



# Studies on sensory evaluation, chemical quality and cost structure of sweet yoghurt from cow milk blended with Soymilk

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**ABSTRACT :** The present investigation was carried on the studies on sensory evaluation, chemical quality and cost structure of sweet yoghurt from cow milk blended with soymilk in the Department of Animal Husbandry and Dairy Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. Fresh and clean cow milk and soymilk was blended in various proportions as 100 : 00, 75 : 25, 50:50, 25: 75 and 00:100 for treatment T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> and T<sub>5</sub>, respectively. The chemical composition in respect to per cent fat, total solids and solids not fat content recorded significantly decreased trend due to increase in the rate of addition of soymilk in cow milk. While the levels of protein content were found non-significant only numerical decrease was recorded. Yogurt prepared from 100 per cent cow milk recorded highest score for overall acceptability (92.85) then after score was decreased due increase in rate of addition of soymilk, while it was noticed that yoghurt prepared from 50 per cent cow milk and 50 per cent soymilk also scored satisfactory score for its acceptability. The cost of production of yoghurt was decreased with the increase in the level of soymilk.

**KEY WORDS :** Cow milk, Soymilk, Sweet yoghurt, Sensory evaluation, Chemical composition, Cost structure

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## INTRODUCTION

Dairying in India is diversified and agriculture based and a stepping stone towards socio-economic progress. The interdependence of Dairy and Food Industries is known since ancient times. This is due to the fact that no single food provides all the nutrients in the right quantity for good health. It has been an established fact that the use of improper food perhaps the root cause of every disease. Still, despite good nutritional significance, soymilk delicacies remain confined to the domestic kitchen segment. This has the potential to alleviate

the persistent malnutrition and unemployment problem in India. Milk is a very important component in the diet of human being. The Indian dairy sector acquired substantial growth momentum from 9<sup>th</sup> plan onward and achieved an annual output of 112.54 MT of milk during 2009-10 and estimated up to 120MT for 2013. The national per capita availability of milk reached at a level of 263 g/day and 184 g/day in Maharashtra, but it is still lower than the world average of 284 g/day. In recent years farmers of Maharashtra have given overwhelming response to soybean cultivation. Therefore, for fulfilling the requirement, there is a wide scope for replacement of cow milk by soymilk in preparation of various milk products.

Yoghurt is the solid, custard like fermented milk product made from fortified high solid milk using a symbiotic mixture of two micro-organisms, i.e. *Lactobacillus bulgaricus* and *Streptococcus thermophilus* (De, 1991). Fermented milk products are easy for digestion because of breakdown of protein into peptides and free amino acids as a result of microbial action. The substances like lactic acid, alcohol, non-protein,

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volatile acids, calcium and phosphorus appears in more assimilable level in curd as compound to milk (Laxminarayan and Shankar, 1980). Present investigation was planned and carried out with main objectives to prepare sweet yoghurt from cow milk blended with soymilk, to evaluate chemical and sensory quality of sweet yoghurt and estimate the cost structure for preparation of yoghurt.

### MATERIAL AND METHODS

Whole, fresh, clean cow milk procured from Livestock Instructional Farm of Department of Animal Husbandry and Dairy Science was standardized at 4 per cent fat was used for yoghurt preparation. Soymilk was prepared as per the procedure given by Nelson *et al.* (1976). Fresh and clean cow milk and soymilk was blended in various proportions as 100:00, 75:25, 50:50, 25:75 and 00:100 for treatment T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> and T<sub>5</sub>, respectively. Analytical grade chemicals were used as per requirement of experiment. Preliminary trials were conducted to fix the rate of addition of sugar and accordingly 8 per cent clean crystalline cane sugar was used in all the treatments. The freeze dried cultures of *Lactobacillus bulgaricus* and *Streptococcus thermophilus* obtained from NDRI, Karnal was used. Well sterile paper cups/containers of 100 ml was used for filling the cultured milk and incubated at 38±2 °C temperature for 8 hours.

Chemical properties like fat, protein, moisture, total solids, SNF and acidity was determined as per procedures of BIS standards (ISI Handbook of Food Analysis- Dairy Products (1981) *i.e.* for Fat, SNF and TS Part XI, for Protein Part- I and for Acidity- Part-VI). The acceptability of yogurt was measured in terms of score allotted as per sensory attributes such as flavour (45), body and texture (35), colour and appearance (10) and acidity (10). Acceptability of product was recorded in score card as per procedure given by Nelson and Trout (1964). Cost structure for 1 kg yoghurt was calculated for each treatment by prevailing the rates of milk and ingredients used for preparation of the product. The data obtained was statistically analyzed by implementation of Completely Randomized Design (CRD) as suggested by Gomez and Gomez (1984).

### RESULTS AND DISCUSSION

Cow milk procured from Livestock Instructional Farm and Soymilk prepared for blending was analyzed for chemical composition and the data obtained was presented in Table 1.

**Table 1 : Chemical composition of cow milk and soy milk (%)**

Constituents	Cow milk	Soy milk
Fat	4.00	1.32
Protein	3.35	3.24
Solids not fat (SNF)	9.00	5.72
Total solids (TS)	13.00	7.04
Acidity	0.13	0.10

Cow milk standardized at 4.0 per cent fat, 9.00 per cent SNF and having 3.35 per cent protein, 13.00 per cent TS, 0.13 per cent acidity was used for preparation of yoghurt, soy milk with an average 1.32 per cent fat, 3.24 per cent protein, 5.72 per cent SNF, 7.04 per cent Ts and 0.10 per cent acidity was used for blending with cow milk as per different treatments for preparation of yoghurt.

#### Chemical properties of sweet yoghurt prepared from cow milk blended with soy milk :

Sweet yoghurt prepared from various combinations of cow milk and soymilk was analysed for chemical composition by using standard procedures and the data obtained was presented in Table 2 and interpreted as below.

#### Fat content :

From Table 2, it was observed that treatment differences were statistically significant at 5 per cent level of significance indicating that there was significant decrease in fat content of Sweet yoghurt prepared from cow milk blended with soymilk. Fat content was decrease with increase in the blending levels of soymilk, which shows negative correlation. These results were supported by the results recorded by Krupal (2003) who observed same decreasing trends.

**Table 2 : Effect on chemical composition of sweet yoghurt prepared from cow milk blended with soy milk (Mean values of five replications)**

Treatments	Chemical composition (%)				Titratable acidity
	Fat	Protein	SNF	TS	
T <sub>1</sub>	3.95	3.31	8.92	12.86	0.89
T <sub>2</sub>	3.31	3.28	8.17	11.18	0.87
T <sub>3</sub>	2.65	3.25	7.35	9.99	0.85
T <sub>4</sub>	1.95	3.23	6.52	8.44	0.82
T <sub>5</sub>	1.29	3.20	5.67	6.96	0.79
S.E. ±	0.0055	0.0033	0.010	0.018	0.0034
C.D. (P=0.05)	0.165	0.0078	0.030	0.054	0.010
F test	Sig.	NS	Sig.	Sig.	Sig.

NS= Non-significant

**Protein content :**

The perusal of data from Table 2 revealed that addition of soymilk had non-significant effect on protein content of sweet yoghurt. But addition of soymilk showed gradual decrease in Protein content of sweet yoghurt prepared from cow milk blended with soymilk. These results were in agreement with the results noted by Krupal (2003) who reported that soymilk blending positively affecting the protein content of yoghurt.

**Solids not fat content :**

It would be seen from the data presented in Table 2 that the variation in solids not fat content of sweet yoghurt is due to addition of soymilk. Solids not fat content of sweet yoghurt showed significant decrease with increase in level of soymilk. The results obtained in this study are in agreement with the result reported by Lee *et al.* (1990) that cow skim milk based yoghurt contains higher SNF than soymilk based yoghurt. Which are also in agreement with the result reported by Bire (1995) that as blending proportion of soymilk increased with cow milk, proportionately reduction in SNF content of curd was recorded.

**Total solids content :**

The perusal of data from Table 2 revealed that addition of soymilk significantly affected the total solids content. Addition of soymilk showed significant decrease in Total solids content of sweet yoghurt prepared from cow milk blended with soymilk. These results are in agreement with the results of Krupal (2003) observed that as proportion of soymilk increased there was decrease in Total solids contents in yoghurt.

**Titratable acidity :**

Table 2 showed that average acidity for cow milk sweet yoghurt (T<sub>1</sub>) was 0.89, while for remaining treatments' it was observed that titratable acidity of yoghurt was decreased due to increase in the rate of addition soymilk this might be due to high level of lactose content in cow milk. The results obtained in this study are in agreement with the results of Lee *et al.*

(1990) who observed that acidity content of soymilk yoghurt was less than acidity of cow skim milk yoghurt. Above results are also in agreement with the results of Bhutey (1994) who observed that as blending proportion of soymilk increased with cow milk, proportionally decreased in acidity content of yoghurt.

**Sensory evaluation of sweet yoghurt prepared from cow milk blended with soy milk :**

The data obtained in respect to sensory evaluation of sweet yoghurt prepared from cow milk blends with soymilk were tabulated and presented in Table 3.

**Flavour :**

It was observed from Table 3, that the yoghurt prepared from T<sub>1</sub> level *i.e.* from 100 per cent cow milk recorded highest score for flavour (42.82) then after score was decreased due increase in rate of addition of soymilk but it was noticed that yoghurt prepared from 50 per cent cow milk and 50 per cent soymilk (T<sub>3</sub>) also scored satisfactory score for its acceptability. These results are in agreement with results showed by Rajor (1990) that as proportion of soymilk increased there was decrease in flavour score of yoghurt. Krupal (2003) also observed that proportion of soymilk increased there was decrease in flavour score of yoghurt.

**Body and texture :**

It was revealed from Table 3, that the yoghurt prepared from T<sub>1</sub> level *i.e.* from 100 per cent cow milk recorded highest score for body and texture (32.20) then after score was decreased due increase in rate of addition of soymilk but it was noticed that yoghurt prepared from 50 per cent cow milk and 50 per cent soymilk (T<sub>3</sub>) also scored satisfactory score for its acceptability. These results are in agreement with (Ranganatham and Gupta, 1987) said that weak body may be due to low total solids content in milk, which is used for preparation of yoghurt Yadav *et al.* (2003) also observed the decreasing trend in the body and texture score of yoghurt prepared from cow milk blended with soymilk.

**Table 3 : Sensory evaluation of sweet yoghurt prepared from cow milk blended with soy milk (Mean score values of ten judges for five replications)**

Treatments	Flavour (Max.45)	Body and texture (Max.35)	Colour and appearance (Max. 10)	Acidity (Max.10)	Overall acceptability (Max. 100)
T <sub>1</sub>	42.82	32.20	8.97	8.86	92.85
T <sub>2</sub>	40.71	30.89	8.77	8.63	88.99
T <sub>3</sub>	39.14	30.36	8.55	8.54	86.59
T <sub>4</sub>	37.05	29.07	8.34	8.21	82.67
T <sub>5</sub>	35.21	26.91	7.90	7.81	77.89
S.E. ±	0.247	0.297	0.045	0.081	0.466
C.D. (P=0.05)	0.735	0.882	0.133	0.240	1.383
'F' test	Sig.	Sig.	Sig.	Sig.	Sig.

**Colour and appearance :**

It was revealed from Table 3, that the yoghurt prepared from T<sub>1</sub> level *i.e.* from 100 per cent cow milk recorded highest score for colour and appearance (8.97) then after score was decreased due increase in rate of addition of soymilk but it was noticed that yoghurt prepared from 50 per cent cow milk and 50 per cent soymilk (T<sub>3</sub>) also scored satisfactory score for its acceptability. These results are in agreement with the results noted by Bire (1995) and Yadav *et al.* (2003) who recorded the decreasing trend in the score of yoghurt for colour and appearance attribute due to increase in blending of soymilk.

**Acidity :**

It was revealed from Table 3, that the yogurt prepared from T<sub>1</sub> level *i.e.* from 100 per cent cow milk recorded highest score for acidity (8.86) then after score was decreased due increase in rate of addition of soymilk but it was noticed that yoghurt prepared from 50 per cent cow milk and 50 per cent soymilk (T<sub>3</sub>) also scored satisfactory score for its acceptability. Bhutey (1994) who observed that as blending proportion of soymilk increased with cow milk, proportionally decreased in acidity content of yoghurt.

**Overall acceptability :**

It was revealed from Table 3, that the yoghurt prepared from T<sub>1</sub> level *i.e.* from 100 per cent cow milk recorded highest score for overall acceptability (92.85) then after score was decreased due increase in rate of addition of soymilk while it was noticed that yoghurt prepared from 50 per cent cow milk and 50 per cent soymilk (T<sub>3</sub>) also scored satisfactory score for its acceptability. T<sub>4</sub> and T<sub>5</sub> scored very less score which is significantly less in term of statistics; it means it was not acceptable at all but comparatively it scored less score but individually it can be accepted as a drink. Considering the consistency and compactness it can be accepted as drink but not as yoghurt as compare to the control due decrease in total solids and increase in the moisture content of yoghurt. It was

observed that soymilk can be treat as one of a alternative to milk but not take place of milk at all. Changade and Tambat (1992) reported that, the effect on acceptability of curd prepared from blending of soy milk with cow milk or buffalo milk, they showed that addition of soy milk in cow milk / buffalo milk reduced the acceptability of curd. They observed that acceptability score in pure fermented cow milk was higher than that of soymilk blends. The acceptability score was reduced proportionately with the increase in proportion of soymilk addition. This results are also in agreement with the results noted by Bire (1995), Rajor (1990), Krupal (2003) and Yadav *et al.* (2003).

**Cost structure of sweet yoghurt prepared from cow milk blended with soy milk :**

Cost of production was calculated on the basis of prevailing rates of ingredients, labour, fuel, electricity and other charges and tabulated and presented in Table 4.

The cost of sweet yoghurt was worked out by considering the prevailing retail cost of ingredients and presented in Table 4. It was observed that the cost of yoghurt was decreased with the increase in the level of soymilk but the acceptability was also decreased. The production cost of acceptable combination in the present comparative study (50 % cow milk and 50 % soymilk) was recorded Rs. 34.30/ per lit. Where you can save Rs.12.25/- *i.e.*26 per cent over control cost of Rs. 46.55/-As a soy drink yoghurt obtained from T<sub>4</sub> and T<sub>5</sub> can be sold in market having very less cost of production Rs.28.18 and 22.05/-, respectively. These results are agreement with results noted by some past workers as Bharad *et al.* (2010) observed that cost of production of kulfi was decrease as level of replacement of soymilk increased. Krupal (2003) observed that cost of production of was decrease as level of soymilk increased for preparation of yoghurt from cow skim milk blended with soymilk

Thus, results are obtained from the comparative study of 100 per cent cow milk yogurt and different blend as well as 100

**Table 4 : Cost of sweet yoghurt prepared from cow milk blended with soy milk (Rs./ lit.)(Based on cost of ingredients only)**

Sr. No.	Particulars	Treatments cost (Rs.)				
		T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>
1.	Quantity of milk used in ml, cow milk	1000	750	500	250	--
	Soymilk	--	250	500	750	1000
2.	Cost of milk Rs./lit, cow milk Rs. 34/- per lit	34	25.50	17.00	8.50	--
	Soymilk Rs. 9.50/- per lit	--	2.38	4.75	7.13	9.50
	Total exptd. on milk	34	27.88	21.75	15.63	9.50
3.	Cost of sugar (Rs. 35 per kg) @8% = 80gm	2.80	2.80	2.80	2.80	2.80
4.	Cost of starter culture	0.75	0.75	0.75	0.75	0.75
5.	Cost of processing <i>i.e.</i> utensils, heating, electricity, labour charges, etc.	5.00	5.00	5.00	5.00	5.00
6.	Cost of paper cups	4.00	4.00	4.00	4.00	4.00
7.	Cost of production of yoghurt Rs./lit. without container	42.55	36.34	30.30	24.18	18.05
8.	Cost of production of yoghurt Rs./lit. with container	46.55	40.43	34.30	28.18	22.05

per cent soymilk yoghurt so comparative decrease in score of sensory evaluation was recorded, otherwise individually 75 per cent blend can be accepted as yoghurt and 100 per cent soymilk yoghurt can be accepted as a soy drink only not as a yoghurt due to very low fat, solids not fat and total solids content which affect the quality of yoghurt.

#### Conclusion :

- The chemical composition in respect to per cent fat, total solids and solids not fat content recorded significantly decreased trend due to increase in the rate of addition of soymilk in cow milk. While the levels of protein content were found non-significant only numerical decrease was recorded.
- Yogurt prepared from  $T_1$  level *i.e.* from 100 per cent cow milk recorded highest score for overall acceptability (92.85) then after score was decreased due increase in rate of addition of soymilk while it was noticed that yoghurt prepared from 50 per cent cow milk and 50 per cent soymilk ( $T_3$ ) also scored satisfactory score for its acceptability.
- The cost of production of yoghurt was decreased with the increase in the level of soymilk.

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