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Studies on Effect of Kokum Syrup on Physico-chemical Properties of Herbal Kokum Whey Beverage

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ABSTRACT

Background: Whey is the major by-product in dairy industry obtained during production of coagulated milk products like paneer, chaana, casein and cheese. Whey beverages are pure water containing sugar, flavour, edible acids and pigments and sometimes it was carbonated with carbon dioxide gas.

Methods: In, present investigation kokum whey beverage was manufactured with different levels of honey and kokum syrup *viz*., 14 and 16 per cent level of honey and 10, 12.5 and 15 per cent level of kokum syrup incorporated with chhana whey.

Result: The finished product was objected to physico-chemical analysis such as total solids, fat, protein, total sugar, ash and pH. Kokum whey beverage prepared with 14 per cent honey and 12.5 per cent kokum syrup found superior over rest of the treatments.

Key words: Chhana whey, Honey, Kokum syrup, Kokum whey beverage.

INTRODUCTION

Whey is a by-product obtained during coagulation of milk by using acid and/or rennet or physico-chemical process for the preparation of cheese, paneer, chhana, chakka and casein. Whey contains about 80-90% of the volume of milk that is used for production of these products. It contains about half of the milk solids in which nutritional components such as lactose, protein and minerals are present in large amount. (1) In the absence of systematic surveys/statistics, the predicted value of whey production in India is estimated at 4.84 million tonnes per annum. (2) The chhana and paneer whey give the major contribution (about 80%) in total whey production. (3) Considerable work has been done throughout the world to utilize whey for production of Whey Protein Concentrate (WPC), whey powder, lactose, lactic acid, whey paste *etc*. (4) The total solid present in whey is about 6.5-7.0 per cent in addition to water soluble vitamins and proteins. The conversion of whey into beverages through fermentation or without fermentation is one of the most attractive avenues for the utilization of whey for human consumption. Beverages based on fruit and milk products are currently receiving considerable attention as their market potential is growing.

Kokum (*Garcinia indica*) is a fruit tree of culinary, medicinal, nutraceutical and industrial importance in South India, especially in the Konkan region of Maharashtra state. The syrup is much appreciated as a health drink while the dried fruit peel is used as a spice and condiment. The fruit rind is a rich source of benzophenone garcinol, which has potential biological activities, especially antioxidant and cytotoxic. Cyanidine-3-glucoside and cyanidine-3- sambubioside were identified as the main red pigments in the fruit rind. Traditionally, kokum is used in herbal medicine to treat diarrhoea, inflammatory diseases, vitiligo, intestinal problems and rheumatism, and to prevent hyper perspiration. The fruit is used as an anthelmintic and cardio tonic. Kokum juice from rind is used against piles, colic problems, dysentery and diarrhoea (Baliga *et al.,* 2011; Watt, 1890).

Codex alimentrius commission (CAC) reported honey as a natural sweetener produced by honey bees (Buba *et al.* 2013). For centuries, honey has been a common sweetener and a powerful medicinal tool. Honey is widely used on an industrial scale to add sweetness and special flavour to foods such as sweets, fruits, candies, marmalades, jams, spreads, breakfasts, cereals, beverages, dairy products and many other preserved products. Honey is an important and unique food product that contains bioactive compounds made from bees and plants. The bioactive ingredients in honey include many flavonoids, phenolic acids, ascorbic acid, tocopherols, alkaloids, number of aromatic acids and carotenoids.

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MATERIALS AND METHODS

Ingredients

For preparation of Kokum whey beverage, chhana whey was received from Dairy Science Lab., College of Agriculture, Dapoli. Both kokum syrup and honey were purchased from local market of Dapoli.

Preparation

For preparation of kokum whey beverage chhana whey was prepared as per the method given by Kadam *et al.* (2017). Fresh cow milk was preheated to 30-40°C and cow milk was strained through muslin cloth. Then milk was pasteurized for at 90 for 5 mimutes. Then milk was allowed to coo at temperature 70-72. The coagulant *i.e.* citric acid @ 2.0 per cent was added slowly and stirred so that it was mixed well. Coagulated milk strained through muslin cloth for separation of chhana and whey. The pure clean whey is collected in vessel. The clear yellowish green whey was then used for the preparation of kokum whey beverage.

Preparation of herbal kokum whey beverage

For the preparation of kokum whey beverage the collected chhana whey was filtered with four fold muslin cloth for removal of fat traces and other particles. Then chhana whey is heated for 75 for 5 minutes, after heating whey was cooled at room temperature, then sweetening agent *i.e.* honey (14 per cent and 16 per cent) and kokum syrup (10 per cent, 12.5 per cent and 15 per cent) was added as per the treatment into the whey. Then all ingredients are mixed thoroughly. The final product kokum whey beverage was bottled, cooled at room temperature and then stored in refrigerator at temperature 72.

Flow chart for preparation of kokun whey beverage

A) Preparation of chhana whey

Chhana whey was prepared as per the procedure given by Kadam *et al.* (2017), as follows, (Fig 1):

Reciving of cow milk
↓
Preheating (35-40°C for 10 min)
↓
Filtration/clarification
↓
Pasteurization (90°C for 5 min)
↓
Cooling (70-72°C)
↓
Addition of Cirtic acid (@ 2.0 per cent)
↓
Hanging in muslim cloth
↓
Chhana → Whey

Fig 1: Preparation of chhana whey.

B) Preparation of kokum whey beverage

The whey beverage blended with kokum syrup (*Garcinia idicia*) was prepared as per flow diagram given below, (Fig 2):

Chhana Whey
↓
Filtration
↓
Heating
↓
Cooling at room temperature
↓
Addition of sweetering agent and mixing
(Honey as per treatment on w/w basic of whey)
↓
Addition of kokum syrup and mixing
(as per treatment on w/w basic of whey)
↓
Bottling
↓
Cooling (room tempretature)
↓
Storage (7±2°C)

Fig 2: Preparation of kokum whey beverage.

The total solids and protein content was determined by gravimetric method as per IS: 1479 (Part II), 1961. The fat content was determined by using standard Gerber method as described in IS: 1224 (Part I), 1977. The total sugar content was determined as per the method described IS: 1479 (II) 1961. The ash was determined as per the Procedure of AOAC (1975). The pH was determined by using pH meter according to procedure of IS: 1479 (Part-I), 1960 The data were statistically analysed with FCRD- factorial completely randomized design using eight treatment combination and five replications.

Treatment combinations

Honey H_1=14%, H_2= 16% and Kokum K_1=10%, K_2= 12.5%, K_3= 15%.

H_1K_0= 14% Honey + 00% of kokum syrup
H_2K_0= 16% Honey + 00% of kokum syrup
H_1K_1= 14% Honey + 10% of kokum syrup
H_1K_2= 14% Honey + 12.5% of kokum syrup
H_1K_3= 14% Honey + 15% of kokum syrup
H_2K_1= 16% Honey + 10% of kokum syrup
H_2K_2= 16% Honey + 12.5% of kokum syrup
H_2K_3= 16% Honey + 15% of kokum syrup

Plate 1 of kokun whey beverage with different levels of honey and kokum syrup are presented.

RESULTS AND DISCUSSION

The chemical analysis given in (Table 1) indicated that the whey used for preparation of kokum whey beverage had as average of 0.36 per cent fat, 6.70 per cent total solids, 0.54

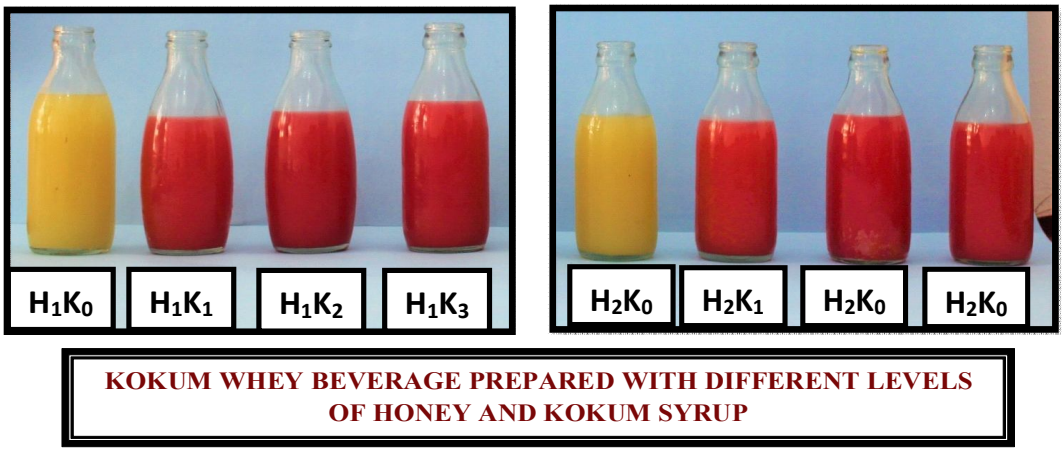

Plate 1: Kokum whey beverage prepared with different levels of honey and kokum syrup.

Table 1: Average chemical quality of whey, honey and kokum syrup.

Constituents	Whey	Honey	Kokum syrup
Total solids	6.70	82.95	82.5
Fat	0.36	0.30	0.07
Protein	0.54	0.55	0.50
Sugar	5.10	78.8	58.75
Acidity	0.85	2.10	1.85
pH	5.6	3.85	2.9

per cent protein, 0.85 per cent acidity, 5.10 per cent total sugar, 1.1 per cent ash, and 5.6 pH. Honey had 0.30 per cent fat, 82.95 per cent total solids, 0.55 per cent protein, 2.10 per cent acidity, 78.8 per cent total sugar, 0.28 per cent ash and 3.85 pH and kokum syrup had 0.07 per cent fat, 82.5 per cent total solids, 0.50 per cent protein, 1.85 per cent acidity, 58.75 per cent total sugar, 1.85 per cent ash and 2.96 pH. The results are formulated in (Table 2) and graphically presented in (Fig 3).

Table 2: Average chemical quality of kokum whey beverage.

Treatment	Total solids	Fat	Protein	Total sugar	Ash	pH
H_1K_0	16.05	0.352	0.541	14.14	0.999	5.55
H_2K_0	17.25	0.351	0.541	15.25	0.990	5.45
H_1K_1	21.40	0.329	0.641	17.75	1.007	5.40
H_1K_2	22.60	0.324	0.537	18.55	1.009	5.40
H_1K_3	23.75	0.320	0.536	19.3	1.010	5.35
H_2K_1	22.40	0.329	0.538	18.71	1.023	5.35
H_2K_2	23.58	0.325	0.537	19.48	1.001	5.30
H_2K_3	24.70	0.320	0.538	20.23	1.003	5.30
SE	0.321662349	0.011356483	0.004534046	0.044345749	0.005400786	0.087679858
CD	0.6544	0.0231	0.0092	0.0902	0.0110	0.1784

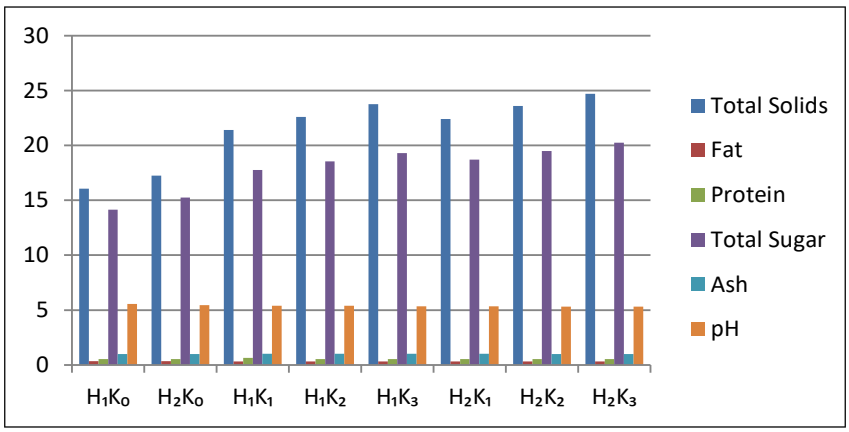

Fig 3: Chemical composition of Kokum whey beverage (mean of five replication).

Chemical analysis of kokum whey beverage

Total solid content

The total solids content was significantly increased with the increase in the level of honey and kokum syrup. The average total solids content of kokum whey beverage was 16.05% (H_1K_0), 17.25% (H_2K_0), 21.40% (H_1K_1), 22.60% (H_1K_2), 23.75% (H_1K3), 22.40% (H_2K_1), 23.58% (H_2K_2) and 24.70% (H_2K_3). The highest total solids content was noticed at H_2K_3 (24.70%) *i.e*. kokum whey beverage manufactured with 16 per cent honey and 15 per cent kokum syrup, while lowest total solids content was observed at H_1K_0 (16.05%) *i.e*. kokum whey beverage manufactured with 14 per cent honey and 0 per cent kokum syrup. The average values for total solids content in beverage are more or less similar to figures reported by Yadav *et al*. (2016) and Bhalekar *et al.* (2018).

Fat content

The fat content decreased significantly with the increase in the level of honey and kokum syrup. The average fat content of kokum whey beverage was 0.352% (H_1K_0), 0.351% (H_2K_0), 0.329% (H_1K_1), 0.324% (H_1K_2), 0.320% (H_1K_3), 0.329% (H_2K_1), 0.325% (H_2K_2), and 0.320% (H_2K_3). The highest fat content was noticed at H_1K_0 (0.352%) *i.e*. kokum whey beverage manufactured with 14 per cent honey and 0 per cent kokum syrup, while lowest fat content was observed at H_1K_3 (0.320%) *i.e*. kokum whey beverage manufactured with 14 per cent honey and 15 per cent kokum syrup and H_2K_3 (0.320%) *i.e*. kokum whey beverage manufactured with 16 per cent honey and 15 per cent kokum syrup. The fat content decreased significantly with the increase in the level of honey and kokum syrup. The values of present investigation for fat content of beverages corroborate well with the values reported by Ingale *et al.* (2018) and Dhumale (2016).

Protein content

The protein content increased significantly with the increase in the level of honey and kokum syrup. The average protein content of kokum whey beverage was 0.541% (H_1K_0), 0.541% (H_2K_0), 0.641% (H_1K_1), 0.57% (H_1K_2), 0.536% (H_1K_3), 0.538% (H_2K_1), 0.537% (H_2K_2) and 0.538% (H_2K_3). The highest protein content was noticed at H_1K_1 (0.641%) *i.e*. kokum whey beverage manufactured with 14 per cent honey and 10 per cent kokum syrup, while lowest protein content was observed at H_1K_3 (0.536 %) *i.e*. kokum whey beverage manufactured with 14 per cent honey and 15 per cent kokum syrup. These results are quite comparable with the values reported by Chavan *et al*. (2015) and Gond (2015).

Total sugars

The sugar content increased significantly with the increase in the level of honey and kokum syrup. The average total sugar content of kokum whey beverage was 14.14% (H_1K_0), 15.25% (H_2K_0), 17.75% (H_1K_1), 18.55% (H_1K_2), 19.30% (H_1K_3), 18.71% (H_2K_1), 19.48% (H_2K_2) and 20.23% (H_2K_3). The highest total sugar content was noticed at H_2K_3 (20.23%) *i.e*. kokum whey beverage manufactured with 16 per cent honey and 15 per cent kokum syrup, while lowest total sugar content was observed at H_1K_0 (14.14%) *i.e*. kokum whey beverage manufactured with 14 per cent honey and 0 per cent kokum syrup. These results are quite comparable with the values reported by Gond (2015) and Ingale (2018).

Ash content

The ash content increased significantly with the increase in the level of kokum syrup but increase in level of honey shows slight decrease in ash. The average ash content of kokum whey beverage was 0.999% (H_1K_0), 0.990% (H_2K_0), 1.007% (H_1K_1), 1.009% (H_1K_2), 1.010% (H_1K_3), 1.023% (H_2K_1), 1.001% (H_2K_2) and 1.003% (H_2K_3). The highest ash content was noticed at H_2K_1 (1.023%) *i.e*. kokum whey beverage manufactured with 16 per cent honey and 10 per cent kokum syrup, while lowest total solids content was observed at H_2K_0 (0.990%) *i.e*. kokum whey beverage manufactured with 16 per cent honey and 0 per cent kokum syrup. The ash content increased significantly with the increase in the level of kokum syrup but increase in level of honey shows slight decrease in ash. The values of present investigation for ash content of beverages coroborate well with the values reported by Bhavsagar *et al*. (2010) and Gond (2015).

pH content

The pH decreased significantly with the increase in the level of honey and kokum syrup.The average pH of kokum whey beverage was 5.55 (H_1K_0), 5.45 (H_2K_0), 5.40 (H_1K_1), 5.40 (H_1K_2), 5.35 (H_1K_3), 5.35 (H_2K_1), 5.30 (H_2K_2) and 5.30 (H_2K_3). The highest pH was noticed at H_1K_0 (5.55) *i.e*. kokum whey beverage manufactured with 14 per cent honey and 0 per cent kokum syrup, while lowest pH was observed at H_2K_2 (5.30) *i.e*. kokum whey beverage manufactured with 16 per cent honey and 12.5 per cent kokum syrup and H_2K_3 (5.30) *i.e*. kokum whey beverage manufactured with 16 per cent honey and 15 per cent kokum syrup. The results of present investigation in respect of pH are well comparable with the values for pH of whey beverage reported by Yadav Ritika (2010), Girisha (2011), Yadav *et al*. (2016) and Bhalekar (2018).

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