



P-ISSN: 2349-8528

E-ISSN: 2321-4902

www.chemijournal.com

IJCS 2021; 9(1): 2700-2702

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Received: 22-10-2020

Accepted: 30-11-2020

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Physico-chemical properties of ready to reconstitute carrot flavoured milk beverage

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DOI: <https://doi.org/10.22271/chemi.2021.v9.i1al.11633>

Abstract

Spray drying is a novel technique for production of dried milk powders to enhance the storage life of milk and making it convenient to reconstitute without much loss of nutrients. A study was conducted to develop a ready to reconstitute milk beverage by using the spray drying technology with optimum physico-chemical and nutritional parameters. Ready to reconstitute milk beverage was prepared by incorporation of 20 per cent level of carrot extract and 1.5 per cent level of cardamom with varying levels of milk fat at 3, 4.5, 1.5 and 0.5 per cent as Control, T1, T2 and T3. Further, the selected treatments and control were subjected to spray drying technology with standardized spray drying parameters and packed in polyethylene bags and stored at room temperature for 120 days during which the physico-chemical properties were studied on day 0, 30, 60, 90 and 120. The mean \pm SE values for pH, titrable acidity and solubility index of different treatments of ready to reconstitute milk beverage ranged from 6.68 ± 0.02 to 6.74 ± 0.03 , 0.176 ± 0.02 to 0.185 ± 0.04 and 0.67 ± 0.011 to 0.83 ± 0.017 respectively. It was concluded that ready to reconstitute milk beverage can be prepared by using skim milk (0.5 per cent milk fat), carrot extract 20 per cent and cardamom 1.5 per cent with standardized parameters of spray drying technology as input feed rate at 8RPM, inlet temperature at 185.0°C for set1 and 195.0°C for set 2, outlet temperature at 102.5°C for set1 and 105.5°C for set 2 and with good physico-chemical properties within the prescribed standards.

Keywords: Carrot flavoured milk, Physico-chemical properties, ready-to-reconstitute milk beverage, Spray drying

Introduction

Today there is a demand for ready-to-serve convenience food among consumers. Ready to serve foods are those that are consumed immediately without much cooking/working. Fruit or vegetable beverages such as ready to serve are becoming increasingly popular in comparison to synthetic drinks, because of their taste, flavour and nutritive value. Spray drying is the most suitable technique for producing milk powders and the removal of water which prevents the growth of microorganisms by reducing the water activity and facilitates preservation and storage of milk constituents. (Schuck P. 2002) ^[12]. It was also used to encapsulate carotene from carrot (Desobry SA *et al.*, 1998) ^[3].

Carrot is an important root vegetable rich in carotenoids (Sharma KD *et al.* 2012) ^[13], vitamin C, calcium, iron and magnesium (Olalude CB *et al.*, 2015) ^[11]. Carrot root has plenty of antioxidant activity and contain 80% of linoleic acid (Arabshahi DS *et al.*, 2007) ^[1] Cardamom acts as flavouring agent in food products with a lot of health properties like antioxidant, blood pressure lowering, fibrinolysis enhancing, diuretic and sedative (Dhulap S *et al.*, 2008) ^[4].

Nowadays, consumer demand is increasing for low fat foods made with value added ingredients such as carotenoids. Hence the present study has been carried out to enhance the properties of ready to reconstitute milk beverage by using carrot extract and cardamom with increased shelf life by spray drying technology.

Materials and Methods**Cow Milk**

High quality fresh milk was obtained from crossbred cows at the Livestock Farm Complex, Veterinary College and Research Institute, Namakkal, Tamil Nadu.

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Carrot juice and Cardamom

Good quality fresh carrots and cardamom were purchased from the local market which are utilized for this study.

Skim milk powder and Butter

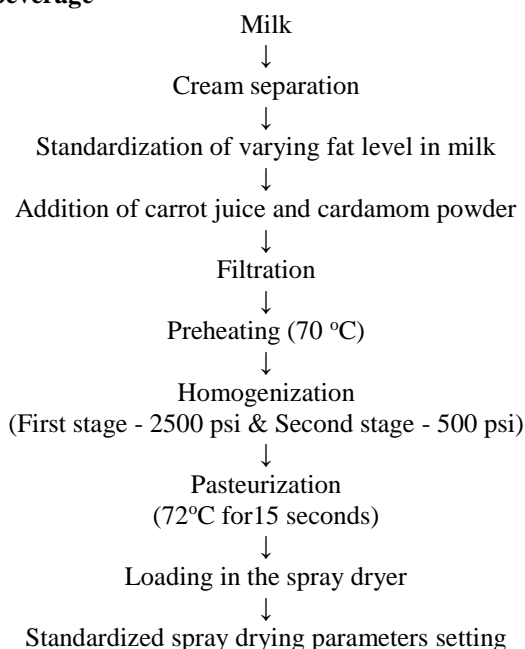
Good quality Skim milk powder and Butter was obtained from the District Cooperative Milk Producers Union Limited (Aavin), Salem, TamilNadu, India was utilized for this study.

Experimental design

The following three combinations of treatment and control have been prepared for this study.

Selected treatments	Fat content in milk (%)	Levels of ingredients	
		Carrot extract (%)	Cardamom (%)
Control	3.0	20	1.5
T ₁	4.5	20	1.5
T ₂	1.5	20	1.5
T ₃	0.5	20	1.5

Flow chart for the preparation of ready to reconstitute milk beverage



Inlet Temperature	Outlet Temperature	De-block nozzle
Set 1-185.5°C	Set 1-102.5 °C	On-1second
Set 2-195.5°C	Set 2-105.5 °C	Off-60 seconds

Feeding rate of carrot flavoured milk = 8.0 rpm
 ↓
 Collection of powder
 ↓
 Packaging and storage (32 °C)

The prepared/spray dried ready to reconstitute milk beverage powder was collected in a polyethylene cover and stored in a cool and dry place at ambient temperature.

Physico-chemical parameters

pH

The pH of ready to reconstitute milk beverage powder was determined by mixing 10 g of powder with 10 ml of glass distilled water and dipping the electrode directly into the milk beverage to get the pH value.

Titration acidity

The titration acidity of ready to reconstitute milk beverage powder was determined as per the procedure in IS: 1479 (part I) 1981 [6].

Solubility index

Solubility index of ready to reconstitute milk beverage powder was estimated according to IS: SP18 (part XI) 1981 [7].

Statistical analysis

The data were analyzed by two-way ANOVA in SPSS (version 20.0).

Results and Discussion

pH

The pH of ready to reconstitute milk beverage at different storage period in room temperature is presented in table 1. The mean ± SE values for pH of different treatments of ready to reconstitute milk beverage ranged from 6.68 ± 0.02 to 6.74 ± 0.03 during different storage period. The results revealed that, no significant difference observed between different treatments and also between different storage periods. This result indicated that, there was no biochemical changes and increment in development of acidity and pH during storage of the prepared product. These results closely related to the findings of Kajal *et al.*, (2012) [9] who reported that the range of pH of whole milk was 6.6 to 6.8.

Table 1: pH of ready to reconstitute milk beverage during storage

Treatment	Storage period (in days)				
	0	30	60	90	120
Control	6.71 ± 0.02	6.73 ± 0.02	6.71 ± 0.03	6.72 ± 0.02	6.69 ± 0.02
T ₁	6.68 ± 0.03	6.70 ± 0.02	6.69 ± 0.03	6.71 ± 0.01	6.72 ± 0.03
T ₂	6.73 ± 0.03	6.74 ± 0.03	6.73 ± 0.02	6.69 ± 0.02	6.70 ± 0.03
T ₃	6.69 ± 0.02	6.71 ± 0.02	6.72 ± 0.02	6.70 ± 0.02	6.68 ± 0.02

Titration acidity

Titration acidity of ready to reconstitute milk beverage at different storage period in room temperature is presented in table 2. The mean ± SE values for titration acidity of different treatments of ready to reconstitute milk beverage ranged from 0.176 ± 0.02 to 0.185 ± 0.04. The results showed that, no significant difference observed in storage period and also between different treatments. The result observed that there was no further development of acidity during storage period and it was due to lack of biochemical reactions and microbial changes in prepared product during storage period. The results concur with the findings of Kajal *et al.* (2012) [9] who reported that the whole milk powder acidity range was 0.10 to 0.15 and Jayaprakash *et al.* (2013) [8] found that 0.15 per cent lactic acid in ready to reconstitute milk beverage.

Table 2: Titration acidity (%) of ready to reconstitute milk beverage during storage

Treatment	Storage period (in days)				
	0	30	60	90	120
Control	0.185 ± 0.03	0.181 ± 0.03	0.182 ± 0.02	0.185 ± 0.04	0.180 ± 0.02
T ₁	0.179 ± 0.02	0.183 ± 0.02	0.178 ± 0.01	0.181 ± 0.03	0.176 ± 0.02
T ₂	0.184 ± 0.03	0.177 ± 0.01	0.180 ± 0.02	0.184 ± 0.03	0.181 ± 0.03
T ₃	0.185 ± 0.02	0.181 ± 0.02	0.183 ± 0.03	0.180 ± 0.01	0.179 ± 0.02

Solubility index

Solubility index of ready to reconstitute milk beverage at different storage period in room temperature is presented in table 3. The mean \pm SE values for solubility index of different treatments of ready to reconstitute milk beverage ranged from 0.67 ± 0.011 to 0.83 ± 0.017 . The statistical analysis revealed that, a significant difference ($P < 0.05$) observed between treatments on a particular period of storage but no significant difference was observed within a treatment during storage period. It could be due to compositional changes of different treatments, particularly higher the level of fat content in the

treatment showed higher the value of solubility index and low moisture content of powder had more solubility than higher moisture content powders. Further the results of above treatment are within the standards of FSSAI, (2011) [5] as maximum 1ml. Celestino *et al.* (1997) [2] reported the solubility index of milk powder ranged from 0.13 to 0.43. Kudo *et al.* (1990) [10] cited several factors contributing to decreased solubility during storage, such as crystallization of lactose, non-enzymatic browning, higher moisture content and elevated storage temperature of powder.

Table 3: Solubility index (ml) of ready to reconstitute milk beverage during storage

Treatment	Storage period (in days)				
	0	30	60	90	120
Control	$0.75^b \pm 0.013$	$0.75^b \pm 0.002$	$0.76^c \pm 0.008$	$0.76^b \pm 0.015$	$0.76^b \pm 0.015$
T ₁	$0.81^c \pm 0.015$	$0.80^c \pm 0.013$	$0.82^d \pm 0.011$	$0.83^c \pm 0.011$	$0.83^c \pm 0.017$
T ₂	$0.71^{ab} \pm 0.015$	$0.69^a \pm 0.015$	$0.72^b \pm 0.017$	$0.72^a \pm 0.011$	$0.73^b \pm 0.017$
T ₃	$0.68^a \pm 0.017$	$0.67^a \pm 0.011$	$0.67^a \pm 0.011$	$0.68^a \pm 0.011$	$0.68^a \pm 0.011$

Mean \pm (SE) bearing different superscripts in same column differ significantly ($P < 0.05$)

Conclusion

The present study was observed that, ready to reconstitute milk beverage prepared by using skim milk (0.5 per cent milk fat), carrot extract 20 per cent and cardamom 1.5 per cent with standardized parameters for spray drying technology as input feed rate at 8RPM, inlet temperature on 185.0°C for set1 and 195.0°C for set2, outlet temperature on 102.5°C for set1 and 105.5°C for set2 showed a good physico-chemical and shelf life qualities of up to 120 days at room temperature.

Reference

1. Arabshahi DS, Devi DV, Urooj A. Evaluation of antioxidant activity of some plant extracts and their heat, pH and storage stability. *Food Chemistry* 2007;100(3):1100-1105.
2. Celestino EL, Iyer M, Roginski H. The effects of refrigerated storage of raw milk on the quality of whole milk powder stored for different periods. *Int. Dairy J* 1997;7(3):119-127.
3. Desobry SA, Netto FM, Labuza TP. Preservation of β -carotene from carrots. *Critical Reviews in Food Science and Nutrition* 1998;38(5):381-396.
4. Dhulap S, Anita M, Hirwani RR. *Phyto-pharmacology of Elettaria cardamom Review* 2008;2(4):27-35.
5. Food Safety and Standards Authority of India (FSSAI) 2011.
6. IS: 1479 (part I). Methods of test for dairy industry rapid examination of milk. Bureau of Indian Standards, New Delhi 1981.
7. IS: SP18 (part XI). ISI hand book of food analysis, Dairy products. Bureau of Indian Standards, New Delhi 1981.
8. Jayaprakash HM, Ramachandra Rao HG, Puranik DB, Arun Kumar H, Jayashri PH. Development of Ready-to-Reconstitute Milk Beverage (Doctoral dissertation, Karnataka Veterinary Animal and Fisheries Sciences University, Bidar) 2013.
9. Kajal MFI, Wadud A, Islam MN, Sarma PK. Evaluation of some chemical parameters of powder milk available in Mymensingh town. *Journal of the Bangladesh Agricultural University* 2012;10(1):95-100.
10. Kudo N, Hols G, van Mil PJM. The insolubility index of moist skim milk powder: Influence of the temperature of

the secondary drying air. *Neth. Milk Dairy J* 1990;44(2):89-98.

11. Olalude CB, Oyedeji FO, Adegboyega AM. Physicochemical analysis of daucuscarota (carrot) juice for possible industrial applications. *Journal of Applied Chemistry* 2015;8(8):110-113.
12. Schuck P. Spray drying of dairy products. *State of the art/ Le Lait* 2002;82(4):375-382.
13. Sharma KD, Karki S, Thakur NS, Attri S. Chemical composition, functional properties and processing of carrot - A review of *Journal of Food Science Technology* 2012;49(1):22-32.