



Studies on sensory evaluation of Curcumin powder as natural color for butterscotch flavor ice cream

A. Manoharan¹, D. Ramasamy², B. Dhanalashmi³ K.S.Gnanalashmi⁴ and D.Thyagarajan⁵

^{1,2 & 5} Institute of Food and Dairy Technology, Koduvalli, Alamathi (post), Chennai – 52, India.

^{3 & 4} Department of Dairy Science, Madras Veterinary College, Chennai -7

*premmo_vet@yahoo.co.in; ayyavoo.manoharan@gmail.com

Abstract

The demand for natural food colorants are because of public awareness of regarding their health issues. Turmeric is a bright yellow colorant made from the roots of the herb *Curcuma longa*. The pigments are responsible for the colour: curcuminoids: curcumin and related compounds. Solubility of turmeric compound depends on the processing medium. Turmeric oleoresin is water soluble; but oil extract could be added to fat based foods. It is used as coloring dairy product, meat and frozen desserts. An investigation is carried out to find the acceptable level of curcumin as natural coloring agent for ice cream and assess the sensory score of the resultant product. Curcumin powder is incorporated at different level in butterscotch flavor ice cream. Prepared ice cream was subjected to sensory analysis and found out the optimum level of inclusion of curcumin powder in the ice cream preparation.

Key words: Ice cream, Natural colors, Curcumin, Butterscotch flavor, Food color

Introduction

Ice cream is one of the oldest fat rich delicious dairy products relished by all age groups of people throughout the world. In 2007, the global market of ice creams was pegged at \$61.6 billion in terms of retail value or 15 billion liters in terms of volume. Of this, the Asia-Pacific ice cream market was worth \$13 billion in terms of retail value and 5,128 million liters in terms of volume. Coming to India, the Indian ice cream industry, currently estimated to be worth Rs. 2,000 crores, growing at a rate of approximately 12%. Color becomes the most sensitive part of any commodity not only for its appeal, but also it enhances consumer acceptability. In addition, the color of a food substance is important to indicate its freshness and safety that are indices of good aesthetic and sensorial values. The color of food enhances its appeal to the consumer.

The use of natural colors in food preparation is an ancient practice. Recently, consumers have been varying of synthetic colors due to their hazardous nature. For example, several countries have already prohibited the use of a number of synthetic food colorants. Most natural colors have health attributes in addition to their pleasing appearances. Therefore, natural colors are gaining significance not only for their, relishing appearances, in addition, to enhance the health benefits of the products that it contains.

There is a great demand for food and supplements containing an efficacious dose of these natural colors. It therefore, necessitates looking into natural sources of food grade colorants and their use potentials. Turmeric is a bright yellow colorant made from the roots of the herb *Curcuma longa*. The pigment responsible for the color is known as curcuminoids: curcumin and related

Table 1. Sensory analysis score (Mean± SE)* for ice cream with curcumin as natural color

Parameters	Control	Curcumin		
		0.3%	0.5%	0.7%
Flavor	38.70±0.146 ^c	38.52±0.242 ^b	39.38±0.172 ^c	37.58±0.212 ^a
Color	4.92±0.032 ^c	4.23±0.052 ^a	4.97±0.019 ^c	4.41±0.056 ^b
Body& Texture	28.18±0.123 ^b	27.29±0.194 ^a	28.18±0.155 ^b	27.31±0.207 ^a
Melting quality	4.80±0.046 ^c	4.37±0.062 ^a	4.18±0.046 ^c	4.61±0.063 ^b
Microbial	15.00±0.000 ^a	15.00±0.000 ^a	15.00±0.000 ^a	15.00±0.000 ^a
Overall score	92.22±0.203 ^b	89.41±0.327 ^a	92.34±0.240 ^b	88.91±0.314 ^a

Means bearing different superscript in a row differ significantly (P< 0.01)
* Average of 8 trails

compounds. Solubility of turmeric compound depends on the processing medium. Turmeric oleoresin is water soluble; but oil extract could be added to fat based foods. At high pH, the extract turns orange. There is no usage restriction as long as the level conforms to Good Manufacturing Practices (GMP). (Pritam *et al.*,2008).Turmeric oleoresin-used in brine pickles was reported by Eiserle (1966), also in mayonnaise for relishing formulations, and in non-alcoholic beverages such as : orangeades, lemonades, gelatins, breading of frozen fish sticks, potato croquettes, butter and cheese in the form of powder or granules for garnishing, and even in ice creams, mainly as a coloring material (Perotti,1975).

Materials and methods

The present study was conducted at the modern dairy plant, Institute of Food and Dairy Technology, Koduvalli, Alamathi (post), Chennai. The raw materials used for the preparation of ice cream are as follows: Buffalo milk (5.0 % fat and 9.5 % MSNF) purchased from the nearby village; Butter (80 per cent fat) purchased from the Tamil Nadu Co-operative Milk Producers Federation Ltd., Aavin and was used to standardize the fat content of the ice cream. Skimmed milk powder (95 % MSNF) obtained from Tamil Nadu Co-operative Milk Producers Federation Ltd. Aavin was used to standardize the milk solids not fat (MSNF) content of ice cream. High quality stabilizers (gelatin) and emulsifiers (Glycein-mono-strate) were used for this research. Curcumin powder purchased from the M/s Cifal Herbal Pvt. Ltd. Gogineripuram, Gudur, 524 103 was used for

coloring the butterscotch flavor ice cream. High quality cane sugar (sucrose) was used.

Ice cream mix was prepared to contain a final composition of, 10 % fat, 36 % total solids, 15 % sugar, 0.5 % stabilizer and emulsifier, as per ISI (IS: 2802, 1964) specification (Sukumar De, 1980). Natural color like curcumin was added for butterscotch flavor (0.3, 0.5, and 0.7 %) just before freezing. Ice creams with the different levels of curcumin powder was subjected to sensory evaluation and compared with the control sample to assess its acceptable level.

In each treatment, mix ingredients were homogenized as described by Arbuckle, (1977) and then heated to 80°C for 30 sec as suggested by Rothwell (1976). Mixes were cooled to 5°C and aged over night at the same temperature. The freezing was done in a batch freezer. The sensory characteristics of the ice cream samples were assessed using the ADSA IC scorecard. The sensory panel belongs to staffs and students of Institute of Food and Dairy Technology, Koduvalli, Chennai.

ADSA IC Score Card	
Items	Perfect score
Flavor	45
Body and Texture	30
Color	5
Melting quality	5
Bacterial count	15
Total score	100

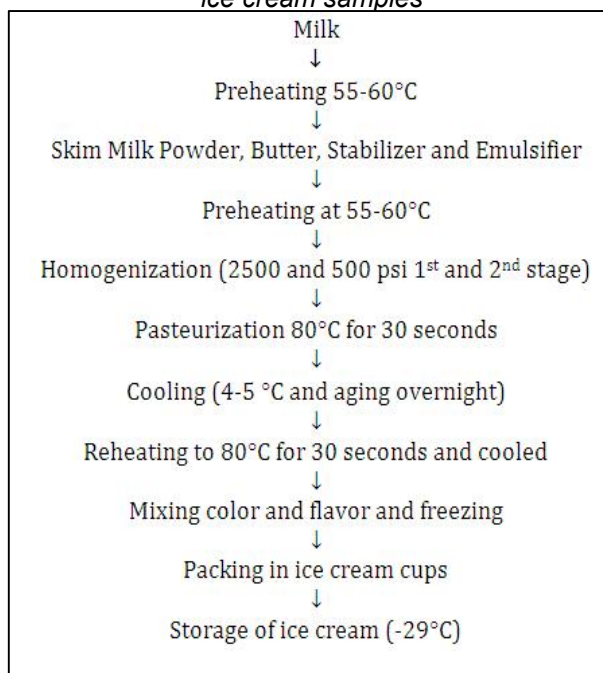
The data collected were analyzed by analysis of variance (One-way ANOVA) as described by Snedecor and Cochran (1989). Duncan's multiple range tests were used as post hoc technique to study the significant difference among the means.

Result and Discussion

Table 1 shows the average sensory analysis scorecard for the curcumin powder as natural color for the butterscotch flavor ice cream. Preliminary screening tests were conducted by visual perception revealed that 0.5 % curcumin was the optimum level of incorporation in butterscotch flavored ice creams. Hence, it is immediate lower and higher level of incorporation i.e., 0.3 % and 0.7 % along with 0.5 % were taken up for sensory evaluation.

Table 1 shows the average sensory analysis scores for the curcumin powder as natural color for the butterscotch flavored ice cream. The overall average score for the control samples was 92.22 and the inclusion of curcumin powder at 0.3, 0.5 and 0.7 % obtained the scores of 89.41, 92.34 and 88.91, respectively. The inclusion of curcumin powder at both 0.3 and 0.7 % levels in the butterscotch flavored ice cream significantly diminished the sensory while; at the inclusion, level of 0.5 % curcumin enhanced the sensory scores of butterscotch flavored ice cream, though not significantly in comparison to that of control samples. Fig.1 predicts the process for the preparation of ice cream samples.

Fig.1 Process flow chart for the preparation of ice cream samples



Some phenolic compounds, in edible plants have received much attention as powerful antioxidants not only to protect against the oxidative deterioration of food, but also to reduce oxidation-induced diseases by their ingestion. A main mechanism for a phenolic antioxidant in food is the trapping and stabilizing of radical species, such as the lipid peroxy radical, which are generated from radical chain oxidation of food components. This property is also important in biological systems for scavenging harmful oxygen radicals. Curcumin is the main yellow phenolic material of turmeric and has been widely used as a food-coloring reagent (Govindarajan, 1980).

Turmeric is commonly found in Indian curries, giving the food a golden orange color. Turmeric, have also been used as a dye for mustards, canned chicken broth, and pickles. It has been coded as food additives "E100" in canned beverages, baked products, dairy, ice cream, yogurts, yellow cakes, biscuits, popcorn, sweets, cake icing, cereal, sauces, gelatins, in addition to direct compression tablets. In combination with annatto, turmeric is used to color cheese, dry mixes, salad dressing, butter and margarine (The Wikipedia Encyclopedia, 2011). In India, Rule 26 of The Prevention of Food Adulteration Rules (PFAR) permits the use of curcumin as food coloring agent (Pritam *et al.*, 2008).

Curcumin is a potent anti-oxidant, anti-carcinogenic and anti-inflammatory agent and is a more effective anti-clotting agent than aspirin, without the ulcer-inducing stomach irritation caused by aspirin (Tripathi *et al.*, 2004). Pritam *et al.* (2008) suggested that there is no usage restriction as long as the level conforms to Good Manufacturing Practices (GMP). Hence, using of the curcumin as a coloring material in the preparation of the butterscotch flavor ice cream will have the above said properties and good the health. It was concluded that 0.5 per cent curcumin was the optimum level of inclusion in butterscotch flavor ice cream.

Conclusion

The results of the present study revealed that the inclusion of curcumin powder for butterscotch flavored ice cream significantly altered the organoleptic scores. Among the different inclusion levels of curcumin powder, 0.5 per cent had the maximum scores. Hence, it was recommended that the curcumin powder could be added for butterscotch flavor at the maximum of 0.5 per cent in the preparation of natural color ice cream without much affecting its acceptability.

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