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## Chemical quality changes in ajwain 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. Ajwain is an important spice widely used in the world. Ajwain extract @ of 0.4, 0.5, 0.6 and 0.7% by weight of milk, was incorporated into milk from which paneer was prepared. Paneer was prepared using the milk as per standardised method. It was observed that paneer incorporated with ajwain extract @ 0.6% was acceptable and selected for further analysis. Ajwain extract, prepared by extraction of ajwain @ of 0.4, 0.5, 0.6 and 0.7% by weight of milk, was incorporated into milk from which paneer was prepared. Shelf life of control and ajwain paneer (@ 0.6%) 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, ajwain, moisture, pH, 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) [5]. 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) [7]. 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) [3]. 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) [12]. Present study was conducted to investigate the effect of ajwain extract 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) [3]. 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. Pressing of curd was done with the weight of 35-40 g/cm<sup>2</sup> 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 ajwain (@0.4, 0.5, 0.6 and 0.7% by weight of milk) was weighed

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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.

#### Ajwain paneer preparation

In the preparation of spice paneer, same procedure was followed as given above.

#### Sensory evaluation

Nine-point Hedonic scale method (Lawless and Heymann, 2010) [8] 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) [6].

#### pH

The pH of paneer was measured as described by Awad *et al.* (2005) [2]. 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.

#### Titrate acidity

Titrate acidity of paneer was determined by titration method (BIS, 1983) [4].

## Result and Discussion

### Effect of Ajwain extract on sensory quality of paneer

Ajwain extract was incorporated into paneer at the rate of 0.4, 0.5, 0.6 and 0.7% by weight of milk. The ajwain incorporated paneer was then subjected to sensory evaluation by judges. After sensory analysis, it was found that paneer incorporated with ajwain at 0.6% got maximum flavor score (Table-1), which was significantly different from control. However, use of 0.7% ajwain gave harsh taste, resulting in lower flavor score. Thus, 0.6% ajwain incorporated paneer was chosen for further studies.

Color and appearance scores of ajwain paneer were significantly lower ( $p \leq 0.05$ ) than control paneer due to reduction in whiteness of paneer. It may be due to color imparted by ajwain. On incorporation of 0.6% ajwain, color and appearance score decreased ( $p \leq 0.05$ ) to 7.20 as compare to 7.90 for control (Table-1). Body and texture score decreased ( $p \leq 0.05$ ) from 7.81 for control to 7.33. Reduction in body and texture score of ajwain paneer was due to slight softening of paneer. It might be due to spice particle interference in development of body and texture of the paneer. Flavor score of paneer increased from 7.58 for control paneer to 7.93 for ajwain paneer, which may be due to ajwain flavor. The overall acceptability scores also decreased ( $p \leq 0.05$ ) from 7.93 for control to 7.55 for ajwain paneer, which might be due to reduction of color and soft body of ajwain paneer (Table-1).

**Table 1:** Effect of incorporation of ajwain extract on sensory score of paneer

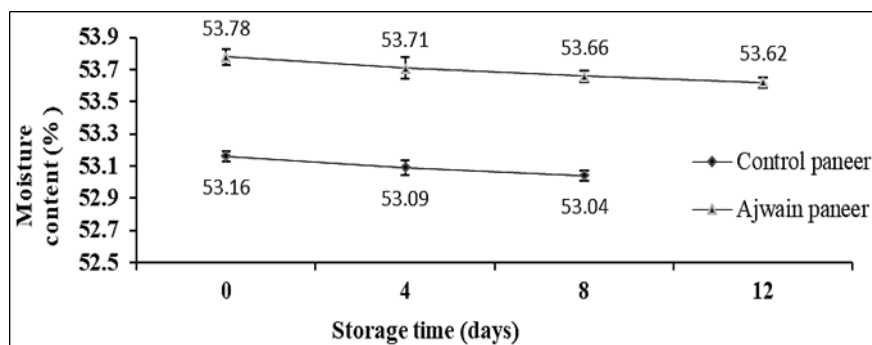
Ajwain treatment	Color and appearance	Body and texture	Flavor	Overall acceptability
Control paneer	7.90±0.10 <sup>a</sup>	7.81±0.17 <sup>a</sup>	7.58±0.12 <sup>a</sup>	7.93±0.05 <sup>a</sup>
0.4%	7.58±0.12 <sup>ab</sup>	7.61±0.12 <sup>ab</sup>	7.60±0.10 <sup>a</sup>	7.71±0.07 <sup>ab</sup>
0.5%	7.45±0.08 <sup>bc</sup>	7.51±0.13 <sup>ab</sup>	7.68±0.16 <sup>a</sup>	7.61±0.15 <sup>ab</sup>
0.6%	7.20±0.10 <sup>c</sup>	7.33±0.12 <sup>bc</sup>	7.93±0.05 <sup>b</sup>	7.55±0.15 <sup>b</sup>
0.7%	6.80±0.20 <sup>d</sup>	7.00±0.15 <sup>c</sup>	6.81±0.17 <sup>c</sup>	6.93±0.16 <sup>c</sup>

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

#### Moisture content

The moisture contents of control paneer and ajwain paneer is presented in Fig.1. Initial moisture content of control paneer and ajwain paneer were 53.16 and 53.78%, respectively. From the Fig.1, it could be seen that moisture content of both

control and ajwain paneer slightly decreased during storage at refrigeration temperature. It decreased from 53.16 to 53.04 after 8 days for control paneer and from 53.78 to 53.62 after 12 days for ajwain paneer. This reduction in moisture is very slight, however showed impact on textural property of paneer. Similarly Rai (2008) [10] also reported decreasing moisture content of paneer during storage.



**Fig 1:** Changes in moisture content (%) of ajwain paneer during storage at 7±1 °C

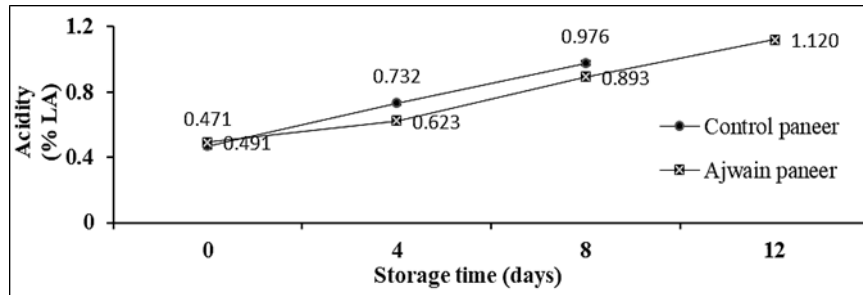


Fig 2: Changes in acidity (% LA) of ajwain paneer during storage at  $7\pm 1$  °C

### Titrateable acidity

Titrateable acidity values of both control and ajwain paneer is shown in Fig. 2. Titrateable acidity of control paneer and ajwain paneer were 0.471 and 0.491% lactic acid. It may be seen from the Fig.-2 that acidity of both control and ajwain paneer increased during storage at refrigeration temperature. Acidity increased from 0.471 to 0.976% lactic acid after 8

days for control and from 0.491 to 1.12% lactic acid after 12 days for ajwain paneer. Increase in titrateable acidity in paneer was an indication of bacterial spoilage by lactose fermenting organisms. The rate of acidity development in ajwain paneer was slower than in control paneer. Sachdeva and Singh (1990)<sup>[11]</sup> and Mishra (2021)<sup>[9]</sup> also observed increase in titrateable acidity of paneer samples during storage.

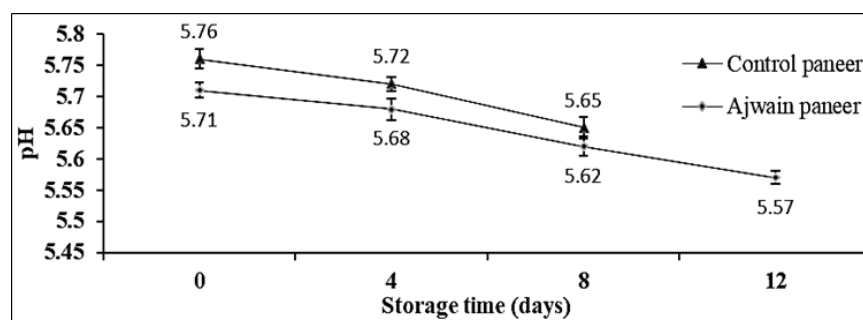


Fig 3: Changes in pH of ajwain paneer during storage at  $7\pm 1$  °C

### pH

The pH of both control and ajwain paneer is given in Fig. 3. The pH of control paneer and ajwain paneer were 5.76 and 5.71, respectively. It may be seen from Fig. 3, it could be observed that pH of both control and ajwain paneer decreased during storage at refrigeration temperature. It decreased from 5.76 to 5.65 after 8 days for control paneer and from 5.71 to 5.57 after 12 days for ajwain paneer. Decrease in pH of paneer samples during storage might be due to utilization of lactose by microorganisms and its conversion to lactic acid. Arora and Gupta (1980)<sup>[11]</sup> 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 ajwain paneer increases during storage at refrigeration temperature.

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