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Standardization and Development of Avocado Pulp-Carrot Juice Blended Probiotic Dahi

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A B S T R A C T

A study was conducted for the development of value added dahi by incorporating avocado pulp and carrot juice to increase the nutritional and sensory quality. Avocado is a highly nutritious fruit rich in proteins, fats and oils, low in sugar and is a rich source of dietary fiber. Carrot juice is an excellent source of β-carotene, ascorbic acid, tocopherol and photochemical including good sources of dietary fiber, minerals and contains appreciable number of vitamins B1, B2, B6, and B12. The research work was undertaken to develop the avocado pulp-carrot juice blended probiotic dahi to get functional attributes. Combination of Avocado pulp and carrot juice incorporated at the level 5.0, 10.0, 15.0 per cent, added with optimized probiotic culture (1 per cent). Avocado pulp-carrot juice blended probiotic dahi containing 10 per cent level of combination of avocado pulp and carrot juice with probiotic culture (1 per cent) was optimized. The sensory scores regarding the effect of incorporation of probiotics for colour and appearance, body and texture, flavour and overall acceptability are presented in this paper. Among the various levels of avocado pulp used in dahi at 8.0, 10.0 and 12.0 per cent based on the volume of product 8 per cent level secured highest sensory scores, while for carrot juice used in dahi at 10.0, 15.0 and 20.0 per cent based on the volume of product, 15 per cent level secured highest sensory scores.

Introduction

Dahi is a well-known fermented milk product consumed by large section of the population throughout the country, either as a part of the daily diet or as a refreshing beverage. Dahi is a yoghurt-like fermented milk product (FAO, 2013) widely consumed all over India and the neighboring countries including the Himalayan region either plain, sugared or salted. About 8 per cent of total milk production is used for dahi making. In India, dahi is largely made at individual homes using traditional kitchen recipes, involving milk of buffaloes, cows and goats. Milk is boiled, cooled and inoculated with dahi starter, usually the left over from the previous day's stock and undisturbed at ambient temperature for four to six hours until it acquires a thick consistency. Along with taste, dahi has many health benefits (Lin, 1999) and in the tropical climate, it has higher storability compared

to milk. Dahi may be consumed as such as sweet or savory drink as a dessert containing sugar, spices, fruits, nuts, etc. Mild dahi is made by mesophilic *lactococci* spp. *Leuconostoc* spp. may be adjunct organisms for added buttery odour and flavour.

Sour dahi contains additional cultures belonging to the thermophilic group, which are generally employed in the manufacture of yoghurt. These thermophilic organisms grow rapidly at 37- 45ºC, producing dahi in less than 4 hours' time.

Dahi and yoghurt are more or less similar cultured and fermented dairy products with some differences between them. Consumption of yoghurt/curd containing live lactic bacteria called probiotics, may well interfere with the colonization and proliferation of food-borne pathogens. Scientists currently investigated the protective effect of *Streptococcus thermophiles, Lactobacillus bulgaricus, Lactococcus species* and *Lactobacillus acidophilus* against these upsets and cite the following central characteristic abilities:

Lowering intestinal pH, favoring lactic acid bacteria.

- Competing with pathogens for essential nutrients.
- Producing antibacterial substances (bacteriocins) and Neutralizing toxins.

The term 'probiotic' is a Greek word meaning 'prolife'/'supporting life'. Probiotics may be defined as "Live microorganisms which when administered in adequate amounts confer a health benefit on the host". The beneficial effects of food with added live microbes (probiotics) on human health, and in particular dairy-based probiotic on children and other populations, are being increasingly promoted by health professionals. Prebiotics are "Non digestible food ingredient beneficially affects the host by selectively stimulating the growth and / or activity of one or a limited number of bacteria in the colon". A Synbiotic refers to a product in which a probiotic and a prebiotic are combined. Low-fat and fat-free yoghurts have gained popularity because of the increasing demands of consumers who seek healthy options across product categories. Production of low-fat and non-fat yoghurt demands a careful control of texture and flavour attributes. Though, milk price and demand are increasing day by day, researchers are now thinking to add some milk replacer in partial amount like fruit juice, soybean and powder milk to prepare dahi. Yoghurt with different fruit-flavors (Cornelian, Morello Cherry and Rose hip marmalade, grape molasses, date pulp, and control (without additive)) have been prepared and stored up to 10 days at 5°C. The fruit flavors were added at the rate of 7 per cent w/w. Y (Tarakci and Kucukoner, 2003).

The avocado (*Persea americana*) originated in Mexico, Central or South America, and was first cultivated in Mexico as early as 500 BC (Ervina, and Abdillah, 2017). Avocado is considered as nature's butter having a high proportion of fat compared to other fruits. It is a native of Tropical America. Some of the common names of Avocado are nature's butter, Butter fruit, Benne hannu, Alligator Pear, Midshipman's butter, Vegetable butter, Butter pear, Cura, Abacate, and Avocatier. It is considered as most nutritive fruit which is a rich source of vitamins, minerals, dietary fiber, proteins and fat. The fruit is having a higher energy value of 144 k cal/100g (Prakash *et al.,* 2014).

Avocado contains substantial amounts of bioactive compounds such as phytosterols, especially in the lipid fraction, and the main representative is the β-sitosterol. Diets rich in phytosterols can lead to the reduction of the total cholesterol and LDL cholesterol (Patricia *et al.,* 2016). The fat in avocado is predominantly monounsaturated oleic acid, which has been shown to reduce blood levels of the low-density lipoprotein (LDL) cholesterol that contributes to atherosclerotic heart disease (Gunawardhana and Dilrukshi, 2016). Avocado is recognized as a functional food that contains health-promoting phytochemicals such as glutathione and beta-sitosterol (Benhilda and Khursheed, 2007). Carrot *(Daucus carota*) is one of the popular root vegetables grown throughout the world and is the

most important source of dietary carotenoids. In recent years, the consumption of carrot and its products have increased steadily due to their recognition as an important source of natural antioxidants besides, anticancer activity of β-carotene being a precursor of vitamin A (Krishan *et al.*, 2012). The flavonoids and phenolic derivates, present in carrot roots play an important role as antioxidants. They also exert anti-carcinogenic activities, reduce inflammatory insult, and modulate immune response (Zhang and Hamauzu, 2004).

In the present work, development of fruit blended yogurt by optimizing the different levels of avocado pulp and carrot juice, effects on the sensory quality of dahi of avocado pulp- carrot juice blended probiotic dahi and its impact on the storage stability of blended probiotic dahi were done.

Materials and Methods

Pasteurized and homogenized toned milk obtained from Nandini milk parlour Ganganagar, Bengaluru, was used for the preparation of avocado pulp-carrot juice blended probiotic dahi**.** Dahi cultures such as *Lactococcus lactis* ssp *lactis, Lactococcos lactis* bv. *diacetylactis, L. plantarum* and lactose fermenting yeasts in the form of freeze-dried direct Vat set (FD-DVS), Probiotic cultures such as *Bifidobacterium bifidum* in the form of freeze-dried direct Vat set (FD-DVS) was obtained from Chr. Hansen Laboratories, Copenhagen, Denmark.

Processed Avocado pulp was procured from "Saldanha's fresh avocado"- Mumbai. Fresh carrot was procured from the local market and juice extracted is used in the preparation of avocado pulp-carrot juice blended probiotic dahi. Stainless steel vessels of varying capacities and Stainless-steel stirrers were used at various stages of the investigation.

Glassware's such as, conical flasks, beakers, volumetric flasks and measuring jars of Borosil were used for preparation of avocado pulp-carrot juice blended probiotic dahi.

The chemicals and reagents used were mainly of highest purity, commercially available analytical grades. All the aqueous reagents used were freshly prepared. The procedure followed by Lee and Lucey (2010) (Figure 1) for preparation of control dahi was adopted with suitable modifications (Figure 2).

Avocado pulp-carrot juice blended dahi samples were given to a panel of five judges for sensory evaluation. Each judge was supplied with standard score card of a total of 9 Point Hedonic Scale (Annexure-1) for colour and appearance, body and texture, flavor and overall acceptability. The scores given by panel of judges were then statistically analyzed. The samples were code numbered to avoid identification and bias. The data was analyzed using R software {R Programme, R-Version 3.1.3(2015-3-09), Copyright © 2015} both one way and two way Completely Randomed Design (CRD) which is the most appropriate for the study. Data on the response variables were collected for three replications for each of these treatments.

Results and Discussion

The results pertaining to the process optimization for the development of avocado pulp-carrot juice blended probiotic dahi presented here. The different levels of avocado pulp on sensory quality of dahi were optimized by sensory evaluation. The sensory scores pertaining to colour and appearance, body and texture, flavour and overall acceptability of product as adjudged by a five panel of judges during sensory evaluation of control and experimental dahi by incorporation of various levels of avocado pulp presented in Table 1 and Figure 1. The mean scores for colour and appearance of control sample was 8.42 as against 8.40, 8.28 and 8.00 for dahi incorporated with 8.0, 10.0 and 12.0 per cent levels of avocado pulp respectively. There was decrease in the sensory scores with increase in avocado pulp from 8.0 to 12.0 per cent levels. 8.0 per cent level avocado pulp added dahi has highest score with respect to control, when compared to 10 and 12 per cent levels. Statistical analysis revealed that a different level of avocado pulp has significant effect

on colour and appearance of dahi. The result of this experiment supports the findings of Gunawardhana and Dilrukshi (2016) who reported that 8 per cent of avocado addition in drinking/stirred yoghurt has resulted with good quality attributes for consumers.

The results are in conformity with the findings of Kabir *et al.,* (2014), who reported that the dahi samples containing mango fruit (10 per cent) ranked significantly higher flavour score (8.70).

Among the various levels of carrot juice used in dahi at 10.0, 15.0 and 20.0 per cent based on the volume of product (Table 2), 15 per cent level secured highest sensory scores for all the sensory attributes viz., colour and appearance, flavour, body and texture and over all acceptability compare to 10.0 and 20.0 per cents.

There was significant difference in colour and appearance and flavour at 15.0 per cent of carrot juice incorporation in dahi with control. Considering all the quality parameters, the highest score was given to dahi incorporated with 15.0 per cent carrot juice. The result of this experiment supports the findings of Sarker *et al.,* (2017), who reported that dahi samples prepared by using 15 per cent carrot juice has scored highest sensory scores.

Among the various level of combination of avocado pulp and carrot juice used in dahi at 5.0, 10.0 and 15.0 per cent based on the volume of product (Table 3). 10 per cent level secured highest sensory scores for all the sensory attributes viz., colour and appearance, flavour, body and texture and over all acceptability compare to 5.0 and 15.0 per cents.

There was non-significant difference in colour and appearance, body and texture, flavour and over acceptability at 10.0 per cent level of combination of avocado pulp and carrot juice dahi with control. Considering all the quality parameters, the highest score was given to dahi with 10.0 per cent level of combination of avocado pulp and carrot juice. These results are in conformity with the findings of Afreen *et al.,* (2016), who reported that RTS beverage with 50:50 carrot juice and sour orange juice was most effective beverages with high nutritional qualities. The results are in conformity with the findings of Parveez *et al.,* (2014), reported that combination of orange and chikku pulp when incorporated at 14.0 per cent was found to be optimum in shrikhand with respect to all the sensory attributes.

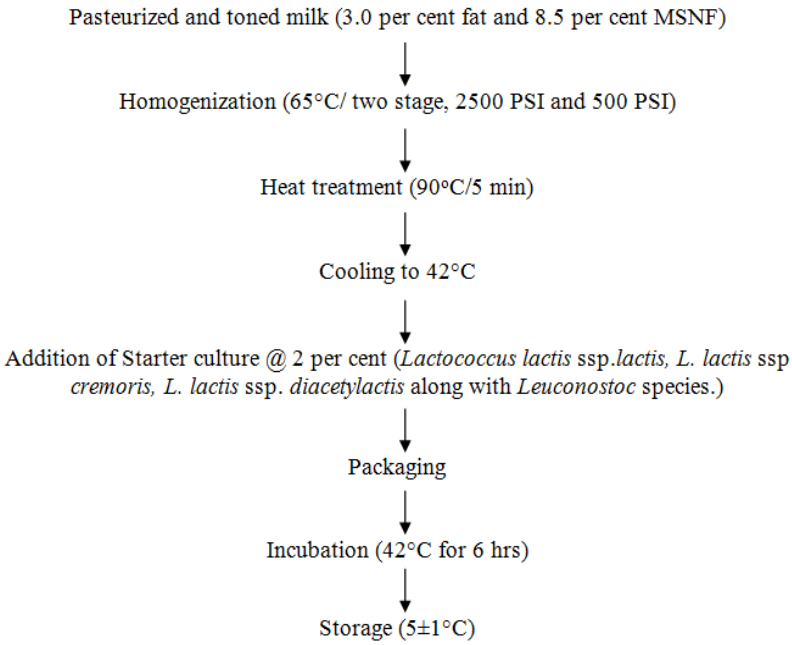
The probiotics were added to dahi at three different levels viz., 1.0, 2.0 and 3.0 per cent. The experimental samples were subjected to sensory analysis by a panel of judges using 9-point hedonic scale. The sensory scores regarding the effect of incorporation of probiotics for colour and appearance, body and texture, flavour and overall acceptability are presented in Table 4.

Addition of probiotics at the rate of 1.0 per cent was found to be optimum for the preparation of avocado pulp-carrot juice blended probiotic dahi in terms of all sensory attributes. Higher level of addition of probiotics other than 1 per cent have resulted in unacceptable body texture and flavour properties of dahi and also had high acidic flavour.

Similar findings were observed by the result of this experiment supports the findings of Reeta *et al.,* (2016), who reported that dahi fortified with pomegranate pulp (20 percent) and 1.0 per cent of probiotic culture (*Lactobacillus acidophilus*, *Lactobacillus casei* and *Lactobacillus plantarum*) added dahi has got highest sensory score compared to control. These results are in conformity with the findings of Salwa *et al.,* (2004), who reported that the yoghurt samples containing carrot juice (15 per cent) ranked higher sensory score.

It is evident from the investigation that developed avocado pulp-carrot juice blended probiotic dahi can be developed by incorporating with combination of avocado pulp- carrot juice, which enhances the nutritional and therapeutic properties of dahi. Production of avocado pulp-carrot juice blended probiotic dahi on commercial scale has an economic advantage and to meet the requirements of vulnerable group of population.

Flowchart.1 The flow diagram for the preparation of control dahi



Flowchart.2 The flow diagram for the preparation of avocado pulp-carrot juice blendedprobiotic dahi

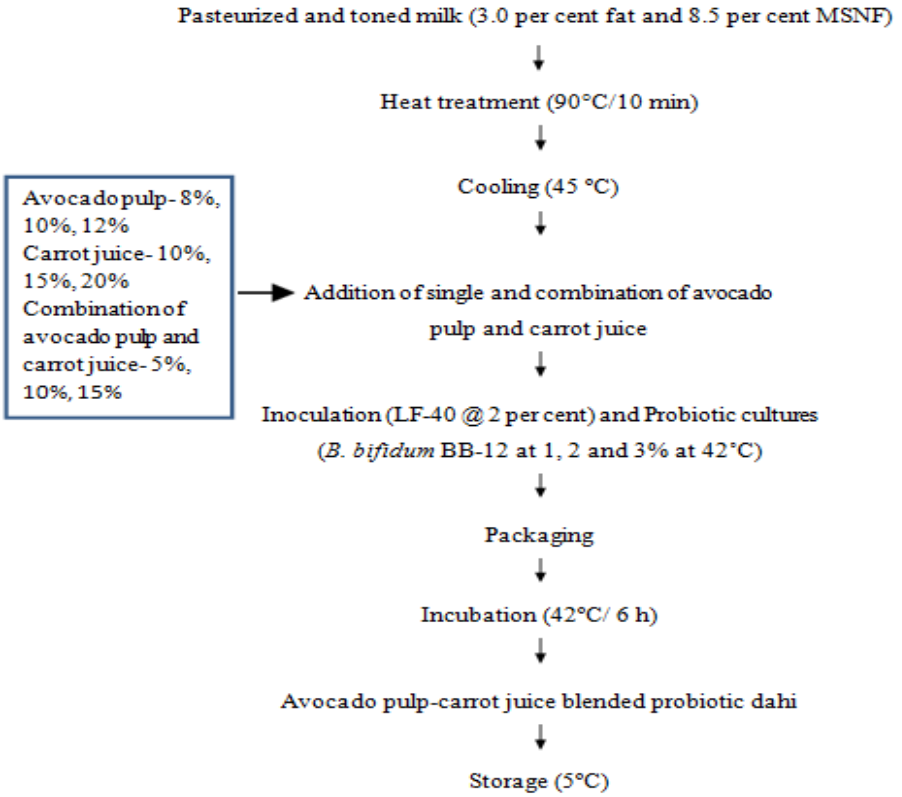


Table.1 The effect of different levels of avocado pulp on sensory quality of dahi

Levels of avocadopulp (%)	Colour and Appearance	Body and Texture	Flavour	Overall acceptability
Control	8.42[a]	8.40[a]	8.50[a]	8.46[a]
8	8.40[a]	8.41[a]	8.40[a]	8.42[a]
10	8.28[a]	8.32[a]	8.33[a]	8.32[a]
12	8.00[b]	8.16[b]	8.00[b]	8.08[b]
CD (P≤0.05)	0.26	0.10	0.27	0.20

Note
All values are average of three trials.
Similar superscripts indicate non-significance at the corresponding critical difference.Control– Plain Dahi

Table.2 The Effect of different levels of carrot juice on sensory quality of dahi

Levels of carrotjuice (%)	Colour and Appearance	Body andTexture	Flavour	Overall acceptability
Control	8.42[a]	8.40[a]	8.50[a]	8.46[a]
10	8.43[a]	8.43[a]	8.53[a]	8.48[a]
15	8.45[a]	8.45[a]	8.55[b]	8.50[a]
20	8.40[b]	8.42[a]	8.38[b]	8.35[b]
CD (P≤0.05)	0.10	NS	0.10	0.10

Note
All values are average of three trials.
Similar superscripts indicate non-significance at the corresponding critical difference.Control– Plain Dahi

Table.3 The effect of different levels of combination of avocado pulp and carrot juiceon sensory quality of dahi

Levels of combination of avocado pulp and carrotjuice (%)	Colour and Appearance	Body and Texture	Flavour	Overall acceptability
Control	8.42[a]	8.40[a]	8.50[a]	8.46[a]
5	8.40[a]	8.38[a]	8.50[a]	8.40[a]
10	8.45[a]	8.40[a]	8.54[a]	8.47[a]
15	8.30[a]	8.33[a]	8.39[b]	8.34[a]
CD (P≤0.05)	NS	NS	0.10	NS

Note
All values are average of three trials.
Similar superscripts indicate non-significance at the corresponding critical difference.Control– Plain Dahi

Table.4 The effect of different levels of probiotic on sensory quality of dahi

Levels of probiotics (%)	Colour and Appearance	Body and Texture	Flavour	Overall acceptability
Control	8.42[a]	8.40[a]	8.50[a]	8.46[a]
1	8.45[a]	8.43[a]	8.53[a]	8.48[a]
2	8.40[a]	8.38[a]	8.45[a]	8.43[a]
3	8.38[a]	8.35[a]	8.38[b]	8.35[b]
CD (P≤0.05)	NS	NS	0.10	0.10

Note
All values are average of three trials.
Similar superscripts indicate non-significance at the corresponding critical difference.Control– Plain Dahi

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