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Studies on physicochemical quality of fruit yoghurt prepared from different levels of milk and strawberry pulp

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Abstract
Yoghurt is a snow white, custard like fermented milk product, obtained through the controlled lactic acid fermentation of milk by *Lactobacillus bulgaricus* and *Streptococcus thermophiles*. A study was undertaken by using different levels of Milk and Strawberry pulp i.e. T_1 (95:05), T_2 (90:10), T_3 (85:15), T_4 (80:20) respectively. Experimental fruit yoghurt mix was standardized to 4.0% fat, 11.5% solids not fat, 10% sugar and 2% culture adjusted to 25.2% total solids. Yoghurt samples for different treatments were analyzed for organoleptic attributes (colour and appearance, body and texture, taste and flavour) by trained panelist using 9 point hedonic scale. The fruit yoghurt obtained from (85:15) (T_3) ratio was the best product among all treatments. Thus, as far as product acceptability judged by organoleptic evaluation, the treatment can be rated as $T_3 > T_0 > T_2 > T_4 > T_1$. The data regarding cost of Control and Strawberry pulp fruit yoghurt was found as cheap in T_0 (28.80 Rs/Kg) followed by, T_1 (33.36 Rs/Kg), T_2 (37.92 Rs/Kg), T_3 (42.48 Rs/Kg) and T_4 (47.04 Rs/Kg).

Keywords: Milk, Strawberry pulp, Fruit yoghurt.

Introduction
Fermented milk products have been the essential part of our food consumption; since ancient times. The symbiosis of two most important microorganisms, i.e., *Lactobacillus bulgaricus* and *Streptococcus thermophiles* resulted in lactic acid fermentation to convert milk into a fermented milk product known as Yoghurt. It is an exotic product but now very much accommodated as an Indian fermented milk product, because of its nutritional and therapeutic value like *Dahi* "curd". Yoghurt is a low caloric diet. It can serve as an alternative source of calcium for people, who are lactose intolerant. It can help in stimulation of immune system, reduction in bacterial enzymes and reduction of serum cholesterol. It also help in anti-tumor activity, Folic acid and vitamin B synthesis and enhance mineral bioactivity (David, 2012) [3]. Yoghurt is a famous fermented dairy product which plays an important role in preventing gastrointestinal infections which causes diarrhea. It also reduces the chances of cancer and lowers the blood cholesterol (Gilliland, 1979) [4]. Mudgal and Devendra (1999) [6] remarked that after cow, buffalo, is the most important dairy species. In India, buffalo's milk in general is considered to be inferior to cow's or buffalo's milk and is entirely use for beverage purpose. Yoghurt prepared from milk has been widely accepted for infants and convalescents because of its easy digestibility. Milk is more digestible than cow and buffalo's milk because smaller average size of the fat globules (Jennes and Patton 2005) [5]. Milk yoghurt did not show any whey off but preferred for its smooth body and texture and sharp flavour. By the addition of fruit pulps in yoghurt its nutritional content viz. proteins and vitamins enhanced without compromising its palatability. This filler will also give nutritious product at an economic rate, which will make the product further popular in domestic and international market.

Material and Methods
First of all fresh milk was collected and standardized for 6% fat and 9.0% SNF using spray dried skim milk powder. Then the milk was heated at 85 °C for 5 minutes. Sugar was added @ of 10% of milk. It was then cooled at 42 °C. Milk was then inoculated with 2% culture. At this stage strawberry pulp was added @ 5, 10, 15 and 20%. The mix was then sent for incubation at 42 °C. After that yoghurt was filled in the cups and sent for storage under refrigeration. Thus the yoghurt was ready. The samples were analyzed for physicochemical, microbial and organoleptic qualities as per procedure laid down by ICAR manual in Dairy chemistry and microbiology (1972) [1].

Table 1: Details of different treatments for making Strawberry pulp fruit Yoghurt.

Materials (%)	Different treatments Strawberry pulp fruit Yoghurt				
	T_0	T_1	T_2	T_3	T_4
Milk	100	95	90	85	80
Strawberry pulp	-	05	10	15	20

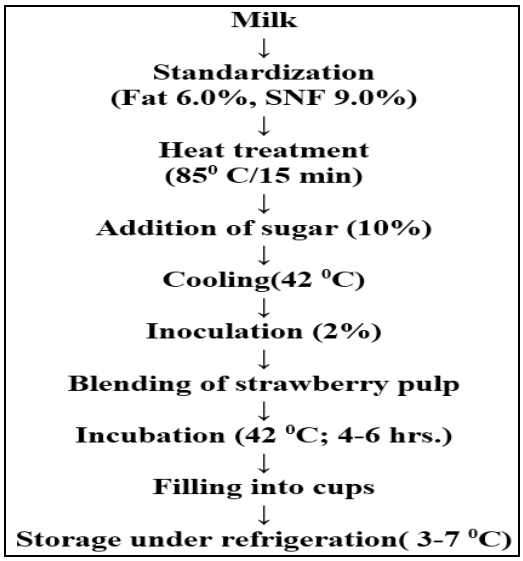

Fig 1: Flow chart for preparation of Strawberry pulp fruit Yoghurt

Statistical analysis

The data obtained on different aspects as per plan were tabulated and statistically analyzed as per Chandel (1991) [2].

Results and Discussion

Average of different physicochemical properties of the Control and Strawberry pulp fruit Yoghurt

Protein percentage

The highest mean value for protein percentage was found in T_4 (4.40) followed by T_3 (4.33), T_2 (4.23), T_1 (4.14) and T_0 (3.86). There were significant differences found among the treatments. F value was 53.255, indicating significant effect of treatment on protein percentage.

Fat percentage

The highest mean value for fat percentage was found in T_0 (5.99) followed by T_1 (5.87), T_2 (5.78), T_3 (5.60) and T_4 (5.55). There were significant differences found among the treatments. F value was 52.438, indicating significant effect of treatment on fat percentage.

Table 2: Average of different physicochemical parameters of the Control and Strawberry pulp fruit Yoghurt.

Parameters (%)	Control and strawberry pulp fruit Yoghurt					F value	C.D.
	T_0	T_1	T_2	T_3	T_4		
Protein	3.86	4.14	4.23	4.33	4.40	53.255*	0.086
Fat	5.99	5.87	5.78	5.60	5.55	52.438*	0.075
Ash	0.96	0.97	0.97	0.98	1.06	5.044*	0.006
Moisture	84.54	84.47	84.41	84.38	84.30	2.988**	-
Total solids	15.46	15.52	15.59	15.62	15.70	2.988**	-
Acidity	0.77	0.79	0.81	0.83	0.85	67.385*	0.010

* Significant at 5 % level
** Non-significant at 5 % level

Ash percentage

The highest mean value for ash percentage was found in T_4 (1.06) followed by T_3 (0.98), T_1 (0.97), T_2 (0.97) and T_0 (0.96). There were significant differences found among the treatments. F value was 5.044, indicating significant effect of treatment on ash percentage.

Acidity

The highest mean value for acidity percentage was found in T_4 (0.85) followed by T_3 (0.83), T_2 (0.81), T_1 (0.79) and T_0 (0.77). There were significant differences found among the treatments. F value was 67.385, indicating significant effect of treatment on acidity percentage.

Total solids

The highest mean value for total solids percentage was found in T_4 (15.70) followed by T_3 (15.62), T_2 (15.59), T_1 (15.52) and T_0 (15.46). There were no significant differences found among the treatments. F value was 2.988, indicating no significant effect of treatment on total solids percentage.

Moisture

The highest mean value for moisture was found in T_0 (84.54) followed by T_1 (84.47), T_2 (84.41), T_3 (84.38) and T_4 (84.30). The moisture percentage content not differed significantly among the treatments. F Value was 2.988, indicating no significant effect of treatment on moisture percentage. Thus, it showed that different levels of milk and strawberry pulp have a great impact on the quality of fruit yoghurt (Fig. 2).

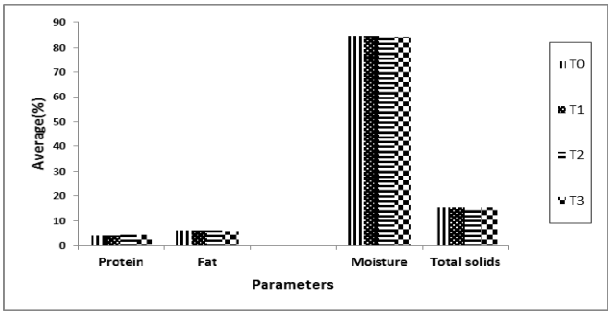

Fig 2: Average of different physiochemical parameters of Control and Strawberry pulp fruit Yoghurt

Average of different Microbial Parameters of the Control and Strawberry pulp fruit Yoghurt

Table 3 showed the highest mean value for yeast and mold count in fruit yoghurt was found in T_1 (2.20), T_2 (2.20) followed by T_3 (2.00), T_4 (1.80) and T_0 (1.20). There were no significant differences found among the treatments. There were no coliform found in all the treatments, thus indicated proper hygiene was followed during the trials.

Table 3: Average of different Microbial Parameters of the Control and Strawberry pulp fruit Yoghurt.

Parameters	Control and strawberry pulp fruit Yoghurt					F value	C.D.
	T_0	T_1	T_2	T_3	T_4		
Yeast and mold count (10^2)cfu/g	1.20	2.20	2.20	2.00	1.80	1.303**	-
Coliform count (10^1)cfu/g	Nil	Nil	Nil	Nil	Nil	Nil	Nil

* Significant at 5 % level
** Non-significant at 5 % level

Conclusion

The results obtained from the statistical analysis revealed that the milk and strawberry pulp can be satisfactorily used to manufacture fruit yoghurt. Fruit yoghurt contain 15% strawberry pulp (T_3) found to be best among all the treatments.

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