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RESEARCH PAPER

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Composition and economics of chhana whey based tomato soup

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ABSTRACT

An attempt was made to study the chemical composition and cost structure of tomato soup prepared from tomato pulp blended with different levels of chhana whey. Proximate analysis of finished product indicated the increase trend of total solids and proteins as the proportion of chhana whey increased in the tomato soup. It was also observed that as the proportion of tomato pulp in the soup increased, the energy value also increased. The chhana whey based tomato pulp prepared from the combination of 25 parts tomato pulp and 75 parts chhana whey (T_3) was most acceptable. The cost of production of tomato pulp for treatment for treatment T_0, T_1, T_2, T_3 and T_4 was Rs 11.53, 11.38, 12.37, 13.37 and 14.37, respectively. The cost of production for whey based tomato soup in laboratory was comparatively much less than market cost. By utilizing whey in the preparation of tomato soup, essential nutrients can be incorporated in food products.

KEY WORDS : Chhana, Cost of production, Tomato soup, Whey

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INTRODUCTION

India has emerged as the leading milk producer in the world. With this significant progress, large quantities of milk are being utilized for the production of cheese, *paneer*, chhana and casein, which are resulting in enormous quantities of whey as a byproduct.

Dairy technologists are engaged to utilize each and every constituent of milk properly. Whey constitutes about 20 per cent total milk proteins and contains most of water soluble vitamins, lactose and minerals (Rao and Ganeshkumar, 1999). Although whey has excellent nutritional value, proper solutions for their utilization have not been worked out and hence are being drained. There is increasing awareness all over the world on potential utilization of whey, not only because of its nutritive value, but also due to pollution prevention regulations (Jayaprakasha and Brueckner, 1999). The valuable nutrients of whey can be utilized in preparation tomato of whey soup, thus increasing the nutritive value of soup.

Tomato (*Lycopersicon esculentum*) is one of most popular and widely grown vegetable crops in world. During flush season tomato is available in abundance. Ripe tomato fruit is consumed fresh and utilized in the manufacture of range of processed products such as puree, paste, powder, ketchup, sauce, soup and canned whole fruits. A large variety of soups such as tomato, onion and mushroom are liked very much by different aged group population. Soups are used as appetizers before lunch or dinners. Attempt, therefore, was made to study the chemical composition and cost structure of chhana whey based soup.

MATERIALS AND METHODS

Cow milk required for study was obtained from C.C.B.P., M.A.U., Parbhani. The chhana whey was obtained as per the procedure described by De (1980). The tomato pulp was prepared as per the procedure described by Sangu (2004). The tomato pulp and whey was mixed as per the treatment details :

T_0 - 20 parts tomato pulp + 80 parts water
T_1 - 15 parts tomato pulp + 85 parts whey
T_2 - 20 parts tomato pulp + 80 parts whey
T_3 - 25 parts tomato pulp + 75 parts whey
T_4 - 30 parts tomato pulp + 70 parts whey

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Chemical analysis:

Fat content was determined as per Gerber's method described in ISI (1956), protein content by A.O.A.C. (1965), total solids and ash by the method described in ISI (1961), acidity by ISI (1981). Energy value was calculated from the analysis of tomato soup for fat, proteins and carbohydrates and multiplication of the content of their components with appropriate factors.

Cost of production:

The ingredients required for preparation of chhana whey based tomato soup was calculated on the basis of prevailing market price and cost per litre of chhana whey based tomato soup was worked out. The labour charges @ 5 per cent of total cost were also taken into consideration.

Statistical analysis:

In all six trials were conducted. The results obtained during the course of investigation were subjected to statistical analysis by using Completely Randomized Design (CRD) as described by Panse and Sukhatme (1985).

● RESULTS AND DISCUSSION ●

The results obtained from the present investigation as well as well as relevant discussion have been presented under following heads

Chemical composition:

Chemical composition of chhana whey based tomato pulp prepared from different blends of tomato pulp and chhana whey was studied and is presented in Table 1.

Fat content:

The fat content of treatment T_0, T_1, T_2, T_3 and T_4 was 1.32, 1.50, 1.42, 1.35 and 1.30 per cent, respectively. It was observed that the fat content of soup decreased as the level of tomato pulp in the soup increased. This decrease in fat content of soup might be due to less fat content of the tomato pulp. There were significant differences amongst the treatment for fat content of soup. Treatment T_1 contained significantly higher fat than treatment T_0, T_2, T_3 and T_4 (Table 1).

Protein content:

The protein content of soup for the treatment T_0, T_1, T_2, T_3 and T_4 was 0.67, 0.70, 0.79, 0.89 and 0.90 per cent, respectively. The highest protein content was noted in treatment T_4. The protein content was found to be in an ascending order. This might be due to more protein content of whey and tomato pulp. There were significant differences amongst the treatments for protein content of soup. Treatment T_4 was significantly superior over treatment T_0, T_1, T_2 and at par with treatment T_3 (Table 1).

Total solid content:

The total solids content of the soup for treatment T_0, T_1, T_2, T_3 and T_4 was 9.39, 8.80, 9.31, 9.85 and 10.48 per cent, respectively. There were significant differences amongst the treatments for total solids. Treatment T_4 was significantly superior over treatments T_0, T_1, T_2 and at

Table 1: Chemical composition of chhana whey based tomato pulp

Treatments	Fat (%)	Protein (%)	Total solids (%)	Ash (%)	Titratable acidity (%)
T_0	1.32	0.67	9.39	1.55	0.51
T_1	1.50	0.70	8.80	1.69	0.50
T_2	1.42	0.79	9.31	1.67	0.52
T_3	1.35	0.89	9.85	1.62	0.54
T_4	1.30	0.90	10.48	1.58	0.55
C.D. (P=0.05)	0.0073	0.08	1.087	0.02	0.042

Table 2 : Energy value of chhana whey based tomato soup

Treatments	Fat (%)	Energy value (Kcal)	Protein (%)	Energy value (Kcal)	Carbohydrate (%)	Energy value (Kcal)	Mean energy value (Kcal)
T_0	1.32	11.88	0.67	2.68	5.80	23.20	37.76
T_1	1.50	13.50	0.71	2.84	4.90	19.60	35.94
T_2	1.42	12.78	0.79	3.16	5.43	21.72	37.66
T_3	1.35	12.15	0.89	3.56	5.92	23.68	39.39
T_4	1.30	11.70	0.90	3.60	6.70	26.80	42.10

par with treatment T_3. It was observed that total solids content of soup increased with the increased level of tomato pulp in the soup. This increase in total solid content of soup might be due to more total solid content of the tomato pulp (Table 1).

Ash content:

The ash content of chhana whey based tomato soup for treatment T_0, T_1, T_2, T_3 and T_4 was 1.55, 1.69 1.67, 1.62 and 1.58 per cent, respectively. The highest ash content was observed in treatment T_1 as 1.69 per cent, wherein 15 per cent tomato pulp was blended with chhana whey. Treatment T_1 contained significantly more ash over rest of treatment T_3, T_4 and T_0. As the proportion of tomato pulp in the soup increased there was decrease in ash content. This decrease in ash content might be due to low ash content of the tomato pulp (Table 1).

Titratable acidity:

The titratable acidity of soup for the treatment T_0, T_1, T_2, T_3 and T_4 was 0.51, 0.50, 0.52, 0.54 and 0.55 per cent, respectively. The lowest titratable acidity was observed in treatment T_1 *i.e.* 0.50 per cent whereas highest acidity was observed in treatment T_4 *i.e.* 0.55 per cent. There were no significant differences as regards to acidity amongst the treatments. The acidity of all the treatments was at par. There was increase in the acidity of soup with the increased level of tomato pulp in the soup. The above findings are supported by the results of Singh *et al.* (1994).

Energy value:

Energy value of the whey based tomato soup was calculated from the analysis of tomato soup for fat, proteins and carbohydrates and multiplication of the content of their components with appropriate factors *i.e.* one gram of carbohydrate or protein yields 4 Kal energy and one gram of fat yields 9 Kcal energy. The energy value of all the constituents provide the total energy value of the soup.

The total energy value of whey based tomato soup for treatment T_0, T_1, T_2, T_3 and T_4 was 37.76, 35.94, 37.66, 39.39 and 42.10 Kcal, respectively (Table 2). It was observed that carbohydrates of soup provided higher energy followed by fat and proteins. The energy value of fat ranged from 11.70 (T_4) Kcal to 13.50 (T_1) Kcal, protein from 2.68 (T_0) to 3.60 Kcal (T_4), carbohydrates 19.60 Kcal (T_1) to 26.80 Kcal (T_4). It was observed that as the proportion of tomato pulp in the soup increased the energy value also increased.

Cost of production:

The cost of production of chhana whey based tomato soup (per lit.) for treatment T_0, T_1, T_2, T_3 and T_4 was Rs 11.53, 11.38, 12.37, 13.37 and 14.37, respectively (Table 3). The cost of production of one litre of chhana whey based tomato soup for treatment T_1 was Rs 11.38 which increased to Rs 12.37 (T_2), Rs 13.37 (T_3) and Rs 14.37 (T_4). Thus, as the proportion of tomato pulp in the blend increased there was increase in the cost of production of whey based tomato soup.

Conclusion:

It can concluded that preparation of chhana whey based tomato soup was more economical. The cost of production for whey based tomato soup in laboratory was comparatively much less than market cost. The chhana

Table 3 : Cost of production of chhana whey based tomato soup (Rs./lit.)

Sr. No.	Particulars	Cost (Rs.)	Treatments									
			T_0		T_1		T_2		T_3		T_4	
			Qty.	Amt. (Rs.)	Qty.	Amt. (Rs.)	Qty.	Amt. (Rs.)	Qty.	Amt. (Rs.)	Qty.	Amt. (Rs.)
1.	Quantity of chhana whey used (ml)	1.00/l	--	--	850	0.85	800	0.80	750	0.75	700	0.70
2.	Quantity of tomato pulp (ml)	20.00/l	200	4.00	150	3.00	200	4.00	250	5.00	300	6.00
3.	Quantity of onion required (g)	10.00/kg	10	0.10	10	0.10	10	0.10	10	0.10	10	0.10
4.	Quantity of garlic and ginger required (g)	25.00/kg	4	0.10	4	0.10	4	0.10	4	0.10	4	0.10
5.	Qty. of oil required (ml)	80.00/kg	20	1.60	20	1.60	20	1.60	20	1.60	20	1.60
6.	Fuel charges @ Rs. 302 per cylinder	--	0.15	3.19	0.15	3.19	0.15	3.19	0.15	3.19	0.15	3.19
7.	Miscellaneous cost (Rs.)	--	--	2.00	--	2.00	--	2.00	--	2.00	--	2.00
8.	Labour charges @ 5 % of total changes (Rs.)	--	--	0.54	--	0.54	--	0.58	--	0.63	--	0.68s
9.	Total cost (Rs./kg)	--	--	11.53	--	11.38	--	12.37	--	13.37	--	14.37

whey based tomato soup prepared from 25 parts tomato pulp and 75 parts whey (T_3) was most acceptable and the cost of production of chhana whey based tomato soup for treatments T_0, T_1, T_2, T_3 and T_4 was Rs. 11.53, 11.38, 12.37, 13.37 and 14.37 per litre, respectively. By utilizing whey in the preparation of tomato soup, essential nutrients can be incorporated in food product.

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