

# EFFECT OF FAT AND SUGAR LEVELS ON THE SENSORY ATTRIBUTES OF NUTRACEUTICALS BASED HERBAL FLAVOURED MILK

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## KEYWORDS

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## ABSTRACT

The research was conducted to examine the effect of Fat and Sugar levels on the sensory attributes of herbal flavoured milk prepared by incorporating nutraceuticals (gulkand, saunf extract and carrot juice). The objective of the present research was to develop to improved nutraceuticals based herbal flavoured milk with health benefit beyond those of traditionally formulated dairy products. The cow milk was standardized to three fat levels viz. A<sub>1</sub>, A<sub>2</sub> and A<sub>3</sub> as 2, 2.5 and 3.0% respectively, sugars B<sub>1</sub>, B<sub>2</sub>, B<sub>3</sub> and B<sub>4</sub> as 5%, 6%, 7% and 8% respectively and gulkand (C<sub>1</sub>), saunf extract (C<sub>2</sub>) and carrot juice (C<sub>3</sub>). The herbal flavoured milk was optimized on the basis of 9-point hedonic scale. The effect of various factors on herbal flavoured milk was analyzed for sensory quality (flavour, sweetness, colour and appearance, and overall acceptability). The overall suitability of herbal flavoured milk was found in samples prepared from 2.5 per cent fat level, 6 per cent sugar with adding gulkand.

## INTRODUCTION

Flavoured milk is a beverage in which sugar, flavouring and coloring agents are added and it contains all the constituents of milk. It is a good source of protein, carbohydrate and minerals. Provides energy and water to digest the food, regulate body temperature and prevent dehydration. Over the years, the importation of extremely large quantities of milk to satisfy the consumer demands for milk and other dairy products has been the source of genuine concern for the governments, processors and consumers alike because the imported milk is expensive and it drains large sums of foreign exchange reserves (AOAC, 2000; Azadbakht *et al.*, 2005). New value-added milk products are entering the market. Some examples are milks fortified with calcium, cultured milk fortified with multivitamins and minerals, flavored milks with banana, chocolate and strawberry flavors, new ready-to-drink blends of evaporated milk and black, green and chamomile teas with spices of cinnamon, ginger and clove (Stubbs, 1996; Triebold, 2000).

Gulkand has been traditionally used as a cooling tonic to fight fatigue, lethargy, muscular aches, biliousness, itching, and heat-related conditions. It is good for memory and eyesight as well as a good blood purifier. It is also rich in calcium and has antioxidant properties (Sundaram, 2010).

Anise (Saunf) is very common in culinary and medicinal uses due to its aromatic and medicinal properties. In constipation

you should drink milk before sleeping by adding 1 gm gulkand and saunf. It will keep constipation away. If you are suffering from omitting then boil 100 gm saunf in 250 ml milk. Filter it and add some sugar to it and drink it will help you to stop omitting (Garcia *et al.*, 2007).

Carrot (*Daucus carota L.*) is one of the most commonly used and well-known vegetables in the everyday kitchen that is rich in functional food components such as vitamins (A, D, B, E, C, and K) and minerals (Daneshi *et al.*, 2012). Carrot (*Daucus carota*) is highly valued for its nutritional and therapeutic properties and carotenoids content (Bandyopadhyay *et al.*, 2012). Carrot juice taken regularly also helps in preventing cancer and increases overall immunity of the body.

Nutraceutical are products derived from food sources that provide extra health benefits, in addition to the basic nutritional value found in foods. Depending on the jurisdiction, products may claim to prevent chronic diseases, improve health, delay the aging process, increase life expectancy, or support the structure or function of the body (Hasler *et al.*, 2005). Therefore, it might be interesting to develop new flavoured milk with the addition of bioactive agents from nutraceuticals herbs to extend its shelf-life. The present investigation deals with assessment of the sensory attribute of herbal flavoured milk, improved herbal flavoured milk.

## MATERIALS AND METHODS

Raw fresh cow milk, Skimmed Milk required for study was

procured from University Dairy Farm, Banaras Hindu University and Varanasi. The ingredients Sugar, Stabilizer, Preservative (sodium alginate), nutraceuticals- Gulkand, Saunf and Carrot, Flavour were purchased from local market of Varanasi.

During the preparation of flavoured milk following steps viz., standardization technique, pre-heating, mixing of sugar, stabilizer, addition of preservative, preparation of carrot juice methods describe (Sharib, 2013), preparation of saunf extract (Shahat *et al.*, 2011), preparation of gulkand use of rose petals in making gulkand. In a wide mouthed glass jar, arrange the layers of rose petals and sugar alternately using sugar twice the weight of petals ([htt: // ayurveda-foryou.com](http://ayurveda-foryou.com)). Addition and mixing of nutraceuticals (Gulkand, Saunf & Carrot), flavouring agent, packaging/bottling, corking, sterilization and cooling were adopted. A series of trials were conducted to ascertain various quantitative and qualitative parameters alongwith the processing technique thereof.

**Treatment details:** Fat levels viz. A<sub>1</sub>, A<sub>2</sub> & A<sub>3</sub> as 2, 2.5 and 3.0% respectively, sugars B<sub>1</sub>, B<sub>2</sub>, B<sub>3</sub> & B<sub>4</sub> as 5%, 6%, 7% and 8% respectively, gulkand (C<sub>1</sub>), saunf extract (C<sub>2</sub>) & carrot juice (C<sub>3</sub>).

**Statistical analysis:** The results obtained during the course of investigation were subjected to statistical analysis by using Factorial Completely Randomized Design (Gupta and Kapoor, 2007). The statistical significance was tested at the 5% level. All experiment was replicated three times.

**Sensory analysis:**

Organoleptic evaluation was carried out according to the method of .The samples of different treatments were analyzed for organoleptic quality (flavour, sweetness, color and appearance and overall acceptability). Attributes will be rated on nine point hedonic scale in laboratory at ambient condition.

**Judging panel:** Ten semi-trained panelists were selected. They were healthy postgraduate students (M.Sc.) and Ph. D Research scholars of the department and outside department between age group of 23 to 30 years without any medical disorder. Sensory panelists were asked to rate and give score for different parameters as flavour, sweetness, color & appearance and overall acceptability. The numerical score will be used as an indication of the quality. The judges will be also identifying

qualities and they will consider to unsatisfactory or satisfactory.

**RESULTS AND DISCUSSION**

The results obtained during the said investigation as “Effect of fat and sugar levels on the sensory attributes of nutraceuticals based herbal flavoured milk”. The results shown above indicate that the different nutraceutical based herbal flavoured milk has good sensory score which was confirmed by method used for the sensory evaluation. The herbal flavoured milk prepared by different concentration of gulkand, saunf extract and carrot juice in 3%, 5% and 7% are summarized below

**Effect of Fat, Sugar levels and Nutraceuticals on Flavour Score**

**Flavour:** Table 1 represent the mean values of flavour score of flavoured milk samples prepared from different levels indicated that highest score (7.29) was found in A<sub>2</sub> samples (2.5%) followed by A<sub>3</sub> (3%) and lowest score (6.73) in A<sub>1</sub> samples. The mean differences of flavour score varied significantly from one another when compared with CD at 5% level of significance. While comparing the average flavour scores of flavoured milk on account of different sugar levels, it was observed that the best flavour score (7.39) was noted when the sample contained 6 per cent sugar (B<sub>2</sub>) followed by B<sub>3</sub>, B<sub>1</sub> and lowest (6.63) in samples containing 8% sugar (B<sub>4</sub>). The results indicated that 6% sugar levels were most suitable as compared to 5 per cent, 7 per cent and 8 per cent sugar levels. The findings closely agreed with the finding of De, (1993); Hanif *et al.* (1996) and Badrie *et al.* (1998) who found that sugar concentration influenced the flavour and rheological acceptability. The effect of different nutraceuticals (C) on flavour score of flavoured milk revealed a highest score (7.26) on addition of Gulkand (C<sub>1</sub>) followed by Saunf extract (C<sub>2</sub>), while lowest score (6.79) was noted in case of carrot juice (C<sub>3</sub>) samples. It was also observed that gulkand added samples were significantly superior over that of saunf extract and carrot juice added samples. The interactional effect due to fat levels and nutraceuticals (AC) revealed a maximum score of (7.54) when the samples were prepared with 2.5 percent fat and gulkand flavoure (A<sub>2</sub>C<sub>1</sub>) followed by A<sub>2</sub>C<sub>2</sub> score (7.30). However, result varied non-significantly. The interactions between sugar levels (B) and nutraceuticals (C) recorded that the maximum score (7.62) was noted when the samples were

**Table 1: Effect of fat levels (A), sugar levels (B), and nutraceuticals (C) on flavour score of flavoured milk**

Fat & sugar levels (%)	Different Nutraceuticals (C)			Mean
	Gulkand (C <sub>1</sub> )	Saunf extract (C <sub>2</sub> )	Carrot juice (C <sub>3</sub> )	
A <sub>1</sub>	6.96	6.73	6.50	6.73
A <sub>2</sub>	7.54	7.30	7.04	7.29
A <sub>3</sub>	7.29	7.09	6.84	7.07
B <sub>1</sub>	7.18	6.90	6.63	6.90
B <sub>2</sub>	7.62	7.37	7.18	7.39
B <sub>3</sub>	7.46	7.20	6.96	7.21
B <sub>4</sub>	6.79	6.68	6.40	6.63
Mean	7.26	7.04	6.79	

	A	B	C	AB	AC	BC
S.E. (diff.)	0.019	0.022	0.019	0.038	0.033	0.038
C.D. at 5%	0.032	0.037	0.032	0.063	NS	0.063

**Table 2: Effect of fat levels (A), sugar levels (B), and nutraceuticals (C) on colour and appearance score of flavoured milk.**

Fat & sugar levels (%)	Different Nutraceuticals (C)			Mean		
	Gulkand (C <sub>1</sub> )	Saunf extract (C <sub>2</sub> )	Carrot juice (C <sub>3</sub> )			
A <sub>1</sub>	6.86	6.63	6.40	6.63		
A <sub>2</sub>	7.44	7.31	6.94	7.23		
A <sub>3</sub>	7.19	6.99	6.74	6.97		
B <sub>1</sub>	7.08	6.80	6.53	6.80		
B <sub>2</sub>	7.52	7.27	7.08	7.29		
B <sub>3</sub>	7.36	7.10	6.86	7.11		
B <sub>4</sub>	6.69	6.53	6.30	6.51		
Mean	7.16	6.95	6.84			
	A	B	C	AB	AC	BC
S.E. (diff.)	0.019	0.022	0.019	0.038	0.033	0.038
C.D. at 5%	0.032	0.037	0.032	0.063	0.055	0.063

**Table 3: Effect of fat levels (A), sugar levels (B), and nutraceuticals (C) on sweetness score of flavoured milk**

Fat & sugar levels (%)	Different Nutraceuticals (C)			Mean		
	Gulkand (C <sub>1</sub> )	Saunf extract (C <sub>2</sub> )	Carrot juice (C <sub>3</sub> )			
A <sub>1</sub>	6.76	6.54	6.30	6.53		
A <sub>2</sub>	7.34	7.21	6.84	7.13		
A <sub>3</sub>	7.09	6.89	6.62	6.87		
B <sub>1</sub>	6.98	6.70	6.40	6.69		
B <sub>2</sub>	7.42	7.17	6.98	7.19		
B <sub>3</sub>	7.26	7.00	6.76	7.01		
B <sub>4</sub>	6.60	6.44	6.20	6.41		
Mean	7.06	6.85	6.59			
	A	B	C	AB	AC	BC
S.E. (diff.)	0.019	0.022	0.019	0.038	0.033	0.038
C.D. at 5%	0.032	0.036	0.032	0.063	0.055	0.063

**Table 4: Effect of fat levels (A), sugar levels (B), and nutraceuticals (C) on overall acceptability score of flavoured milk**

Fat & sugar levels (%)	Different Nutraceuticals (C)			Mean		
	Gulkand (C <sub>1</sub> )	Saunf extract (C <sub>2</sub> )	Carrot juice (C <sub>3</sub> )			
A <sub>1</sub>	6.86	6.63	6.42	6.64		
A <sub>2</sub>	7.44	7.31	6.94	7.23		
A <sub>3</sub>	7.19	6.99	6.74	6.97		
B <sub>1</sub>	7.08	6.80	6.54	6.81		
B <sub>2</sub>	7.52	7.27	7.10	7.29		
B <sub>3</sub>	7.36	7.10	6.85	7.10		
B <sub>4</sub>	6.69	6.43	6.29	6.47		
Mean	7.16	6.93	6.70			
	A	B	C	AB	AC	BC
S.E. (diff.)	0.021	0.025	0.021	0.043	0.037	0.043
C.D. at 5%	0.035	0.041	0.035	0.070	0.061	NS

treated with 6% sugar and gulkand flavoure (B<sub>2</sub>C<sub>1</sub>) followed by B<sub>3</sub>C<sub>1</sub> (7.46) while minimum (6.40) was noted in B<sub>4</sub>C<sub>3</sub>. The flavour score of herbal flavoured milk presented in fig. 1.

#### **Effect of Fat, Sugar levels and Nutraceuticals on Colour and appearance Score**

**Colour and appearance:** Table 2 represented the mean value of colour & appearance score of flavoured milk samples prepared from different fat levels indicated that highest score (7.23) was found in A<sub>2</sub> samples followed by A<sub>3</sub> and lowest score (6.63) in A<sub>1</sub> samples. The mean differences of colour &

appearance score varied significantly from one another when compared with CD at 5% level of significance. While comparing the average colour & appearance scores of flavoured milk on account of different sugar levels, it was observed that the best score (7.29) B<sub>2</sub> followed by B<sub>3</sub>, B<sub>1</sub> and lowest (6.51) in 8 % sugar level (B<sub>4</sub>) samples. The result indicated that 6 % sugar level was most suitable as compared to 5, 7 and 8 per cent sugar levels. The findings closely agreed with the findings of Hanif *et al.* (1996) and Badrie *et al.* (1998) who found that sugar concentration influenced the sensory and rheological acceptability. The effect of different

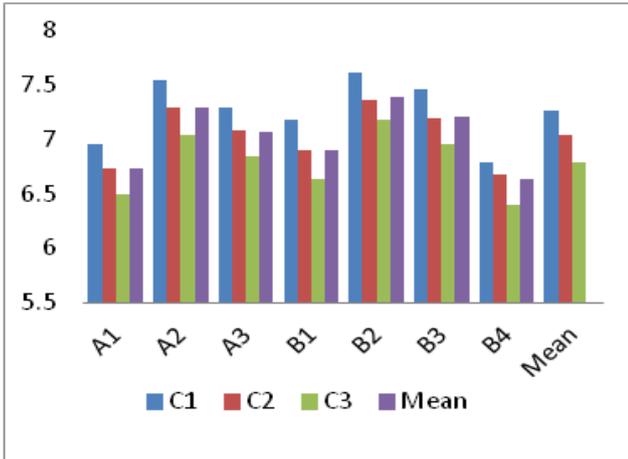


Figure 1: Effect of Fat & Sugar on Flavour Score

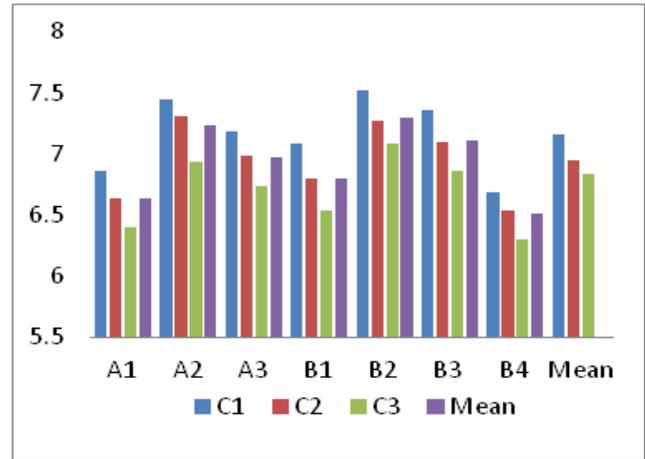


Figure 2: Effect of Fat & Sugar levels on Colour & Appearance Score

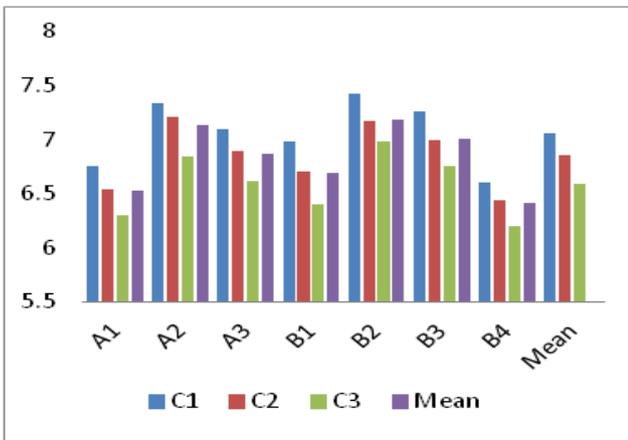


Figure 3: Effect of Fat & Sugar levels on Sweetness Score

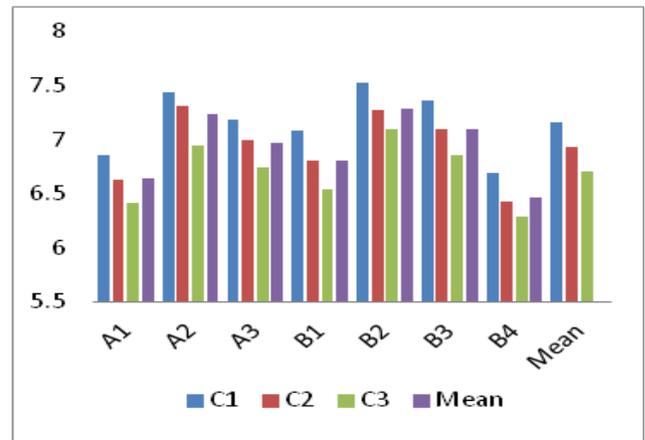


Figure 4: Effect of Fat & Sugar levels on Overall acceptability Score

nutraceuticals (C) on colour and appearance score of flavoured milk revealed a highest score (7.16) on addition of gulkand (C<sub>1</sub>) followed by saunf extract (C<sub>2</sub>), while lowest (6.84) was noted in case of carrot juice (C<sub>3</sub>) samples. It was also observed that gulkand added sample was significantly superior to saunf extract and carrot juice added samples. The interactional effect due to fat levels and nutraceuticals (A.C) revealed a maximum score (7.44) in case of samples were prepared with 2.5 per cent fat and gulkand (A<sub>2</sub>C<sub>1</sub>) followed by A<sub>2</sub>C<sub>2</sub> (7.31). However results varied non-significantly. The interactions between the treatment combinations of sugar levels and nutraceuticals (B.C) revealed that the maximum score (7.52) was noted when the samples were treated with 6 per cent sugar and gulkand (B<sub>2</sub>C<sub>1</sub>) followed by B<sub>3</sub>C<sub>1</sub> (7.36), while minimum (6.30) was noted in B<sub>4</sub>C<sub>3</sub> samples. The colour and appearance score of herbal flavoured milk presented in Fig. 2.

**Effect of Fat, Sugar levels and Nutraceuticals on Sweetness Score**

**Sweetness:** Table 3 represented the mean value of sweetness score of flavoured milk samples prepared from different fat levels indicated that highest score (7.13) was found in A<sub>2</sub> samples followed by A<sub>3</sub> and lowest score (6.53) in A<sub>1</sub> samples. The mean differences of sweetness score varied significantly

from one another when compared with CD at 5% level of significance. While comparing the average sweetness scores of flavoured milk on account of different sugar levels, it was observed that the best score (7.19) was noted when the samples contained 6% sugar (B<sub>2</sub>) followed by B<sub>3</sub>, B<sub>1</sub> and lowest score (6.41) in case of 8 % sugar (B<sub>4</sub>) samples. The result indicated that 6 % sugar level was most suitable as compared to 5, 7 and 8 % sugar levels. The findings closely agreed with the findings of Hanif *et al.*, (1996) and Badrie *et al.*, (1998) who reported that sugar concentration influenced the sensory and rheological acceptability. Similarly, the highest score (7.06) was found in samples containing gulkand (C<sub>1</sub>) followed by saunf extract (C<sub>2</sub>) and carrot juice (C<sub>3</sub>) when the interactional impact of nutraceuticals (C) on sweetness scores of flavoured milk was compared. The interactional effect between level of fat and nutraceuticals (A.C) revealed a maximum score of (7.34) in A<sub>2</sub>C<sub>1</sub> (2.5 per cent fat level with gulkand) followed by A<sub>2</sub>C<sub>2</sub>. So far as the interaction of sugar levels and nutraceuticals are concerned the treatment B<sub>2</sub>C<sub>1</sub> exhibited the maximum (7.42) followed by (B<sub>3</sub>C<sub>1</sub>) score (7.26). The sweetness score of herbal flavoured milk presented in fig. 3.

**Effect of Fat, Sugar levels and Nutraceuticals on Overall acceptability Score**

**Overall acceptability:** The overall acceptability scores on account of various treatment combinations were presented in Table 4. The means of various levels of all factors with regard to overall acceptability scores. The effect of fat levels (A) on overall acceptability was found to be significant at 0.1% level of significance. The maximum score (7.23) was noted in A<sub>2</sub> samples and lowest score (6.64) was noted in A<sub>1</sub> sample. The scores differed significantly from each other. The overall acceptability score on account of various sugar levels indicated highest score (7.29) in B<sub>2</sub> followed by B<sub>3</sub> (7.10) and lowest in B<sub>4</sub> (6.47). The result varied significantly from one another when compared with CD at 5%. These finding agreed with the findings of Hanif *et al.* (1996) and Badrie *et al.*, (1998) who observed that sugar concentration influenced the flavour and rheological acceptability. The overall acceptability score as influenced by nutraceuticals (C) exhibited maximum overall acceptability score (7.16) when treated with gulkand (C<sub>1</sub>) followed by saunf extract (6.93) while carrot juice scored the least (6.70) statistically these values differed significantly when compared with CD at 5%. The gulkand added samples were significantly superior over saunf extract and carrot juice added samples. The interaction effect due to treatment combinations of fat level (A) and nutraceuticals (C) showed maximum (7.44) overall acceptability score in A<sub>2</sub>C<sub>1</sub> followed by A<sub>2</sub>C<sub>2</sub> (7.31). The results varied significantly when compared with CD at 5% level of significance. So far as the interaction of sugar levels and nutraceuticals are concerned the treatment B<sub>2</sub>C<sub>1</sub> exhibited the maximum (7.52) followed by B<sub>2</sub>C<sub>2</sub> (7.36). The overall acceptability score of herbal flavoured milk presented in fig. 4.

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