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To study the changes in microbial profile and sensory profile of apple *Rabri* during storage

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Abstract

India has emerged today as the largest milk producer in world with an annual production of 165.4 million tons (NDDB, 2017). India is the world's fastest growing market for milk and milk products with an annual growth rate of about 5%. Heat desiccation is the most ancient technology used to process the milk and milk products. These have been used as desserts at the end of meals. Present study was conducted to analyze the changes occur in microbial profile and sensory profile of Apple Rabri which consist of 20% Apple on milk basis. Microbial quality was analyzed by analyzing Standard plate count, Yeast & Mould Count and Coliform count. Sensory changes were analyzed by calculating the changes in different sensory parameters during storage like Flavor, color and Appearance, Body and Texture and Overall acceptability. From this study, we can examine the rate of microbial growth in Apple Rabri and through sensory analysis, we can examine how the level of acceptance decreases with time.

Keywords: microbial, sensory, shelf life, *Rabri*, acceptance

1. Introduction

Utilization of milk and milk products in human diet is common from the beginning of the human civilization. This is because milk and milk products which originate from animals are in position to supply the nutrients in balanced proportion to them. The digestibility coefficient of milk nutrients is also very high and hence they are considered indispensable in balancing the dairy food. Heat desiccated milk products have thus been traditionally produced in Indian sub-continent since ancient times. *Rabri* has been classed as indigenous partially concentrated and sweetened whole milk product, containing several layers of flakes and cream (Malai). It is quite popular in rural as well as urban parts of central and eastern regions of India. The manufacture of *Rabri* is still confined to milk confectioners (Halwais) in each locality. There is a great variation its quality, since no standard method is employed in the manufacture of *Rabri* by the Halwais.

Delicious and crunchy, apple fruit is one of the most popular and favorite fruits among the health conscious, fitness lovers who firmly believe in the concept of "health is wealth." This wonderful fruit indeed packed with rich phytonutrients that in the real sense indispensable for optimal health and wellness. Certain antioxidants in apples have health promoting and disease prevention properties, and thereby, truly justifying the adage, "an apple a day keeps the doctor away." As recently discovered in many fruit crops, flavonoids may play an important role in preventing many kinds of cancer and may also reduce the risk of heart disease and stroke. Primary nutritional benefit is in the pectin and fiber. The average apple contains about 5 grams of fiber as much as a bowl of oatmeal or other cereal.

Stevia is also very popular sweetener because this is non-caloric, zero carbohydrate and natural sweetener. It is derived from a South American plant *Stevia rebaudiana*. It derives its sweetness from a glycoside called stevioside. Stevia extract contains about 90% stevioside (Arora et. al.) Extracts of stevioside is usually 250 to 300 times sweeter than sugar. It is freely soluble in water and alcohol. It is available as a liquid extract or a white crystalline powder made from the extract or simply the powdered green herb leaf. It shows potential bitter taste. Stevia does not affect blood sugar metabolism. It has been claimed that stevia can be heated to 195 °C with no adverse reactions. It is not destroyed by heat, so can be used in cooking and baking. It has also been used as sweetener in a number of countries including Japan, China, Brazil, Korea, Mexico, US, Indonesia and Tanzania. It is not approved in the United States by the Food & Drug Administration, pending safety studies.

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Materials and Methods

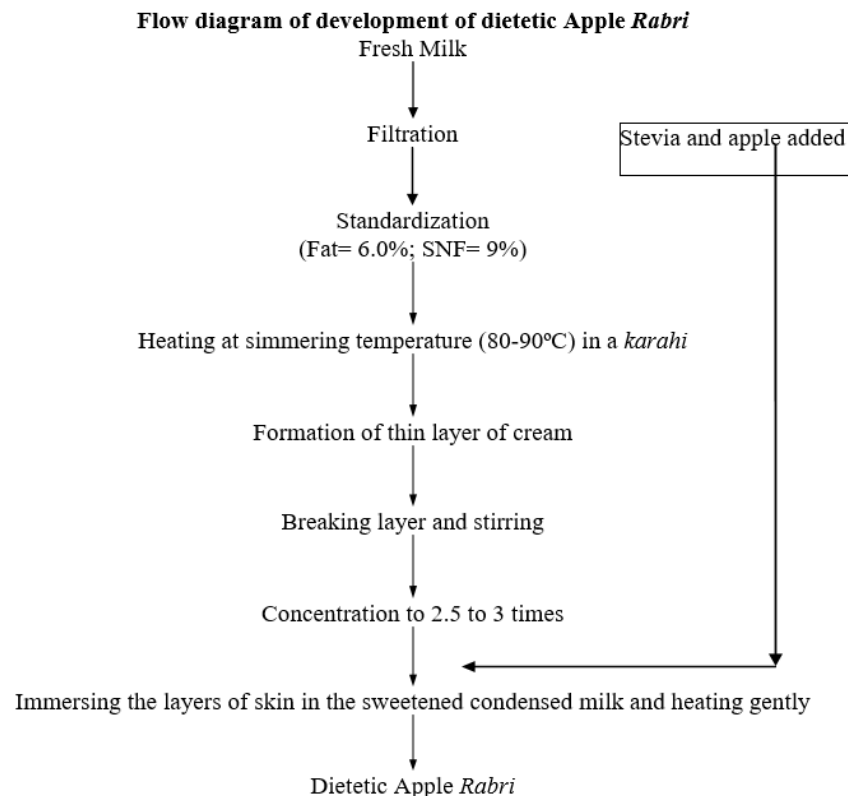
The present investigation was carried out in Department of Animal Husbandry and Dairying, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi. Fresh, clean buffalo milk was procured from Dairy farm Unit from Department of Animal Husbandry and Dairying, Institute of Agricultural Sciences, BHU, Varanasi, U.P., India. A good quality of Apple was procured from local market of Lanka and Kamachha, Varanasi U.P. India. The *stevia* powder containing 90% *steviosides* was purchased from *Sardar shop* Local market *Sigra*, Varanasi.

Initially different combination of Apple was added in Rabri with fixed proportion of Stevia of 0.3%. The level of Apple was optimized through sensory analysis and finally Rabri was made by adding Apple in concentration of 20% of milk weight. This study was done to examine the microbial and

sensory changes of optimized sample.

Dietetic apple *Rabri* was analyzed for different sensory characteristics like colour & appearance, flavour, body & texture, taste and overall acceptability. Sensory evaluation was performed by a panel of semi-trained from the Department of Animal husbandry and Dairying, Institute of Agricultural Science, Banaras Hindu University, Varanasi (India) and all the analyses were conducted in triplicate for better results. Sensory evaluation was done at 25 °C and 62% relative humidity. Hedonic rating (9-point scale; 1 = dislike extremely, 9 = like extremely) (Amerine *et al.*, 1965) [2] was used for color and appearance, flavor, texture, melting property sweetness and overall acceptability scores.

Microbial analysis was done by observing Standard Plate Count, Yeast & Mould Count and Coliform count. During this study, storage temperature was kept at 5±1 °C.



Results and Discussion

Microbial changes during storage

Microbial analysis was done to study the microbial quality of *Rabri* blended with 20% apple crush and 0.3% stevia by using pour plate technique.

Effect of storage period on microbial quality of dietetic apple *Rabri* (5±1 °C)

Storage periods (days)	Standard plate count (CFU x 10 ⁻⁵ per g)	YMC (CFU x 10 ⁻⁵ per g)	Coliform count
0	4.489	0.0	Absent
5	8.155	0.0	Absent
10	11.489	0.0	Absent
15	15.822	1.333	Absent

Data presented in table represent the SPC count of dietetic apple *Rabri* sample at 0, 5, 10 and 15 days of storage was ranged between 4.489×10⁻⁵, 8.155×10⁻⁵, 11.489×10⁻⁵,

15.822×10⁻⁵ cfu per gram, respectively. It was revealed that there was a significant increase in SPC of the sample as storage period increases. The SPC count of the dietetic apple *Rabri* sample was lower at 0-day storage.

The Dietetic apple *Rabri* sample were evaluated for Yeast and mould count by pour plate technique. There was 1.333x10⁻⁵cfu per gram growth of Yeast and moulds observed at 15th day of storage in the dietetic apple *Rabri* samples.

The dietetic apple *Rabri* sample was evaluated for coliform count by pour plate technique. There was no growth of coliform observed in the dietetic apple *Rabri* sample. It indicates that proper pasteurization of the product had been done due to heating process while manufacturing of the *Rabri* and there is no post pasteurization contamination in the product. Least number of cfu/g noticed at 0 day and highest at 15 days of storage. The significant increases in SPC were observed after 10 to 15 days, but yeast and mold count were observed at 15th day of storage.

Sensory changes during storage**Effect of storage period on sensory characteristics of apple *rabri***

No. of days	Color and Appearance	Taste	Flavor	Consistency	Overall acceptability
0 days	8	8.3	8.4	7.8	8.5
5 days	7.6	7.7	8.2	7.6	7.7
10 days	7.4	7.3	7.6	7.2	7.3
15 days	7.2	7.1	7	6.8	7

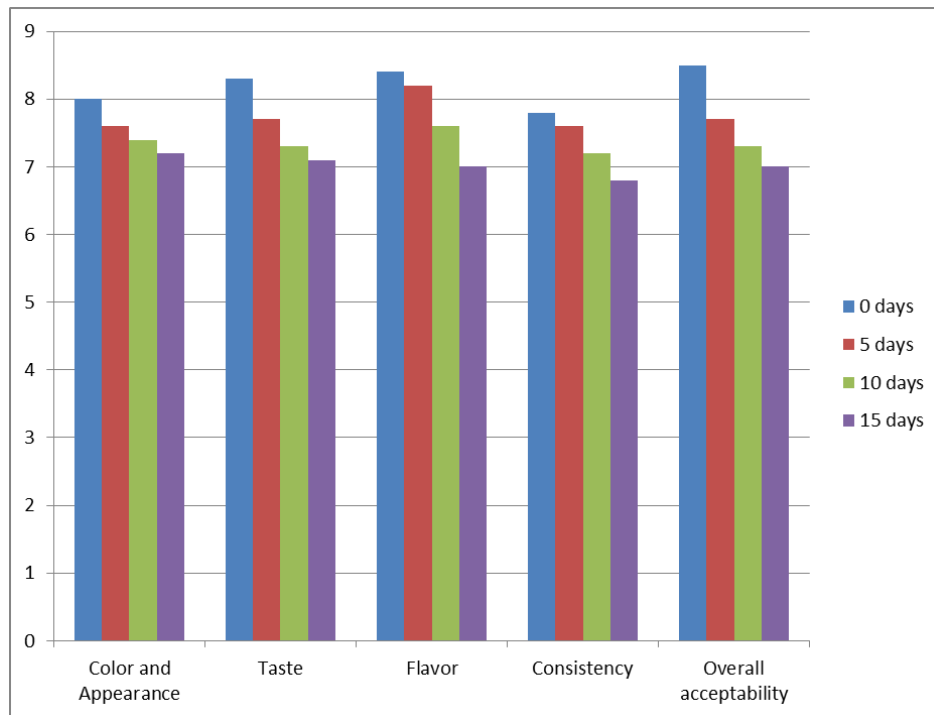
Effect of storage period on sensory characteristics of optimized Dietetic apple *rabri*

Table and graph shows sensory score over a period of storage. The sensory score of apple *Rabri* shows decreasing trend as period of storage increases; this might be due to increase in microbial action. Color and appearance score decreases from 8.0 to 7.2, Taste decreases from 8.3 to 7.1 and similarly flavor, consistency have decreasing trend and ultimately results in decrease of overall acceptability of the product.

Conclusion

Sincere efforts were made to standardize the process of manufacture of apple *Rabri* which would be nutritious, comparatively cheaper and highly acceptable by the consumer. During study, it was found that, microbial changes occur during entire storage period specially in SPC count, YMC shows presence during 15th day of storage and Coliform count did not show any significant growth during period of study. Sensory score of optimized treatment were judged during Storage period. It was observed that as the period of storage increases, scores decreases. Scores of Body and Texture, Colour and appearance, Flavour, Taste and overall acceptability decreases and this may be due to deterioration in quality of the product over a period of time.

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