Textural Characterization of Dietetic Amrakhand Prepared by using Stevia Leaf Extracts Powder

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ABSTRACT

Background: The name Amrakhand comes from two words 'aam' and 'shrikhand' literally meaning mango shrikhand. It is popular mango yoghurt in Maharashtra and Gujarat. Amrakhand contains high sugar content, but in the context of health consciousness refined carbohydrate is necessary to curb in the diet of both insulin and non-insulin dependent diabetic patient. Hence dietetic Amrakhand was prepared using stevia to study its effect and suitability as a natural sweetener.

Methods: Amrakhand prepared using different proportions of sucrose and powdered stevia leaf extract. The proportions used are 30:70 (T_1), 25:75 (T_2), 20: 80 (T_3), 15:85 (T_4), 10:90 (T_5) with control sample 100:0 (T_0). Textural properties of dietetic Amrakhand such as hardness, consistency, index of viscosity and cohesiveness were evaluated by using a texture analyzer (TA-XT2I, Stable Micro System, UK).

Result: Textural parameters reveals that effect of increasing the concentration level of powdered stevia leaf extract, decreases the hardness, consistency, cohesiveness and index of viscosity values of the product. Whereas good sensory results were found at 70% (T_1) of sucrose replacement by stevia leaf extract in dietetic Amrakhand. Hence, present paper focused on evaluation of textural characterization of dietetic Amrakhand prepared by using Stevia leaf extracts powder.

Key words: Dietetic amrakhand, Sensory characteristics, Stevia leaf extract powder, Textural properties.

INTRODUCTION

Amrakhand is an Indigenous fermented and sweetened milk product of Indian origin, is very popular in Maharashtra and Gujarat. Amrakhand is thick, creamy and has a smooth consistency. It has pleasant yellow color, sweet in taste and has mango flavor with sourness of yoghurt. Mango and mango flavored products has great acceptance by consumers mainly due to its sweet and flavor characteristics (Rehman, 2003; Bowden, 2007; Barnett *et al*., 2008).

Amrakhand is prepared by blending chakka (strained dahi/curd) sugar, fruit pulp, cream and other ingredients like nut, flavor, spices, colour *etc*. Now a day's growing interest in the diversification of this functional product attract wide range of consumers. In the recent past years it is noticed that many attempts made to incorporate different fruit pulps and additives such as mango pulp (Bardale *et al*., 1986), cocoa powder with or without papaya pulp (Vagdalkar *et al*., 2002), strawberry pulp (Sonwane *et al*., 2007), ashwagandha powder (Landge *et al*., 2011) and apple pulp with celosia powder (Kumar *et al*., 2011) in shrikhand.

With the changing food style, diseases like obesity, diabetes and cardiovascular have become major concern worldwide. The production of sugar free product enables diabetic people to relish the dairy product without affecting their blood glucose level. Further the trend of low fat and low sugar food is spurred by calorie conscious section of the modern society. In this context various low calorie sweeteners and zero calorie sugar replacers have been used in formulating traditional Indian dairy products thereby replacing sugar either partially or completely, such as aspartame in dietetic and diabetic rasogolla (Jayprakash *et al*., 2003), aspartame, sucralose and stevia in basundi (Goel, 2008), aspartame and sucralose in burfi (Prabha, 2006). However stevia reduces blood sugar level and doesn't affect the metabolism of insulin (Kinghorn, 2002). Good sensory score was observed while replacing 70% of sucrose by powdered stevia leaf extract in dietetic Amrakhand (Tondare and Hembade, 2019). Therefore, stevia leaf extract powder is used for preparation of dietetic Amrakhand. Textural characterization of product is valuable in process development studies. As food texture is the way in which various constituents and structural elements are arranged and combined into a microstructure leading to a macrostructure, external manifestation of flow and deformation.

Keeping these in mind, evaluated the effect of powdered stevia leaf extract on textural properties of dietetic Amrakhand.

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MATERIALS AND METHODS

Ingredients

Fresh buffalo milk, good quality cane sugar and Alphonso mango pulp of 'Chitale' brand was purchased from local market. Refined Stevia leaf extract powder (containing 97% Rebaudioside A) was purchased from Stevia world Agro Tech. Pvt. Ltd. Bangalore, Karnataka, India. 1 gm of refined stevia leaf extracts powder is equals to approximately 200 gm of cane sugar. The study was carried out at Department of Dairy Science, Yeshwant Mahavidyalaya Nanded during February 2019 to March 2020.

Production of dietetic Amrakhand

Amrakhand was prepared by using fresh, pasteurized buffalo milk with 6% fat and 9% solids not fat in a known quantity. Milk was heated at 85°C for 30 minutes, followed by cooling at 28°C. It was then inoculated @ 2% with locally available starter culture, which is mixed well and incubated at 35°C for 8 hours. When the curd has set firmly it was broken and placed in muslin cloth and pressed for expulsion of whey for 6 hours, the semi solid mass thus obtained was Chakka, form the base for shrikhand (De, 2009). As depicted in Table 2 at 27°C chakka was admixed with six different treatment combination of sucrose: stevia leaf extract powder *viz.* 30:70 (T_1), 25:75 (T_2), 20: 80 (T_3), 15:85 (T_4), 10:90 (T_5) with control sample 100:0 (T_0). Alphonso mango pulp was added at the rate of 30% (30 gm) per 100 gm of Chakka.

Textural characterization

A texture analyzer (TA-XT2I, Stable Micro System, UK) was used to determine the textural characteristics *viz.*, hardness, consistency, index of viscosity and cohesiveness of the dietetic Amrakhand. The analysis was carried out at 23°C. For each parameter three replications were taken by using a 25 mm stainless steel cylindrical probe (P25). The penetration depth at the geometrical center of the sample was 10 mm and the penetration speed was set at 1 mm/s. space.

Statistical analysis

Data analyzed statistically by one way ANOVA using WASP web based agricultural statistics software package developed by ICAR-Central Coastal Agricultural Research Institute, Goa-403 402, India.

RESULTS AND DISCUSSION

Effect of stevia leaf extract powder on textural properties of dietetic Amrakhand

Firmness

It is peak compression force (N), a soft product is one that displays a slight resistance to deformation and a firm product describes one that is moderately resistant to deformation and hardness that describes a product which displays substantial resistance to deformation, firmness value of all the sample was decreased with increased level of stevia leaf extract powder, *i.e.* From 1.27 N to 1.21 N respectively as compared to control sample containing 100% sugar 1.28N, it might be due to compositional differences which produces variation in microstructure as amount of sugar content reduced, which leads to increase in moisture content. Also addition of mango pulp increases the softness of Amrakhand.

Mehrotra *et al.* (2013) found in TPA of low-calorie Shrikhand prepared by using stevia leaf powder showed hardness value decreases with decrease in amount of sugar. The decreasing trend was in the pattern of 65.1g (10% replacement), 64.1g (20% replacement), 63.2g (30% replacement) and 62.2g (40% replacement) against control product was 66.1g. These results are comparable with the results of present study.

Consistency

Consistency analysis showed a significant difference with the addition of stevia leaf extract powder. The consistency value of dietetic Amrakhand decreases with substituting sucrose with stevia leaf extract powder in the pattern of T_1 (9.83 Ns), T_2 (9.59 Ns), T_3 (9.49 Ns), T_4 (9.48) and T_5 (9.30 Ns), as compared to control T_0 (11.45 Ns). With increasing proportion of stevia leaf extract powder, dietetic Amrakhand loses its thickness, higher value indicate a more viscous or thicker sample, consistency relates to the firmness, thickness or viscosity of liquid or fluid semi-solid. Stirring a fluid or semi-solid fluid with a spoon or a finger is frequently used by consumers to an indication of viscosity or consistency.

Cohesiveness

Cohesiveness is the tendency of a product to cohere or stick together. The intermolecular attractions by which the elements of the body or mass of material are held together determine its cohesiveness (Nasaruddin *et al.*, 2012).

Table 1: Nutritional information of refined stevia powder.

Reb A	97.28%
pH	< 7.0
Total ash	< 1%
Methanol residue	<111mg/kg
Ethanol residue	143mg/kg
TPC	< 1000 cfu/gm
Yeast and mold	100 cfu/gm
E.coli	< 10
Shelf life	2 years

Table 2: Treatment combinations of sucrose and stevia leaf extract powder.

Treatment	Concentration of Sucrose: stevia leaf extract powder	
	Percent	Grams
T_0	100:0	40:0
T_1	30:70	12:0.140
T_2	25:75	10:0.148
T_3	20:80	8:0.160
T_4	15:85	6:0.170
T_5	10:90	4:0.180

Table 3: Effect stevia leaf extracts powder on textural properties of dietetic Amrakhand.

Treatment	Hardness (N)	Consistency (Ns)	Index of viscosity (Ns)	Cohesiveness (N)
T_0	1.28±0.10	11.45±0.29	-1.50±0.03	-2.14±0.06
T_1	1.27±0.08	9.83±0.44	-1.34±0.31	-1.97±0.39
T_2	1.25±0.04	9.59±1.18	-1.25±0.27	-1.83±0.26
T_3	1.23±0.14	9.49±1.00	-1.02±0.28	-1.67±0.32
T_4	1.22±0.08	9.48±0.35	-0.90±0.06	-1.51±0.07
T_5	1.21±0.05	9.30±0.42	-0.81±0.31	-1.34±0.34
C.D. at 5%	-	1.079	0.446	0.511
SE (m)	0.052	0.313	0.129	0.148
C.V.	7.937	6.018	-21.581	-16.097

*Data based on Mean± SD of three replicates.

Table 4: Effect stevia leaf extracts powder on sensorial properties of dietetic Amrakhand.

Treatment	Sensory attributes					
	Color and appearance	Flavor	Mouth feel	Body and texture	Taste	Overall acceptability
T_0	7.73±0.15^b	7.82±0.09^a	7.82±0.03^a	7.54±0.15^b	8.22±0.32^a	7.82±0.24^a
T_1	8.13±0.18^a	7.95±0.09^a	7.91±0.29^a	7.97±0.18^a	8.04±0.04^b	8.00±0.08^a
T_2	7.85±0.24^b	7.91±0.07^a	7.90±0.54^a	7.71±0.07^b	8.01±0.37^b	7.87±0.10^a
T_3	7.82±0.09^b	7.91±0.07^a	7.87±0.21^a	7.65±0.18^b	7.94±0.28^b	7.83±0.11^a
T_4	7.13±0.10^c	7.33±0.18^b	7.57±0.71^b	7.24±0.25^c	7.56±0.29^c	7.36±0.19^b
T_5	6.34±0.40^d	6.46±0.64^c	6.85±0.20^c	6.77±0.24^d	6.98±0.18^d	6.68±0.27^c

All values are given in mean ± s.d. where n=5, $^{a-d}$ Values with the same superscript within the same column are not significantly different ($P < 0.05$).

Mean cohesiveness value of dietetic Amrakhand decreases from -1.97 to -1.34N by replacing 70 to 90% against control -2.14N by 0% replacement of sugar. Decrease in amount of sugar showed that the cohesiveness value of product decreases compared to control sample. It may be due to an addition of mango pulp. Pon *et al*. 2015 revealed that replacement of sugar with stevia in different concentration, there was significant increase in cohesiveness of ice-cream.

Index of viscosity

Mean Index of viscosity value in terms of Ns decreases from -1.34, -1.25, -1.02, -0.90 and -0.81 for T_1, T_2, T_3, T_4 and T_5 against -1.50 for T_0 (control) with increasing the concentration level of stevia leaf extracts powder. Though mango pulp increases the intermolecular attraction but stevia leaf extract powder might decreases the force required to withdrawal of probe from the product. Index of viscosity is the extrusion energy or work of adhesion where as it becomes higher; more resistance is required when pulling out the sample (Liu *et al*. 2007). These suggest that viscosity is very much related to resistance to flow and may be related to cohesiveness and consistency (Nasaruddin *et al*. 2012). Thus in prepared dietetic Amrakhand decreasing trend was observed for each textural property with substitution of sugar by stevia leaf extract powder.

Sensory attributes

It was depicted in Table 4 that Sensory attributes color and appearance, flavor, Mouthfeel, body and texture, aftertaste and overall acceptability score was in the pattern of $T_1>T_2>T_0>T_3>T_4>T_5$, the treatment T_1 had best overall acceptability score over other treatments by the panel of judges. Treatment T_1 had highest overall acceptability score (8.00) than control (T_0) *i.e.* (7.82). (Tondare and Hembade, 2019).

The results are in line with the Kalicka *et al*. 2017 found that yoghurt with stevia considered worse, but yoghurt contains 75% addition of stevia in the mixture, was usually selected as a second choice. The present study was also in line with the Mehrotra *et al*. 2013 revealed that substitution of 30% of stevia leaf powder scored highest and the replacement of sugar by the powder, till 30% did not differ significantly from the control sample.

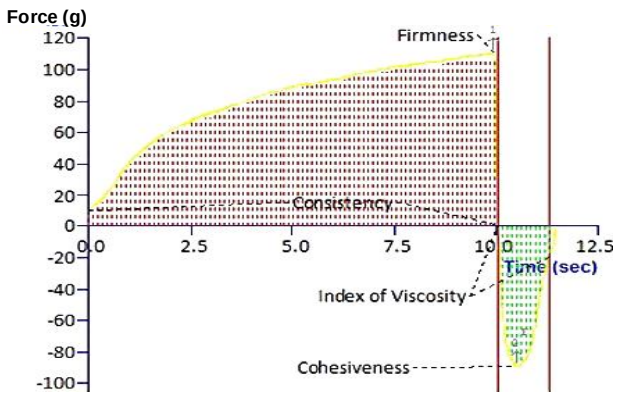

Fig 1: A Force-Time graph showing textural properties.

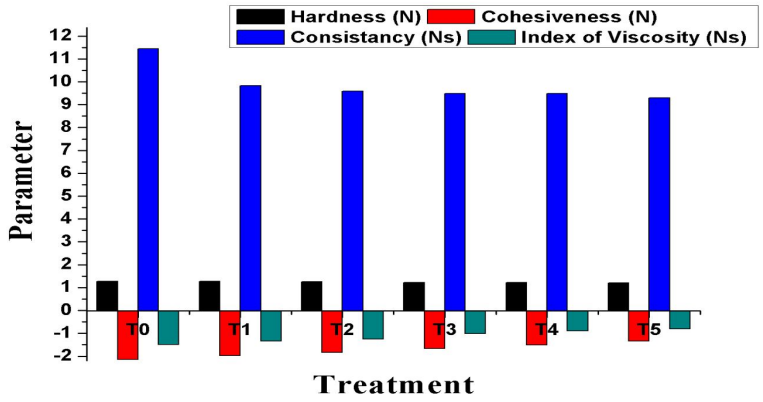

Fig 2: Effect of stevia leaf extracts powder on textural properties of dietetic Amrakhand.

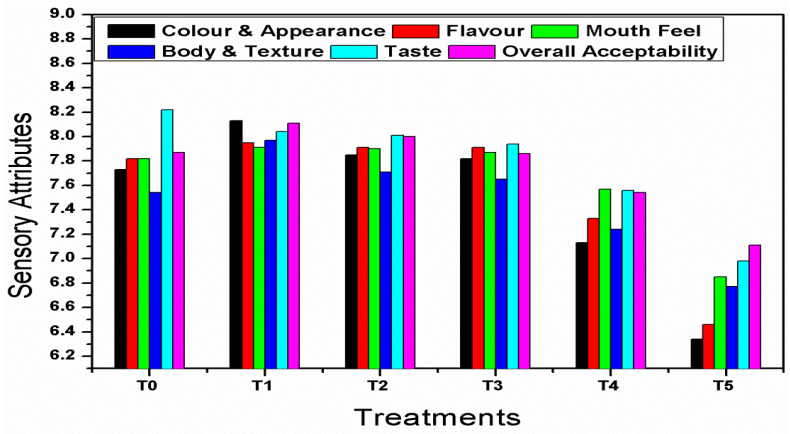

Fig 3: Effect of stevia leaf extracts powder on sensory properties of dietetic Amrakhand.

CONCLUSION

It is concluded that substitution of sugar with stevia leaf extract powder decreases the hardness, consistency, cohesiveness and index of viscosity values of dietetic Amrakhand. Dietetic Amrakhand containing 70% replacement (T_1) of sugar with stevia leaf extracts powder thrive better over other treatment combinations in terms of its textural characterization. Therefore minimum concentration of stevia leaf extracts powder can be adjudged to be formulated in the dietetic Amrakhand for calorie conscious section of the society.

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