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Comparative study on physico-chemical attributes of ice-cream prepared by using Hebal menthol and crystal menthol

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Abstract

Research was conducted to examine the effect of herbal menthol leaves extract and crystal menthol extract on the physico-chemical characteristics of ice-cream desserts. The objective of the present research was to develop improved herbal based ice-cream with health benefits beyond those of traditionally formulated dairy products. The product was formulated with different levels of herbal menthol leaves extract at the rate 0.5, 1 and 1.5 per cent and crystal menthol extract at 0.2, 0.4 and 0.6 per cent.

The product obtained was subjected for physico-chemical analysis result to be recorded. The on an average the acidity observed 0.27, 0.30, 0.32, 0.34, 0.33, 0.34 and 0.35, pH content of herbal and crystal menthol ice-cream was found to be 6.19, 6.20, 6.23, 6.25 and 6.21, 6.23 and 6.27, fat 10.22, 9.77, 9.53, 9.31, 9.81, 9.71 and 9.67 per cent, protein 5.15, 5.21, 5.28, 5.31, 5.12, 5.10 and 5.08 per cent, total solids 36.72, 36.67, 36.62, 36.61, 36.51, 36.35 and 36.12 per cent, moisture 63.27, 63.32, 63.37, 63.38, 63.48, 63.65 and 63.87 per cent, overrun 31.65, 30.63, 29.78, 28.08, 30.23, 29.45 and 27.45 per cent, and mix viscosity 25.82, 25.48, 25.28, 25.09, 26.21, 26.28 and 26.32 cPs for treatment T₁, TH₂, TH₃, TH₄, TC₂, TC₃ and TC₄, respectively. It was also observed that as the using of herbal and crystal menthol extract increased, there was increased in acidity, pH, and protein content and decreased in moisture, fat, overrun and mix viscosity content of herbal and crystal menthol ice-cream. There was also observed that as the using of herbal and crystal menthol extract increased, there was increased in acidity, pH, and protein content and decreased in moisture, fat, overrun and mix viscosity content of herbal and crystal menthol ice-cream.

Keywords: Ice-cream, Herbal menthol, Crystal menthol and physico-chemical properties

Introduction

Ice-cream is a highly palatable, nutritious and commercially important dairy product. It is a valuable accompaniment to the normal diet for all age groups especially for children. The production of ice-cream and its popularity is increasing rapidly. The dairy industry also more interested in ice-cream business due to its popularity, more profit margin and long shelf life as compare to other milk products as well as good stability in storage and transportation. It is manufactured with homogenized and pasteurized mix followed by ageing the mix at low temperature and finally freezing the aged mix with the incorporation of air at proper conditions (Guner *et al.* 2007) [10].

Many innovations are developed in ice-cream and till research on it is being throughout the world. The major emphasis behind that is to develop nutritionality as well as functionality of the products. Bajwa *et al.* (2003) [5] investigated the effect of different concentrations (10 to 25 per cent) of strawberry pulp on the physico-chemical properties of ice-cream. Choo *et al.* (2009) [6] prepared three formulations by using virgin coconut oil (VCO) viz., VCO4, VCO8 and VCO12 was substituted with 4%, 8% and 12% of VCO, respectively. Temiz and Yesilsu (2010) [23] examine the effects of grapes and mulberry pekmez concentrate on the physical, chemical and sensory properties of ice-cream samples. Agrawal *et al.* (2015) [2] observed that the effect of variation of ginger juice on some physical and sensory properties of cream by using ginger juice as a flavouring agent in ice-cream at different levels.

As menthol have GRASS states for its application in dairy foods (200/800 Average usual ppm/Average maximum ppm) and possible average daily intake (PADI) is 13,400 µg/day, its application in food items are very rear, but *puddina* leaves usually use at domestic level in kitchen. The maximum application of *Mentha arvensis* (*puddina*) were found in medicinal field to treat stomach disorders and chest pains for example dabar market *Pudinhara* for stomach disorder such as indigestion, gas, acidity etc (Tandan *et al.* 1991) [22]; as an ingredient of cough drops and ointments like vicks vaporub etc (Anonymous 2013) [4]; widely used in

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medication for the relief of common cold symptoms such as nasal congestion and cough (Eccles 1994) [8]; *Mentha spp.* oil effect on digestive system and it helps to promote the production of digestive juices, so we can use on a regular basis to help our body. It is important to explore the possibility of improving the nutro-functional attributes of ice-cream using menthol.

Material and Methods

Treatment Combinations

For comparison between two type of ice-cream prepared by using herbal menthol and crystal menthol with buffalo milk, the following treatment combinations were finalized on weight basis as follows:

Treatment	Per cent menthol extract	Ice cream mix
T ₁ (Control)	0	100
TH ₂	0.5	99.5
TH ₃	1.0	99
TH ₄	1.5	98.5
TC ₂	0.2	99.8
TC ₃	0.4	99.6
TC ₄	0.6	99.4

Preparation of *Mentha arvensis* Extract

Fresh leaves of *Mentha arvensis* were collected, sorted without bruising and washed under tap water. These leaves were ground in a mixer grinder by adding of distilled water at proportion (1: 0.5) volume basis. The obtained mentha extract was filtered by muslin cloth and collected in a glass bottle. The menthe extract (Fig.1) was prepared as reported by Satpute, 2016 [16] with slight modification.

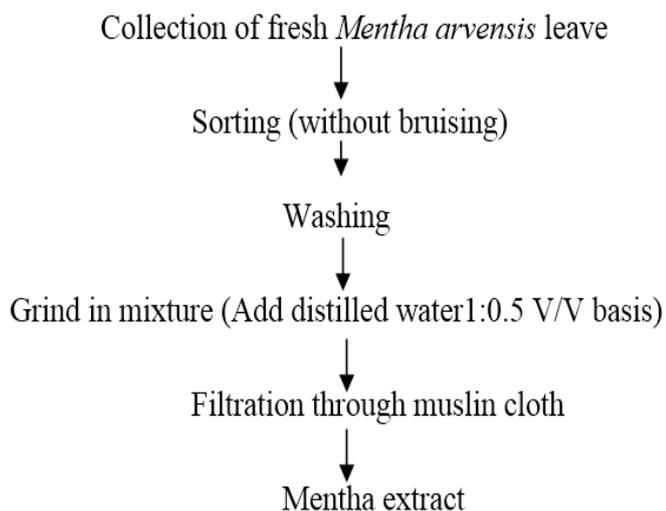


Fig 1: Flow diagram for preparation of menthe (*pudina*) extract

Preparation of Ice-cream

For preparation of ice-cream, all ingredients were weighted separately in the appropriate proportion (as suggested De, 2004) [7] shown in figure 2.

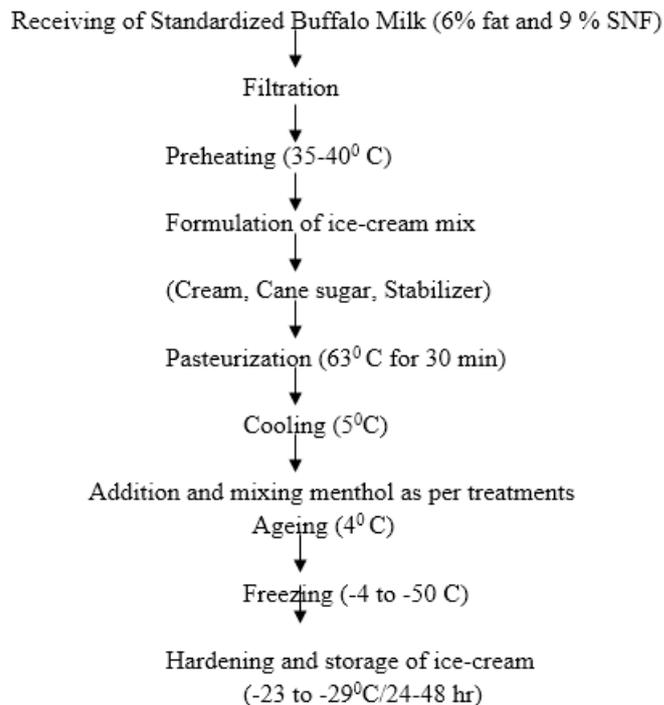


Fig 2: Flow chart for preparation of ice-cream (De, 2004) [7]

Evaluation of physico-chemical properties of herbal and crystal menthol ice-cream

Herbal and crystal menthol ice-cream samples of different treatments were subjected for physico-chemical analysis *viz.* The pH of ice-cream was measured by using digital pH meter at a temperature of 25°C. The acid content of ice-cream was determined the procedure described in IS: 1479 (1967) Part- I. The Fat content of ice-cream was determined by Gerber's method as in IS: 1224 (part II) 1977. The Moisture and total solid content of ice-cream was determined by standard procedure as described IS: SP (Part XI) 1981. The protein content of ice-cream was determined by method described in A.O.A.C. (1965) [1]. The overrun refers to the increased in volume of ice-cream over the volume of ice-cream mix. Measurements of the mix viscosity was taken after overnight aging at 4 °c on spindle No 4 at 30 rpm by using Brooke Field Visco-meter. (LVDV-E visco-meter).

Statistical analysis

In all four replications were carried out. The data obtained were analyzed statistically by using completely randomized design (CRBD) and software developed by Sheoran *et al.*, 1998 [20] as Statistical Software Package for Agricultural Research Workers.

Result and Discussion

Physico-chemical analysis of herbal and crystal menthol ice-cream

The requisite samples of developed herbal and crystal menthol ice-cream were subjected for the proximate analysis *viz.* acidity, pH, fat, protein, total solids, moisture, over run and mix viscosity. The results obtained on account of this parameter are presented in following table.

Table 1: Physico-chemical analysis of ice-cream prepared by using herbal and crystal menthol score recorded mention blow table.

Sr. No.	Parameters	Treatments							S.E. ±	C.D. at 5%
		T ₁ Control	TH ₂	TH ₃	TH ₄	TC ₂	TC ₃	TC ₄		
1)	Acidity	0.27 ^a	0.30 ^b	0.32 ^c	0.34 ^d	0.33 ^{cd}	0.34 ^d	0.35 ^{ed}	0.005	0.016
2)	pH	6.19 ^a	6.20 ^{ac}	6.23 ^b	6.24 ^b	6.21 ^c	6.24 ^b	6.27 ^d	0.006	0.018
3)	Fat	10.22 ^a	9.77 ^b	9.53 ^c	9.31 ^d	9.81 ^b	9.71 ^e	9.67 ^f	0.017	0.05
4)	Protein	5.15 ^a	5.21 ^b	5.28 ^c	5.31 ^d	5.12 ^e	5.10 ^{ef}	5.08 ^f	0.007	0.02
5)	Total solids	36.61 ^a	36.62 ^a	36.67 ^a	36.72 ^b	36.51 ^c	36.35 ^d	36.12 ^e	0.034	0.072
6)	Moisture	63.27 ^a	63.32 ^{ab}	63.37 ^b	63.38 ^{bc}	63.48 ^d	63.65 ^e	63.87 ^f	0.034	0.071
7)	Overrun	31.65 ^a	30.63 ^b	29.78 ^c	28.08 ^d	30.23 ^{bc}	29.45 ^{bc}	27.45 ^d	0.267	0.791
8)	Mix viscosity	25.82 ^a	25.48 ^b	25.28 ^c	25.09 ^d	26.21 ^e	26.28 ^f	26.32 ^g	0.037	0.013

The observations are the average of four replications

Acidity and pH

The acidity content of control, herbal menthol and crystal menthol ice-cream for treatments T₁, TH₂, TH₃, TH₄, TC₂, TC₃, and TC₄ were 0.27, 0.30, 0.32, 0.34, 0.33, 0.34 and 0.35, respectively. In both cases of ice-cream the acidity was found increasing order from 0.27 to 0.35, crystal form was more prone than herbal form. Ice-cream with herbal menthol with 1.5 per cent (acidity 0.34) and crystal menthol with 0.6 per cent (0.35) had highest acidity. It was observed the acidity of control sample (T₁) was lower as compared to other samples it may be due to more ascorbic acid in mint leaves content (20.40 mg/100gm) as compared to pure ice-cream mix responsible for increased acidity supported by Tucker 2012 reported that as the herbal menthol extract increased ascorbic acid increased and acidity also increased. The similar finding was reported by Temiz and Yesilsu (2010) [23], Goraya (2013) [9].

The pH of control, herbal menthol ice-cream for treatment T₁, TH₂, TH₃ and TH₄ were 6.19, 6.20, 6.23 and 6.25 and crystal menthol ice-cream treatment score for TC₂, TC₃ and TC₄ were 6.21, 6.23 and 6.27, respectively. Treatment TC₄ of crystal menthol ice-cream showed highest pH content while T₁ (control) sample ice-cream showed lowest pH. It was observed the increased the pH was found increased as the menthol proportion increased, the pH should be decreased due to the increased acidity but actually pH also found in increasing order which might be due to the presence of phenolic substance in mint leaves increased the pH and acidity of ice-cream with increased the level of herbal and crystal menthol. This finding observed similarly reported by Choo *et al.* (2009) [6] and Silva *et al.* (2010) [21].

Fat and Protein

The fat content of control and herbal menthol extracted ice-cream for treatment T₁, TH₂, TH₃ and TH₄ were 10.22, 9.77, 9.53 and 9.31. For crystal menthol ice-cream treatment score for TC₂, TC₃ and TC₄ were 9.81, 9.71 and 9.67, respectively. Near about all treatments significantly differ from each other except TH₂ and TC₂. It was also observed that maximum fat content was observed in T₁ while minimum fat content observed in TH₄ of herbal ice-cream, because of mint leaves contained less fat and more fibre hence their incorporation led to decrease in fat. Herbal menthol reduced the fat content more proportion than crystal one might be due to the pure crystalline nature of crystal menthol. The similar results reported by Silva *et al.* (2010) [21] and Bajwa *et al.* (2003) [5]. The mean values for protein content of control, herbal menthol ice-cream were found as 5.15, 5.21, 5.28 and 5.31 for treatment T₁, TH₂, TH₃ and TH₄, respectively whereas the corresponding values for crystal menthol ice-cream treatments were 5.12, 5.10 and 5.08 for TC₂, TC₃ and TC₄, respectively. All herbal treatment significantly differ with each other and control whereas crystal menthol treatments were found at par

each other and low protein content as compare to herbal and control, it may be due to the contribution of protein from herbal in herbal ice-cream. Treatment TC₄ of crystal menthol ice-cream showed lowest protein content while treatment TH₄ of herbal ice-cream showed highest protein. The mint leaves content protein the increased the level of herbal menthol extract in ice-cream also increased the protein level. Comparable findings were found by Goraya (2013) [9], Pandiyan *et al.* (2010) [16] and Silva *et al.* (2010) [21].

Total solid and moisture

The total solids content of control, herbal menthol and crystal menthol ice-cream for treatment T₁, TH₂, TH₃, TH₄, TC₂, TC₃ and TC₄ were 36.72, 36.67, 36.62, 36.61, 36.51, 36.35 and 36.12, respectively. Treatment TC₄ (36.12) of crystal menthol ice-cream showed lowest total solids content while TH₄ (36.72) of herbal ice-cream showed highest total solids. This was due to total solids content (16.22 per cent) in fresh mint leaves. Similar results were reported by Ahanian *et al.* (2014) [3] Choo *et al.* (2009) [6] and Bajwa *et al.* (2003) [5].

The average moisture content of control and herbal menthol ice-cream for treatments T₁, TH₂, TH₃ and TH₄ were 63.27, 63.32, 63.37 and 63.38 per cent, and for crystal menthol ice-cream treatments score for TC₂, TC₃ and TC₄ were 63.48, 63.65 and 63.87, respectively. Treatment T₁ was control for both herbal and crystal ice-cream showed intermediate moisture per cent as compared to trial treatments between herbal ice-cream and crystal ice-cream, which may be due to the micro capillary water retained in the interactive bond of crystal menthol components with milk components particularly proteins and low moisture in herbal treatments was due to the high moisture percent in herbal menthol as compare to ice-cream mix. The highest moisture content observed in TC₄, then subsequently observed reducing in TC₃ and TC₂ in crystal applied samples, whereas lowest moisture content observed in TH₄, then subsequently observed increasing order in TH₃ and TH₂ in herbal ice-cream which justified the above mention reason. In case of crystal applied ice-cream more stickiness was observed indicating some physico-chemical change might be occurred due to crystal menthol which looks to investigate and give scope for further study. Again one thing is observed from table that the successive treatments at par with each other and alternative treatments differ significantly indicating the effect of menthol on moisture contain in ice-cream was influenced by incorporating menthol more than 0.5 and 0.2 per cent for herbal and crystal form, respectively. Similar result were recorded by Bajwa *et al.* (2003) [5].

Overrun and Mix viscosity

Ice-cream is sold by volume, and its overrun is thus an important property from the regulatory, as well as the product quality, point of view. Air is an important volumetric

ingredient of ice cream. The air content is expressed as overrun, which is defined as the percentage increase in the volume of the ice cream mix achieved by whipping air into the mix prior to freezing. This investigation under observed that the overrun content of control, herbal and crystal menthol ice-cream for treatment T₁, TH₂, TH₃, TH₄, TC₂, TC₃ and TC₄ were 31.65, 30.63, 29.78, 28.08, 30.23, 29.45 and 27.45, respectively. All developed treatments were significantly lower than the control treatment. Treatment TC₄ of crystal menthol ice-cream recorded lowest over run while T₁ (control) sample ice-cream was recorded highest over run. Incorporation of herbal and crystal menthol depressed the whipping ability of milk protein by hindering air incorporation and therefore caused a decrease over run of ice-cream, it is due modification in typical oil-in-water (o/w) emulsion or even converted into another physical state (Fox and Mcsweeney, 2002). Similar finding were recorded by Pinto *et al.* (2006) [7], Murtaza *et al.* (2004) [15] and Marzieh *et al.* (2008) [13].

The viscosity of herbal and crystal menthol ice-cream with incorporating different levels of mentha extract and crystal menthol recorded. The mean viscosity of control, herbal and crystal menthol ice-cream for treatments T₁, TH₂, TH₃, TH₄, TC₂, TC₃ and TC₄ were found 25.82, 25.48, 25.28, 25.09, 26.21, 26.28 and 26.32 cPs., respectively. The viscosity was highest in control treatments i.e. T₁ (25.82 cPs) in control ice-cream as compared to mixed samples with menthol extract were TH₂ (25.48 cPs), TH₃ (25.28 cPs) and TH₄ (25.09 cPs) and for samples mixed with crystal menthol powder were TC₂ (26.21 cPs), TC₃ (26.28 cPs) and TC₄ (26.32 cPs) respectively. All treatments were significantly differed from each other and control ice-cream. Viscosity of milk decreases with increasing shear rate at a temperature below 40°C (Randhahn, 1973) [18], which Mulder and Walstra (1974) [14] suggested may be due to disruption of clusters of milk fat globules, which were formed as a result of cold agglutination which might be occurred in the present study. Similar finding observed by Marzieh *et al.* (2008) [13], Temiz and Yesilsu (2010) [23] and Ahanian *et al.* (2014) [3].

Conclusion

Since current exploration it can be concluded that the herbal type menthol is suitable @ 0.5 per cent of ice-cream mix as natural sensory means for the development of ice-cream which imparts cooling sensation without affecting the sensory and physical properties of ice-cream. The application of crystal type menthol produce unpleasant adulated mouth feel, suggest need more investigation for its application.

References

1. AOAC. Official Methods of Analysis, 9th Edn., Association of Official Analytical Chemist, Washington, USA, 1965, 222-276.
2. Agrawal AK, Karkhele PD, Karthikeyan S, Shrivastava A, Sinha G. Effect of variation of ginger juice on some physical sensory properties of ice-cream. *Indian J Dairy Sci*, 2015, 69(1).
3. Ahanian B, Pourahmad R, Mirahmadi F. Effect of substituting soy milk instead of skim milk on physico-chemical and sensory properties of sesame ice-cream. *Indian J Sci. Res.* 2014; 7(1):1134-1143.
4. Anonymous C. Can Mint, Rosemary Prevent Alzheimer's, 2013. <http://www.newsmax.health.com/Health-News/Mint-rosemary-Alzheimer-memory-2013/11/18/id/537283>.
5. Bajwa UA, Huma N, Ehsan B, Jabbar K, Khurram A. Effect of Different Concentrations of Strawberry Pulp on the Properties of Ice Cream. *Int J Agri. Biol*, 2003, 5(4).
6. Choo SY, Leong SK, Henna, Lu FS. Physicochemical and sensory properties of ice-cream formulated with virgin coconut oil. *Food Sci. Tech. Int.* 2009; 16(6):0531-11.
7. De S. In: *Outlines of Dairy Technology: Ice cream.* Oxford University Press 1st edn. New Delhi, 2004, 182-83.
8. Eccles R. Menthol and related cooling compounds. *J. pharm Pharmacol.* 1994; 46:618-630.
9. Goraya RK, Bajwa U. Enhancing the functional properties and nutritional quality of ice cream with processed amla Indian gooseberry. *J Food Sci Technol.* 2015; 52(12):7861-7871.
10. Guner A, Aredic M, Keles A, Dogruer Y. Production of yogurtice-cream at different acidity. *Intl J Food Sci Tech.* 2007; 42:948-952.
11. IS. Determination of fat by Gerber method. *Indian standard institute New Delhi*, 1977, 1224(2).
12. IS, Part I. Bacteriological analysis of milk. Bureau of Indian Standard, New Delhi. IS: SP: Methods of Test for Dairy Industry. Rapid Examination of Milk. Indian Standard Institution, Manak Bhavan, New Delhi, 1479-1981, 18(11).
13. Marzieh M, Mazaheri T. Effect of some stabilizers on the physicochemical and sensory properties of ice cream type frozen yogurt, *American Eurasian J Agric. & Environ. Sci.* 2008; 4(5):584-589.
14. Mulder H, Walstra P. *The Milk Fat Globule: Emulsion Science as applied to Milk Products and Comparable Foods.* PUDOC, Wageningen, 1974.
15. Murtaza MA, Huma N, Asim SM, Mahmood S. Effect of fat replacement by fig addition on ice cream quality. *Int. J Agri. Biol*, 2004, 6(1).
16. Pandiyan C, Kumaresan G, Annal VR, Rajarajan G. Incorporation of whey protein concentrate in ice cream. *Int J Chem Sci.* 2010; 8:563-567.
17. Pinto SV, Rathour AK, Jana AH, Parjapati JP, Solanky MJ. Ginger shreds as flavoring in ice cream. *Natural Product Radiance.* 2006; 5:15-18.
18. Randhahn H. Beitrag zum Fliessverhalten von Milch und Milchkonzentraten. *Milchwissenschaft.* 1973; 28:620-628.
19. Satpute DB. Studies on preparation of herbal whey based beverage by using menthol. Thesis submitted College of Agriculture, Latur. VNMKV Parbhani, 2016.
20. Sheoran OP, Tonk DS, Kaushik LS, Hasija RC, Pannu RS. Statistical Software Package for Agricultural Research Workers. Recent Advances in information theory, Statistics & Computer Applications by D.S. Hooda & R.C. Hasija Department of Mathematics Statistics, CCSHAU, Hisar, 1998, 139-143.
21. Silva PDL, Varela MSS, Correia RTP. Composition, sensory evaluation and melting properties of caprine ice cream produced with different fat sources. *Rev Inst Adolfo Lutz.* 2010; 69(3):341-5.
22. Tandan NAP, Yadav S. Antimicrobial activity and medicinal values of essential oil of *Mentha piperita*. *International Jour. of Engg. And innovative tech.* 1991; 2(8):214-218.
23. Temiz H, Yesilsu AF. Effect of pekmez addition on the physical, chemical, and sensory properties of ice cream. *Czech J Food Sci.* 2010; 28:538-546.