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Research Article

EFFECT OF OIL BASED PICKLING ON SHELF LIFE OF PANEER

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ABSTRACT

The effect of oil based pickling on shelf life of paneer was investigated. Two types of oil based pickles viz., spiced sweet and sour pickle and spiced oil based pickle were prepared as per prior optimized formulation on the basis of sensory evaluation. There was a significant increase in standard plate count, yeast and mold count upto 60 days of storage. The results revealed that about19.7 % of energy, 38.8 % of protein, 29 % of calcium and 11 % of magnesium of Daily Reference Value could be met from a single serving of 100 g of spiced sweet and sour pickle and spiced oil based pickle. Both the pickles remained in the 'liked moderately' upto the end of storage period. Both the products maintained acceptable microbiological quality during storage for 60 days at room temperature.

Key words: Spiced sweet and sour pickle, spiced oil based pickle, shelf life, paneer

Dairying is a vital part of the food system and it contributes to the economical and social sustainability of the people in India. Paneer, a popular indigenous dairy product, is nutritious and wholesome food as it is a rich source of protein, fat, vitamins and minerals such as calcium, phosphorus etc. Its relatively short shelf life is a major hindrance in commercial adoption of paneer manufacture and its marketing. Spoilage of paneer occurs due to the presence of contaminants and post-processing microbial growth (Oliver *et al*., 2005) including *Staphylococcus aureus* (Pinto *et al.*, 2011), *Salmonella spp*., *Escherichia coli* and *Listeria monocytogenes* (Torres *et al.*, 2012).

Pickling is used as a food preservation technique since time immemorial. Apart from food preservation, pickling also makes food tastier and more appetizing thus giving a sense of satisfaction. To meet growing demand of the market, the manufacturers need to build capabilities to supply food of desired quality with prolonged shelf life to the consumers. The present investigation was therefore, carried out to investigate the effect of pickling of paneer on its stability and shelf life.

MATERIALS AND METHODS

Preparation of Paneer: Whole milk (6% fat, 8.5% SNF) obtained from the institutional dairy production unit was used for the preparation of paneer as per the method suggested by Singh *et al*. (1988) with some modifications. Milk was heated to 90^{0}C and then cooled to 80^{0}C and coagulated using a solution of citric acid (10g/l). Stirring began when the citric acid solution was added. After complete coagulation, the stirring was stopped and the curd was allowed to settle for 5 min. The whey was then drained through a muslin cloth. The curd was collected and filled into hoops. Pressure was applied on the top of each hoop by placing a 10kg wt for 10 min., the pressed block was immersed in chilled water (5^{0}C) for 2 h.

Preparation of Spiced Sweet and Sour Paneer Pickle (SSSP): One kg paneer cubes (1cm×1cm×1cm) were immersed in preheated mustard oil containing mustard seeds (3 g), red chili powder (20 g), 15 % of paneer {add 15 % sugar syrup thoroughly mixed with garam masala (25 g), salt (40-60 g), acetic acid (5 ml)} and the SSSP was prepared as per the method of Vashista (2000).

Preparation of Spiced Oil Based Paneer Pickle (SOBP): One kg paneer cubes (1cm×1cm×1cm) were immersed in preheated mustard oil containing salt (200 g), red chili powder (30 g), black pepper powder (30 g), fennel seeds (30 g) and turmeric powder (30 g) so as to prepare SOBP. After 2 days additional oil (preheated and cooled) was added so that it formed a layer over pickle surface as per the method of Vashista (2000).

Storage Study of Oil Based Paneer Pickles: The paneer pickles (SSSP and SOBP) were filled in sterile glass bottles with moisture proof laboratory seal films and lids. The samples were stored at room temperature and analyzed for nutritional composition and microbiological quality at 15 days intervals till 60 days.

Chemical Analysis: SSSP and SOBP samples were

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analyzed for total energy (by calculation), fat (by Majonnier method), moisture, ash and protein (AOAC, 1995), cholesterol, Ca and Mg by an auto analyzer (Erba Mannheim) kits. Standardized paneer**,** prepared according to the Sachdeva and Singh (1988)**,** was obtained from the department and was used as control.

Microbiological Analysis: Microbiological analysis of the paneer product samples was done out by the methods of BIS (1989). The samples were examined for standard plate counts (SPC), yeast and mold counts, coliform counts, *Staphylococcus aureus*, *E. coli*, *Salmonella spp*. and *Listeria monocytogenes.*

RESULTS AND DISCUSSION

Nutritional Composition of Products: Moisture content of pickled paneer was much lower than that of control paneer (Table 1) probably due to presence of salt, sugar, spices etc. These ingredients might have lowered the moisture in these pickled paneer in two ways. First increase in percent total solids due to diffusion of various ingredients of pickles into paneer cubes. Akbulut *et al.* (1996) reported diffusion as governing transport mode in the process of salt transfer during short term brining of white pickled cheese. Rao and Patil (1999) reported that diffusion of NaCl was higher than that of citric acid due to lower weight of the former. Second reason could be loss of moisture during pickling which may be due to movement of water molecules along concentration gradient. As pickle media were highly concentrated, water moved out of paneer cubes to media. Since no water was added in SSSP and SOBP, therefore, loss of moisture during first three days of maturation was more in these two pickles.

Total fat content (Table 1) of SSSP and SOBP was 33.04g and 34.71g per 100g, respectively as compared to 25.55g per 100g in standardized paneer which was well above the prescribed values as per Food Safety and Standards Authority of India (FSSAI). Higher fat content in SSSP and SOBP was due to adsorption/absorption of mustard oil on the surface of paneer cubes. These results are in agreement with those of Vashista (2000) and Shukla and Vaid (2004).

Table 1

Nutritional composition of paneer pickles

Nutritional constituents (100g)	Standardized paneer	SSSP	SOBP
Moisture (%)	54.00±0.27	44.20±0.34	42.50±0.24
Total fat (g)	25.55±0.04	33. 04±0.52	34.71±0.37
Total cholesterol (mg)	134.30±0.07	124.63±1.23	126.22±1.06
Total proteins (g)	18.63±0.02	19.06±0.24	19.43±0.35
Total carbohydrates(g)	1.75±0.06	2.04±0.25	1.94±0.44
Total ash (g)	2.21±0.03	8.92±0.16	13.25±0.33
Calcium (mg)	233.02±0.01	244.44±1.47	290.46±1.12
Magnesium (mg)	23.89±0.02	28.04±0.68	45.47±0.3

Values are mean±SE; SSSP=Spiced sweet and sour paneer pickle; SOBP= Spiced oil based paneer pickle. (Only standard error mean was calculated)

Relatively higher ash content in SSSP and SOBP (Table 1) might be because of penetration of salt from pickle media into paneer cubes due to diffusion as also reported by Rao and Patil (1999). The results of the present study are in conformity with Vashista (2000). Calcium content was comparatively higher in SOBP as compared to SSSP which may be due to addition of fennel seeds which contained 266mg of calcium per 100g. Calcium and magnesium contents of gravy might have raised the calcium and magnesium content in the products. These observations are consistent with the findings of Vashista (2000). Other nutritional parameters of the products are given in Table 1.

The results of this study revealed that 19-19.7% of Daily Reference Value (DRV) of energy, 38-38.8% DRV of protein, 24.4-29% of calcium and 7-11% of magnesium could be met from a single serving of 100 g of SSSP and SOBP. People who want to take fewer carbohydrates can include these products in their diet

Microbiological Quality and Effect of Storage at Room Temperature: Microbiological quality of the two products is shown in Table 2. On day 0, SPC in the SSSP and SOBP was 2.25 and 2.39 log cfu/g, respectively while coliform count was 1.84 and 1.95 log cfu/g, respectively. The SPC was well within the permissible limits under Food Safety and Standard Authority of India Regulations, (FSSR, 2011) for paneer i.e. 50,000/g. This may be attributed to the presence of salt, spices and mustard oil. Bactericidal and bacteriostatic properties of spices are well documented (Singh *et al*., 2002). On storage at room temperature, there was gradual rise in the SPC in SSSP and SOBP products, respectively. Pal (1998) also reported an increase in bacterial count in fresh paneer from 3.03 log cfu/g to 4.5 log cfu/g on day 5th during storage at 10^{0}C. Therefore, pickling process in the present study was effective in keeping bacterial count low. Coliform counts also showed a gradual rise in both the products and the number was found well beyond FSSR limits i.e. more than 1.95 log cfu/g. This may be because of post processing contamination while dipping of paneer in water.

Yeast and moulds were not detectable till 15 days of storage. It could be because of the action of essential oils from various spices, which cause their inhibition (Schmitz *et al.,* 1993). While yeast and mould in paneer kept at 10^{0}C was 2.19 log cfu/g on 5th day (Pal, 1998). Both became detectable in both the products

Table 2
Microbiological quality of paneer pickles during storage at room temperature

Microbial count(log cfu/g)	Products	Storage (Days)				
		0	15	30	45	60
Standard plate count	SSSP	2.25±0.03	2.83±0.01	3.06±0.21	3.27±0.11	4.20±0.36
	SOBP	2.39±0.16	2.95±0.36	3.21±0.08	3.39±0.12	4.44±0.22
Coliform count	SSSP	1.84±0.15	2.38±0.18	2.91±0.35	3.03±0.17	3.33±0.22
	SOBP	1.95±0.34	2.44±0.22	2.93±0.06	3.10±0.18	3.33±0.36
Yeast and mould count	SSSP	ND	ND	1.69±0.13	2.17±0.26	2.32±0.16
	SOBP	ND	ND	1.90±0.25	2.30±0.34	2.39±0.26

Values are mean ± SE. ND=Not detectable; SSSP=Spiced sweet and sour paneer pickle; SOBP=Spiced oil based paneer pickle

after 15th days of storage and subsequently rose steeply.

However, their counts remained below the permissible limits prescribed by FSSAI for paneer i.e. not more than 250/g. Therefore, pickling process reduced yeast and mold growth in paneer. Vashista (2000) has also reported similar observations on the microbiology of the paneer pickles. According to Vashista (2000), for colour, appearance and odour, these pickles were initially in range of 'like extremely upto 1 month and started declining in 2nd month, however, these were liked very much in terms of all sensory attributes. Shukla and Vaid (2004) have also reported similar changes in microbiology for oil and vinegar based paneer pickle sample on storage. *E. coli*, *S. aureus*, *Salmonella spp.* and *L. monocytogenes* were not detected in both the products at all stages of storage. This may be due to high heat treatment involved during paneer manufacture and no post manufacture contamination with respect to *E. coli* was observed.

Both the pickles remained in the liked moderately upto the end of storage period. Both the products maintained acceptable microbiological quality during storage for 60 days at room temperature. However, coliform counts showed that there is further scope of improvement in hygiene.

From the present study, it is concluded that shelf life of fresh paneer may be extended up to 60 days by making SSSP and SOBP pickles and in this way surplus milk can fetch more price as well as can get marketing time also. These products also add to the variety in the market.

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