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Microbiological and Sensory Properties of Cherry and Orange Fortified Camel Milk for Human Nutrition

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Key words: Cherry syrup, orange syrup, fortified camel milk, microbiological properties, sensory evaluation

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Abstract: Camel milk is a nutritious milk which is consumed in some pastoral areas in Iran. Preparing the fortified camel milk using different fruits can be effective for decreasing the undernurishment in many areas. In this study, effect of orange and cherry syrups at different concentrations (5, 10 and 15%) on bacteriological and sensory properties of camel milk studied. Results reavealed that samples contain orange 10% gained highest scores and then cherry milk (15%) was better. Milk contains 5% cherry syrup gained lower scores in comparison to control sample. Bacteriological results showed changes in total counts (Cfu mL^{-1}) in camel milks containing different concentrations of cherry and orange syrup. The total counts in orange and cherry fortified camel milk decreased from high concentration to low concentration and were 730, 680, 490 and 310, 240, 160 Cfu mL^{-1} at 5, 10 and 15% concentrations, respectively. Whereas, no changes in the yeast and mold counts at all concentration of pasteurized camel milk (control and fruit milks) and were zero. Accordingly, orange and cherry syrups can be use in production of fruit fortified camel milk for human nutrition.

INTRODUCTION

There is a direct relationship between nourishment and health. Use of nutritious foods help in increasing life expectancies and increase resistance against many diseases. Camel milk in comparison to other ruminant milk is low in cholesterol, sugar and protein but high in minerals (Sodium, Potassium, Iron, Copper, Zinc and Magnesium), Vitamins A, B2, C and E and contains a high concentration of insulin and milk solids in addition to nutriments as lactoferin, immunoglobulins, antimicrobial agents and so, one (Knoess, 1979). Camel milk has not allergic properties and can be consumed by lactase-deficient individuals and those with weakened immune system. Present in many regions camel milk is used against some diseases such as dropsy, jaundice, problems of the spleen, tuberculosis, asthma, anaemia and piles, in fact this milk believed to have medicinal properties (Rao *et al*., 1970; Akhundov *et al*., 1972). Chronic hepatitis of patients had improved after treating with camel milk and its fermented products (Sharmanov *et al*., 1978). Camel milk was as effective, as ass milk and superior to treatment with only medication or a diet consisting of cow milk protein. The camel milk

works as a laxative on people unaccustomed to drinking this milk (Rao *et al*., 1970). Camel milk is said to be of such a strength and have such health properties that all the bacteria are driven from the body. Orange is good source of vitamins, especially Vitamin C also Eberhard and Bower (1940) observed that orange juice resulted in increase in the free and total acidity in the stomach and help in better digestion of proteins. Cherry is rich in antioxidants, anthocyanins and melatonin which may help aid with sleep. Research suggests cherry reduce inflammation (Chandra *et al*., 1992; Wang *et al*., 1997, 1999), ease the pain of arthritis and gout, protection against heart disease and certain cancers (Blando *et al*., 2004), reduce the risk of diabetes and insulin resistance syndrome and prevention of memory loss (Sun *et al*., 2002). Accordingly, production of new fortified camel milk which be nutritious can be a ideal matter for public nutrition.

The objective of this study was to ispect for production the flavoured camel milk using different concentrations of orange and cherry syrup and determine the effects of concentration syrups on microbiological and sensory properties of fortified camel milk.

MATERIALS AND METHODS

Cherry and orange syrup used in this study were pasteurized commercial products from Sanich Company, Iran. Their compositions according to manufacturer's data were: Natural cherry concentrate, sugar, water, citric acid (E330) and natural orange concentrate, sugar, water, citric acid (E330), ascorbic acid (Vitamin C) E330, beta-caroten (vitamin A) 160a, pectin (E440) and orange flavor, respectively camel milk obtained from Aghghala City. The composition of the camel milk as determined by AOAC (1990) that included, water 86.5%, Ts 13.5%, (Fat 4.4%, Ash. 9%, lactose 4.3% and protein 3.9%), pH equal to 6.6 and titratable acidity 15D. Also, 0.3% sodium aleginate as stabilizer used.

Preparation of fortified camel milks: Raw camel milk pasteurized at 72°C for 15 sec. The 3 levels of cherry and orange syrup (5, 10 and 15%) were used in this study. Fruit syrups and stabilizer were added to pasteurized camel milk under sterility conditions and followed by stirring with a steril spoon until homogenous. Then, produced flaoured camel milk used for analysis the sensory properties and for microbiological assay, 1st make serial dilutions from samples. Also, a control batch (without any syrups) was considered.

RESULTS AND DISCUSSION

Microbiological assay: For examination the microbial growth, 1st serial dilutions from samples make in sterile distilled water and plating in plate count agar (Mirmedia, Iran) for total counts in manitol salt agar (micro media, hungary) for staph. aureus counts, in VRBA (micro media, hungary) for entrobacteriaceae counts and in YGC agar (Mirmedia, Iran) for yeast and mold counts. Plates were incubated at 37°C for 48 h for bacteria and at 30°C for 5 days for yeast and mold counts. Results given in Table 1.

Table 1: Microbial analysis of different camel milks (Cfu mL^{-1})

Milk types	Total counts	Yeast and molds	Eriaceae	Entrobact-St. aureus
Raw milk	560000	62	0	500
Pasteurizad camel milk (control)	900	0	0	0
Milk contains cherry (5%)	310	0	0	0
Milk contains cherry (10%)	240	0	0	0
Milk contains cherry (15%)	160	0	0	0
Milk contains orange (5%)	730	0	0	0
Milk contains orange (10%)	680	0	0	0
Milk contains orange (15%)	490	0	0	0

These results show changes in total counts (Cfu mL^{-1}) in raw camel milk and camel milks containing different concentrations of cherry and orange syrup.

The total counts in orange and cherry fortified camel milks decreased from high concentrations to low concentrations, i.e., from 730, 680, 490 and 310, 240, 160 Cfu mL^{-1} at 5, 10 and 15% concentrations, respectively. Orange milk has high total counts in comparison with cherry milk.

Whereas, no changes in the yeast and mold counts at all concentration of pasteurized camel milk (control and fruit milk) and all of them were zero.

It is clear that the total counts, especially for raw camel milk exceed but because of the pasteurization treatment, they may not necessarily pose a hazard to the health of the consumers (pasteurization are known as treatment which destroy all spoilage and hazardious microorganisms). Table 1 showed there were no entrobacteriaceae in raw milk.

Sensory evaluation: Panelists were selected based on interest, time available and a liking for camel milk (n = 6). Panelists were university students, 3 were female and 3 were male and ages ranged from 20 years. During training, panelists discussed terms and attributes and learned to consistently use the scale.

Panelists evaluated each treatment within each experiment in duplicate. All the samples were organoleptically rated for appearance, taste, flavor, texture and overall acceptability using the 5-point hedonic scale (Larmond, 1987). The data obtained in this study was subjected to statistical analysis according to Steel *et al*. (1996). Results given in Table 2.

These results indicate that syrup concentration play a crucial role in formulating camel milk fortified with fruit syrup. Syrup type, also had clear effect on sensory properties. Camel milks containing orange received higher flavor quality scores than milk with cherry syrup.

Table 2: Organoleptical characteristics (scores) of fortified camel milks

Milk types	Appearance	Taste	Flavor	Texture	Overall acceptability
Raw milk	3.83	3.50	3.66	3.83	3.83
Pasteurizad camel milk (control)	3.33	3.00	3.33	3.33	3.00
Milk contains cherry (5%)	4.00	3.50	3.33	3.66	3.66
Milk contains cherry (10%)	4.16	3.83	3.83	4.00	3.83
Milk contains cherry (15%)	3.83	3.16	3.33	3.66	3.50
Milk contains orange (5%)	4.66	4.50	4.33	4.33	4.33
Milk contains orange (10%)	3.66	3.50	3.83	3.50	3.83
Milk contains orange (15%)	3.83	3.50	3.66	3.83	3.83

Flavorness increased with syrup concentration, i.e., flavorness increased with increasing cherry concentration. Cherry fortified camel milk at 5 and 10% in comparison with 15 gained lower scores, wherase orange fortified camel milk at 5 and 15% in comparison with 10% had the lower scores, accordingly cherry milk at 15% and orange milk at 10% were the best of them. The addition of fruit syrup at 5% decreased flavor in comparison with control sample (pasteurized camel milk without any syrup). Cherry and orange flavors were effective in decreasing camel milk flavor. Orange fortified camel milk had high acceptability in comparisson to cherry fortified camel milk and orange flavor were the most popular fortified camel milk.

CONCLUSION

It is concluded from the present investigation that the use of cherry and orange syrups improve the sensory properties of the fortified camel milks.

Panelists gave the highest flavor, texture, appearance and overall acceptability scores to the camel milks with 10% of orange and second 15% cherry among the camel milks with added fruit. Hence, it is concluded that addition of 10% orange syrup and 15% cherry in camel milk improve the organoleptic, as well and nutrition properties of camel milk.

This study recommends a new variety of fruit fortified camel milk particularly rich in nutrition compounds and has pleasant flavor which can be manufactured by utilizing cherry and orange fruits.

Also, if heat treatment achieve correctly, fortified camel milk has acceptable colony counts but for prevention from spoilage, these products need a cold chain for their storage and distribution.

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