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To study the physico-chemical properties of *Ashwagandha* enriched pineapple ice cream

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Abstract
The study compared the difference observed in physico-chemical properties of Ice cream due to addition of *Ashwagandha* and Pineapple. *Ashwagandha* (*Withania somnifera*) is one of the most valued medicinal plant and widely used in Indian traditional health care systems and Pineapple contain considerable calcium, potassium, fiber and vitamin C and is low in fat and cholesterol. Different level of *Ashwagandha* and Pineapple was added and optimized on the basis of sensory test. The moisture content of treatment is increasing with increasing level of pineapple while decreasing with increase in *Ashwagandha* powder level when pineapple pulp is constant and same trend was observed in the case of protein content. In case of fat content, it shows decreasing trend with increase of Pineapple and *Ashwagandha* and also pH of the treated product shows inverse relationship with level of *Ashwagandha* and Pineapple. The overrun percentage of treatments is decreasing with increasing level of pineapple and *Ashwagandha* powder. So, it can be concluded that a good quality of ice cream can be prepared using fruit and medicinal plant.

Keywords: Pineapple, *Ashwagandha*, sensory test

Introduction
Dairy sector is of pivotal importance to the Indian economy as contributed to a great extent in bringing about a dynamic change in the economic set up of the agricultural sector particularly in rural areas. The country is the world's largest producer of dairy products and also their largest consumer. Milk production in India increased from 17 million tons in 1950-51 to 146.3 million tons in 2014-2015 (NDDB, 2014) [8]. Out of the total milk produced, 46% is utilized as liquid milk while 50% is converted into traditional products like ghee; makkhan (33%) dahi/yoghurt (7%), khoa (7%) and chhana/paneer (3%) and the remaining 4%is converted mainly into western products such as ice cream, milk powder, etc., Herbal supplements have been used for thousands of years in the years in the east as mentioned in our Vedas. According to World Health Organization (WHO), more than 80% of the world`s population relies on the traditional medicinal for their primary health care needs. The antioxidants are the chemical substance that reduce or prevent oxidation and have ability to counter against cancer; artiosclerosis, heart diseases.

Ashwagandha (*Withania somnifera*) is one of the most valued medicinal plant and widely used in Indian traditional health care systems for curing various diseases. It is also one of the members of GRAS (Generally Regarded As Safe) category of plants that can be used for therapeutic purposes.

Ashwagandha, in Sanskrit means "horse`s smell" probably originating from the odour of its which resembles that of sweaty used in Ayurvedic medicine in a way similar to that ginseng is used in traditional Chinese medicine. Roots of *Ashwagandha* has been extensively used in many indigenous preparations for its medicinal values such as antiaging,aphrodisiac, cardio tonic, antistress, anti-inflammatory, antioxidants, hyroregulatory, antiperooxidative, hemopoietic, rejuvenating, anti tumouretc (Mishra *et al.*, 2000) [7]. *Ashwagandha* exerts these properties because of its biochemical constituents like alkaloids and steroidal lactones.

Pineapple (*Ananascomosus*, Bromeliaceae) is a wonderful tropical fruit having exceptional juiciness, vibrant tropical flavor and immense health benefits. Pineapple contain considerable calcium, potassium, fiber and vitamin C. It is low in fat and cholesterol. Vitamin C is the body`s primary water soluble antioxidant, against free radicals that attack and damage normal cells. It is also a good source of vitamin B_1. vitamin B_6, copper and dietary fiber. Pineapple is a digestive aid and a natural anti-inflammatory fruit.

A group of sulfur containing proteolytic enzymes (bromelain) in a pineapple aid digestion. Bromelain has demonstrated significant anti-inflammatory effects, reducing swelling in inflammatory conditions such as acute sinusitis, sore throat, arthritis and speeding recovery from injuries and surgery. Pineapple enzymes have been used with success to treat rheumatoid arthritis and to speed tissue repair as a result of injuries, diabetic ulcers and general surgery. Pineapple reduces blood clotting and helps remove plaque from arterial walls. Studies suggest that pineapple enzymes may improve circulation in those with narrowed arteries such as angina sufferers. Pineapples are used to help cure bronchitis and throat infections. It is efficient in the treatment of arteriosclerosis and anemia. Pineapple is an excellent cerebral toner; it combats loss of memory, sadness and melancholy. Pineapple fruits are primarily used, in the three segments, namely, fresh fruit, canning and juice concentrate with characteristic requirements of size, shape, color, aroma and flavor.

Material and Methods

The experimental study on "Development of *Ashwagandha* enriched pineapple Ice Cream" was conducted in the Departmental Laboratory, Animal Husbandry &Dairying, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi (U.P.), India.

The plan of work was as follows

(A) *Ashwagandha* enriched pineapple ice cream treatments

(1) T_0= control product
(2) T_1 = 0.5% *Ashwagandha* powder and 10% pineapple pulp
(3) T_2 =1.0% *Ashwagandha* powder and 10% pineapple pulp
(4) T_3 = 1.5% *Ashwagandha* powder and 10% pineapple pulp
(5) T_4 = 0.5% *Ashwagandha* powder and 15% pineapple pulp
(6) T_5 =1.0% *Ashwagandha* powder and 15% pineapple pulp
(7) T_6 = 1.5%*Ashwagandha* powder and 15% pineapple pulp
(8) T_7 = 0.5%*Ashwagandha* powder and 20% pineapple pulp
(9) T_8 = 1.0% *Ashwagandha* powder and 20% pineapple pulp
(10) T_9 =1.5% *Ashwagandha* powder and 20% pineapple pulp

(B) Replication: Number of replications =3

(1) R_1
(2) R_2
(3) R_3

(C) Total number of observation = 10 ×3 =30

Moisture content was calculated as per the method of AOAC (1995) [1], Total solids content in the control and optimized *Ashwagandha* enriched pineapple Ice Cream was determined as per the BIS Method, The fat content of control and *Ashwagandha* enriched pineapple Ice Cream was estimated by using Soxhlet apparatus (Sock-plus), The protein content of control and *Ashwagandha* enriched pineapple Ice Cream was estimated by using Kjeldahl method described by The titrable acidity of ice cream mix was determined by back titration method essentially similar to The pH of control and *Ashwagandha* enriched pineapple Ice Cream was measured using a digital pH meter according to standard of the Overrun is amount of air incorporated in the frozen ice cream. It is expressed by the percentage increase in volume that the initial ice cream mix undergoes during freezing/whipping. This was calculated by comparing the weight of a known volume of ice cream (M_2) to the weight of the same volume of unfrozen ice cream mix (M_1) as follows, and melting rate was calculated by taking a 50 gm sample of control and optimized *Ashwagandha* enriched pineapple Ice Cream was placed in a Buchner funnel on the top of a flask and was allowed to melt at room temperature (24± 1 C) for 30 min. After this time, the dipped volume was weighed and melting resistance was obtained using the following equation:

$$\text{Melting Rate (\%)} = \frac{A_1 - A_2}{A_2} \times 100$$

Where, $A_1$and $A_2$are the weight of initial sample (50 g) and melted sample respectively.

Results and Discussion

Total moisture content

The control ice cream was analysed for moisture content against different treatment of *Ashwagandha* powder enriched pineapple Ice Cream. The moisture content of treatment is increasing with increasing level of pineapple while decreasing with increase in *Ashwagandha* powder level when pineapple pulp is constant. Highest moisture level is reported in T_9 and lowest in T_3 which can be easily seen in table no. 1.

Table1: Effect of various combination of *Ashwagandha* powder and pineapple pulp on moisture content of Ice cream

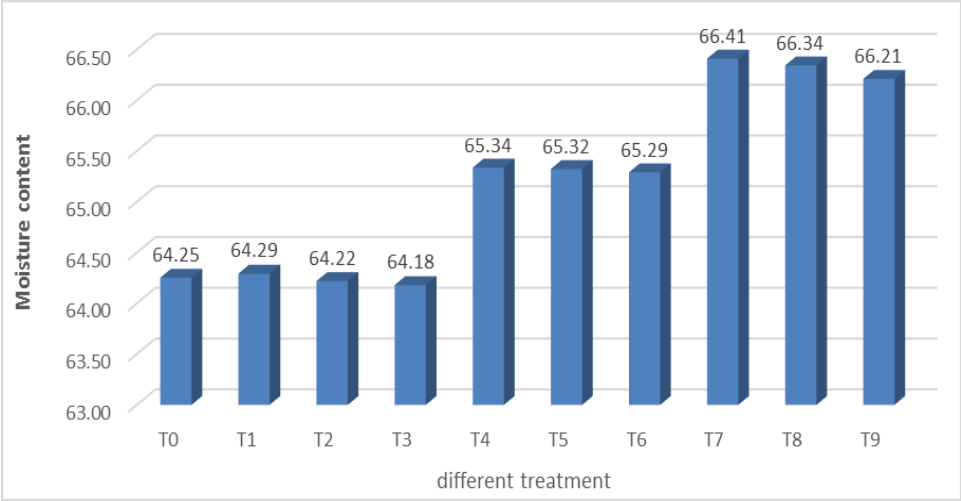
	R1	R2	R3	TOTAL	MEAN
T0	64.22	64.25	64.29	192.76	64.25
T1	64.28	64.29	64.31	192.88	64.29
T2	64.27	64.18	64.21	192.66	64.22
T3	64.16	64.09	64.29	192.54	64.18
T4	65.33	65.36	65.32	196.01	65.34
T5	65.31	65.32	65.34	195.97	65.32
T6	65.29	65.27	65.31	195.87	65.29
T7	66.41	66.39	66.43	199.23	66.41
T8	66.39	66.21	66.43	199.03	66.34
T9	66.37	66.15	66.11	198.63	66.21
TOTAL	652.03	651.51	652.04		
MEAN	65.203	65.151	65.204		

Table 1(b): Analysis of variance for moisture content of different combination of *Ashwagandha* powder and pineapple pulp on Ice cream

Source	Df	SS	MSS	Fcal	Ftab	SIG
Treatment	9	22.65139	2.516821	517.1549	3.456676	S
Error	20	0.097333	0.004867			
Total	29	22.74872				

For comparing product

SEm	0.04
CD	0.16
CV	0.11



Protein Content

The total protein content of treatments is decreasing with increasing level of pineapple while increasing with increasing level of *Ashwagandha* powder when pineapple pulp level is constant. Highest total protein level is reported in T_3 and lowest in T_7 which can be easily seen in the table no. 2. The observations revealed that as the pulp level in the Ice Cream increased, the protein content of the Ice Cream decreased. Pulp did not contribute significantly for the protein content.

Table 2: Effect of various combination of *Ashwagandha* powder and pineapple pulp on protein content of Ice Cream

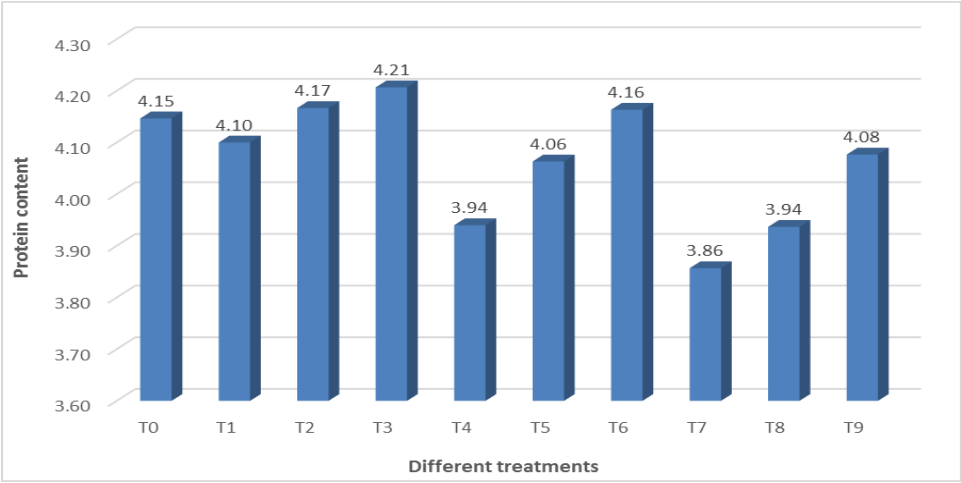
	R1	R2	R3	Total	Mean
T0	4.13	4.15	4.16	12.44	4.15
T1	4.09	4.10	4.11	12.3	4.10
T2	4.15	4.18	4.17	12.5	4.17
T3	4.22	4.21	4.19	12.62	4.21
T4	3.92	3.96	3.94	11.82	3.94
T5	4.01	4.11	4.07	12.19	4.06
T6	4.12	4.18	4.19	12.49	4.16
T7	3.89	3.83	3.85	11.57	3.86
T8	3.93	3.97	3.91	11.81	3.94
T9	4.08	4.02	4.13	12.23	4.08
Total	40.54	40.71	40.72		
Mean	4.054	4.071	4.072		

Table 4.3.2(b): Analysis of variance for protein content of different combination of *Ashwagandha* powder and pineapple pulp on Ice Cream

Source	Df	SS	MSS	Fcal	Ftab	SIG
Treatment	9	0.370803	0.0412	40.92752	3.456676	S
Error	20	0.020133	0.001007			
Total	29	0.390937				

For comparing product

SEm	0.02
CD	0.07
CV	0.78



Fat content

The fat content of treatments is decreasing with increasing level of pineapple and *Ashwagandha* powder. Highest fat content level is reported in T_0 followed byT_1 and lowest in T_9 which can be easily seen in the table no. 3.

Table 3: Effect of various combination of *Ashwagandha* powder and pineapple pulp on total fat of Ice cream

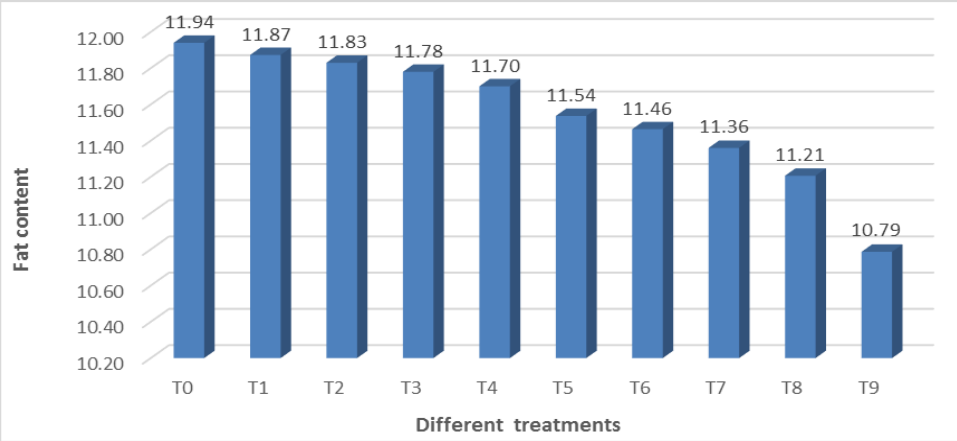
	R1	R2	R3	TOTAL	MEAN
T0	11.94	11.92	11.96	35.82	11.94
T1	11.89	11.85	11.88	35.62	11.87
T2	11.82	11.83	11.84	35.49	11.83
T3	11.76	11.77	11.81	35.34	11.78
T4	11.55	11.67	11.88	35.1	11.70
T5	11.51	11.53	11.57	34.61	11.54
T6	11.48	11.42	11.49	34.39	11.46
T7	11.32	11.37	11.39	34.08	11.36
T8	11.01	11.07	11.54	33.62	11.21
T9	10.77	10.83	10.76	32.36	10.79
Total	115.05	115.26	116.12		
Mean	11.505	11.526	11.612		

Table 4.3.3(b): Analysis of variance for total fat of different combination of *Ashwagandha* powder and pineapple pulp on Ice cream

Source	Df	SS	MSS	Fcal	Ftab	SIG
Treatment	9	3.464203	0.384911	32.38178	3.456676	S
Error	20	0.237733	0.011887			
Total	29	3.701937				

For comparing product

SEm	0.06
CD	0.25
CV	0.94



Effect on pH

The pH of treatments is decreasing with increasing level of pineapple and *Ashwagandha* powder. Highest pH is reported in T_0 followed byT_1 and lowest in T_9 which can be easily seen in the table no. 4.

Table no. 4: Effect of various combination of *Ashwagandha* powder and pineapple pulp on pH of Ice cream

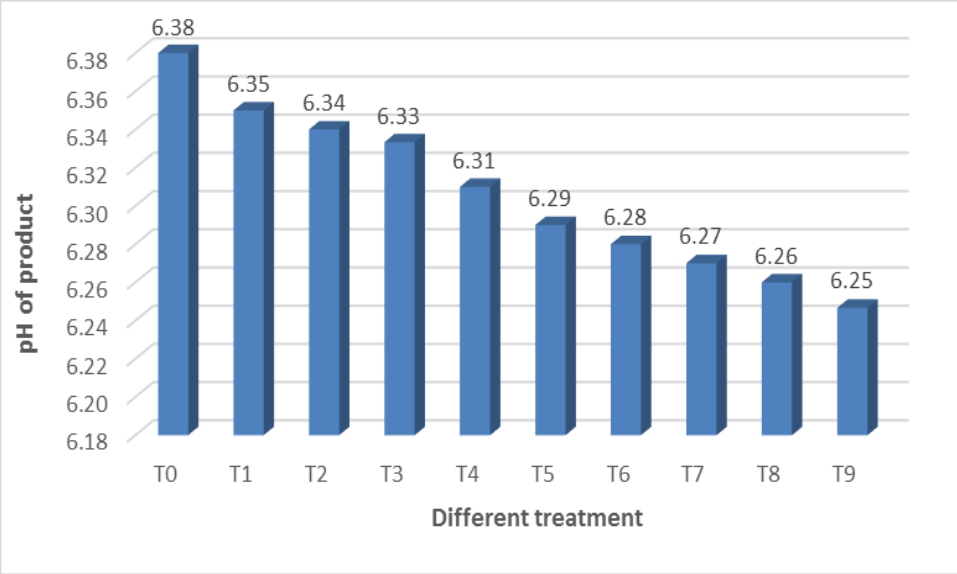
	R1	R2	R3	Total	Mean
T0	6.38	6.39	6.37	19.14	6.38
T1	6.36	6.34	6.35	19.05	6.35
T2	6.34	6.36	6.32	19.02	6.34
T3	6.33	6.33	6.34	19	6.33
T4	6.32	6.3	6.31	18.93	6.31
T5	6.28	6.29	6.3	18.87	6.29
T6	6.28	6.28	6.28	18.84	6.28
T7	6.26	6.28	6.27	18.81	6.27
T8	6.25	6.27	6.26	18.78	6.26
T9	6.25	6.25	6.24	18.74	6.25
Total	63.05	63.09	63.04		
Mean	6.305	6.309	6.304		

Table 4(b): Analysis of variance for pH of different combination of *Ashwagandha* powder and pineapple pulp on Ice cream

Source	Df	SS	MSS	Fcal	Ftab	SIG
Treatment	9	0.051587	0.005732	53.73611	3.456676	S
Error	20	0.002133	0.000107			
Total	29	0.05372				

For comparing product

SEm	0.01
CD	0.02
CV	0.16



Effect on Overrun percentage

The overrun percentage of treatments is decreasing with increasing level of pineapple and *Ashwagandha* powder. Highest overrun percentage is reported in T_0 followed byT_1 and lowest in T_9 which can be easily seen in the table no. 5.

Table no. 5: Effect of various combination of *Ashwagandha* powder and pineapple pulp on overrun percentage of Ice cream

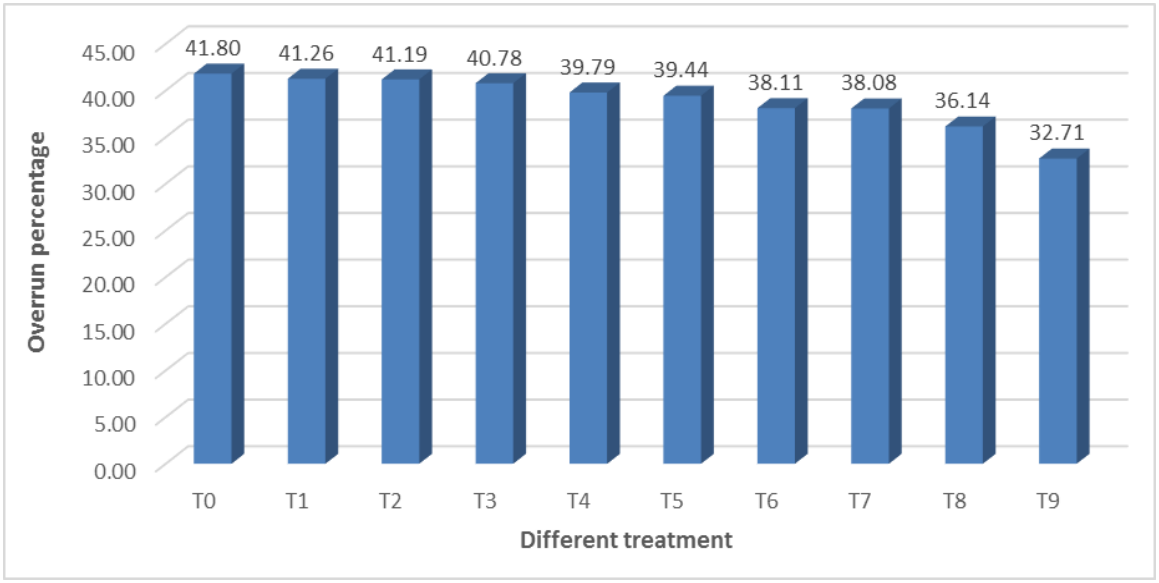
	R1	R2	R3	Total	Mean
T0	41.81	41.77	41.83	125.41	41.80
T1	41.28	41.27	41.24	123.79	41.26
T2	41.19	41.17	41.21	123.57	41.19
T3	40.88	40.75	40.72	122.35	40.78
T4	40.15	40.09	39.12	119.36	39.79
T5	39.21	39.01	40.11	118.33	39.44
T6	38.29	38.23	37.81	114.33	38.11
T7	38.41	38.39	37.43	114.23	38.08
T8	36.39	36.41	35.63	108.43	36.14
T9	33.37	33.35	31.41	98.13	32.71
TOTAL	390.98	390.44	386.51		

Table 5(b): Analysis of variance for overrun percentage of different combination of *Ashwagandha* powder and pineapple pulp on Ice cream

Source	Df	SS	MSS	Fcal	Ftab	SIG
Treatment	9	213.2844	23.69827	93.51995	3.456676	S
Error	20	5.068067	0.253403			
Total	29	218.3525				

For comparing product

SEm	0.29
CD	1.17
CV	1.29



Conclusion

From the above study, it can be concluded that functional property of Ice cream can be improved by the addition of *Ashwagandha* and Pineapple. Both ingredients were added in different combination and had different effect on physic-chemical property of Ice-cream. Different combination have different effect on different physic-chemical properties. But after analysis of the result, it was found that T_3 combination (1.5% *Ashwagandha* powder and 10% pineapple pulp) is most suitable, as it had most positive effect on different properties. It is therefore concluded that a good quality of ice cream can be prepared using fruit and medicinal plant.

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