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Chemical quality changes in black pepper paneer during storage

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Abstract

Paneer is an important, acid-coagulated indigenous milk product extensively used as a cooking ingredient along with vegetables. Good quality paneer is characterized by a marble white color, sweetish, mildly acidic taste, nutty flavor, spongy body and closely knit, smooth texture. Due to high moisture content (about 55%), it has shelf life of only one day at room temperature and up to a week at refrigeration temperature. Hurdles like spices, smoking, packaging etc. can be used to enhance shelf life of paneer. Black pepper gives characteristic flavor to food products. It has a number of functional properties including: analgesic and antipyretic properties, antioxidant effects and antimicrobial properties. Black pepper extract, prepared by extraction of black pepper @ of 0.6, 0.7 and 0.8% by weight of milk, was incorporated into milk from which paneer was prepared. Shelf life of control and black pepper paneer (@ 0.7%) were 8 and 12 days at refrigeration temperature, respectively. Moisture content and pH decreases while lactic acid content of both control and spiced paneer increased during storage at refrigeration temperature.

Keywords: Paneer, black pepper, sensory, moisture content, acidity

Introduction

Paneer is a tempting, nutritious indigenous dairy product obtained by acid and heat coagulation of milk. About 5% of milk produced in India is converted into paneer (Chandan *et al.*, 2007) [6]. Good quality paneer is characterized by a marble white color, sweetish, mildly acidic taste, nutty flavor, spongy body and closely knit smooth texture. It has a fairly high level of fat (22-25%) and protein (16-18%) and a low level of lactose (2.0-2.7%) (Kanawjia and Singh, 1996) [9]. It is a rich source of animal protein available at affordable costs and forms an important source of animal protein for vegetarians. 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) [14]. Because of its high moisture content (about 55%), paneer has a shelf life of not more than one day at room temperature and up to a week at refrigeration temperature (Bhattacharya *et al.*, 1971) [4]. The spoilage of paneer occurs mainly due to the growth of microorganisms, which bring about various Physico-chemical changes leading to the development of off-flavor in the product. Spices have been well known for their medicinal, preservative and antioxidant properties (Souza *et al.*, 2005) [15]. They are currently used mainly for enhancing the flavor of foods rather than extending shelf life (Almeida and Regitano, 2000) [1]. Black pepper is the most important and most widely used spice in the world. It gives characteristic flavour to food products. It has a number of functional properties including: analgesic and antipyretic properties, antioxidant effects and antimicrobial properties. The quality of pepper is contributed by two components: Piperine (contributes the pungency) and volatile oil (responsible for the aroma and flavor) (Narayanan, 2000) [11]. Present study was conducted to investigate the effect of black pepper on changes in chemical quality of paneer during storage at refrigeration temperature.

Materials and methods

Preparation of paneer

Paneer was prepared by a standardized method (Bhattacharya *et al.*, 1971) [4]. Fresh toned milk was procured from Experimental Dairy Plant of Southern Regional Station of ICAR- National Dairy Research Institute, Bengaluru. Milk was heated to 90 °C without holding and cooled to 80 °C and was coagulated with by adding 1 percent citric acid (2 g/litre of milk) solution at 80 °C. Acid was slowly added to the milk with continuous slow stirring until the curd and clear slightly yellow-greenish whey separated out. The mixture was then allowed to settle down for 5 minutes and whey was drained out through using muslin cloth.

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Pressing of curd was done with the weight of 35-40 g/cm² for 15-20 minutes into muslin cloth lined perforated wooden cubical hoop. Finally prepared paneer sample was kept in cold water at 5-7 °C for 2 hours. The chilled paneer removed from water and placed on a wooden plank for 10-15 min to drain occluded water and cut into 1cm cubes for further studies.

Spice extract preparation

Required quantity of ground black pepper (@ 0.6%, 0.7% & 0.8% by weight of milk) was weighed and taken into a beaker. Water (about 3 times weight of spice) was added to the spice and kept at room temperature for 12 hours. This soaked spice was again ground in a grinder and filtered through muslin cloth. This filtrate was added to milk during boiling of milk.

Black pepper paneer preparation

In the preparation of spice paneer, black pepper paneer extract was added to milk during boiling of milk. Same procedure for preparation of paneer was follow as given above.

Sensory evaluation

Nine-point Hedonic scale method (Lawless and Heymann, 2010) [10] was used for sensory evaluation of all the samples by a panel of 7 semi trained judges.

Moisture analysis

Moisture content of paneer was determined by gravimetric method (IS: 10484, 1983) [8].

pH

The pH of paneer was measured as described by Awad *et al.* (2005) [3]. Approximately 20 g paneer was mixed with 20 ml warm distilled water (35-40 °C) and slurry was prepared. pH of paneer was measured directly by inserting the electrode into the slurry.

Titrateable acidity

Titrateable acidity of paneer was determined by titration method (BIS, 1983) [5].

Result and discussion

Effect of black pepper extract on sensory quality of paneer

Black pepper extract, extracted from black pepper @ 0.6%, 0.7% and 0.8% by weight of milk, was incorporated into paneer. The black pepper incorporated paneer was subjected to sensory evaluation by judges. After sensory analysis, it was found that paneer incorporated with black pepper extract at 0.7 % got maximum flavor score (Fig.- 1). So, 0.7% black pepper incorporated paneer was chosen for further studies.

Color and appearance scores of black pepper paneer were significantly lower ($p \leq 0.05$) than control paneer due to changed color of paneer from white to slightly dark. Dark color in paneer may be due to color imparted by black pepper extract. On incorporation of 0.7% black pepper extract, color and appearance score decreased ($p \leq 0.05$) from 8.06 for control to 7.16 for black pepper paneer (Fig.- 1). Body and texture score decreased ($p \leq 0.05$) from 7.81 for control to 7.48 for black pepper paneer. Reduction in body and texture score of black pepper paneer may be because of softer paneer formed as a result of incorporation of the pepper extract. Spice particles because of their granular nature may interfere in development of body and texture of the paneer (Eresam *et al.*, 2015) [7]. Flavor score of paneer increased from 7.63 for control paneer to 7.81 for black pepper paneer, which may be due to black pepper flavor. The overall acceptability scores also decreased ($p \leq 0.05$) from 8.00 for control to 7.53 for black pepper paneer, which may be due reduction of color and soft body of black pepper paneer (Fig.- 1). From experiment, it was found that shelf life of control and black pepper paneer (0.7%) were 8 and 12 days at refrigeration temperature, respectively.

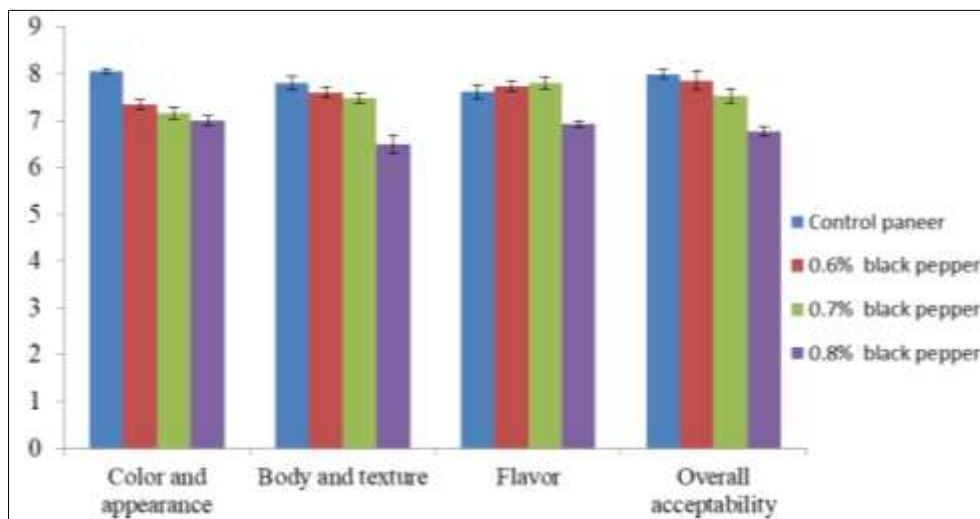


Fig 1: Effect of incorporation of black pepper extract on sensory score of paneer

Changes in chemical characteristics of paneer during storage at 7±1 °C

Moisture content

Initial moisture contents of control paneer and black pepper paneer were 53.16 and 53.97% respectively. From the Fig.2, it was found that moisture content of both control and black

pepper paneer decreased during storage at refrigeration temperature. Moisture content decreased from 53.16 to 53.04 in 8 days for control paneer and from 53.97 to 53.78 in 12 days for black pepper paneer. Rai (2008) [12] also reported decreasing moisture content of paneer during storage.

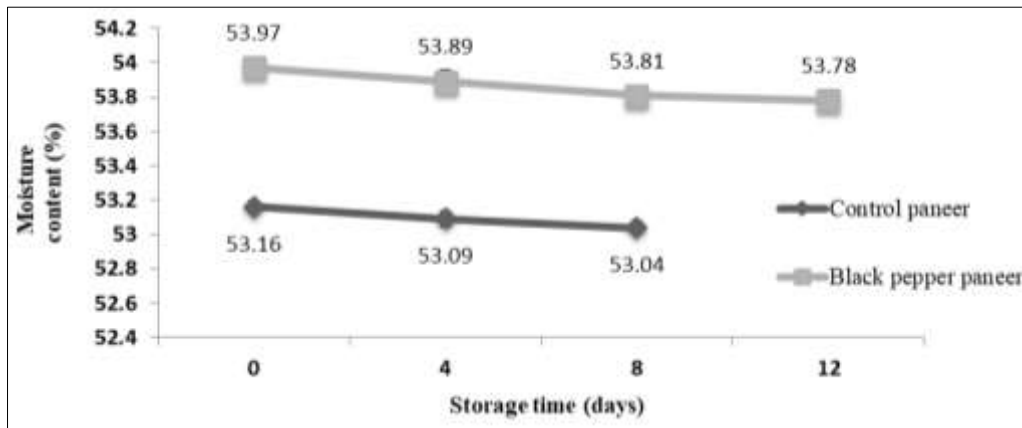


Fig 2: Changes in moisture content (%) of black pepper paneer during storage at 7±1 °C

Titratable acidity

Titratable acidity of control paneer and black pepper paneer was 0.471 and 0.486 % lactic acid (Fig.3). The acidity of both control and black pepper paneer increased during storage at refrigeration temperature. Acidity increased from 0.471 to 0.976 % lactic acid in 8 days for control paneer and from 0.486 to 1.09 % lactic acid in 12 days for black pepper

paneer. Increase in titratable acidity in paneer was an indication of bacterial spoilage by lactose fermenting organisms. The rate of acidity development in black pepper paneer was slower than control paneer. Sachdeva and Singh (1990) [13] also observed increase in titratable acidity of paneer samples during storage.

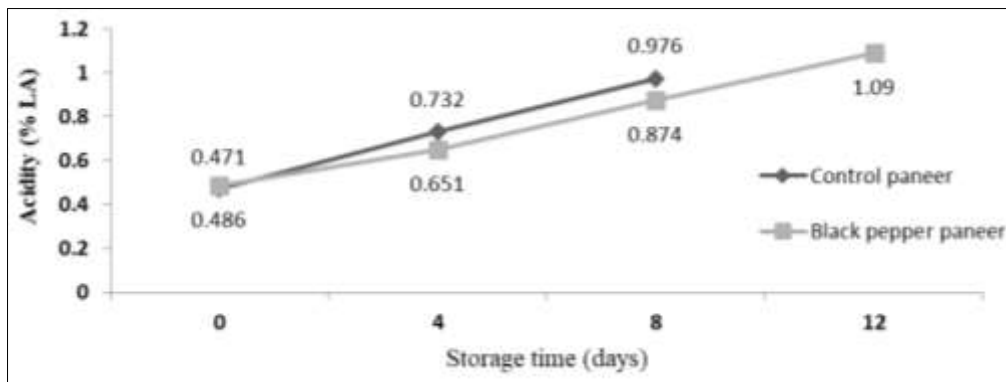


Fig 3: Changes in acidity (% LA) of black pepper paneer during storage at 7±1 °C

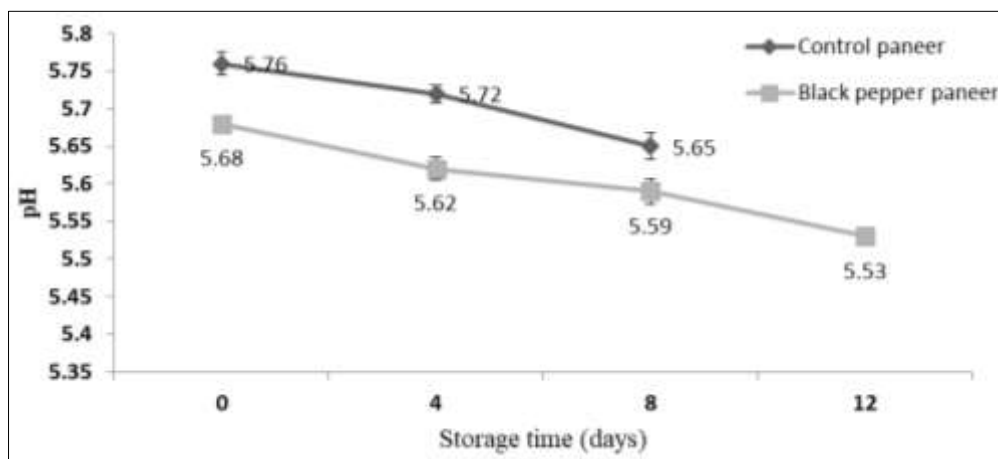


Fig 4: Changes in pH of black pepper paneer during storage at 7±1 °C

pH

The pH of control paneer and black pepper paneer were 5.76 and 5.68 respectively (Fig.4). From the graph, it was found that pH of both control and black pepper paneer decreased during storage at refrigeration temperature. The pH decreased from 5.76 to 5.65 in 8 days for control paneer and from 5.68 to 5.53 in 12 days for black pepper paneer. Arora and Gupta (1980) [2] also reported decrease in pH of paneer samples

during storage.

Conclusion

From above result it can be concluded that moisture content and pH decreases while lactic acid content of both control and spiced paneer increases during storage at refrigeration temperature.

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