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Suresh Bharti
Department of AH. & Dairying, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India

DC Rai
Department of AH. & Dairying, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India

Himanshu Kumar Rai
Department of A.H. & Dairying, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India

Correspondence
Himanshu Kumar Rai
Department of AH. & Dairying, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India

To study the optimization process of apple *Rabri* through sensory analysis

Suresh Bharti, DC Rai and Himanshu Kumar Rai

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 optimize the level of Apple concentration by analyzing different concentration of Apple with fixed concentration of Stevia (0.3%). Apple concentration taken were 15%, 20% and 25% added based on milk weight. The apple was added during concentration stage. Sensory analysis of different trials was done, and it was found that *Rabri* with 20% apple concentration was most suitable. This study ultimately results in production of *Rabri* with increased functional value and it was concluded that a good quality *Rabri* can be prepared by adding Apple without hampering its sensory characteristics.

Keywords: stevia, *Rabri*, functional, sensory, optimization

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^{o}C with no adverse reactions. It is not destroyed by heat, so can be used in cooking and baking (Lawson, 2000). It has also been used as sweetener in a number of countries including Japan, China, Brazil, Korea, Mexico, US, Indonesia and Tanzania (Brandle and Rosa, 1992). It is not approved in the United States by the Food & Drug Administration, pending safety studies (Goel, 2008).

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% s*teviosides* was purchased from *Sardar shop* Local market *Sigra*, Varanasi.

Dietetic apple *Rabri* was analyzed for different sensory characteristics like colour & appearance, flavour, body & texture, taste, sweetness 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 ℃ and 62% relative humidity. Hedonic rating (9-point scale; 1 = dislike extremely, 9 = like extremely) (Amerine *et al*., 1965) [2] was used for colour and appearance, flavour, texture, melting property sweetness and overall acceptability scores.

Final Treatment

T_0: milk with no apple crush and 0.3 percent stevia (control).
T_1: milk + 15 per cent apple crush and 0.3 percent stevia.
T_2: milk + 20 per cent apple crush and 0.3 percent stevia
T_3: milk + 25 per cent apple crush and 0.3 percent stevia

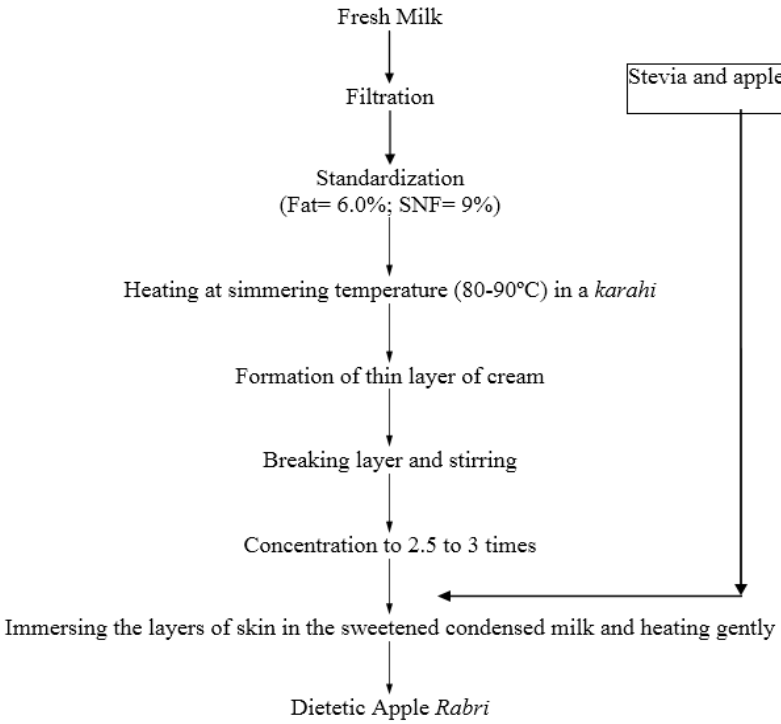
Replications

Number of replications =3

1. R_1
2. R_2
3. R_3

Hence, total number of observation = 4 ×3 =12

Flow diagram of development of dietetic Apple *Rabri*



Results and Discussion

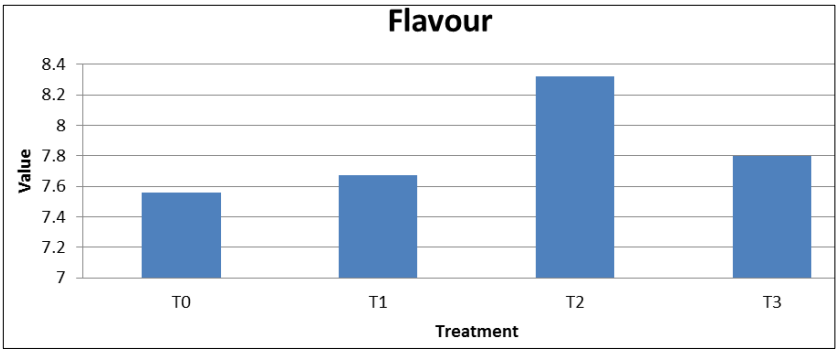
Flavour: The data pertaining to sensory score on flavour with different level of apple crush and stevia percent of dietetic apple *Rabri*.

Effect of different level of apple crush percentage on flavor of dietetic apple *Rabri*

S. No	Treatment	Observations			Mean
		R_1	R_2	R_3	
1	T_0	7.50	7.48	7.70	7.56
2	T_1	7.60	7.65	7.75	7.67
3	T_2	8.20	8.40	8.36	8.32
4	T_3	7.70	8.10	7.60	7.80

Analysis of variance of effect of different level of apple crush on Flavour

SE(d)	CV%	SE.m.±	CD
0.116466	2.27523	0.082354	0.268572



From the above result we can say that, T_2 gave highest flavor score i.e. 8.32 among different level of apple crush. The flavor score varied from 8.32 to 7.42 with different apple crush combination.

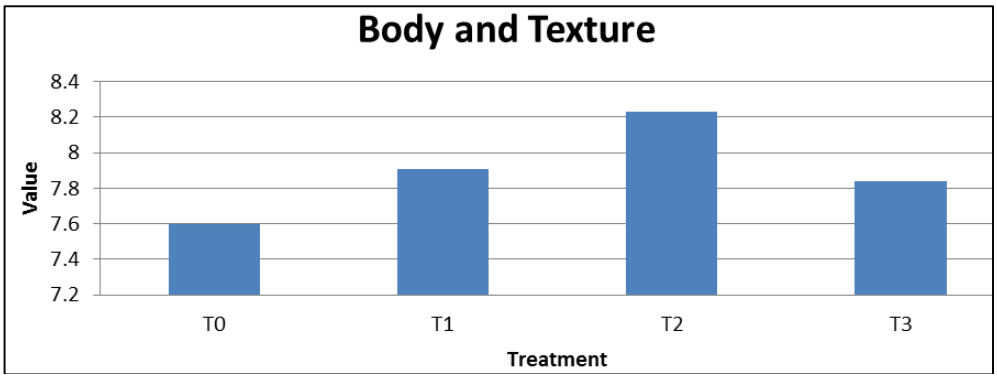
Body and Texture: The data pertaining to sensory score of Body and Texture of apple crush and stevia percentage on flavor of dietetic apple *Rabri*.

Effect of different level of apple crush and stevia percentage on Body and Texture of dietetic apple *Rabri*

S. No	Treatment	Observations			Mean
		R_1	R_2	R_3	
1	T_0	7.60	7.50	7.70	7.60
2	T_1	8.04	7.94	7.76	7.91
3	T_2	8.10	8.40	8.20	8.23
4	T_3	7.92	7.74	7.87	7.84

Analysis of variance of effect of different level of Apple crush on body and texture

SE(d)	CV%	SE.m.±	CD
0.116452	1.805941	0.082344	0.284948



From the above result, it was concluded that the score for Body and Texture varied from 7.60 to 8.23, and highest score was observed in case of treatment T_2 and lowest was observed in T_0.

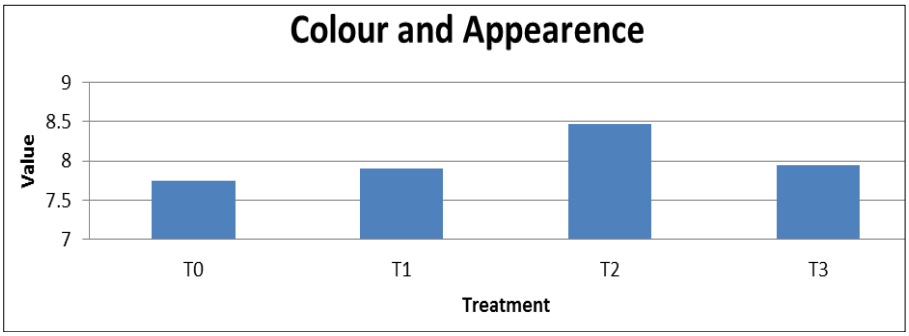
Colour and Appearance: The data pertaining to sensory score of Colour and Appearance of apple crush and stevia percentage on flavor of dietetic apple *Rabri*.

Effect of different level of apple crush and stevia percentage on Colour and Appearance of dietetic apple *Rabri*

S. No	Treatment	Observations			Mean
		R_1	R_2	R_3	
1	T_0	7.60	7.86	7.80	7.75
2	T_1	8.10	7.80	7.79	7.90
3	T_2	8.30	8.40	8.72	8.47
4	T_3	7.82	8.10	7.90	7.94

Analysis of variance of effect of different level of Apple crush on Colour and Apperance

SE(d)	CV%	SE.m.±	CD
0.154374	2.358699	0.109159	0.377741



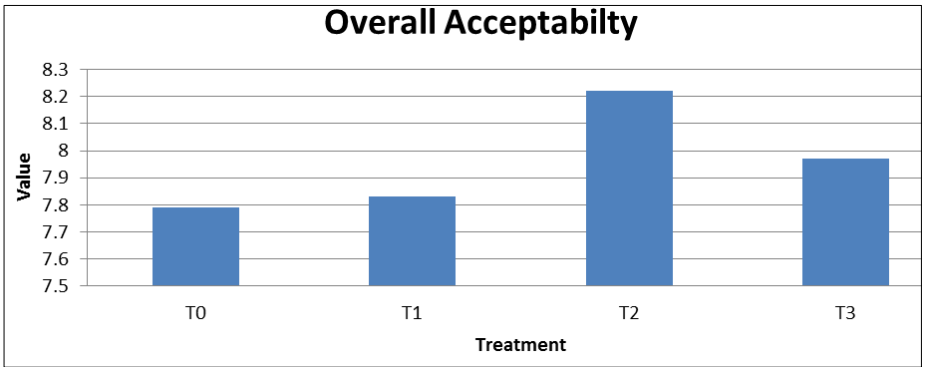
In the above trial, T_2 gave highest Colour and Appearance score i.e. 8.47 among other trial of different level of apple crush. The Colour and Appearance score varied from 8.47 to 7.75 with different apple crush.

Overall Acceptability: The data pertaining to sensory score of Overall Acceptability of apple crush and stevia percentage on flavor of dietetic apple *Rabri*.

Effect of different level of apple crush and stevia percentage on Overall Acceptability of dietetic apple *Rabri*.

S. No	Treatment	Observations			Mean
		R_1	R_2	R_3	
1	T_0	7.76	7.82	7.80	7.79
2	T_1	8.05	7.80	7.64	7.83
3	T_2	8.10	8.24	8.32	8.22
4	T_3	8.12	7.86	7.92	7.97

SE(d)	CV%	SE.m.±	CD
0.120547	1.856508	0.085239	0.294967



In the above trial, T_2 gave highest Overall Acceptability score i.e. 8.22 among other trial in which different level of apple crush addition done. The Overall Acceptability score varied from 8.22 to 7.79 with different level of apple crush concentration. Controlled sample score was less as compare to another treated sample.

Conclusion

Immediately after preparation of dietetic apple *Rabri*, the samples were subjected to sensory evaluation for testing their sensory parameters. From the consumer point of view, the sensory quality of the product holds highest position in marketability; therefore, it was intended to study this aspect of sensory qualities. By analyzing different results, it can be concluded that 20 per cent apple crush and 0.3 percent stevia concentration (T_2) found good in flavour, body and texture, colour and appearance and overall acceptability of dietetic apple *Rabri*. It was found that T_2 trial was superior in all the ensory attributes and significant in all sensory characteristic over the other samples.

Dietetic Apple *Rabri* is a good dairy product having viscous body and creamy consistency, containing several layers of clotted cream with a soft, chewy texture. It has a pleasant flavour, creamy white to light brown colour and sweetish caramel and pleasant aroma. It is a high value product among traditional dairy products. However, because of higher sugar content, initially diabetic people can't enjoy this delicacy. This study helps to develop the product which not only improves the sensory characteristics but also replacement of sugar from stevia results the product very much suitable for diabetic patients.

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