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Optimization of Carotene Enriched Functional Yoghurt

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ABSTRACT

Food enrichment is thought to be a highly effective solution and among the most cost effective public health interventions currently available. Yoghurt is a favorite dairy product for billions of people around the world and the producers constantly seek out ways of bringing new varieties for new eating occasions to be enjoyed anywhere and anytime. An attempt was made to incorporate the carotene in yoghurt. Milk was supplemented with carrot juice at 10, 15 and 20 per cent levels. The enriched yoghurt samples were subjected to sensory evaluation for its acceptance, using the 9-point hedonic scale. There was no significant difference observed in acidity and overall acceptability. It was concluded that the yoghurt fortified with natural beta carotene@15% in one litre of milk revealed better sensory acceptability during storage up to 14 days at 5^0C.The daily requirement of vitamin A is 5000 IU. Hence, by consuming 100 ml of yoghurt enriched with carotene at 15 per cent level, about 10 per cent of the vitamin A daily requirement can be fulfilled.

Key Words: Carotene, Enrichment, Sensory evaluation Yoghurt

INTRODUCTION

Vitamin A is essential for sight and cell differentiation. Deficiency of vitamin A results in night blindness and ultimately blindness, growth retardation, damage of mucous membrane, and reproductive disorders.Carotene supplementation of milk is very simple and easy to incorporate. The supplementation like iodine in salt, vitamin A in milk is being done in routine practice (Petrogianni *et al* 2014). Carotenoids perform a variety of biologicalfunctions which include functioning as vitamin A precursors (Matsuno, 1991), scavenger and quencheragainst free radicals and active singlet oxygen (Miki, 1991), anti-cancer agents (Krinsky, 1989) and immune system enhancers.

Food enrichment is thought to be a highly effective solution and among the most cost effective public health interventions currently available. Yoghurt is a favorite dairy product for billions of people around the world and the producers constantly seek out ways of bringing new varieties for new eating occasions to be enjoyed anywhere and anytime. In order to redress the abovementioned issue, yoghurt is a logical vehicle for enrichment of carotene. Hence, an attempt had been made toincorporate carotene in yoghurt and make it as a functional food and there by address the vitamin Adeficiency in the society.

MATERIALS AND METHODS

Milk was procured from Livestock Farm Complex, Veterinary College and Research Institute, Orathanadu. Skim milk powder testing 5% moisture and 95% solubility was purchased from Tamil Nadu Co-operative Milk Producers' Federation (Aavin) and used to standardize the milk solids not fat content of yoghurt.Good quality carrot (*Daucuscarota*)purchased from local market was used to obtain juice as a source of carotene in the preparation ofyoghurt.Carrot roots (vegetables) were washed thoroughly; the juice was obtained by blending in blender with sieves.Milk was

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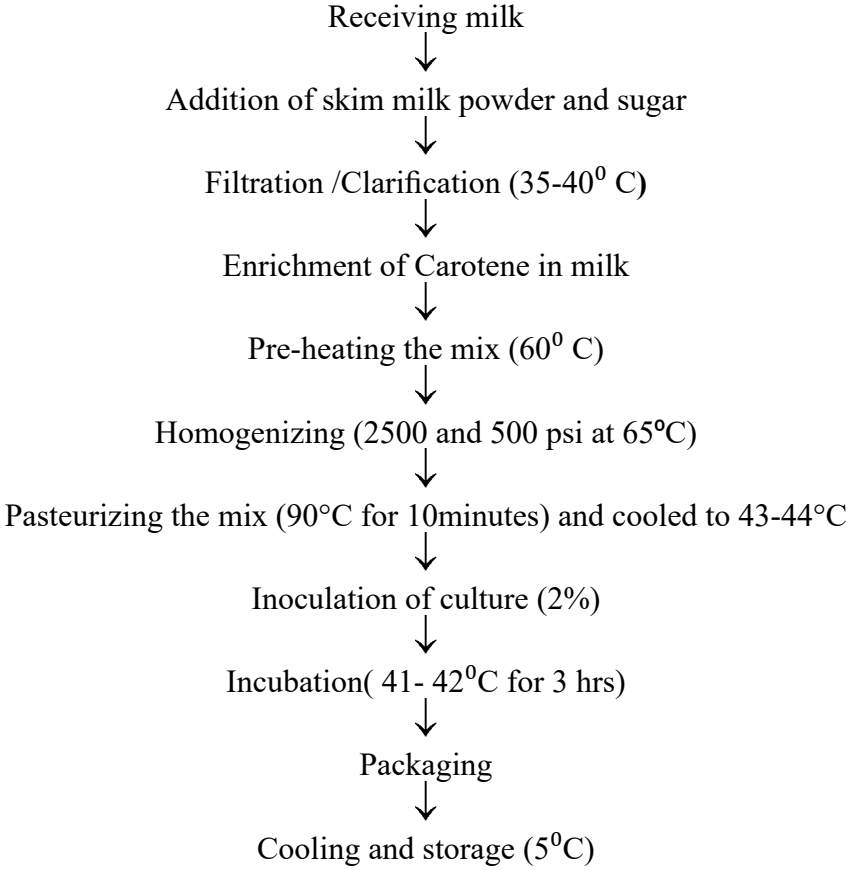
Flow chart for the preparation of Carotene enrichedyoghurt



supplemented with carrot juice at 10, 15 and 20 per cent levels. The milkwas heated to 65°C and homogenized at 2500 and 500 PSI in a two stage homogenizer. Commercially available good quality cane sugar was used in the preparation of yoghurt. Freeze dried DVS culture containing yoghurt bacteria *Lactobacillus delbrueckii ssp.bulgaricus* and *Streptococcus salivarius ssp. thermophilus* (YC-X11) obtained from Chr. Hansen, Denmark was used.The guidelines prescribed by IS: 12898(1989) and the flow chart indicated by De (1980) were followed in the preparation of yoghurt.

The carotene enrichedyoghurt samples were evaluated by a semi trained panel of seven judges for the attributes of flavour, body and texture, colour and package, acidity and overall acceptability scores on a 9-point hedonic scale (Tomic *et al,* 2017).All the statistical analyses were performed by using SPSS. The results were expressed as the mean± S.E., and in all applications (ANOVA) the differences were considered statistically significant at $P<0.05$ and highly significant at $P<0.01$.

RESULTS AND DISCUSSION

The developed carotene enriched yoghurt was assessed by sensory evaluation using the 9-point hedonic scale by a semi-trained panel of sevenmembers, and the scores were presented in Table-1-Optimizing the enrichment levels of Carotene in yoghurt by sensory evaluation using 9-point hedonic scale

Statistical analysis revealed that there was significant difference ($p<0.05$) in flavour, body and texture and overall acceptability scores between control and treatments. There was no significant difference observed in acidity and overall acceptability. The fortified yoghurt samples with carotene up to 15% per litre of milk had better

Attribute	Control	T1	T2	T3
Flavour	8.67 ± 0.07^{c}	8.33 ± 0.09^{b}	8.14 ± 0.09^{b}	7.45 ± 0.10^{a}
Body & texture	8.52 ± 0.08^{c}	8.29 ± 0.10^{bc}	8.19 ± 0.09^{b}	7.28 ± 0.11^{a}
Colour and Package	8.07 ± 0.10	8.07 ± 0.09	8.07 ± 0.11	8.00 ± 0.10
Acidity	8.43 ± 0.10	8.31 ± 0.09	8.31 ± 0.11	8.21 ± 0.12
Overall acceptability	8.69 ± 0.07^{c}	8.38 ± 0.10^{b}	8.19 ± 0.09^{b}	7.48 ± 0.09^{a}

Mean ± SE with different superscripts in a row differ significantly (P<0.05).

C- Control (unfortified) T1 - Treatment with 10% carrot juice /L T2 - Treatment with 15% carrot juice /L T3 - Treatment with 20% carrot juice /L n = 42 for each treatment

Sensory scores based on 9-point hedonic scale, where 1: dislike extremely and 9: like extremely.

ANOVA for optimizing the enrichment levels of Carotene in yoghurt by sensory evaluation

Attribute	Source of variation				
	Treatment			Error	
	d.f.	MSS	F value	d.f.	MSS
Flavour	3	11.022	33.341**	164	0.331
Body & texture	3	12.349	30.642**	164	0.403
Colour and Package	3	0.054	0.125	164	0.429
Acidity	3	0.329	0.724	164	0.447
Overall acceptability	3	11.149	35.275**	164	0.316

** Highly significant (P<0.01)

acceptability than 20% per litre. Hence the yoghurt fortified with carotene at the concentration of 15% per litre of milk (T2) was selected for further studies.

CONCLUSION

Adequate carotene intake has been demonstrated to reduce the risk of night blindness and ultimately blindness, growth retardation, damage of mucous membrane, and reproductive disorders. Several advanced nations have launched nationwide enrichment programs to improve children's vitamin A status. Hence an attempt has been made to enhance carotene content in yoghurt at 15 per cent in one litre of milk which evinced better overall sensory acceptability of the finished product. Therefore it might be concluded that carotene enriched yoghurt could be a mass intervention to address vitamin A deficiency.

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