

Process Optimization, Sensory Evaluation and Physico-chemical analysis of Carrot Milkshake

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Abstract

Milkshake is a cold beverage which is obtained by combination of milk, skim milk powder and sugar followed by speed mixing of the product in a mixer to make it pourable. It can be made more nutritive and healthier by adding carrot which are a particularly good source of beta-carotene, fiber, potassium, antioxidants and have been linked to lower cholesterol levels and improves eye health. Addition of jaggery is known to be good for the digestive system and acts as a detoxifying agent, improves the health of bones and teeth. The buffalo milk is preheated, filtered and standardised to 6% fat. The carrot puree is prepared by blanching the carrots and straining the puree through a muslin cloth. Then organic jaggery, carrot puree and almond powder added to the standardised milk and mixed well in a domestic mixer. The study was undertaken to optimize the proportion of carrot puree and milk in carrot milkshake and to evaluate physicochemical and sensory parameters of prepared milkshake.

Keywords: Milk, Carrot Puree, Jaggery, Almond Powder

1.0 Introduction:

Milk has been recognized as a complete food by nutritionists all over the world. Milk is the perfect food for all ages. It has almost all the vital nutrients needed for growth and well-being of the human body. Milk is the richest source of calcium and essential amino acids which is good for bone formation. (Surve 2017). Besides direct consumption as market milk, surplus milk is converted in to various milk products as per the liking of the people.

Milkshake is a cold beverage which is obtained by combination of milk, skim milk powder and sugar followed by speed mixing of the product in a mixer to make it pourable. The milkshakes which are available in market consist of fruit flavours and different flavour blends of rose, coffee and chocolate. Day by day use of fruit pulps are done for preparation of milkshake and sugar or jaggery are used as sweeteners. When fresh fruits are not available in the market, the preserved pulp can be used to prepare such fruit milk blend. (Ubale *et al.*, 2014) It can be made more healthier by addition of Carrots.

Carrot (*Daucus carota* L.) is the crop of Apiaceae family. It is a root vegetable grown worldwide. The cultivation of the crop is favored during the months of September to November in tropical and subtropical regions whereas the temperate conditions offer a wide option of cultivation throughout the year. (Raees-ul & Prasad, 2015)

Carrots play an important role in human nutrition as they constitute a rich source of health-promoting ingredients such as carotenes. Carrots contain many medicinal properties, such as to cleanse the intestines and to be diuretic, revitalizing, antidiarrheal, and rich in alkaline elements which purify and revitalize the blood. It also has a reputation as a vegetable that helps to maintain good eyesight. (Olalude *et al.*, 2015)

Jaggery is a natural sweetener prepared by concentrating sugarcane juice. The traditional name of jaggery is Gur. (Singh *et al.*, 2009) It can be used as an alternative to sugar in many food products. In Ayurveda jaggery is considered to be the best of all the sugarcane preparations and can be used as medicine, blood purifier and base material for syrups. It is rich in important minerals (viz Calcium, Potassium, Phosphorus, Sodium, Iron, Manganese, Zinc). Magnesium present in jaggery strengthens the nervous

system, it helps to relax muscles, gives relief from fatigue and takes care of blood vessels. Selenium present in it acts as an antioxidant property which scavenges free radicals from our body. The presence of potassium and low amount of sodium helps to maintain the acid balance in the body cells. It is a good source of iron, and helps to prevent anaemia. It also helps to relieve tension and takes care of asthma as it has anti-allergy properties. (Singh *et al.*, 2013)

In recent years, a lot of interest has been generated in the developments of milk and vegetable, fruit based delicacies. The blend of vegetable, fruits or nut in the product preparation improves flavour, palatability and nutritive value. Almonds are one of the nutritious nuts. Almonds are a good source of vit. E (tocopherol) flavonoids and other antioxidants and it helps to lower the bad cholesterol. Almond contains less amount of carbohydrate so it is perfect for low carbohydrate diets. It can help to burn fat because it is low in calories. Almonds are rich in some essential minerals such as magnesium and calcium. (Kuchekar, 2011)

Milkshake is being prepared adding many fruits, but no scientific study has been done by addition of carrot in milkshake and studied the physicochemical and sensory profile of carrot milk shake. This is described for the first time, in this paper, that the carrot milk shake prepared from buffalo milk.

2.0 Materials and Methods

Raw materials used for preparation of milkshake are evaluated, Carrot, Jaggery, and almonds were purchased from local market and has undergone various evaluations like moisture content, determined by hot air oven method, Ash content, Protein content was determined by formal titration method as described by (Ranganna *et al.*, 2001). Acidity was determined by titrimetric method described by (KC and Rai *et al.* 2007). Crude fiber was determined by the method described by KC and Rai (2007). Protein content was determined by Kjeldahl nitrogen method as per (Ranganna *et al.*, 2001). Determination of sodium, potassium, calcium and magnesium content was done by atomic absorption spectrometry (AAS). Poitevin, E. (2016)

For preparation of carrot milkshake, following blends of carrot puree and buffalo milk was prepared

T0- 100% buffalo milk (Control)

T1- 90% buffalo milk +10% Carrot puree

T2- 80% buffalo milk +20% Carrot puree

T3- 70% buffalo milk +30% Carrot puree

T4- 60% buffalo milk +40% Carrot puree

T5- 50% buffalo milk +50 % Carrot puree

For preparation of carrot puree, first carrots were washed with clean water. It was then trimmed with the help of knife and then chopped into small slices which were blanched for a certain time period to soften the tissues. Finally, it was converted into homogeneous mass of puree by putting in grinder. The puree was extracted using a muslin cloth. It was then poured in a glass bottle and kept in a refrigerator for further use.

2.1 Preparation of Carrot Milk shake

Carrot milk shake was prepared by following the procedure as described by Ubale *et al.*, (2014) with slight modification. The buffalo milk was standardized to 6 per cent fat. The flow chart for preparation of carrot milk shake is depicted (Fig. 1)

The carrot milk shake was subjected to sensory evaluation by a panel of five trained judges from Department of Technology, Shivaji university, Kolhapur using 9-point hedonic scale as described by Gupta (1999). It was judged for appearance,

taste, flavour consistency, overall acceptability. The scores ranged from 1 to 9, depending upon the liking of the Panellist. The descriptions for each score were as follows, extremely liked (9), liked very much (8), liked moderately (7), liked slightly (6), neither liked nor disliked (5), disliked slightly (4), disliked moderately (3), disliked very much (2), and extremely disliked (1).

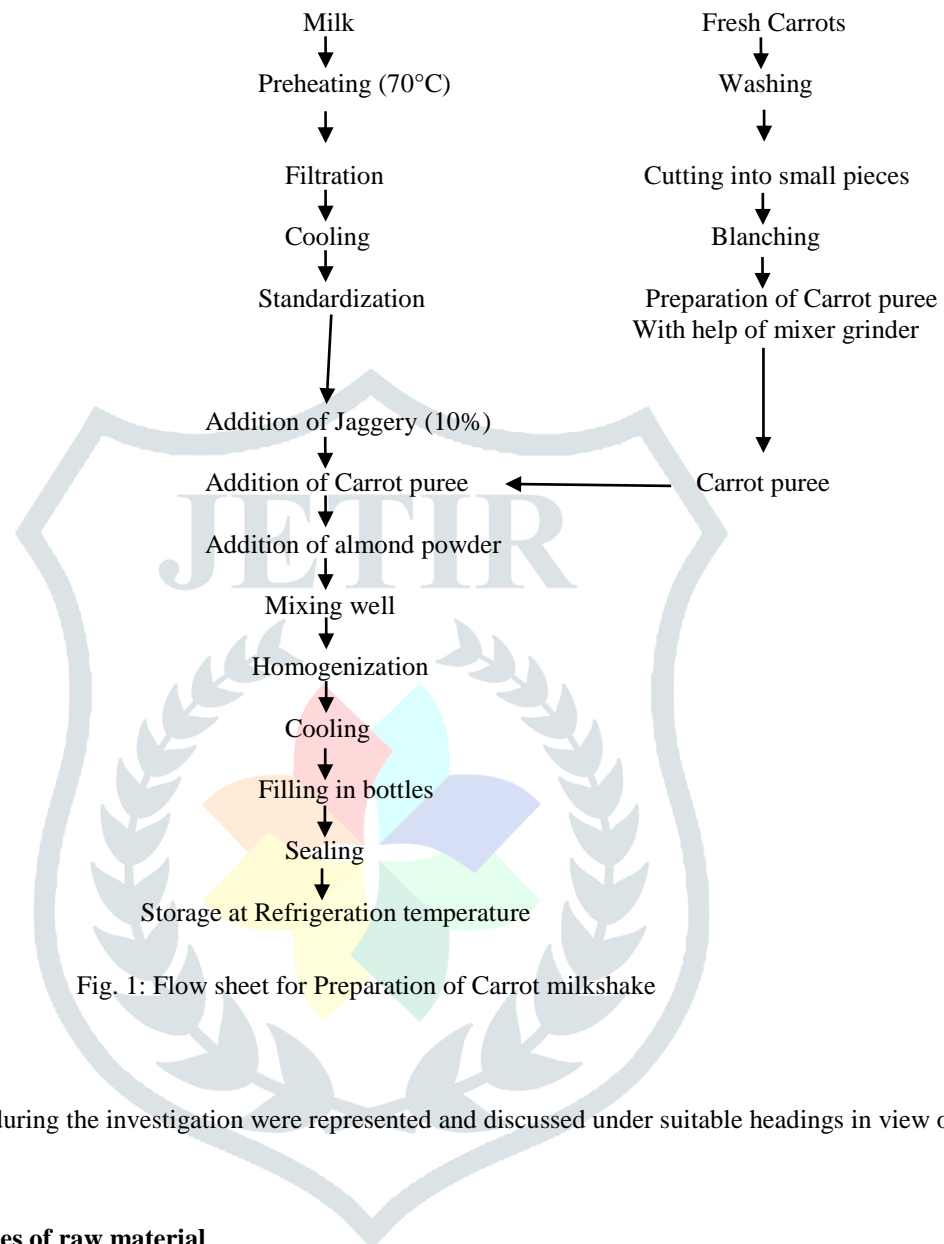


Fig. 1: Flow sheet for Preparation of Carrot milkshake

3.0 Results and Discussion:

The results obtained during the investigation were represented and discussed under suitable headings in view of available relevant scientific literature.

3.1 Physicochemical properties of raw material

Table 1 Physicochemical properties of raw material

Parameter	Carrot	Milk	Almond Powder	Jaggery
Moisture (%)	86.21±0.03	84.80±0.02	4.63±0.02	7±0.10
Ash (%)	1.14±0.01	0.79±0.03	3.02±0.02	1.5±0.20
Protein (%)	0.83±0.03	4.07±0.05	10.05±0.01	0.4±0.01
Fat (%)	0.26±0.20	6.5	5±0.02	0.2±0.01
Crude fiber (%)	2.5±0.02	-	4.9±0.01	-

Total solid		15.2±0.06		
Solid Non-Fat		10		
pH		6.3		
β carotene (mg/100gm)	35.7±0.01			
Calcium (mg/100ml)	95	130	77.5	47.5
Iron(mg/100ml)	0.3	0.9904	3.0	11
Magnesium(mg/100ml)	7.933	9.194	12.79	9.849
Zinc (mg/100ml)	0.1902	0.6101	0.5382	
Potassium (mg/100ml)	17500	147.5	1000	10500

Data expressed as mean ± standard deviation of triplicate experiments (n=3)

Table 1 showed that the analysis of the four samples such as milk, Carrot, Jaggery, Almond. The percentages of crude protein in Milk, Carrot, Jaggery, Almond of values was 4.07 %, 0.83 %, 10.05%, 0.4% respectively. Percentage of Ash in milk, Carrot, Jaggery, Almond is 0.79%, 1.4%, 3.02% and 1.5% respectively.

3.2 Sensory evaluation of Carrot milkshake:

The carrot milk shake prepared from different blends of carrot puree and buffalo milk were subjected to sensory evaluation and scores recorded for different parameter are presented in Table 2.

Table 2: Sensory Evaluation of Carrot milkshake by varying milk and Carrot Puree

Sample Code	Colour and Appearance	Taste	Flavour	Consistency	Overall acceptability
T0	6.4	6	5.7	5.8	6.1
T1	6.5	5.8	6.2	5.8	6.3
T2	6.9	6.7	6.8	6.5	6.3
T3	7.8	7.8	7.9	7.6	7.9
T4	8	8	8	7.8	8.2
T5	7.9	7.4	7.2	7.8	7.5

3.2.1 Colour and Appearance

The mean score of colour and appearance for different blends of carrot milkshake was found to be in the range of 6.4 to 8. It was observed that increased level of carrot puree in milkshake increases the score colour and appearance slightly. There was slight difference between the treatments. Treatment T4 showed the highest score for colour and appearance.

3.2.2 Taste

The highest taste score was observed for treatment T4(8) followed by T3(7.8), T5(7.4), T2(6.7), T0(6) and lowest T1(5.8). It was observed that decreasing the percent of carrot puree in the blend was not much accepted by the sensory panellists. Carrot puree blending of 40% (T4) was found to be most accepted.

3.2.3 Flavour

The data show that 60% buffalo milk blended with 40% carrot puree gave good flavour to milkshake. There was difference between the scores of all treatments except T4 and T3 out of which T4 was having slightly higher score.

3.2.4 Consistency

The mean score for consistency of Carrot milkshake was found in the range of 5.8 to 7.8. The treatment T4 scored highest (7.8) among the treatments. The addition of carrot puree in the blend, naturally increased the score of consistency.

3.2.5 Overall acceptability

The mean score of overall acceptability was found to be highest for treatment T4(8.2) followed by T3(7.9), T5(7.5), T2(6.3), T1(6.3) and lowest T0(6.1). The treatment T4(60% milk and 40% carrot puree) was most accepted by judges than the other combination.

Blended carrot milkshake was prepared based on one factor variation. In this case optimization of amount of carrot puree to be added was carried on the basis of 9 point hedonic scale. Out of the results obtained from sensory evaluation are given (table 5) Sample containing 60% milk and 40% carrot puree gave good characteristics drink. Sample containing more than 50ml carrot puree gave more carrot flavour and increase thickness of milkshake and below 30ml carrot puree was not so appealing as well as had no proper colour, finally prepared milkshake with carrot puree i.e. sample (60:40) gives a good sensory score and overall acceptability. Therefore, sample containing 60% milk and 40% carrot puree was finalized as blended carrot milkshake.

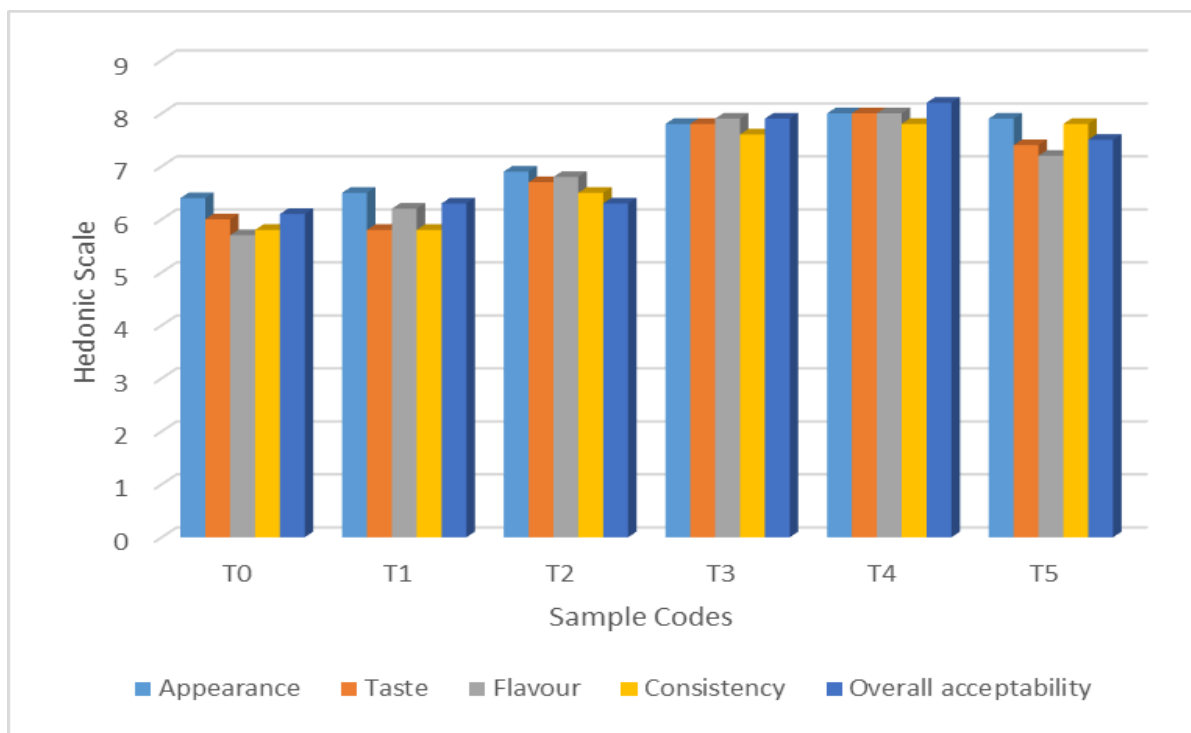


Fig.2 Sensory evaluation of Carrot Milkshake

3.3 Physicochemical Analysis of Carrot Puree

Table 3: Physicochemical Analysis of Carrot Puree

Parameter	Carrot Puree
Moisture (%)	94.04±0.04
Ash (%)	3.0±0.25
Protein (%)	0.8±0.01
Fat (%)	0.20±0.02
Crude fiber (%)	4.16±0.01
Vit. C (mg/100gm)	3.2±0.6
T.S.S (Brix)	6-7
Acidity (%)	0.128±0.002
pH	6-6.5
β carotene (mg/100gm)	27.9±0.02

Data are expressed as mean ± standard deviation of triplicate experiments (n=3)

Table 3 gave the summary of the analysis of the Carrot puree. The percentage of crude protein in Carrot puree is 0.8 %. The puree contains ash 3%, fat 0.2% and crude fiber 4.16%. the TSS of puree is 6° Brix. The moisture content of puree was 94.04 %. Carrot milkshake was good source of vitamin C it is in the range of 3.2mg/100. The acidity, pH, TSS content of blended health drink was 0.12%, 6, 6°Brix respectively.

3.4 Physiochemical Composition of prepared Carrot Milkshake

The fresh carrot puree was used for preparation of carrot milkshake. The data regarding the physico-chemical composition of prepared carrot milkshake was tabulated in table 4.

Table no. 4 Physiochemical Composition of prepared Carrot Milkshake

Sr.no.	Parameters	Milkshake
1.	Moisture (%)	78.64
2.	Total solids (%)	21.36
3.	Protein (%)	7.54
4.	Total fat (%)	6
5.	Carbohydrates (%)	74.12
6.	Total Ash (%)	4.7
7.	Calcium (Ca) (mg/100ml)	230
8.	Iron (Fe) (mg/100ml)	24.03
9.	Magnesium (mg/100ml)	14.44
10.	Phosphorus (mg/100ml)	8.60
11.	Energy (Kcal)	425

Data are expressed as mean \pm standard deviation of triplicate experiments (n=3)

The moisture content of milkshake was 78.64 %. The acidity, pH, TSS content of carrot milkshake was 0.13%, 6, 6.5 °Brix respectively. It contains protein 7.54%, fat 6%, ash 4.7%, total solids 21.36%. The mineral contents of carrot milkshake such as calcium, iron, magnesium and Phosphorus are 230mg/100ml, 24.03mg/100ml, 14.44mg/100ml and 8.60mg/100ml respectively. Hence carrot milkshake is a good source of mineral content and can prove use full for mineral deficient people.

4.0 Conclusion:

In this study milkshake was developed by using carrot puree. The carrots are good source of Beta Carotene, minerals and almonds also contain phenolic compounds and certain amount of crude fibre. For control sample, milk and jaggery are used in proportion (100:10) ratio, it is accepted based on sensory evaluation.

Optimization of milkshake was carried out by varying carrot puree. The Sample containing 60% milk and 40% carrot puree gave good characteristics drink. It is observed that milkshake is a good source of minerals such as calcium (230mg/100ml), iron (24.03mg/100ml).

Thus, it can be recommended that milkshake can be potentially used to improve health condition. It indicates that milkshake should be further investigated in terms of possible applications in developing functional and nutritional food products.

5.0 References:

- Gupta, S.A. (1999). Sensory Evaluation in Food Industry, Indian dairyman 28(7):293-395.
- KC, J.B. and Rai, B.K., Basic food analysis Handbook, (2007). 1st edition.pp-(12-94)
- Kuchekar, D. D. (2011). *Studies on preparation almond milk shake* (Doctoral dissertation, Vasantnao Naik Marathwada Krishi Vidyapeeth, Parbhani).
- Olalude, C. B., Oyedeji, F. O., & Adegboyega, A. M. (2015). Physicochemical analysis of daucus carota (carrot) juice for possible industrial applications. *Journal of Applied Chemistry*, 8(8), 110-113.
- Poitevin, E. (2016). Official methods for the determination of minerals and trace elements in infant formula and milk products: a review. *Journal of AOAC International*, 99(1), 42-52.
- Raees-ul, H., & Prasad, K. (2015). Nutritional and processing aspects of carrot (*Daucus carota*)-A review. *South Asian Journal of Food Technology and Environment*, 1(1), 1-14.
- Ranganna, S. (2001). Proximate constituents. *Handbook of analysis and quality control for fruit and vegetable products*, 2, 12-17.
- Singh, J., Solomon, S., & Kumar, D. (2013). Manufacturing jaggery, a product of sugarcane, as health food. *Agrotechnology*, S11.
- Singh, S., Dubey, A., Tiwari, L., & Verma, A. K. (2009). Microbial profile of stored jaggery: A traditional Indian sweetener. *Sugar Tech*, 11(2), 213-216.
- SURVE, S. (2017). *PROCESS STANDARDIZATION FOR PREPARATION OF MILK SHAKE BY INCORPORATION OF DATE (*Phoenix dactylifera* L.) AND JAGGERY* (Doctoral dissertation, DBSKKV., Dapoli).
- Ubale, P. J., Hembade, A. S., & Choudhari, D. M. (2014). Sensory and chemical quality of sapota milk shake. *Research Journal of Animal Husbandry and Dairy Science*, 5(2), 116-121.