

Research Paper :

Utilization of dairy waste for development of orange flavoured whey beverage

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ABSTRACT

The present study was undertaken with the objectives of developing suitable combination of whey, orange juice and sugar for the preparation of orange flavoured whey beverage and ascertain their nutritional qualities. The orange juice and whey were used in the ratio of 1:1 (T₁, T₂, T₃), 1:2 (T₄, T₅, T₆) and 3:1 (T₇, T₈, T₉) with three different sugar levels *i.e.* 8%, 10% and 12%. The analysis of nutritional (carbohydrate, protein, fat and ash) were done by using the methods laid down in AOAC. The maximum calories and total carbohydrates per cent was obtained in T₉. Treatment T₁ showed maximum per cent of protein and fat. While the highest average ash per cent was in T₈. Hence, treatment T₁ was the best treatment in terms of protein and fat. Thus, orange flavoured whey beverage prepared has higher content of carbohydrate, protein and lower fat and can be useful for the people suffering from ailments such as degenerative diseases, cardio-vascular diseases, pregnancy, lactation, obesity etc.

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Whey is a highly nutritious by-product of paneer, cheese, chhana and casein industries. It contains about 50 per cent of the milk solids, 6-7 per cent dry matter which account for 45-50 per cent of all the milk constituents, casein, fat soluble vitamins. Whey contains 70 per cent of sugar lactose, 10-29 per cent of milk proteins, good source of minerals like calcium, phosphorus, magnesium etc. and almost all essential amino acids (Rani *et al.*, 2007). Whey is nutritious for people of all ages. Thus, it can be regarded as the natural supplement to have a healthy life free of deficiency diseases which may be either due to lack of essential amino acids or B-complex vitamins and minerals. It is a boon to those who suffer from obesity, cardiovascular diseases and health conscious consumers (Tomer and Prasad, 2002). Whey is excellent beverage base as it is a genuine thirst quencher. Whey drinks are light, refreshing, healthful and nutritious. They also offer good profit margin (Gupta and Prasad, 2000). Oranges are good source of vitamin (A, E, B₆) and minerals (magnesium, iron, potassium). Orange juice being favourite of consumers as a soft drink can be incorporated in whey to develop the beverages, which also enhances the nutritional as well as overall acceptability of the product (Prasad, 2004). Thus, the present study was undertaken to develop orange flavoured whey beverage with suitable combinations and ascertain their nutritional composition.

EXPERIMENTAL PROCEDURE

Milk, oranges, sugar, colour and essence were procured from the local market of Allahabad. Whey was procured by the preparation of paneer by the researcher itself. Orange juice was procured by squeezing and straining properly. Nutritional analyses of orange flavoured whey beverage were done by standardized procedure laid down in AOAC (1980). Total carbohydrate was estimated by subtracting the sum of percentage of protein, fat and ash. Carbohydrate = 100 (protein + fat + ash), formula given in ISI methods of test Dairy Industry. Protein was estimated by the Kjeldhal Method. Fat was estimated by Gerber methods, ash percentage was determined according to the methods described in AOAC. Calories were calculated by using the nutritive values given by Gopalan (2001). Whey was procured from the Dairy Department. In this, orange juice was added in the ratio 1:1, 1:2, 1:3. Then, the sugar was added in different per cent value *i.e.* 8%, 10% and 12%. After this, it was heated at 85°C and hold for five minutes. Then it was cooled at 10°C for ten minutes and the product was ready to serve.

Treatments and replications:

No. of treatments = 9, No. of replications = 4

Treatments were as follows: $T_1 = O_1W_1S_1$ (125 ml orange juice, 125 ml whey, 8% sugar), $T_2 = O_1W_1S_2$ (125 ml orange juice, 125 ml whey, 10% sugar), $T_3 = O_1W_1S_3$ (125 ml orange juice, 125 ml whey, 12% sugar), $T_4 = O_2W_2S_1$ (83.4 ml orange juice, 166.6 ml whey, 8% sugar), $T_5 = O_2W_2S_2$ (83.4 ml orange juice, 166.6 ml whey, 10% sugar), $T_6 = O_2W_2S_3$ (83.4 ml orange juice, 166.6 ml whey, 12% sugar), $T_7 = O_3W_3S_1$ (62.5 ml orange juice, 187.5 ml whey, 8% sugar), $T_8 = O_3W_3S_2$ (62.5 ml orange juice, 187.5 ml whey, 10% sugar), $T_9 = O_3W_3S_3$ (62.5 ml orange juice, 187.5 ml whey, 12% sugar).

OBSERVATIONS AND ANALYSIS

It is evident from Table 1 and 2 that the maximum total carbohydrate per cent was found in T_9 (18.33%) having highest proportion of orange juice and whey (1:3) and sugar 12 per cent. It is therefore, concluded that as the level of whey and sugar increased, there was increase in total carbohydrate per cent in the orange flavoured whey beverage. The calculated value of F (0.0217326) was less than table value of F (2.36) at 5 per cent level of significance. This indicates that there was no significant difference in the total carbohydrate per cent in orange flavoured whey beverage in different treatment combination. The maximum protein per cent was found in T_1 (1.75%) having highest proportion of orange juice and whey (1:1). The calculated value of F (0.0116897) was less than table value of F (2.36) at 5 per cent level of significance. This indicates that there was no significant difference in the per cent protein in orange flavoured whey beverage in different treatment combinations. The

maximum fat per cent was found in T_1 (0.375%) having same proportion of orange juice and whey (1:1). It is therefore, concluded that as the proportion of orange juice and whey is same (1:1) there was increased fat per cent in the orange flavored whey beverage. The calculated value of F (0.1126379) was less than table value of F (2.36) at 5 per cent level of significance. This indicates that there was no significant difference in the per cent fat in orange flavored whey beverage in different treatment combination.

The highest ash per cent was found in T_8 (0.8235%) having orange juice and whey in the proportion of 1:3. Thus as the level of whey in the beverage increase, there was increase in ash per cent in the orange flavored whey beverage. The calculated F value for treatment as F (0.1496385) was less than table value of F (2.36) at 5 per cent level of significance. Therefore, the treatments had no effect on the ash content of orange flavored whey beverage. The highest calorie was obtained by T_9 (185 K cal) having orange juice and whey in 1.3 proportion and sugar 12 per cent. It is therefore, concluded that as the level of whey and sugar increased, there was increase in calories in orange flavored whey beverage. The data collected as per the methodology were tabulated and analysed statistically.

Conclusion:

The preparation of orange flavored whey beverage is a feasible proposition. The maximum calorie and total carbohydrate per cent was obtained in T_9 . Treatment T_1 showed maximum per cent of protein and fat. While the

Table 1: Average nutrient per cent of orange flavoured whey beverage

Treatments	Mean of Nutrients				
	Carbohydrate	Protein	Fat	Ash	Calorie
T_1	14.35	1.175	0.375	0.375	160
T_2	15.45	1.2	0.325	0.2875	168
T_3	17.165	1.55	0.25	0.2	176
T_4	15.35	1.025	0.275	0.404	165
T_5	16.35	0.85	0.2	0.159	174
T_6	18.10	1.0	0.2	0.213	182
T_7	15.31	0.97	0.2	0.356	169
T_8	17.18	0.875	0.15	0.8235	177
T_9	18.33	0.775	0.2	0.3755	185

* indicates significance of value at $P=0.05$

Table 2: Analysis of variance for nutritional analysis of orange flavoured whey beverage

Source of variation	Mean sum of square			
	Carbohydrate	Protein	Fat	Ash
Due to treatment	8.8126125	0.0192861	0.0064125	0.0198195
Due to replicate	0.1016666	0.0007361	0.0004333	0.0001111
Due to error	405.50142	1.6498027	0.0569302	0.1324491

highest average ash percentage was in T₈. Thus, orange flavored whey beverage prepared has higher carbohydrate and protein, lower fat content and can therefore be good for therapeutic uses such as in the cases of cardiovascular diseases, in many degenerative diseases, malnutrition syndromes, obesity, diabetes etc.

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