COMPARISON OF EFFICACY OF BIS AND FSSAI METHODS FOR ESTIMATION OF TOTAL SOLIDS IN CULTURED DAIRY PRODUCTS

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ABSTRACT

Total solids content of Dahi (a cultured dairy product similar to yogurt) was determined by two methods i.e., BIS and FSSAI (Sodium Hydroxide Method). A total of 54 samples were tested with fat percent ranging from 1 to 6. It was revealed that overall both the methods gave similar results without any significant difference, thereby indicating that any of the methods can be used with equal efficacy. Keywords: BIS method, FSSAI, Dahi, Total solids

The cultured dairy products like Dahi, lassi and voghurt etc. have long been being tested by the BIS method. It involves weighing about 5 ml of the product and then placing the weighed dish, uncovered, on a boiling water bath for at least 30 minutes. Thereafter, the sample is transferred to a well ventilated oven at 98-100°C for 3 hours. Then the dish containing the sample is immediately transferred to a desiccator, cooled and weighed. It is again shifted to the oven for one hour and again placed in the desiccator as above and weighed. The process is repeated till the weight between successive weighing does not exceed by 0.5 mg. The lowest weight so obtained is recorded and calculations are done. Total Solids, percent by weight are 100w/W, where w is weight in g of the residue after drying and W is weight in g of the prepared sample taken for the test.

Food Safety and Standards Authority of India (FSSAI) was established by the Govt. of India under the Ministry of Health and Family Welfare and an act was promulgated as FSSAI Act 2006. The authority in its manual on Milk and Milk products, 2015 suggested a modified method for estimating the total solids in cultured dairy products. In this method 1-2 drops of phenolphthalein solution is added to the weighed sample and it is neutralized with 0.1 N Sodium Hydroxide solution to a faint pink color. The dish containing the sample is placed on a boiling water bath without lid until the water is removed from the sample. The dish is then transferred to an oven maintained at 100±2°C for 3 hours and then placed in a desiccator, cooled and weighed. Heating and reweighing is continued at hourly intervals until successive weighing does not vary by more than 0.5 mg. Half weight of the 0.1 N Sodium Hydroxide added to neutralize the sample is deducted from the residue after drying. Total Solids percent by weight are $100(w_2-a)/w_1$ where a=half of the volume of 0.1 N sodium hydroxide used, w_1 = weight in g of prepared sample taken, w₂=weight in g of residue left after drving.

The BIS method is in vogue for many decades and at field level in the milk plants, this method is generally preferred over the FSSAI which is comparatively new and an extra step of titration is involved. Moreover, it has not been sufficiently proved that the latter gives better results. Therefore, the present study was planned to compare and evaluate the efficacy of both the methods.

MATERIALS AND METHODS

The study was carried out in the Department of Livestock Products Technology of LUVAS, Hisar. Milk was obtained from the Experimental Dairy of LPT Department and it was standardized to 1, 2, 3, 4, 5 and 6 % fat using whole milk and skim milk. Nine replications for each fat % were carried out thereby making a total of 54. Milk was heated to 80°C and immediately cooled down to 35°C by immersion in chilled water. AMUL brand Dahi was procured from the local market on the day of experiment and was used as culture. The culture was used at the rate of 2% and mixed thoroughly with milk. A sample from the culture mixed milk was drawn for testing Total Solids (TS) by the BIS method. The cultured milk was incubated at 35°C for 8 to 10 hours for Dahi preparation. The Dahi so obtained was tested for TS % by both methods i.e. BIS and FSAAI. The data so obtained was analyzed statistically using SPSS.

RESULTS AND DISCUSSION

It was observed that for the Dahi made from 1% Fat milk, the TS % obtained by BIS and FSSAI methods differed significantly from the TS% in the culture mixed milk (Table 1). However, there was no difference in the results obtained by BIS or FSSAI method for Dahi TS %. Thus both the methods are equally effective in determining the TS% of Dahi. For the Dahi made from 2 and 3% Fat milk, the TS % of Dahi obtained by BIS and FSSAI methods were same and there was no difference thereby indicating that the BIS and the FSSAI methods are equally effective. Both these results were similar to the results of TS% in cultured mixed milk of 2 and 3% Fat, respectively.

The TS % obtained of Dahi made from 4% fat milk,

Table 1
Total Solids percent of Culture Mixed (CM) Milk
and Dahi by different methods

Fat content		CM Milk TS %	Dahi TS%	Dahi TS%
(%)	Ν	(BIS)	(BIS)	(FSSAI)
1	9	10.43±0.09 ^a	10.70±0.05 ^b	10.78±0.11 ^b
2	9	11.30±0.06 ^a	11.42±0.14 ^a	11.55±0.10 ^a
3	9	11.67±0.07 ^a	11.53±0.06 ^a	11.70±0.06 ^a
4	9	12.82±0.07 ^{ab}	12.68±0.06 ^a	12.99±0.04 ^b
5	9	14.21±0.16 ^b	13.70±0.03 ^a	13.93±0.07 ^{ab}
6	9	15.40±0.29 ^b	14.66±0.14 ^a	14.98±0.15 ^{ab}
Total	54	12.64±0.24 ^a	12.45±0.19 ^a	12.66±0.20 ^a

Means bearing different superscripts (a, b) differ significantly (p<0.05) in same row

differed for BIS and FSSAI methods. However, both were equal to the results of TS% obtained from cultured mixed milk of 4% Fat.

The results of TS % obtained by FSSAI method were similar to the TS for cultured mixed milk in respect of Dahi containing 5 or 6 % fat. The TS % obtained by BIS method for Dahi was different from cultured mixed milk TS, however the results obtained for TS by BIS method were not significantly different from the TS results obtained by FSSAI method for 5 and 6% level of fat. A closer look on the ANOVA of the data (Table 2) reveals that the significance level in the samples tested having fat % 1, 4, 5, 6, respectively, discussed above is quite low. It may be possible that if the number of replications of individual fat% experiments is increased, experimental error (if any) may be eliminated and both methods may give same results for individual fat percent samples as has been observed in samples containing 2 and 3 % Fat.

In BIS method, which was prescribed in the year

Table 2							
Analysis of Variance (ANOVA)							

FAT	Source of variation	Sum of	df	Mean	F	P value
(70)		Squares		Square	4 0 0 -	0.00
	Between methods	0.628	2	0.314	4.895	0.02
	Error	1.54	24	0.064		
1	Total	2.168	26			
	Between methods	0.275	2	0.137	1.319	0.29
	Error	2.497	24	0.104		
2	Total	2.772	26			
	Between methods	0.147	2	0.073	1.945	0.17
	Error	0.906	24	0.038		
3	Total	1.053	26			
	Between methods	0.432	2	0.216	7.467	0.01
	Error	0.694	24	0.029		
4	Total	1.126	26			
	Between methods	1.163	2	0.582	6.12	0.01
	Error	2.281	24	0.095		
5	Total	3.445	26			
	Between methods	2.458	2	1.229	3.336	0.05
	Error	8.842	24	0.368		
6	Total	11.3	26			

1961, no titration is involved. However, in FSSAI method, which is based on the principle of method prescribed in IDF 151: 1991, the Dahi is first neutralized. Such titration is desirable in Zinc oxide method of TS determination, since, water from a test portion is evaporated in the presence of zinc oxide in a drying oven at $102^{\circ}C \pm 2^{\circ}C$. The lactic acid content is determined in order to compensate for the loss of water produced by neutralization [ISO 13580:2005(E)]. However, the FSSAI Sodium Hydroxide method which involves neutralization of Dahi has not proved to be better over BIS method in determining the TS as it is evident from the results of this study. It reveals that the overall results obtained by BIS and FSSAI Sodium Hydroxide method are the same. It is also evident from table 1 that the mean TS% of culture mixed milk determined by BIS method is similar to the TS of Dahi obtained by both methods.

CONCLUSION

Going by the overall analysis, there is no difference between the results obtained by BIS and FSSAI methods and both are equally effective for determining total solids percent in Dahi and anyone of them can be used as per convenience.

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Significant at p value < 0.05