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Sensory Quality Assessment of Sago Based Sweetened Carrot Yoghurt

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ABSTRACT

One of the exotic fermented milk products, yoghurt is gaining more popularity in India. Yoghurt has therapeutic properties and high nutritive value. It is good for the patient facing bone problem and proper way of the digestion in all human being. Keeping in view, the present study was under taken to investigate the sensory quality of yoghurt prepared from cow milk blended with carrot and sago powder. Carrot yoghurt were prepared with milk standardized for 4% fat and 14% SNF using cream and SMP (M_1) and (M_2) where SMP is replaced with SMP and sago powder in the ratio of 3:1 to maintain 14% SNF in milk. The carrot yoghurt from M_1 and M_2 milks with the addition of 0% (C_0), 2% (C_1) and 5% (C_2) carrot juice and two levels of sugar-4% (S_1) and 6% (S_2). The starter culture *Streptococcus thermophilus* and *Lactobacillus bulgaricus* were mixed in the ratio of 3:1 (v/v) and incubated at 41±0.5°C using 1% mixed culture (v/v) for 8 h. The body and texture and acidity score decreased significantly ($p<0.01$) in the yoghurt samples while the carrot juice was increased levels of 0, 2 and 5% in all yoghurt samples. The highest score of flavour, colour, appearance and overall acceptability were found for sago based yoghurt with 2% carrot juice.

Key words: Carrot juice, cow milk, sago, sensory quality, sugar, skim milk powder

INTRODUCTION

Amongst the popular exotic fermented milk products, yoghurt is gaining more popularity in the country. In the country it is mostly prepared from buffalo and cow milk and with their combination. The fermented products have therapeutic properties and high nutritive value (Karagul-Yuceer *et al*., 2001). It reduces cholesterol in the body and helps to assimilate nutrients in the body (Schieber *et al*., 2002; Marona and Pedrigon, 2004; Patel *et al*., 2009). Yoghurt provide resistant, anti-oxidants, anti-scorbatic, anti-cancer and digestion problem. It is good for the patient facing bone problem and proper way of the digestion in all human being (Beom *et al*., 1998; Sun *et al*., 2001; Seo and Yu, 2003). Keeping in view, the present study was under taken to investigate the quality of yoghurt prepared from cow milk blended with carrot and sago powder.

Carrot (*Dascus carota* L.) is good source of carbohydrate, calcium, phosphorus, iron, potassium, magnesium, copper, manganese and sulphur, it is an excellent source of vitamins A, B1, B2, C, E, thiamin, folic acid and riboflavin but deficient in iron and some of the vitamins (folic acid, riboflavin and vitamin C). Blending of yoghurt with carrot juice would produce a nutritionally rich food (Ikken *et al*., 1998; Raum, 2003).

Sago (Sabudana) is produce in a sago palm (*Mutroxylon sagu*) stem in Indian sago. It is a cheaper source of starch and easily dissolved in hot water and milk. It does not prove any colour,

flavour and taste but it is a good source of energy. One hundred grams of dry sago provide an average of 94 g carbohydrate, 0.2 mg protein, 0.5 dietary fiber, 10 mg calcium, 1.2 mg iron and negligible amount of fat, thiamine and ascorbic acid (Hong, 1980).

MATERIALS AND METHODS

Cross bred cow milk samples were procured form Banaras Hindu University Dairy farm, Varanasi and the freeze dried pure culture of *Streptococcus salivarius* subsp. *thermophilus* and *Lactobacillus delbruechii* subsp. *bulgaricus* were procured from the National Dairy Research Institute, Karnal, Haryana (India). The *S. thermophilus* and *L. bulgaricus* were mixed in the ratio of 3:1 (volume basis) in the culture.

The fresh cow milk was standardized for 4% fat and 14% SNF (Solid- not fat) using fresh cow cream and skim milk powder (M_1) and fresh cow cream along with admixture of skim milk powder (SMP) and sago powder in the ratio of 75:25 (M_2). Two levels of sugar 4% (S_1) and 6% (S_2) and three levels of carrot juice 0% (C_0), 2% (C_1) and 5% (C_2) were added in milk samples M_1 and M_2. The yoghurt prepared with all the levels of sugar and carrot juice from milk M_1 was designated as group-I and from milk M_2 as group-II. All the samples were heated at 90°C for 10 min and cooled at inoculation temperature (41±0.5°C). The samples were inoculated at 41±0.5°C using 1% mixed starter culture for 8 h. Evaluate the physical attributes of the product, score card for fermented milk product as suggested by Nelson and Trout (1981) was followed. Each sample was judged by a panel of five experienced judges and scored for different qualitative parameters (flavour, body and texture, colour and appearance, acidity) of the product.

Statistical analysis: The experiment was laid out in factorial randomised block design. The experiment data was analysed using the methods of Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

The yoghurt samples prepared under various treatments were analysed for important and major physical attributes as fallow:

Flavour: The highest flavour score (33.94) was found in the yoghurt sample M_1S_2 while the samples prepared M_2S_1 scored lowest value (32.17). The difference in the interaction effect between milk and sugar groups of flavour score (Table 1) was not significant. The highest flavour score (34.75) was recorded in the sample M_1C_1 whereas, the lowest flavour score was recorded in the yoghurt samples S_2C_0. The flavour score of yoghurt samples increased ($p<0.01$) with the addition of 6% sugar and 2% carrot juice (34.50), over samples prepare by 4% sugar without carrot juice (31.58).

The maximum flavour score (35.00) in yoghurt was recorded in the sample $M_1S_2C_1$. The value was comparatively lower when the yoghurt samples $M_2S_1C_0$(Table 2). The highest flavour score was found in the samples prepared from 2% carrot juice with 4% and 6% sugar in both the levels (0, 5%) of carrot juice. The best flavor score have also been reported by Aly *et al.* (2004) when yoghurt was prepared with 5% carrot juice as compared to the yoghurt prepared with 0, 10, 15 and 20% levels of carrot juice. Patil *et al.* (2009) reported maximum flavour score at 5% guava pulp and 9% sugar, over the yoghurt the prepared with 15% guava pulp and 6% sugar. They have also noted that as the levels of guava increased (from 5%) in the samples and sugar decreased (from 9%) the flavor score of yoghurt decreased ($p>0.05$).

Table 1: Physical attributes of carrot yoghurt and their interactions between milk with sugar, milk with carrot juice and sugar with carrot juice

Treatment	Flavour	Body and texture	Colour and appearance	Acidity score
M_1S_1	33.22	22.56	10.22	5.58
M_1S_2	33.94	23.17	11.22	5.66
M_2S_1	32.17	21.28	10.06	5.58
M_2S_2	32.61	21.94	10.28	5.49
CD at p<0.01	1.622	1.674	1.088	NS
M_1C_0	33.08	24.50	9.50	6.22
M_1C_1	34.75	22.67	12.17	5.35
M_2C_2	32.92	21.42	10.50	5.28
M_2C_0	31.08	22.58	9.17	6.30
M_2C_1	33.67	22.00	11.33	5.40
M_2C_2	32.67	20.25	10.00	4.90
CD at p<0.01	1.986	2.050	1.332	0.691
S_1C_0	31.58	23.50	9.00	6.08
S_1C_1	33.92	22.00	11.42	5.53
S_1C_2	32.58	20.25	10.00	5.12
S_2C_0	32.58	23.58	9.67	6.43
S_2C_1	34.50	22.67	12.08	5.22
S_2C_0	32.75	21.42	10.50	5.07
CD at p<0.01	1.986	2.050	1.332	0.691
				n = 3

Table 2: Physical attributes of carrot yoghurt and their interaction with milk, sugar and carrot juice

Treatment	$M_1S_1C_0$	$M_1S_1C_2$	$M_1S_1C_3$	$M_1S_2C_0$	$M_1S_2C_2$	$M_1S_2C_3$	$M_2S_1C_0$	$M_2S_1C_2$	$M_2S_1C_3$	$M_2S_2C_0$	$M_2S_2C_2$	$M_2S_2C_3$	CD at p< 0.01
Flavour	32.33	34.50	32.83	33.83	35.00	33.00	30.83	33.33	32.33	31.33	34.00	32.50	2.809
Body and texture	24.33	22.33	21.00	24.67	23.00	21.83	22.67	21.67	19.50	22.50	22.33	21.00	2.899
Colour and appearance	8.83	11.67	10.17	10.17	12.67	10.83	9.17	11.17	9.83	11.50	11.50	10.17	1.884
Acidity score	5.83	5.50	5.40	6.60	5.20	5.17	6.33	5.57	4.83	6.27	5.24	4.97	0.977
Overall acceptability	71.32	74.00	69.40	75.27	75.87	70.83	69.00	71.74	66.49	71.60	73.07	68.64	3.983
													n = 3

Body and texture: The difference in the interaction effect between milk and sugar on the body and texture score of yoghurt was significant (p<0.05). The higher body and texture score (23.17) was found in the yoghurt sample M_1S_2 while the sample M_2S_1 scored lowest value (21.28). The highest body and texture (24.50) score was recorded in the samples M_1C_1 whereas, the lowest score was recorded in the samples M_2C_2 (Table 1). The body and texture score (23.58) of yoghurt samples increased (p<0.01) with the S_2C_0. The lower body and texture score was recorded in the samples S_1C_2.

The highest body and texture scores (24.67) was recorded when samples $M_1S_2C_1$ comparatively lower (19.50) values were recorded in the samples $M_2S_1C_2$. Prior research had observed that panel prefer yoghurt samples were lowered body and texture (Aly *et al*., 2004; Kale *et al*., 2007; Ghadge *et al*., 2008) due to increased level of carrot juice, pomegranate, honey and apple. Vahedi *et al*. (2008) and Walkunde *et al*. (2009) had also contrary findings when used milk and sugar decreased body and texture score in the yoghurt samples.

Colour and appearance: Colour and appearance score (11.22) was the highest in M_1S_2 whereas, the yoghurt prepared from SMP+sago powder based milk mixed with 4% sugar (M_2S_1) scored lowest

value (10.06). The interaction effect between milk and sugar scores in the samples (Table 1) was found to be very high ($p<0.01$). Among the interaction effect between milk and carrot juice, the yoghurt samples M_1C_1 showed highest value (12.17) whereas, the samples M_2C_0 showed lowest score (9.17). The interaction effect in the values obtained between sugar and carrot juice was found to be very high ($p<0.01$). The highest colour and appearance score was in the sample S_1C_1 (12.08) while the score was very low in the sample S_2C_0 (9.00).

The score (12.67) was significantly very high ($p<0.01$) in the samples prepare from SMP based milk blended with 6% sugar containing 2% carrot juice ($M_1S_2C_1$). These results were in close agreement by the observation of Guven and Karaca (2002), Aly *et al.* (2004), Lovely and Meullenet (2009), Patel *et al.* (2009) and Walkunde *et al.* (2009).

Acidity score: A critical observation of the data presented in Table 1 indicates clearly that the interaction effect between milk and sugar had no significant impact on acidity score of yoghurt. The highest acidity score (6.30) was found in the yoghurt samples M_2C_0 while the yoghurt sample M_2C_2 scored lowest acidity score (4.90). The interaction effect between sugar and carrot juice was significantly ($p<0.01$) higher in yoghurt prepared from 6% sugar along without carrot juice (S_2C_0) than the lowest acidity score recorded in group S_2C_2 (5.07).

The increased ($p<0.01$) acidity score due to with the interaction between milk, sugar and carrot juice (Table 2). The interaction effect values between SMP based milk, 6% sugar and without carrot juice ($M_1S_2C_0$) was the highest (6.60). The lowest acidity score (4.83) was found in the sample $M_2S_1C_2$. The interaction of SMP, sago powder, sugar and carrot juice these ingredients increased in the samples. Therefore, acidity score was decrease. The present findings are at par with the findings reported by Drake *et al.* (2001), Kale *et al.* (2007) and Patel *et al.* (2009).

CONCLUSION

Therefore, it can be concluded that the body and texture and acidity score decreased significantly ($p<0.01$) in the carrot yoghurt samples while the carrot juice was increased levels of 0, 2 and 5% in all yoghurt samples. The flavour and colour and appearance scores were significantly ($p<0.01$) higher in the samples prepared with 2% carrot juice as compared to yoghurt prepared with 0 and 5% levels of carrot juice in all the groups.

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