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Development and quality evaluation of traditional styled ready to eat pickle from paneer

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Abstract

Ready to eat traditional styled paneer pickles were developed by using vegetable oil, vinegar and lemon juice and were studied for various physico - chemical characteristics, microbial quality characteristics and sensory acceptability. Significantly ($P < 0.05$) lower pH and higher titrable acidity (% acetic acid) values were observed in vinegar based ready to eat paneer pickle followed by lemon juice and vegetable oil incorporated ready to eat paneer pickle. The product yield (%) and moisture (%) values were significantly ($P < 0.05$) higher in vegetable oil incorporated ready to eat paneer pickle followed by lemon juice and vinegar based ready to eat paneer pickle. No coliform and yeast and mould counts were observed in ready to eat paneer pickle. However, significantly ($P < 0.05$) higher total plate counts were observed in vegetable oil incorporated ready to eat paneer pickle followed by lemon juice and vinegar based ready to eat paneer pickle and the counts were within the standard stipulated for cooked meat products. All sensory scores were significantly ($P < 0.05$) higher for lemon juice based ready to eat paneer pickle as compared to vinegar and vegetable oil based ready to eat paneer pickle. Therefore, it can be concluded that highly acceptable traditional styled ready to eat paneer pickle can be prepared by using lemon juice with optimum physico-chemical and microbial qualities.

Keywords: Paneer, vegetable oil, vinegar, lemon juice, pickle, quality, acceptability

1. Introduction

Paneer is an acid and heat coagulated indigenous milk product and is extensively used as an ingredient for cooking with vegetables in Northern India. The popularity of paneer has spread from the northern parts of country to all over the country. The growing popularity of paneer has led to its integration into Indian cuisine. Typically, paneer is marble white in appearance, having cohesive and spongy body and closely knit, smooth texture. Good quality paneer has a typical acidic flavour with a slightly sweet taste. Paneer can be stored for 6 days at 10 °C without much deterioration in quality. The freshness of the paneer may be lost after 3 days (Rita Narayanan *et al.* 2016) [12]. The high moisture content of paneer (53-55%) and presence of rich source of nutrients are responsible for its shorter shelf life. The relatively short shelf life of paneer is a major handicap in the value addition and commercialization of paneer. Uses of acids have been advocated since time immemorial to increase the shelf life of foods like pickles (Gokhale *et al.* 2016) [7]. Pickling is an alternative method to develop a low cost shelf stable meat product and pickle is highly acceptable ready to eat and convenience meat product of Indian origin (Gadekar *et al.* 2010) [5]. Pickling help to improve desirable characteristics like taste flavour and texture along with preservative effect. The pickling of paneer could offer a new nutritious ready to eat product with a long shelf life and a good market potential. Therefore, the cost effective recipe for traditional styled ready to eat paneer pickle were standardized and their quality characteristics were evaluated.

2. Materials and Methods

2.1 Fresh paneer

Paneer was prepared from after standardizing the milk to 4.5% fat and 8.5% SNF using method suggested by Bhattacharya *et al.* (1971) [3] with slight modifications. Milk is heated to 85 to 90 ± 2 °C for 5 min followed by cooling to 70 ± 1 °C. 1% solution of citric acid is slowly added to milk with continuous agitation till clear greenish whey is separated out. When coagulation was completed, the curd is allowed to settle down, whey is drained out and the curd is scooped into a hoop lined with cheese cloth and is pressed for about 5 min by applying a pressure of about 2 kg/cm². The pressed paneer is then removed and immersed in potable tap water for cooling and then transferred to chilled water to bring its temperature to 10 ± 2 °C.

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Chilled paneer is then removed from the water and allowed to drain out till the loose water is removed. The paneer is then cut into small cubes (1 cm × 1 cm × 1 cm). The fresh paneer cubes were used for preparation of pickle.

2.2 Paneer pickle formulation and treatments

The formula for paneer pickle was developed after conducting a series of preliminary trials. The paneer pickle formulation consisted of paneer pieces 100.0%, spice mixture - 2.0%, red

chilli powder - 2.5%, garlic paste - 5.0%, ginger paste - 5.0%, roasted cumin seed powder- 1.0%, mustard seeds - 1.0%, asafetida powder - 1.0%, roasted fenugreek seeds powder - 1.0%, salt - 3.0%, turmeric powder - 1.0%. Paneer pickle was prepared with incorporation of 75% gingli oil without vinegar and lemon juice (treatment - I), 25% vinegar with 50% vegetable oil (treatment - II) and 25% lemon juice with 50% vegetable oil (treatment - III).

Table 1: Formulation of ready to eat traditional styled paneer pickle

Ingredients	Treatment - I (Oil based paneer pickle)	Treatment - II (Vinegar based paneer pickle)	Treatment - III (Lemon juice based paneer pickle)
Paneer (%)	100.00	100.00	100.00
Vegetable oil - gingili oil (%)	75.00	50.00	50.00
Vinegar (%)	-	25.00	-
Lemon juice (%)	-	-	25.00
Turmeric powder (%)	01.00	01.00	01.00
Mustard seeds (%)	01.00	01.00	01.00
Ginger and garlic paste (%)	10.00	10.00	10.00
Roasted cumin seed powder (%)	01.00	01.00	01.00
Roasted fenugreek seeds (%)	01.00	01.00	01.00
Asafetida powder (%)	01.00	01.00	01.00
Red chilli powder (%)	02.50	02.50	02.50
Salt (%)	03.00	03.00	03.00
Spice mixture (%)	02.00	02.00	02.00

Dry spices consisted of aniseed (10%), black pepper (10%), capsicum (8%) caraway seed (10%), cardamoms (5%), cinnamon (4%), cloves (1%), coriander (20%), cumin seed (22%) and turmeric (10%) and were cleaned to remove the extraneous materials and ground in a grinder. Fresh garlic and ginger were procured from the local market and were. The required quantities of fresh garlic and ginger were peeled of the external covering cut in to small pieces and ground in a laboratory blender to a fine paste.

2.3 Process schedule for preparation of ready to eat traditional styled paneer pickle

The paneer cubes were mixed with turmeric powder and marinated for 1 hr. at 5 ± 2 °C and then the paneer cubes and were used for preparation of pickle. Then the paneer cubes were deep fried in heated gingili oil (25%) till golden brown colour appeared and were kept separately. The mustard seeds, roasted cumin seeds powder, roasted fenugreek seeds powder, garlic paste, ginger paste, red chilli powder and spice mixture were shallow fried in the gingili oil (25%) to get the "golden brown stage". Salt and fried paneer cubes were added to the mixture and allowed to boil for 2 min. Then, oil (remaining 25%) in treatment - I, 25% vinegar in treatment - II and 25% lemon juice in treatment - III was added to make a broth and heated with high constant stirring till boiling started. The pickle was allowed to cool to room temperature. After cooling the paneer pickle were packed in the polyethylene terephthalate (PET) 100 g bottles and stored at 32 ± 2 °C. The products were evaluated for various physico - chemical parameters, microbial profile and sensory attributes on a 9 - point hedonic scale after 7 days maturation period.

2.4 Physico - chemical characteristics analysis

The pH of paneer pickles was determined by using digital pH meter. The weight of pickled products was recorded before and after pickling and the yield was calculated and expressed as percentage. Procedure of APHA (1984) [2] was used for estimation of titrable acidity (% acetic acid). The moisture

contents of paneer pickle were determined by standard method using hot air oven (AOAC, 1995) [1].

2.5 Microbiological analysis

Total plate, coliform, yeast and mold of freshly prepared paneer pickle samples were determined by the methods described by APHA (1984) [2]. Readymade media (Hi-media Laboratory Pvt. Ltd., Mumbai, India) used for enumeration of microbes. Following incubation, plates showing 30 - 300 colonies were counted and the average number of colonies for each species was expressed as log₁₀ cfu/g sample.

2.6 Sensory evaluation

Sensory evaluation was conducted with semi-trained panelists. Paneer pickles were served to the panelists. Sensory scores for appearance and colour, flavour, juiciness, tenderness, saltiness, sourness and overall palatability were evaluated on 9 - point descriptive scale (where in 1 - is extremely undesirable and 9 - is extremely desirable) as suggested by Keeton (1983) [10].

2.7 Data analysis

The experiment was repeated four times. The data generated from each experiment were analyzed statistically by following standard procedures (Snedecor and Cochran, 1989) [13] for Analysis of Variance (ANOVA) comparing the means and to determine the effect of treatment and the least significant differences were calculated at appropriate level of significance ($P < 0.05$).

3. Results and Discussion

3.1 Physico - chemical characteristics of ready to eat traditional styled paneer pickle

Physico- chemical parameters of ready to eat traditional styled paneer pickles are presented in Table 2. Mean pH value was significantly ($P < 0.05$) higher for oil based ready to eat paneer pickle followed by vinegar and lemon juice based ready to eat paneer pickle. The higher pH reduction vinegar

and lemon juice based ready to eat paneer pickle as compared to oil based paneer pickle could be attributed to the addition of acetic acid and lemon juice and its absorption into the paneer pieces (Gault, 1985) [6]. The pH values of vinegar and lemon juice based ready to eat paneer pickle were below 5.0, which is considered to be critical for storage stability of pickled food products (Dziezak, 1986) [4]. Mean pickled product yield was significantly ($P < 0.05$) higher for oil based ready to eat paneer pickle followed by lemon juice and vinegar based ready to eat paneer pickle. Low product yield of vinegar and lemon juice based ready to eat paneer pickle was due to higher cooking loss as compared to oil based ready to eat paneer pickle. The mean titrable acidity (% acetic acid)

value was significantly ($P < 0.05$) higher for vinegar based ready to eat paneer pickle as compared to lemon juice and oil based paneer pickle. The higher titrable acidity in ready to eat paneer pickle could be due to more loss of moisture and the critical absorption acid into the paneer. Moisture contents of ready to eat paneer pickle were differed significantly between treatments. Significantly ($P < 0.05$) lower moisture content value was observed in vinegar based ready to eat paneer pickle as compared to lemon juice and oil based ready to eat paneer pickle. This might be due to the loss of moisture during pickling and cooking with acidic environment, salt and spices.

Table 2: Physico-chemical characteristics of ready to eat traditional styled paneer pickle (Mean \pm S.E)

Parameters	Treatment - I (Oil based paneer pickle)	Treatment - II (Vinegar based paneer pickle)	Treatment - III (Lemon juice based paneer pickle)
pH	5.20 \pm 0.10a	4.40 \pm 0.12b	4.70 \pm 0.18c
Product yield (%)	120.70 \pm 0.22a	98.60 \pm 0.24b	110.60 \pm 0.20c
Titrable acidity (% acetic acid)	0.11 \pm 0.24a	0.87 \pm 0.20b	0.15 \pm 0.22c
Moisture (%)	49.20 \pm 0.18a	45.90 \pm 0.22b	47.50 \pm 0.20c

Number of observations: = 4

Means bearing same superscripts row- wise do not differ significantly ($P < 0.05$).

3.2 Microbial characteristics of traditional styled ready to eat paneer pickle

Microbial characteristics of ready to eat traditional styled paneer pickle are presented in Table 3. Significantly higher total plate counts were observed in oil based ready to eat paneer pickle as compared to lemon juice and vinegar based ready to eat paneer pickle. Total plate counts of lemon juice and vinegar based ready to eat paneer pickle did not differ significantly between them. However, the total plate counts of ready to eat paneer pickle were within the standard stipulated for cooked meat products (Jay, 1996) [9]. Coliform and yeast and mould counts were not deducted in the ready to eat paneer pickles. This could be due to the heat treatment during cooking and addition of vinegar and lemon juice used for

pickling that lead to retardation of microbial growth. Reduction of pH 4.6 in pickled product is intended to prevent the growth of microorganisms and make the pickled product shelf stable at room temperature (Gadekar *et al.* 2010) [5]. As it is well known fact that acid and heat treatment are the major factors for increasing the safety against micro-organisms of pickled products (Young-Lee, 2004) [16]. This may be due to the heat treatment and acetic acid used for pickling which retards the microbial growth (Wani and Majeed, 2014) [15]. Acidic nature, low pH, low moisture, salt and spices in the pickle were able to keep the microbial level very low (Grover *et al.* 2004) [8]. Vaid *et al.* (2004) [14] and Rani *et al.* (2014) [11] have also reported similar microbial profile for oil and vinegar based paneer pickle.

Table 3: Microbial characteristics (log₁₀cfu/g) of ready to eat traditional styled paneer pickle (Mean \pm S.E)

Microbial profile (log 10 cfu/g)	Treatment - I (Oil based paneer pickle)	Treatment - II (Vinegar based paneer pickle)	Treatment - III (Lemon juice based paneer pickle)
Total plate count	1.70 \pm 0.20a	1.20 \pm 0.22b	1.40 \pm 0.18
Coliform count	ND	ND	ND
Yeast and mould count	ND	ND	ND

Number of observations: = 4

Means bearing same superscripts row- wise do not differ significantly ($P < 0.05$).

3.3 Sensory characteristics of ready to eat traditional styled paneer pickle

Table 4: Sensory attributes of ready to eat traditional styled paneer pickle (Mean \pm S.E)

Sensory attributes ***	Treatment - I (Oil based paneer pickle)	Treatment - II (Vinegar based paneer pickle)	Treatment - III (Lemon juice based paneer pickle)
Appearance and colour	7.00 \pm 0.12a	7.50 \pm 0.10b	8.00 \pm 0.10c
Flavour	7.00 \pm 0.15a	7.50 \pm 0.10b	8.50 \pm 0.12c
Juiciness	7.00 \pm 0.13a	7.50 \pm 0.12b	8.00 \pm 0.10c
Tenderness	7.00 \pm 0.10a	7.50 \pm 0.11b	8.00 \pm 0.12c
Saltiness	7.00 \pm 0.11a	7.50 \pm 0.12b	8.00 \pm 0.11c
Sourness	6.00 \pm 0.10a	7.50 \pm 0.10b	7.00 \pm 0.10c
Overall acceptability	6.80 \pm 0.12a	7.50 \pm 0.11b	7.90 \pm 0.11c

***Number of observations: = 32

***Sensory attributes of traditional styled ready to eat paneer pickles were evaluated on a 9 - point descriptive scale (wherein 1 = extremely undesirable; 9 = extremely desirable).

Means bearing different superscripts row- wise differ significantly ($P < 0.05$).

Sensory attributes scores of ready to eat traditional styled paneer pickles are presented in Table 4. The sensory attributes score for appearance and colour, flavour, tenderness, juiciness and saltiness were significantly ($P < 0.05$) higher for lemon juice based ready to eat paneer pickle followed by vinegar and oil based ready to eat paneer pickle. However, the score for sourness was significantly higher for vinegar based ready to eat paneer pickle followed by lemon juice and oil based ready to eat paneer pickle. Overall acceptability scores were significantly ($P < 0.05$) higher for lemon juice based ready to eat paneer pickle as compared to vinegar or oil based ready to eat paneer pickle. Among ready to eat paneer pickle, lemon juice based ready to eat paneer pickle was rated to very acceptable whereas vinegar and oil based ready to eat paneer pickle were moderately acceptable

4. Conclusion

Based on the results of physico-chemical parameters, microbial profile and sensory attributes, it can be concluded that highly acceptable ready to eat traditional styled paneer pickle can be prepared by using lemon juice followed by vinegar with substantial value addition with shelf stability to the materials.

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