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## Manufacturing technology and production cost of ginger (*Zingiber officinale* L.) and *Aloe vera* (*Aloe barbadensis*) juice enriched probiotic (*L. acidophilus*) ice cream

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### Abstract

In the present study, the proportion ginger (*Zingiber officinale* L.) and *Aloe vera* (*Aloe barbadensis*) juice was optimized by incorporation of 1.5, 3.0, 4.5% and 2.0, 4.0, 6.0% (w/w of mix) respectively. The highest score for sensory attributes of ginger and *Aloe vera* flavoured probiotic ice cream was recorded for treatment C2A3 i.e. ice cream prepared by using 3.0 per cent ginger juice and 6.0 per cent *Aloe vera* juice. The cost of ginger and *Aloe vera* flavoured probiotic ice cream increased with the increase in the level of ginger and *Aloe vera* juice. The production cost of most acceptable level i.e. C2A3 was ₹ 106.80 per lit. From the result of present investigation it may be observed that ginger (*Zingiber officinale* L.) and *Aloe vera* (*Aloe barbadensis*) juice could be successfully utilized for preparation of probiotic ice cream. The most acceptable quality ginger and *Aloe vera* flavoured probiotic ice cream can be prepared by using 3.0 per cent ginger and 6.0 per cent *Aloe vera* juice and having production cost of ₹ 106.80 per lit.

**Keywords:** Probiotic, *L. acidophilus*, *Aloe barbadensis*

### Introduction

A large part of Indian population including 70 million rural household, primarily, small and marginal farmers and land less labourers in the country are connected, either directly or indirectly, with the dairy sector. Not only does it bring immense benefits to the economy in terms of raising agricultural yields, meeting productivity targets, creating employment throughout the country, especially in the rural areas, it also has an enormous potential in contributing to the future industrial growth of the economy. Hence, the rapid and coordinated up gradation of this sector attains enormous significance in India's development.

Probiotic cultures especially *Lactobacillus* group have a long association with dairy products. Lactic acid bacteria are industrially important organisms recognized for their fermentative ability, as well as their health and nutritional benefits (Evans and Lopez, 2004) [5]. Some species of LAB are components of the normal human intestinal microflora and play an important role in the normal function of digestive tract, as well as in the prevention of intestinal disorders. These bacteria have been widely used as starter cultures for fermentation in the dairy products, like cheese, yoghurts, fermented milk products, as well as in meat, beverages and other food industries (O'Bryan *et al.*, 2015; Burgain *et al.*, 2014) [8, 3].

The market for foods that provide nutritional benefits and novel eating experiences to consumers is growing rapidly. Ice cream is one of the most widely consumed dairy products in the world; however, the ice cream available commercially is generally poor in natural antioxidants until fortified with such herbal ingredients. In India, as elsewhere in the world, incidence of diabetes and coronary diseases are on the rise, and hence people have become conscious about their diet. The growing interest of consumers in therapeutic products has led to the incorporation of probiotic cultures into ice cream to result in dietetic ice cream. Some studies have demonstrated that it is possible to produce ice cream type frozen yoghurt using different ratios of fermented mixes. Fermented ice cream products are considered a healthy challenge to the ice cream industry which emphasizes the ways of avoiding or masking too strong yoghurt flavour and the use of other cultured milk products as a base for healthy ice

cream products. Probiotic microorganisms are added to the ice cream mixture in producing fermentative ice cream. Probiotic ice cream has the ability to survive in the human digestive system due to its neutral pH which provides protection for probiotic bacteria. Therefore, it is important to explore the possibility of improving the nutritional attributes of ice cream using ingredients with established health benefits, e.g. natural antioxidants, natural colorants, flavours etc. (Waterhouse *et al.*, 2013) [11].

Ginger (*Zingiber officinale* L.) is extensively used as a spice for a variety of food and beverages. It is considered as an important medicine since its roots contain several biologically active compounds. These compounds are responsible for many medical applications (Hanou *et al.*, 2016) [6]. Ginger has been used as a spice and as natural additives for more than 2000 years (Bartley and Jacobs, 2000) [2]. Also, ginger has many medicinal properties. Studies have shown that, the long term dietary intake of ginger has hypoglycaemic and hypolipidaemic effect (Ahmed and Sharma, 1997) [1]. Ginger has been identified as an herbal medicinal product with pharmacological effect.

*Aloe barbadensis miller* (*Aloe vera*) is a plant native from Africa well known for its considerable medicinal properties (Radha and Laxmipriya, 2015) [10]. This plant is considered to be the most biologically active of the approximately 420 *Aloe* species identified and characterized till date. *Aloe vera* is an outstanding source of natural compounds and contains more than 200 different biologically active substances, including vitamins, minerals, polysaccharides, amino acids,

anthraquinones, saponins, phytosterols and salicylic acids (Radha and Laxmipriya, 2015; Yeturu *et al.*, 2015) [10, 12]. Several studies have shown that *Aloe vera* and its constituents act as antimicrobial agents (Pandey and Mishra, 2010; Ferro *et al.*, 2003) [9]. For this reason, as well as for its prebiotic properties, *Aloe vera* represents a valuable functional ingredient for the food industry (Hussai *et al.*, 2015) [7].

Hence, considering the nutritional importance of probiotics, ginger and *Aloe vera* juice, the present research project entitled Process standardization of probiotic ice cream enriched with ginger (*Zingiber officinale* L.) and *Aloe vera* (*Aloe barbadensis*) juice was conducted.

### Materials

For preparation of probiotic ice cream, Fresh buffalo milk was collected from instructional dairy farm of College of Agriculture, Dapoli. Ingredients like cream, skim milk powder, sugar, stabilizer and fresh ginger were purchased from local market. *Aloe vera* juice was purchased from Patanjali shop.

Freeze dried culture of *Lactobacillus acidophilus* (015) were procured from The National Collection of Dairy Cultures, NDRI, Karnal (Haryana). These were sub cultured and maintained in the laboratory of Dairy microbiology, Department of Animal Husbandry, of the University at Dapoli. The working cultures, maintained in plain skim milk were sub cultured once in a week.

Treatment Details

C1A1	:	Addition of ginger juice @ 1.5 per cent and <i>Aloe vera</i> juice @ 2.0 per cent of ice cream mix (w/w)
C1A2	:	Addition of ginger juice @ 1.5 per cent and <i>Aloe vera</i> juice @ 4.0 per cent of ice cream mix (w/w)
C1A3	:	Addition of ginger juice @ 1.5 per cent and <i>Aloe vera</i> juice @ 6.0 per cent of ice cream mix (w/w)
C2A1	:	Addition of ginger juice @ 3.0 per cent and <i>Aloe vera</i> juice @ 2.0 per cent of ice cream mix (w/w)
C2A2	:	Addition of ginger juice @ 3.0 per cent and <i>Aloe vera</i> juice @ 4.0 per cent of ice cream mix (w/w)
C2A3	:	Addition of ginger juice @ 3.0 per cent and <i>Aloe vera</i> juice @ 6.0 per cent of ice cream mix (w/w)
C3A1	:	Addition of ginger juice @ 4.5 per cent and <i>Aloe vera</i> juice @ 2.0 per cent of ice cream mix (w/w)
C3A2	:	Addition of ginger juice @ 4.5 per cent and <i>Aloe vera</i> juice @ 4.0 per cent of ice cream mix (w/w)
C3A3	:	Addition of ginger juice @ 4.5 per cent and <i>Aloe vera</i> juice @ 6.0 per cent of ice cream mix (w/w)

In present research project, different levels of ginger and *Aloe vera* juice were evaluated. Optimum level of probiotic culture 7.5% (w/w of mix) was used commonly for all treatments. The trial was conducted with five replications.

## Results and Discussion

### Manufacturing Technology

The ice cream having standard composition (10% fat, 37% total solids, 11% milk solid not fat, 0.5% stabilizer and 15% sugar) was prepared as per the standard procedure, narrated by De (2015) [4] with slight modifications.

The prepared ginger and *Aloe vera* juice enriched probiotic ice cream was evaluated for its sensory attributes through panel of 7 to 8 semi trained judges. On the basis of sensory score the acceptance level of ginger and *Aloe vera* juice was finalized.

### Production Cost of Ginger and *Aloe vera* Juice Enriched Probiotic Ice Cream

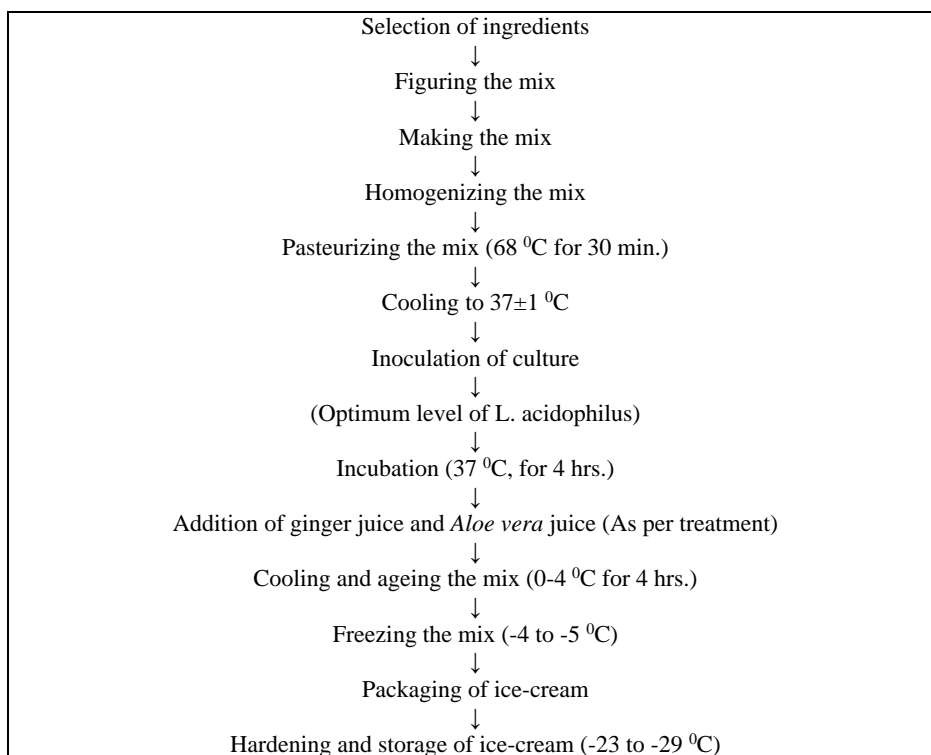
One of the objectives of the study was to know the effect of addition of different level of ginger and *Aloe vera* juice on the cost of probiotic ice cream preparation. The cost of probiotic ice cream production was worked out by considering the

prevailing retail market prices of ingredients, similarly other input cost like ice salt as well as electricity consumption was also consider. However it is found that the cost of ice, salt and electricity was constant for all the treatments, as amount of ice and salt required as well as freezing period required was same for all treatments. The cost data are depicted in Table: 1 and illustrated graphically in Fig. 2.

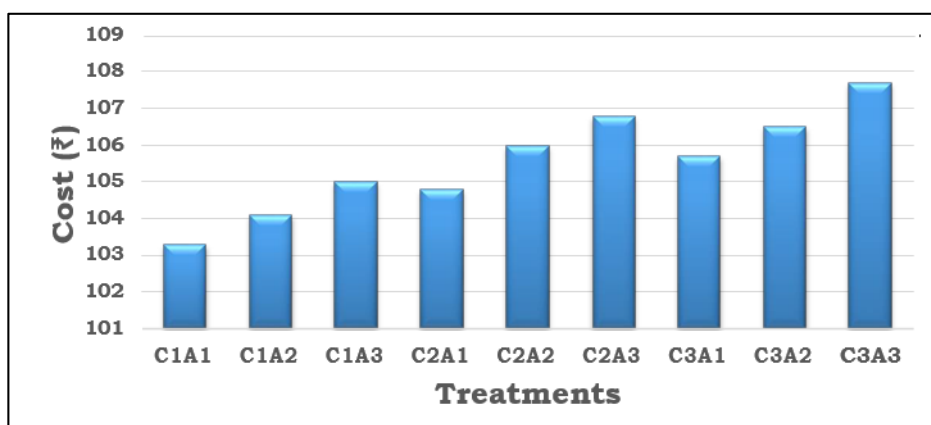
The highest cost (₹ 107.70/lit) was recorded in case of ice cream prepared with 4.5 per cent ginger and 6.0 per cent *Aloe vera* juice (C3A3) while lowest cost (₹ 103.30/lit) was recorded in case of ice cream prepared with 1.5 per cent ginger and 2.0 per cent *Aloe vera* juice (C1A1). It was observed that the cost of ice cream increased with the increase in the level of ginger as well as *Aloe vera* juice. The production cost of most acceptable treatment i.e. ice cream prepared with 3.0 per cent ginger and 6.0 per cent *Aloe vera* juice (C2A3) was ₹ 106.80/lit.

In case of C1A1 the cost of ginger juice and *Aloe vera* juice used for enrichments was less (₹ 5.5) as compare to C3A3 (₹ 16.50) similarly the overrun in case of C1A1 (49.54%) was higher as compare to C3A3 (43.64) as a result of these the production cost of C1A1 (₹ 103.30/lit) was less as compare to C3A3 (₹ 107.70/lit).

**Flow Diagram**



**Fig 1:** Flow chart for preparation of probiotic ice cream enriched with ginger and *Aloe vera* juice



**Fig 2:** Production cost of ginger and *Aloe vera* juice enriched probiotic ice cream/lit.

**Table 1:** Production cost of ginger and *Aloe vera* juice enriched probiotic ice cream

Treatments		C1A1	C1A2	C1A3	C2A1	C2A2	C2A3	C3A1	C3A2	C3A3
Ice cream mix with 7.5% <i>L. acidophilus</i> culture	Qty. (g)	1075	1075	1075	1075	1075	1075	1075	1075	1075
	Cost (₹)	145.97	145.97	145.97	145.97	145.97	145.97	145.97	145.97	145.97
Enrichment ingredients										
Ginger juice	Qty. (g)	15	15	15	30	30	30	45	45	45
	Cost (₹)	1.5	1.5	1.5	3.0	3.0	3.0	4.5	4.5	4.5
<i>Aloe vera</i> juice	Qty. (g)	20	40	60	20	40	60	20	40	60
	Cost (₹)	4.0	8.0	12	4.0	8.0	12	4.0	8.0	12
Total Quantity of enriched Ice cream mix (g)		1110	1130	1150	1125	1145	1165	1140	1160	1180
Total Cost of Ice cream mix (₹)		151.47	155.47	159.47	152.97	156.77	160.47	154.47	158.47	162.47
Ice + salt + Electricity		20	20	20	20	20	20	20	20	20
Total cost of Ice cream making		171.47	175.47	179.47	172.97	176.97	180.97	174.47	178.47	182.47
% Overrun		49.54	49.11	48.70	46.67	45.85	45.49	44.74	44.40	43.64
Total Quantity Ice cream obtained (ml)		1660	1685	1710	1650	1670	1695	1650	1675	1695
Cost of Ice-Cream 100 (ml) (₹)		10.33	10.41	10.50	10.48	10.60	10.68	10.57	10.65	10.77
Cost of Ice Cream per lit (₹)		103.30	104.10	105.0	104.80	106.00	106.80	105.70	106.50	107.70

Rate of ingredients (During 2017-2018):

1. Milk: 54 /Lit.	2. Sugar: 38/kg	3. Ginger Juice: 100/Lit.	4. <i>Aloe vera</i> Juice: 200/Lit.
5. Gelatin: 3000/kg	6. Skim Milk Powder: 320/kg	7. Cream: 182/kg	8. Culture: 300/Ampoule

## Conclusion

From the results of the present investigation, it may be concluded that ginger and *Aloe vera* juice could be successfully utilized for preparation of probiotic ice cream. Addition of ginger and *Aloe vera* juice and probiotic culture in ice cream improved the sensory as well as chemical quality and acceptability of the product. Besides typical flavour, it also adds medicinal properties to the product. Such flavouring did not appreciably affect the composition of ice cream. The most acceptable quality ginger and *Aloe vera* juice enriched probiotic ice cream can be prepared by using 3.0 per cent ginger and 6.0 per cent *Aloe vera* juice with optimum level of probiotic culture (*Lactobacillus acidophilus*) 7.5% (w/w of mix) was used commonly for all treatments. Production cost of most acceptable quality ginger and *Aloe vera* juice enriched probiotic ice cream was ₹ 106.80 per lit.

## Reference

1. Ahmed R, Sharma S. Biochemical studies on combined effect of garlic (*Allium sativum* Linn) and ginger (*Zingiber officinale* Rosc) in albino rats. Indian J Experimental bio. 1997; 35:841-843.
2. Bartley J, Jacobs A. Effects of drying on flavour compounds in Australian-grown ginger (*Zingiber officinale*). J Sci. Food Agric. 2000; 80(2):209-215.
3. Burgain J, Scher J, Francius G, Borges F, Corgneau M, Revol-Junelles AM *et al.* Lactic acid bacteria in dairy food: Surface characterization and interactions with food matrix components. Adv Colloid Interface Sci. 2014; 213:21-45.
4. De Sukumar. Outlines of Dairy Technology, Oxford University Press, New Delhi, India, 2015.
5. Evans JD, Lopez DL. Bacterial probiotics induce an immune response in the honey bee (Hymenoptera: Apidae) J Econ. Entomol. 2004; 97:752-756.
6. Hanou S, Boukhemis M, Benatallah L, Djeghri B, Zidoune MN. Effect of Ginger Powder Addition on Fermentation Kinetics, Rheological Properties and Bacterial Viability of Dromedary Yogurt. Adv J Food Sci Technol. 2016; 10:667-673.
7. Hussain SA, Patil GR, Yadav V, Singh RRB. Effect of storage on sensory quality, pH, wheying-off and probiotic count of lassi supplemented with *Aloe barbadensis* Miller juice. Indian J Dairy Sci. 2015; 68:105-110.
8. O'Bryan CA, Crandall PG, Ricke SC, Ndahetuye JB. Lactic acid bacteria (LAB) as antimicrobials in food products: Analytical methods and applications. Handbook of Natural Antimicrobials for Food Safety and Quality. 2015, 137-151.
9. Pandey R, Mishra A. Antibacterial activities of crude extract of *Aloe barbadensis* to clinically isolated bacterial pathogens. Appl Biochem Biotechnol. 2010; 160:1356-1361.
10. Radha MH, Laxmipriya NP. Evaluation of biological properties and clinical effectiveness of *Aloe vera*: A systematic review. J Tradit Complement Med. 2015; 5: 21-26.
11. Waterhouse DS, Edmonds L, Wadhwa SS, Wibisono R. Producing ice cream using a substantial amount of juice from kiwifruit with green, gold or red flesh. Food Res Int. 2013; 50:647-56.
12. Yeturu SK, Acharya S, Urala AS, Pentapati KC. Effect of *Aloe vera*, chlorine dioxide, and chlorhexidine mouth rinses on plaque and gingivitis: A randomized controlled trial. J Oral Biol Craniofac Res In Press. 2015.