

PRESERVATION OF PANEER BY USING PVC CLING FILM

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ABSTRACT

Paneer is a popular indigenous variety of soft cheese in India and used as a base material for the preparation of a large number of culinary dishes. Paneer, like other indigenous products is highly perishable. At room temperature it cannot be stored more than a day and under refrigeration it may remain acceptable for six days. Therefore, study was undertaken to give a comprehensive package by application of sorbic acid and PVC cling film. It is observed that paneer could be stored safely up to 13 days at $7\pm^{\circ}\text{C}$ by adapting hygienic practices of manufacturing and wrapping during it in PVC cling film. Use of 0.1% sorbic acid alone could be recommended along with wrapping of paneer in cling film to extend its storage life up to 33 days in refrigeration ($7\pm^{\circ}\text{C}$) and for 3 days at room temperature. There was reduction in moisture content but rise in titratable acidity, FFA, peroxide value and soluble nitrogen in treated paneer during storage at both the temperatures.

Key words: Paneer preservation. Cling film, shelf life of paneer

INTRODUCTION

Paneer is an Indian soft cheese manufactured by the combined action of heat and acid in coagulation of milk. This is used as a base material for the preparation of a large number of culinary dishes and is highly nutritious and wholesome. Because of its high nutritive quality, paneer has a high potential to be considered as a component of vegetarian diet. However the major drawback is its short life due to high moisture content and low acidity. The study was undertaken to improve the shelf life of paneer during storage. The shelf life of paneer under refrigeration (10 C) is reported to be only 6 days, though its freshness is lost within 3 days (Bhattacharya et al.,1971).

MATERIALS AND METHODS

Paneer samples were prepared using the method of Bhattacharya *et al* (1971). Investigation was planned to extend shelf life of paneer using antimicrobial agent viz., sorbic acid, bacteriocin viz.,nisin and microwave (Mw) treatment singly and in combination . Treatment combination include (I) 0 level of Mw + 0 level of sorbic acid + 0 level of nisin i.e. untreated (control) (II) 0 level of Mw + 0 level of sorbic acid + 100 R.U. gm of nisin (III) 425 w/5 min level of Mw + 0 level of sorbic acid + 0 level of nisin (IV) 425 w/5 min level of Mw + 0 level of sorbic acid + 100 R.U./gm level of nisin (V) 0 level of Mw + 0.1 % level of sorbic acid + 0 level of nisin (VI) 0 level of Mw + 0.1 level of sorbic acid + 100 R.U./gm level of nisin (VII) 425 w /5 min level of Mw + 0.1% level of sorbic acid + 0 level of nisin (VIII) 425 w/5 min. level of Mw + 0.1 level of sorbic acid +100 R.U./gm of nisin.

In order to enhance the keeping quality, paneer samples treated with different treatment combinations were finally wrapped in PVC cling film.

Paneer samples under eight treatment combinations were stored at $7 \pm 0^\circ\text{C}$ to assess their keeping quality.

The effects of different combinations on chemical, microbiological and sensory qualities of paneer during storage were studied.

Effect of treatment on shelf life of paneer was studied by a rangign

SENSORY QUALITY OF PANEER STORED AT $7 \pm 1^\circ\text{C}$

Flavour

The flavour score of paneer samples under various treatment combinations remained unaffected and non-significant upto 5th day of storage. A significant decline in the score was observed in product treated with T₁, T₂ and T₃ and T₄ after 10th day of storage. The control sample (T₁) and one treated with nisin (T₂) did not show definite flavour defect on 13th day but variety of off flavours experienced on 15th day of storage because of which their mean flavour scores declined to 4.66 and 5.68, respectively. Sorbic acid treated samples either individually (T₅) or in combination with other preservative treatments (T₆ to T₈) had an acceptable flavour upto 33rd day and all the sample had flavour score above 7, however on 35th day flavour defects such as sour, putrid, rancid or mixed were noticed in the samples from T₅ to T₈ and their score declined below 6.

Body and texture

The body and texture of paneer was significantly affected due to treatments right from the day of treatment till the last day of storage.

The body of the microwave heated paneer samples (T₃, T₄, T₇ and T₈) became harder and slightly rubbery, therefore, their score for this parameter was less than 8 while remaining samples scored well above 8 on very first day of treatment and same trend continued during subsequent days of storage. In general there was decrease in score for body and texture as storage period advanced. Secondly, sample of paneer were rejected by the judges due to flavour defects during storage but not because of body and texture defects. In other world, all the sample had body and texture score well above 7.5 on the day of their rejection.

Colour and appearance

As like body and texture, colour and appearance of the paneer samples was not responsible to reject them during storage. Again colour and appearance score of microwave treated paneer was found inferior than paneer from rest of the treatments. Colour and appearance score was well above 8 on first day and remained between 7 to 8 at the end of storage period.

Overall acceptability

The various treatment combinations significantly ($P < 0.05$) influenced the overall acceptability of the paneer. The paneer samples which were not subjected to microwave heat treatment *viz.*, T₁, T₅ and T₆ had significantly higher overall acceptability score than microwave treated samples. It is clear from the overall acceptability score than untreated paneer (control) (T₁) and nisin treated paneer (T₂) was acceptable upto 13th day while microwave heated (T₃) and microwave-cum-nisin treated paneer was acceptable upto 15th day at refrigeration temperature ($7 \pm 1^\circ\text{C}$). Moreover, it was noticed that sorbic acid treated paneer with or without combination of

other preservative treatment (T₅ to T₈) had storage life of 33 days and on this day there was non-significant difference in the overall acceptability score of paneer samples. All the paneer samples were rejected during storage on the basis of flavour defects and not because of body and texture on colour and appearance defects of paneer.

CHEMICAL COMPOSITION OF PANEER STORED AT 7 ± 1 °C

Moisture

The differences in moisture content in paneer due to experimental treatments were significant irrespective of the days of storage and as storage period increased moisture content was significantly decreased. The moisture content in paneer ranged from 44.97 to 52.46 per cent on the day of its production and treatment.

Moisture content in microwave heated paneer samples (T₃, T₄, T₇ and T₈) was reduced by about 7-8 per cent due to heat treatment and it remained low during subsequent period of storage than rest of the samples. While overall reduction in moisture during storage was from 1 to 3 per cent.

Acidity

Differences in titratable acidity (% LA) in paneer due to treatment combinations were significant upto 20th day of storage and non-significant for further storage period. Acidity was gradually increased in all the paneer samples but it was below the maximum permissible limit as per BIS standard (0.5 %) upto 5th day. Then, it increased above 0.5 per cent in T₁ to T₄ from 10th day onwards. Similarly, samples T₅ to T₈ did not cross the BIS limit upto 15th day and raised to 0.59 per cent on 35th day of storage when these samples were also became seniority unacceptable.

pH

There was expected reverse trend of pH to that of titratable acidity in paneer samples as storage period was extended. On the first day pH of paneer samples was around 6.0 then it increased between 5.82 to 5.94 on the day of their spoilage.

Free fatty acid

Free fatty acid content of paneer in the beginning was between 0.27 to 0.28 µeq/g. Thereafter, the rate of rise in FFA content varied considerably causing significant ($P < 0.05$) differences upto 15th day. While samples stored 15th day onwards (T₅ to T₈) had more or less close value of FFA and reached maximum to 0.44 µeq/g on 35th day. This level of FFA was noticed on 15th day in paneer samples under treatments T₁ to T₄.

Soluble nitrogen

At the beginning soluble nitrogen content in paneer was between 0.095 to 0.098 per cent and it increased differently during storage at refrigerated temperature (7 ± 1 °C) for the treatments under study. It reached maximum (0.267 %) in control sample on 15th day when it was spoiled and was at 0.165 per cent on 10th day. Spoilage of paneer was mainly due to proteolytic changes as reported by the judges particularly on the basis of their flavour. Nisin treated paneer (T₂) was also spoiled on 15th day, in which soluble nitrogen content was 0.264 per cent indicating

that nisin alone was in-effective to enhance shelf-life of paneer. Microwave treated paneer (T₃) contained comparatively lower soluble nitrogen during same period of storage.

Among the samples T₅ to T₈, sorbic acid along with microwave (T₇) or three treatments together (T₈) had minimum soluble nitrogen on 35th day of storage implying that sorbic acid and microwave heating were beneficial to destroy proteolytic microorganism compared to nisin.

Peroxide value

There was no development of peroxides upto 10 days except T₁ and T₂. Meaning that oxidative changes in paneer were delayed may perhaps be due to lower temperature of storage. The role of preservatives in controlling this chemical change should be negligible. However, results in this study showed delayed increase in peroxide value in samples T₅ to T₈, which was nil upto 20th day reached to maximum 0.173 (0.002 N Na₂S₂O₃/g) on 35th day.

Penetration value

Among the different treatments effect of microwave heating on body and texture of paneer was significant. Hardness of paneer increased due to expulsion of whey from it during microwave heating which resulted in lower penetration values (94-95) in samples T₃, T₄, T₇ and T₈ than other treatments (143 to 145). On subsequent days of storage penetration values decreased slowly, which was due to reduction in moisture content.

MICROBIAL QUALITY OF PANEER SORED AT 7 ± 1 °C

Standard plate count (SPC)

The effect of different treatments exerted a significant influence (P < 0.05) on SPC in the paneer irrespective of the days of storage. The control sample (T₁) showed the highest bacterial counts during all the days of the preservation period. It increased from 22.33 x 10³ cfu/g on zero day to 170 x 10⁴ cfu/g on 15th day when paneer was unacceptable. The SPC of all the treated samples of paneer increased during storage. Little lower SPC was noticed for nisin treated sample (T₂) as that of control (T₁) but paneer was spoiled within same period of storage as that of T₁. However, microwave heated paneer alone (T₃) and in combination with nisin (T₄) had significantly lower SPC (48.33 x 10⁴ and 46 x 10⁴ cfu/g, respectively) and hence extended shelf life of paneer by two days (upto 15 days). Lower SPC were noticed in T₅ to T₈ sample throughout the storage period and ranged between 20 x 10⁴ to 26.6 x 10⁴ cfu/g on 33rd day. Sorbic acid and microwave heating kept better control on SPC in paneer.

YMC

It is evident from the results that the yeast and mould count of the all treated samples of paneer significantly increased during storage. The rate of increase was higher in case of T₁ and T₂ upto 15 day (60 x 10 cfu/g and 78 x 10cfu/g, respectively). Initial counts were lower in paneer from T₅ to T₈ treatments, which ranged between 60 cfu/g to 63.3 cfu/g. Moreover, subsequent rise in YMC was also very slow. It might be due to presence antifungal agent, sorbic acid, in all these treatments. Nisin did not helped to restrict YMC load. On last day (33rd) of storage YMC ranged between 2.00 x 10² cfu/g (T₈) to 3.00 x 10² cfu/g (T₅). Sorbic acid and microwave heating helps to restrict YMC and enhanced the shelf-life of paneer.

Spore count

The spore count of all treatment combinations showed significant increase during storage. Nisin treated samples (T₂, T₄, T₆ and T₈) showed linear but slow increase in spore count through out the storage period while other treatments (T₁, T₃, T₅ and T₇) showed faster increase in spore count. The control sample had the highest spore counts during storage, that increased from 20.33×10^2 to 380×10^3 cfu/g.

CONCLUSION

From the overall results obtained in the present study the following conclusions could be drawn.

1. Chemical, microbial and organoleptic qualities of paneer were less affected during refrigerated storage as compared to storage at ambient conditions.
2. Paneer could be stored safely upto 13 days at 7 ± 1 °C by adopting hygienic practices of manufacture and wrapping it in PVC cling film.
3. Microwave heating of paneer at 425 watts i.e. 5 power level for 5 min. kept it better for two weeks in refrigerator (7 ± 1 °C) and for two days at room temperature (35 ± 1 °C) but paneer losses moisture considerably making it harder and causes financial loss due to reduction in weight.
4. Treatment of nisin alone did not help to extend shelf-life of paneer.
5. Sorbic acid (0.10 %) alone or in combination with nisin and microwave heating or all three preservative treatments together could preserve paneer upto 33rd day at refrigeration and upto three days at room temperature. Hence use of 0.1 per cent sorbic acid alone could be recommended alongwith wrapping of paneer in cling film to extend its storage life upto 33 days in refrigerator and for three days at room temperature.

Therefore, from view point of cost and convenience of treatment, use of 0.1 per cent sorbic acid alongwith wrapping of paneer in cling film and keeping under refrigeration (7 ± 1 °C) could be recommended for its safe storage for one month.