhyay *et al.*, 2006).

Paneer nugget can be prepared by paneer as a base material along with addition of food additives such as spices mix (black pepper, chilli powder, coriander powder and turmeric powder), condiments (ginger and garlic paste), refined wheat flour, skim milk powder and sodium caseinate for preparation of paneer nuggets by steam cooking method. Different methods can be employed for cooking of paneer nuggets such as deep fat frying and battering. Based on the health benefits and economic aspect, steam cooking method was used for preparation of paneer nuggets, further this method not only improve the parameters such as yield, sensory characteristics, shelf life and also reduces the cost of production. Quality of the Indian dairy products deteriorates due to post manufacture contamination and also during storage. The appropriate packaging method enhances the shelf life of food products by protecting them from different deteriorative changes such as sensory and microbiological etc. Keeping in view of this background, the present study was carried out with the objective of to study the changes in sensory and microbiological parameters of paneer nuggets packed with aerobic packaging under storage conditions.

## **Materials and Methods**

The samples of investigation were manufactured in the Experimental Dairy plant and analyses of samples were conducted in the Dairy Technology laboratory of the

College. Good quality raw materials like spices, condiments, and skim milk powder, refined wheat flour and sodium caseinate were procured from reputed brands. The packaging material LDPE was procured from local market Ludhiana. Toned milk obtained was converted into paneer using method followed by Bhattacharya *et al* (1971). The paneer nugget was prepared by steam cooking method using autoclave as per the procedure followed by Kumar *et al.*, (2018).

To evaluate the shelf life of paneer nuggets product was cooled immediately after manufacturing and converted into small cuboidal pieces and sample sufficient for storage study was packed in LDPE and stored at controlled ambient ( $25 \pm 1^{\circ}\text{C}$ ) and refrigeration ( $4 \pm 1^{\circ}\text{C}$ ) temperature in aerobic packaging till spoilage. The product was analysed for its sensory attributes and microbiological parameter (IS: 1981) at the regular interval of 1 day at controlled ambient ( $25 \pm 1^{\circ}\text{C}$ ) and 3 days at refrigeration ( $4 \pm 1^{\circ}\text{C}$ ) temperature conditions. Sensory profile of stored product was evaluated by a panel of seven semi-trained panellists with the help of 9 point hedonic scale.

## **Results and Discussion**

### **Effect of storage on sensory properties of paneer nuggets stored at refrigeration ( $4 \pm 1^{\circ}\text{C}$ ) and controlled ambient ( $25 \pm 1^{\circ}\text{C}$ ) temperature under aerobic packaging**

A gradual decrease in the sensory scores of paneer nuggets was observed during storage due to the different changes occurring with increase in period of storage i.e. oxidation of fat, loss of moisture, increase in acidity along with the textural changes. All the sensory parameters decreased slowly at refrigeration ( $4 \pm 1^{\circ}\text{C}$ ) temperature as compared to controlled ambient ( $25 \pm 1^{\circ}\text{C}$ ) temperature (Figure 1 and 2) in aerobic packaging. The

flavour, colour and appearance, texture, chewiness and overall acceptability scores of fresh paneer nuggets at initial day were 8.06, 8.08, 8.10, 8.25 and 8.12, respectively.

The colour and appearance scores decreased from 8.08 to 6.55 and 8.08 to 6.84 after 2 days of storage at controlled ambient ( $25 \pm 1^\circ\text{C}$ ) temperature and 9 days storage at refrigeration ( $4 \pm 1^\circ\text{C}$ ) temperature, respectively in aerobic packaging. The decrease in colour and appearance score was may be due to evaporation of moisture from the surface of the paneer nuggets. The decrease in colour scores was statistically significant ( $p < 0.05$ ).

Similarly the texture scores decreased from 8.10 to 6.39 and 8.10 to 6.35 after 2 days of storage at controlled ambient ( $25 \pm 1^\circ\text{C}$ ) temperature and 9 days storage at refrigeration ( $4 \pm 1^\circ\text{C}$ ) temperature, respectively in aerobic packaging. Texture became hard due to loss of moisture during storage and this could be the reason for decrease in texture scores.

Flavour scores decreased from initial value of 8.06 to 6.04 and 6.54 after 2 and 9 days storage at controlled ambient ( $25 \pm 1^\circ\text{C}$ ) and refrigeration ( $4 \pm 1^\circ\text{C}$ ) temperature, respectively in aerobic packaging. Chewiness scores also decreased at both the temperatures, decreasing from initial value of 8.25 to 6.08 and 6.82 after 2 and 9 days storage at controlled ambient ( $25 \pm 1^\circ\text{C}$ ) and refrigeration ( $4 \pm 1^\circ\text{C}$ ) temperature, respectively in aerobic packaging. Overall acceptability score, which is the average value of all other sensory parameters shown a decreasing trend with the progression of storage period. Overall acceptability score decreased from initial value of 8.12 to 6.13 and 6.66 after 2 and 9 days storage at controlled ambient ( $25 \pm 1^\circ\text{C}$ ) and refrigeration ( $4 \pm 1^\circ\text{C}$ ) temperature,

respectively in aerobic packaging. The effect of storage period was significant on sensory scores and multiple comparison test indicated the mean values for different storage parameters differs significantly ( $p < 0.05$ ) on different days of storage. Similar trend of decrease in sensory scores was observed by Singh *et al.*, (2014).

The product was acceptable for 2 and 9 days when stored at controlled ambient ( $25 \pm 1^\circ\text{C}$ ) and refrigeration ( $4 \pm 1^\circ\text{C}$ ) temperature, respectively in aerobic packaging. The effect of storage period was significant on sensory parameters and multiple comparison tests indicated the mean values for different sensory parameters differ significantly ( $p < 0.05$ ) on different days of storage.

#### **Effect of storage on microbiological properties of paneer nuggets stored at refrigeration ( $4 \pm 1^\circ\text{C}$ ) and controlled ambient ( $25 \pm 1^\circ\text{C}$ ) temperature under aerobic packaging**

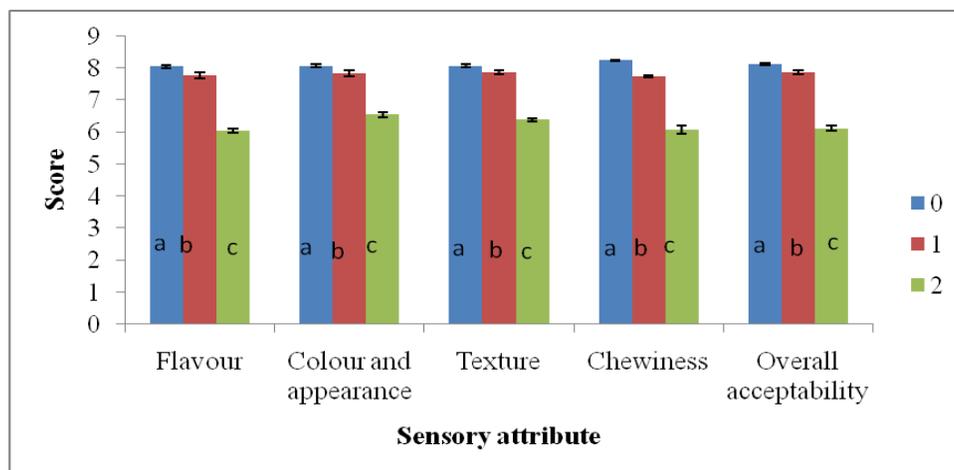
Various types of microorganisms produce decay in the perishable food products leading to the substantial losses of nutrients and considerable changes in properties takes place in the food material. The microbiological stability of heat processed food is affected by temperature and duration of the thermal process. The products which are under processed are liable to microbial spoilage and over processed are inferior in nutritional aspects. Microbiological changes in paneer nuggets during storage are given in Figure 3 and 4. The increase in SPC could be attributed to favourable environmental factors like temperature, relative humidity, storage conditions and food factors like pH, water activity, moisture and nutrients present.

The standard plate count of paneer nuggets increased significantly ( $p < 0.05$ ) during storage at refrigeration ( $4 \pm 1^\circ\text{C}$ ) temperature

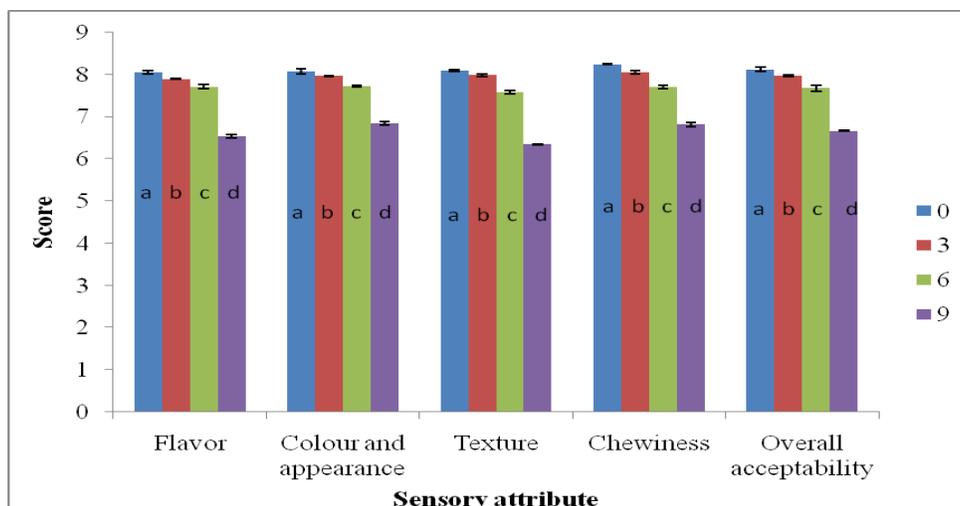
in aerobic packaging. The standard plate count increased from 0 log cfu/g on initial day to 2.47 log cfu/g on 9<sup>th</sup> day at refrigeration (4±1°C) temperature in aerobic packaging, coliform count increased from 0 log cfu/g on initial day to 1.59 log cfu/g on 9<sup>th</sup> day at refrigeration (4±1°C) temperature in aerobic packaging whereas the yeast and mold count increased from 0 log cfu/g on initial day to 1.69 log cfu/g on 9<sup>th</sup> day at refrigeration (4±1°C) temperature in aerobic packaging.

Although most of the microorganism present were destroyed by the steam cooking but the increase in count with increase in storage period may be due to post production contamination. The effect of storage period was significant on microbiological parameters and multiple comparison tests indicated the mean values for different microbiological parameters differ significantly (p<0.05) on different days of storage.

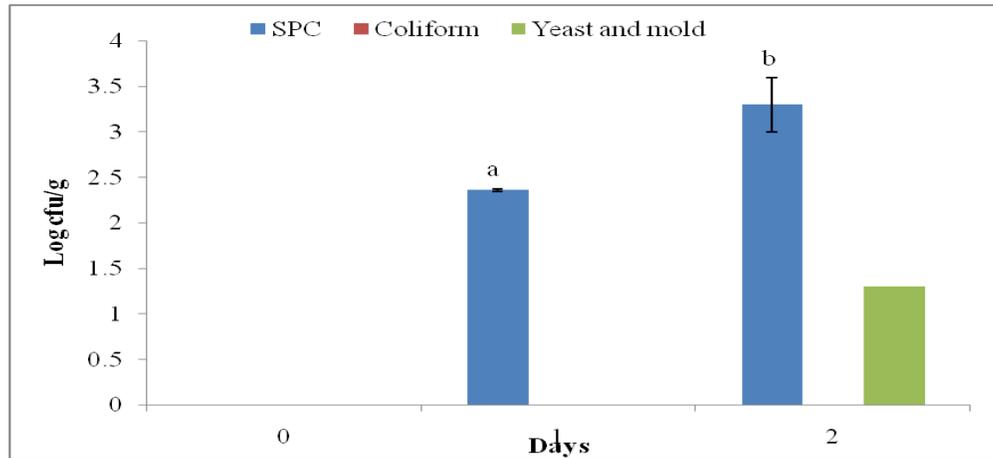
**Fig.1** Effect of storage period on sensory properties of paneer nuggets stored at controlled ambient (25±1°C) temperature (Aerobic Packaging)for 2 days



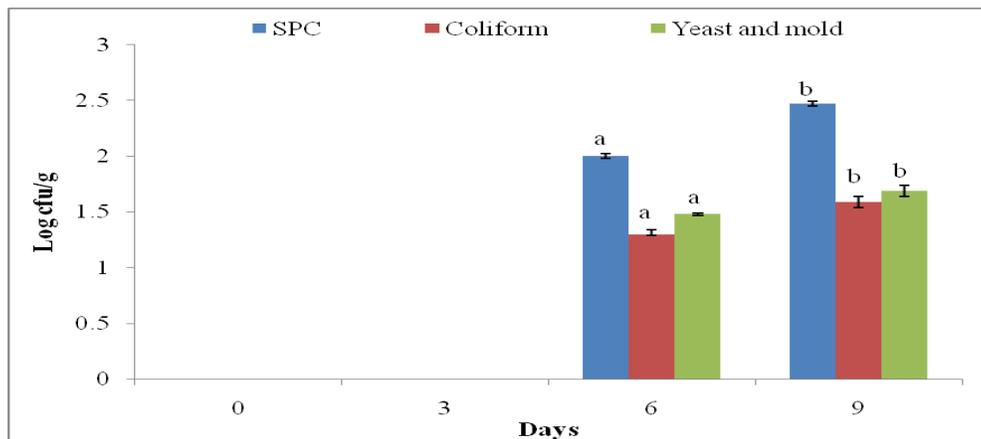
**Fig.2** Effect of storage period on sensory properties of paneer nuggets stored at refrigeration (4±1°C) temperature (Aerobic Packaging)for 9 days



**Fig.3** Effect of storage period on microbiological properties of paneer nuggets stored at controlled ambient ( $25\pm 1^{\circ}\text{C}$ ) temperature (Aerobic Packaging) for 2 days



**Fig.4** Effect of storage period on microbiological properties of paneer nuggets stored at refrigeration ( $4\pm 1^{\circ}\text{C}$ ) temperature (Aerobic Packaging) for 9 days



At refrigeration ( $4\pm 1^{\circ}\text{C}$ ) temperature psychrophiles might have predominated in their growth and multiplication. The yeast and mold count in fresh product was not detected. The increase in acidity during storage leads to favourable environment for the growth and multiplication of yeast and mold. Coliform count increased significantly during entire storage period at either temperature conditions. This refrigeration ( $4\pm 1^{\circ}\text{C}$ ) temperature significantly reduces the growth of spoilage organisms, thus the product shelf

life was increased as compared to ambient temperature. Similar trends were observed by Kumar and Bector (1991); Kumar et al (2007) and Lamdande *et al* (2012).

It was concluded that the shelf-life of paneer nuggets with aerobic packaging was found to be 2 and 9 days respectively at ambient and refrigeration temperature. The product can be further utilized as a ready to eat healthy snack food for the benefit of the consumers.

## References

- Bandyopadhyay, M., Mukherjee, R. S., Chakraborty, R. and Raychaudhuri, U. 2006. A survey on formulations and process techniques of some special Indian traditional sweets and herbalsweets. *Indian Dairyman*.58: 23-35.
- Bhattacharya, D. C., Mathur, O. N., Srinivasan, M. R. and Samlik, O. L. 1971. Studies on the method of production and shelf life of paneer (cooking type of acid coagulated cottage cheese). *Journal of Food Science and Technology*. 8:117–20.
- Chandel, B. S. and Chauhan, A. K. 2010. Present situation and future potential for milk processing in India. *Indian Journal of Dairy Science*.63: 283-91.
- IS: SP 18 (Part XI) 1981. Handbook of food analysis. Part XI, Dairy Products. Bureau of Indian Standards. Manak Bhavan, New Delhi.
- Kumar, P. and Bector, B.S. 1991. Enhancement of shelf-life of paneer with food additives. *Ind. J. Dairy Sci.*, 44: 577–584.
- Kumar, R., Sivakumar, S., Chawla, R. and Talwar, G. 2018. Studies on optimization of paneer nuggets: ready to eat steam cooked product. *Indian Journal of Dairy Science*. 71(1):13-19.
- Kumar, S., Rai, D.C. and Verma, D.N. 2007. Effect of different levels of citric acid on the physico-chemical and sensory attributes of buffalo milk paneer. In: Proceedings of the International Conference on Traditional Dairy Foods. National Dairy Research Institute, Karnal-India, November 14-17.
- Lamdande, A. G., Shyam, R. G. and Kumar, A. 2012. Impact of edible coating and different packaging treatments on microbial quality of paneer. *Journal of Food Process Technology*.3 (6): 22-26.
- NDDB 2018.Milk production <http://www.nddb.org/English/Statistics/Pages/Milk-Production.aspx> India (Accessed on 20.12.2018).
- Patil, G. R. 2011. Traditional dairy products: present status and strategies to promote exports. In: Proceedings of the Brainstorming session on “Promotion of Indigenous Dairy Products in International Market” held at National Dairy Research Institute, Karnal, India.
- Singh, R. R, Singh, R. and Shakya, B. R. 2014. Impact of Turmeric addition on the Properties of Paneer, Prepared from different types of Milk. *International Journal of Current Engineering and Technology*.4: 1874-83.

### How to cite this article:

Rajender Kumar, S. Sivakumar, Rekha Chawla and Mishra, S.K. 2019. Changes in Sensory and Microbiological Parameters of Paneer Nuggets Prepared by Steam Cooking Method under Storage Conditions. *Int.J.Curr.Microbiol.App.Sci*. 8(03): 727-732.  
doi: <https://doi.org/10.20546/ijcmas.2019.803.089>