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Studies on Rheological (Texture Profile) properties of Herbal Sandesh incorporated with Ashwagandha (*Withania somnifera*) and Tulsi (*Ocimum sanctum*)

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Abstract

Herbal Sandesh prepared by incorporating medicinal herbs showed textural properties. Ashwagandha (*Withania somnifera*) and Tulsi (*Ocimum sanctum*) are popular medicinal plant that helps to improve textural quality of dairy product. The present study was carried out to find out the hardness, springiness, cohesiveness and chewiness measured by texture profile analysis with herbal extract inclusion in the Sandesh. The addition of herbs @ 1%, 2%, 3%, 4%, 5% and 6% decrease the hardness, springiness, chewiness of Herbal Sandesh and therefore, it increases the cohesiveness of Herbal Sandesh. The result found that best hardness, springiness, chewiness of herbal Sandesh @ 1% Ashwagandha and cohesiveness of herbal Sandesh by inclusion of Ashwagandha @ 3% and Tulsi 3% herbs extract respectively in selected Sandesh compared to @ 0% used of herb in Sandesh. Sandesh was prepared by this method was subjected to sensory properties of herbal Sandesh.

Keywords: Texture, Sandesh, herbs, hardness, cohesiveness, springiness and cohesiveness

1. Introduction

Sandesh is the oldest and most popular sweet in our country because of its high palatability. It is also a delicious, wholesome, nutritious food and very famous item in Bangladesh. It is also popular in West Bengal and some parts of Assam, Myanmar, Orissa and Tripura and other parts of India. The demand for sandesh is steadily growing (Sen and Rajorhia, 1985) [12]. It is very vital to health because of its fairly high protein and fat content, minerals, specially calcium and phosphorus and also fat soluble vitamins particularly vitamin A and D content. Protein efficiency ratio, biological value and digestibility coefficients of Sandesh are higher than skim milk (Rajani and Sharda, 1983) [11]. The instrumental TPA was developed 40 years ago and it is a very popular and used method not only in research but also in the industry for quality control of food texture (Pons and Fiszman, 1996) [10]. A new recording instrument, the "texturometer", gave good correlation between instrumental values and panel. It was applied to measurement of the mechanical textural parameters: hardness, cohesiveness, viscosity, elasticity, gumminess. Subjective definitions of these parameters are interpreted in terms of physical measurement characterized representative profiles are included (Herman et al., 1963) [4]. The numerous methods for objectively measuring the textural properties of foods are classified on the basis of measurement. Physical methods of measurement are classified under the headings force-measuring, distance-measuring, ratio-measuring, multiple-measuring, and multiple-variable instruments. There are also some chemical methods which are not fit into any of the above categories make a special, miscellaneous group. Examples are given of the kinds of instruments (Bourne, 1966) [3]. *Withania somnifera* (Ashwagandha) is a plant used in medicine from the time of Ayurveda, the ancient system of Indian medicine. Ashwagandha root texture determined by the starch and fiber content plays a significant role in the market price of the roots benefiting farming community. Brittle roots having high starch and low fiber are highly priced because of their ease in making powder and are quoted to be characteristic root textural features of commercial Ashwagandha. The dried roots of the plant are used in the treatment of nervous and sexual disorders. From chemistry point of view, the drug contains a group of biologically active constituents known as withanolides. The biologically active chemical constituents of *Withania somnifera* (WS) include alkaloids (isopelletierine, anaferine, cuscohygrine, anahygrine, etc.), steroidal lactones (withanolides, withaferins) and saponins (Mishra et al., 2000) [8].

Today there is much interest in natural products with anticancer activity. Withanolides are of under research potential as far treatment of cancer is concerned. The research paper reviews the scope of studies published in favour of anticancer potential of withaferin-A (Singh *et al.*, 2010) [13]. Tulsi or Holy Basil is an Indian medicinal plant. Because of its beneficial factors, Tulsi is being used across the globe for health ailment, as antioxidants, etc. Its chemical constituents include Eugenol (main pharmacological ingredient), Carvacrol, Cineole, Limatrol, Sterols, Vitamin A, C, Iron (Fe), Zinc (Zn). Ingestion of 1 g of dried Tulsi leaves daily provides approximately 8.5 mg vitamin C, which is superior to synthetic vitamin C in terms of bioavailability within the body. Most importantly Tulsi possesses both anticancer and antioxidant properties (Mathew *et al.*, 2010; Islam *et al.*, 2011) [10, 6]. These well-established nutritional and pharmacological properties of the whole herb in its natural form result from synergistic interactions of many different active phytochemicals (Bharavi *et al.*, 2010) [1].

2. Materials and methods

The present study has been carried out in the research Lab, Warner School of Food and Dairy Technology, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad, U.P. (India). All the raw materials were collected from the local market of Allahabad. Potable water was used for preparing the product. It was ensured that the materials used were free from any kind of infection.

Herbs: Ashwagandha root powder and Tulsi leaves dried form were purchased from Allahabad city.

2.1 Preparation of herbal water extract: Herbal water extract was prepared by soaking each herb in distilled water (1:10) overnight followed by centrifugation (2000 rpm; 15 min at 40 °C). The supernatant was harvested and refrigerated and used in the preparation of Herbal Sandesh.

2.2 Preparation of chhana: The method adopted to prepare chhana in this study was according to the method given by Bhattacharya *et al.*, (1971) [2] with slight modification. The standardized buffalo milk was heated up to 75 °C. The freshly prepared coagulant solution was heated to 75 °C and then added slowly in a thin continuous stream with continuous gentle agitation till a clear whey separated out. Stirring was then stopped and the curd was allowed to remain in whey for about 5 minutes. It was then drained through a hang with muslin cloth (10 min) and stored for future use.

2.3 Preparation of herbal Sandesh: Fresh chhana and herbs (table 1) was kneaded thoroughly to make an uniform dough. Fine powdered cane sugar (300 g) was added to the dough' and was kneaded again. The dough was then heated (75 °C) in an iron pan with continuous stirring. Heating was continued until the mixture acquired desired consistency with slightly cooked flavour. During the final stages of heating, the mixture developed slight cooked flavour and the sticking tendency to the pan disappeared. The cooking was completed in 15-20 min. The products were then transferred to a shallow pan, cooled and sliced into desired shapes. Thus, final product obtained and packed in plastic box for storage at room temperature (25± 5 °C).

Table 1: Treatment combination (formulation of Sandesh samples)

S.No.	Treatment	Chhana	Ashwagandha Root Extract	Tulsi Leave Extract	Total
		(gm)	(gm)	(gm)	(gm)
1	A ₀ B ₀	1000	0	0	1000
2	A ₀ B ₁	990	0	10	1000
3	A ₀ B ₂	980	0	20	1000
4	A ₀ B ₃	970	0	30	1000
5	A ₁ B ₀	990	10	0	1000
6	A ₁ B ₁	980	10	10	1000
7	A ₁ B ₂	970	10	20	1000
8	A ₁ B ₃	960	10	30	1000
9	A ₂ B ₀	980	20	0	1000
10	A ₂ B ₁	970	20	10	1000
11	A ₂ B ₂	960	20	20	1000
12	A ₂ B ₃	950	20	30	1000
13	A ₃ B ₀	970	30	0	1000
14	A ₃ B ₁	960	30	10	1000
15	A ₃ B ₂	950	30	20	1000
16	A ₃ B ₃	940	30	30	1000
Note: Sugar use For all Treatment: 300 gm (30.0% of total wt.)					
Ashwagandha extract				Tulsi extract	
A ₀ = 0.0%				B ₀ = 0.0%	
A ₁ = 1.0%				B ₁ = 1.0%	
A ₂ = 2.0%				B ₂ = 2.0%	
A ₃ = 3.0%				B ₃ = 3.0%	

2.4 Rheological quality of Herbal Sandesh

2.4.1 Texture Profile Analysis (TPA): Textural parameters of product like hardness, springiness, chewiness and cohesiveness were analyzed using Texture Analyser (TA.XT plus texture profile analyzer, Stable Micro Systems, UK).

2.4.2 Statistical Analysis: The data obtained were statistically analyzed for its validity by using factorial design and critical difference (C.D) technique (Imran and coover, 1983).

Number of treatments - 16

Number of replications - 5

Total number of samples - 80

3. Results and discussions

Rheological properties such as hardness, springiness, cohesiveness and chewiness for the studied herbs based Herbal Sandesh prepared by different concentration of

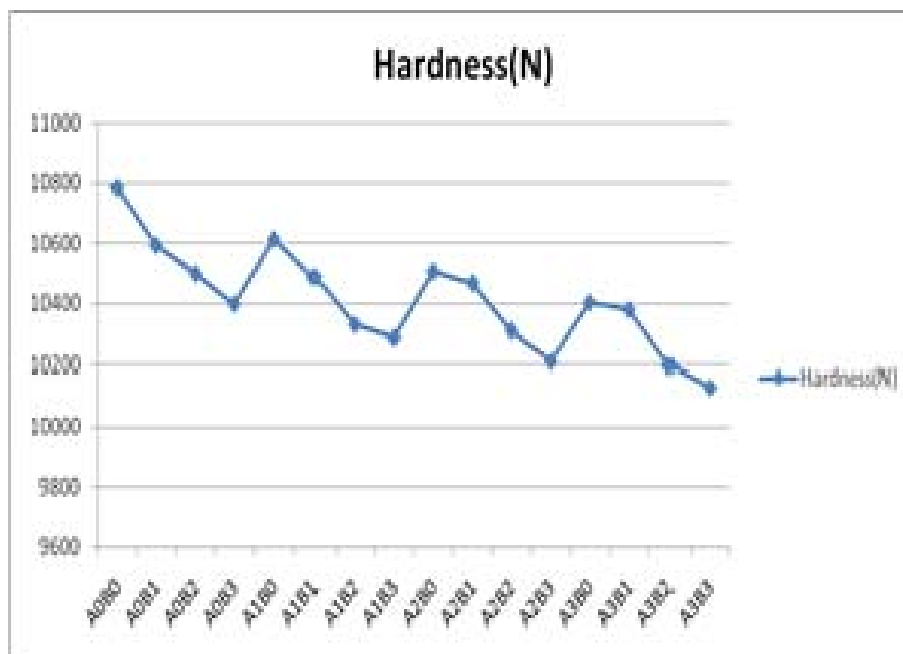
Ashwagandha and Tulsi extract or combination@ 1%, 2%, 3%,4%,5% and 6% respectively are included in Table-2. All properties were affected significantly by the formulation ($P \leq 0.05$).

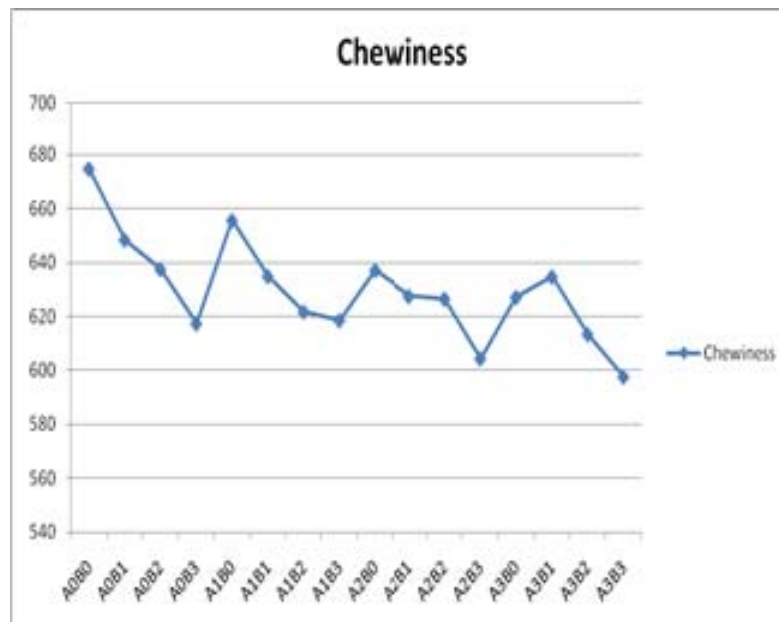
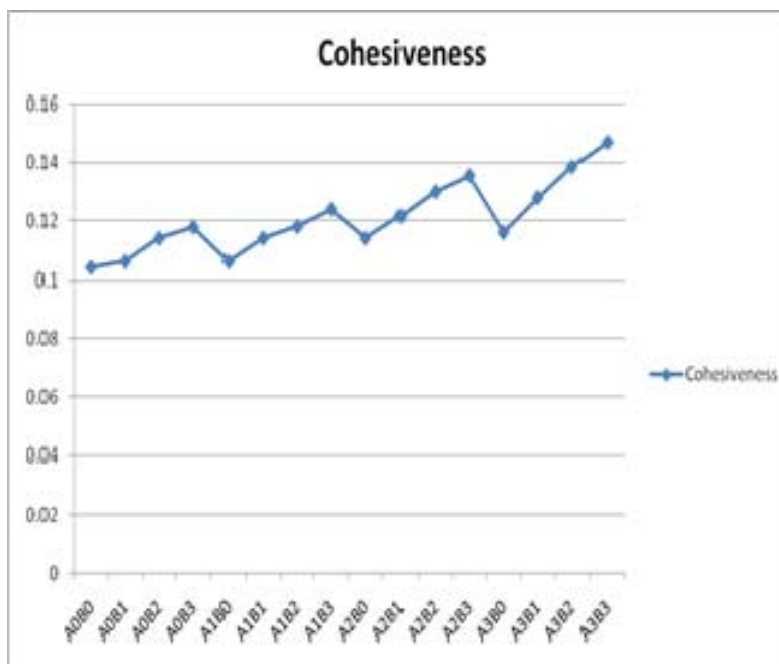
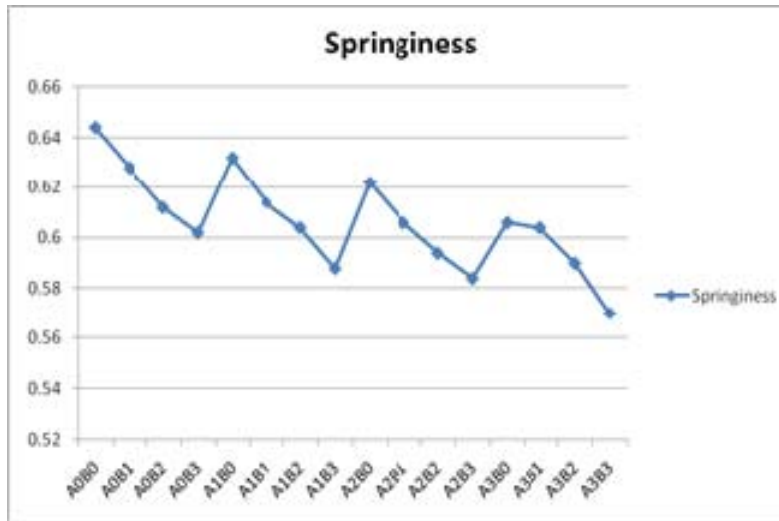
Table 2: Average of Data obtained for Rheological Analysis of Herbal Sandesh

S.No.	Treatments	Hardness(N)	Springiness(mm)	Cohesiveness	Chewiness(Nmm ²)
1	A ₀ B ₀	10783.28	0.644	0.102	674.76
2	A ₀ B ₁	10591.18	0.630	0.110	648.36
3	A ₀ B ₂	10498.28	0.612	0.114	637.40
4	A ₀ B ₃	10396.68	0.602	0.118	617.20
5	A ₁ B ₀	10611.86	0.632	0.112	655.60
6	A ₁ B ₁	10487.44	0.614	0.116	634.80
7	A ₁ B ₂	10328.42	0.604	0.118	621.60
8	A ₁ B ₃	10285.56	0.588	0.124	618.40
9	A ₂ B ₀	10505.22	0.626	0.116	637.00
10	A ₂ B ₁	10466.84	0.606	0.122	627.40
11	A ₂ B ₂	10308.84	0.596	0.130	626.40
12	A ₂ B ₃	10207.66	0.582	0.141	604.20
13	A ₃ B ₀	10401.78	0.606	0.122	627.00
14	A ₃ B ₁	10377.76	0.604	0.128	634.60
15	A ₃ B ₂	10196.42	0.596	0.146	613.20
16	A ₃ B ₃	10126.42	0.570	0.151	597.40

Table 2: Table for Rheological Properties of Herbal Sandesh. The addition of herbs decreases the Hardness, Springiness, Chewiness of Herbal Sandesh and Therefore increases in the Cohesiveness of Herbal Sandesh. Hardness (N) of the Herbal Sandesh lowest ranged from 10126.42 (A₃B₃) and highest ranged from 10591.18 (A₀B₁). There were significant differences in the Hardness(N) of the Herbal Sandesh contained herbs. According to the results of this research there were significant differences found in the Springiness, and Chewiness ($P < 0.05$) in different experimental Herbal Sandesh. Herbal Sandesh containing 1% Ashwagandha had significantly higher Springiness (0.632) and Chewiness of

Herbal Sandesh was recorded as the higher 655.60 (A₁B₀), as shown Table-2. The addition of Herbs increased the Cohesiveness of Herbal Sandesh with the increase in the level of Herbs added. The lowest Cohesiveness for the control sample was 0.102 (A₀B₀) and the maximum was herbal Sandesh was 0.151 (A₃B₃). In vectors represent a graphical display of the loading for the variables used in the PCA. The variables of cohesiveness, hardness and chewiness had similar loads than the variables of protein and fat content, indicating that changes in fat and protein content will affect these texture variables (Nestor and Nalleli 2013) [9].





4. Conclusion

The work provided a better understanding of desired Rheological properties imparted by the herbs to the Herbal Sandesh. The Herbal Sandesh prepared by standard procedure incorporated with Ashwagandha and Tulsi extract. Rheological properties were analyzed in terms of hardness (N), springiness, cohesiveness and chewiness. The results of the present study revealed that the inclusion of herbs in the Herbal Sandesh @1%, 2%, 3%, 4%, 5% and 6% level of Ashwagandha, Tulsi and combination of herbs. The best sample incorporated with the Ashwagandha @ 1% Herbs showed exceptional results as compared to other samples. The evidence from this study suggests that herbs additives in Herbal Sandesh increased the acceptability of Sandesh.

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