Original Research Article  

Effect of Sodium benzoate and Potassium sorbate on the Shelf Life of Kheer  

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Abstract  

Investigation was carried out on the influence of two different preservatives viz. Sodium benzoate and Potassium sorbate (0.1% and 0.2%, respectively on the basis of finished product) on chemical, microbiological and sensory changes in Kheer packed in plastic cups and stored at ambient (30°C) and commercial refrigeration 7°C. Irrespective of storage temperature addition of two preservatives Sodium benzoate and Potassium sorbate into Kheer at final stage of its preparation helped in lowering down the rate of increase in titrable acidity, suppressed microbial growth and retarded deterioration of organoleptic quality, though the deterioration was faster at ambient condition. Kheer samples treated with Sodium benzoate and Potassium sorbate, individually, were found acceptable up to 5 days and 25 days at 30°C and 7°C storage temperature respectively.  

Keywords  
Kheer, Payasam, Organoleptic quality, Preservatives, Sodiumbenzoate, Potassiumsorbate, Shelf life.  

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Introduction  

Kheer is also called Basundhi (De, 1993) Payas, Payasam and Palpayasam in various part of the country. It is prepared by desiccating milk partially with small quantity of rice soaked in water. Cane sugar and dry fruits are also some time mixed to enhance its taste, besides, cardamom and saffron are also mixed to improve its smell and colour. It is considered to be a very notorious food for all age groups. It is characterized with sweet, nutty and pleasant flavor which is highly acceptable to the Indian palate. The product (Kheer) could not achieve market due to its scattered nature of production with a lot of variation in its method of manufacture, chemical composition and due to very short storage life (Jha, 2000). This is one of the important reason due to which its industrial production was hampered.  

Sodium benzoate widely used a food preservative in the various food products is permitted under the FPA Rules, 1955 as well as fruit product order 1955. In India under the FPA rules(1976) addition of Potassium sorbate and Potassium metabisulphite is permitted in canned rassogolla, but to a limited extent only. This investigation was therefore, undertaken to assess the shelf-life enhancement of Kheer treated with Sodium ...
benzoate (C₇H₅O₂Na) and Potassium sorbate (C₇H₅O₂K) individually and stored at 30°C and 70°C respectively.

Materials and Methods

Milk

Fresh mixed cow milk was procured from the experimental dairy farm of the university.

Sugar

Commercial grade white crystalline cane sugar was used as sweetening agent free from dust, dirt and any other foreign impurities purchased from the local market of Kanpur city.

Rice

Rambhog rice free from foreign materials purchased from the local market of Kanpur city.

Kheer was prepared according to the method of De et al., (1976) and Rangappa and Achaya (1973) with some modification. Weighed quantity of fresh cow milk was transferred in to a clean stainless steel Karahi through muslin cloth. Heating of milk was started slowly then briskly. After boiling of milk the weighed amount of rice @ 5% of milk weight, which is washed with cold water and soaked in lukewarm water for a predetermined time, was added after draining water. To avoid burning of milk solids, continuous stirring and scraping was done with the help of stainless steel ladle. As soon as the proper cooking of rice and desired total solids were achieved, the required amount of sugar was added and contents were brought just to boiling. The product (Kheer) was then divided into three equal part. In the first and second portion of the product (Kheer) Sodium benzoate and potassium sorbate were added at the rate of 0.1 and 0.2 per cent respectively, on the basis of finished product and third one is leave without any additives as control. Each trial replicated thrice.

Packaging and storage

Finished product was packaged in clean and pre-sterilized plastic cups and sealed by laminated aluminum foil and placed in an incubator at 30±1°C.

Sample stored under refrigeration were analyzed at five days and incubator were after one day’s intervals, respectively. Storage was continued until the sensory quality of sample become unacceptable.

Kheer samples were tested for moisture (BIS, 1981), fat (IS: 24, (Part II), 1977), Protean (Devis and Mac Denold, 1953), lactose [IS: 1479 (part II), 1961], sucrose (BIS,1981) and ash content (ICAR, 1951).During storage the Kheer samples were analyzed for changes in moisture (BIS, 1981), titratable acidity (TA) as per cent lactic acid (BIS 1981),and lactose [IS: 1479, (Part-II), 1961] (Table 1).

Microbiological examination

The standard plate count (SPC)/g, coli form count/g and moulds counts (YMC)/g in Kheer were determined by using Standard Plate Count Agar Violet Red Bile Agar (VRBA) and Potato Dextrose Agar (PDA), respectively (APHA, 1978).

Sensory evaluation

The fresh and stored Kheer samples were subjected to sensory evaluation, immediately after opening by a panel of seven semi trained judges using a nine point hedonic scale (Amerine et al., 1965) at a regular interval. The Kheer samples were scored for flavor, colour and appearance, sweetness and overall acceptability separately. Sample without any additives were used as control.
Table 1: Effect of addition of sodium benzoate ($T_1$) and potassium sorbate ($T_2$) on the organoleptic, chemical and microbial quality of Kheer stored at 30 °C and 7°C

| Type of treatment | Storage Temperature | 30°C | 7°C |
|-------------------|---------------------|------|-----|
|                   | OA | TA   | Moisture | Lactose | SPC/g | Coil/g | YMC/g | Storage Days | OA | TA   | Moisture | Lactose | SPC/g | Coil/g | YMC/g |
| Control           | 0  | 8.51 | 0.161    | 60.69 | 8.56 | 1421.52 | 0.000 | 0.000 | 0 | 8.51 | 0.161 | 60.69 | 8.56 | 1421.52 | 0.000 | 0.000 |
|                   | 1  | 8.20 | 0.190    | 60.68 | 8.54 | 4075.23 | 32.48 | 3.94  | 5 | 8.20 | 0.167 | 60.65 | 8.55 | 2357.25 | 3.946 | 3.933 |
|                   | 2  | 6.00 | 0.220    | 60.66 | 8.53 | 9537.64 | 63.251 | 13.58 | 10 | 7.50 | 0.185 | 60.66 | 8.54 | 3625.23 | 13.58 | 15.56 |
|                   | 3  | 5.80 | 0.242    | 60.64 | 8.52 | 16481.64 | 138.41 | 64.01 | 15 | 6.72 | 0.275 | 60.65 | 8.53 | 6485.64 | 25.01 | 125.19 |
|                   | 4  | 5.66 | 0.265    | 60.63 | 8.51 | 31018.52 | 215.14 | 181.12 | 20 | 5.35 | 0.299 | 60.50 | 8.52 | 9118.52 | 55.02 | 154.01 |
|                   | 5  | 5.25 | 0.320    | 60.63 | 8.50 | 65478.06 | 524.23 | 250.02 | 25 | 4.83 | 0.320 | 60.52 | 8.52 | 9935.20 | 175.06 | 258.15 |
| Sodium benzoate   | 0  | 8.43 | 0.164    | 60.69 | 8.56 | 1337.21 | 0.000 | 0.000 | 0 | 8.43 | 0.164 | 60.69 | 8.56 | 1337.21 | 0.000 | 0.000 |
| ($T_1$)           | 1  | 8.30 | 0.175    | 60.67 | 8.55 | 1988.31 | 0.000 | 0.000 | 5 | 8.20 | 0.170 | 60.66 | 8.55 | 1498.31 | 0.000 | 0.000 |
|                   | 2  | 8.00 | 0.180    | 60.66 | 8.54 | 3605.50 | 10.00 | 0.305 | 10 | 7.95 | 0.174 | 60.61 | 8.55 | 2039.50 | 0.000 | 2.000 |
|                   | 3  | 7.75 | 0.188    | 60.63 | 8.54 | 7827.02 | 25.14 | 1.390 | 15 | 7.82 | 0.178 | 60.58 | 8.54 | 3246.03 | 0.300 | 8.300 |
|                   | 4  | 7.45 | 0.196    | 60.62 | 8.53 | 14345.16 | 32.44 | 4.953 | 20 | 7.60 | 0.184 | 60.52 | 8.53 | 4815.26 | 1.390 | 12.50 |
|                   | 5  | 7.30 | 0.200    | 60.62 | 8.53 | 35431.35 | 125.64 | 20.210 | 25 | 7.35 | 0.195 | 60.45 | 8.52 | 5431.35 | 4.551 | 34.95 |
| Potassium sorbate | 0  | 8.42 | 0.163    | 60.69 | 8.56 | 1415.54 | 0.000 | 0.000 | 0 | 8.42 | 0.163 | 60.69 | 8.55 | 1347.05 | 0.000 | 0.000 |
| ($T_2$)           | 1  | 8.25 | 0.172    | 60.67 | 8.54 | 2260.43 | 0.000 | 0.000 | 5 | 8.30 | 0.168 | 60.65 | 8.55 | 1425.53 | 0.000 | 0.000 |
|                   | 2  | 8.00 | 0.177    | 60.66 | 8.54 | 4835.13 | 2.120 | 0.300 | 10 | 7.95 | 0.173 | 60.62 | 8.55 | 1849.62 | 0.306 | 8.308 |
|                   | 3  | 7.80 | 0.185    | 60.64 | 8.53 | 8235.24 | 10.420 | 2.780 | 15 | 7.75 | 0.182 | 60.56 | 8.54 | 2081.13 | 2.780 | 12.78 |
|                   | 4  | 7.55 | 0.195    | 60.62 | 8.53 | 16045.32 | 25.530 | 4.960 | 20 | 7.35 | 0.186 | 60.52 | 8.53 | 2812.54 | 14.960 | 14.96 |
|                   | 5  | 7.25 | 0.210    | 60.62 | 8.52 | 3885.42 | 132.60 | 19.370 | 25 | 7.15 | 0.192 | 60.46 | 8.53 | 3825.66 | 9.530 | 39.37 |
Result and Discussion

The sensory examination showed that the overall acceptability scores of control Kheer sample were within acceptable limit up to one day, when stored at 30°C and up to 10 days when stored at 7°C. Overall acceptability score Kheer samples were the average of flavor score, colour and appearance score and body texture score. On the other hand Kheer sample treated with sodium benzoate and potassium sorbate individually showed better sensory quality and lesser chemical deterioration up to 5 days and 25 days of storage at 30°C and 7°C, respectively. Prolonged storage of the treated product for the above said periods gave off-flavor and discoloration.

The freshly prepared Kheer samples had 60.70% moisture, 8.48% fat, 7.56% protean, 8.56% lactose, 14.7% sucrose and 1.42% ash. The result relating to chemical changes of kheer during storage presented in table 1. Addition of either of the two preservatives improved the storage quality of Kheer as determined by the changes in different chemical indices. In general, the chemical changes were higher at 30°C than at 7°C. The rate of decrease in moisture content of kheer was quite similar to control and sample treated with additives. The initial titrable acidity of T1 and T2 Kheer (0.164 and 0.163) was slightly higher than that of control samples (0.161) probably due to the decomposition of salt. During storage irrespective of temperature of storage, rate of increase in titrable acidity was higher in control sample of Kheer than the treated samples.

There was a marked reduction in microbial counts in the Sodium benzoate and Potassium sorbate treated Kheer sample throughout the storage period. Sodium benzoate had reducing effect on standard plate count coli form counts. These results have more conformity to the findings of Patel et al., (1985) and Kaushik et al., (2000) who studied the effect of Potassium metabisulphite on the shelf life of Kheer and effect of Sodium metabisulphite and Potassium metabisulphite on the shelf life of cow milk Burfi, respectively.

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