DEVELOPMENT OF HERBAL ICE CREAM

Dissertation Report-I

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CERTIFICATE

This is to certify that Aman kumar has personally completed M.Sc. dissertation-1 entitled '**STUDY ON DEVELOPMENT OF HERBAL ICE CREAM'** under my guidance and supervision. To the best of my knowledge, the present work is the result of her original investigation and study. No part of dissertation has ever been submitted for any other purpose at any university.

The project report is appropriate for the submission and partial fulfilment of the conditions for the evaluation leading to the award of Master of Food Science and Technology.

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DECLARATION

I hereby declare that the work presented in the dissertation-I entitled **'STUDY ON DEVELOPMENT OF HERBAL ICE CREAM'** is my own original work. The work has been carried out by me at School of Agriculture, Lovely Professional University, Phagwara, Punjab, India under the guidance of **Er. Jasleen Kaur Bhasin**, Assistant Professor (Food Technology) of School of Agriculture, Lovely Professional University, Phagwara, Punjab, India for the award of the degree of Master of Science in Food Technology.

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CONTENTS

1. INTRODUCTION CHAPTER 1

1.1. ICE CREAM

Ice cream is a frozen dairy product which is prepared by suitable blending and processing of cream and other milk products, along with sugar and flavor, stabilizer or color, and with the incorporation of air during the freezing process *(Sukumar De 1991).* Ice-cream is originated from Europe and later introduced in the united states in Baltimore *(Deosarkar S.S et al., 2016*). Frozen desserts are among the most popular dessert eaten in or out of the home. These include ice cream, frozen cream, ices, sherbets and mouses (Peckham, 1974). Ice cream is considered a food of high nutritional value, providing lipids, carbohydrates, protein, calcium, phosphorous, minerals and vitamin A, B1, B2,B6, C, D, E & K.(M.C.A. Maia). It is the most important and of great interest to the dairy industry due to high demand by the population.

According to the PFA Rules(1976), ice cream is the frozen product which is obtained from cow or buffalo milk or combination of therefore or from cream, and of other dairy products with or without the addition of colors, flavours, eggs, sugarcane, nuts and fruits in it. Ice cream is having a wonderful source of energy, having twice to three times the fat content of milk in it.

1.1.1. History

Ice cream manufacturing is not a new process. Ice cream was prepared from ancient time and was known in England in the early 1700s, but was still a rare item. The history of ice cream, starts from ancient greeksand roman, who prepare the ice cream by beating the cream in a pewter pot which was shaken in a large pot of salt and ice *(Mariani, J. F. 1994).* Ice cream was first manufactured by NANCY JOHNSON, who invented the hand cranked Freezer in 1846. This freezer is still used by many of home ice cream maker *(Davidson,1999).*

1.1.2. Composition

In the manufacturing of ice cream various dairy ingredients and related products and some non-dairy products are used. These include whole milk, skim milk, cream, butter, sugar, stabilizer, total solids, etc. Ice cream mainly composed of milk fat and milk solids- non-fat (MSNF). Typical composition of ice cream is given below *(Sukumar De 1991).*

Table 1.Proximate composition of Ice cream (as a percentage)-*(H. Douglas Goff 1997)*

Components	Values (%)
Milk fat	10-16
Milk solid not fat	9-12
Sucrose	9-12
Stabilizer & Emulsifier	0-0.5
Total solids	36-45
Water	55-64

1.2. ROLE OF THE CONSTITUENTS IN ICE CREAM- *(Sukumar De 1991).*

CONSTITUTE	ROLE
Milk fat	Give rich, full & creamy flavor. Contributes to body and melting resistance of ice cream.
Milk –solids-not fat(MSNF)	Consists of milk proteins, milk sugar & mineral matter. Helps to make ice cream compact & smooth.
Sugar	Increases the acceptability of ice cream+
Stabilizers	Prevents the formation of large ice crystals, especially during storage.
Emulsifiers	Provide uniform whipping quality, smoother body & texture
Flavour	Increases the acceptability
Color	Improves appearance

1.3. Basil *(Ocimum)*

Basil is a medicinal plant which known for thousand years and found in various of the world. In Indian subcontinent his medicinal herb is considered as a sacred plant (V. Sharma, A. Joshi*et al*., 2011).During the microscopic studies of leaves, it showed the presence of vascular bundles, trichomes, spongy parenchyma cells etc. There are three types of tulsi which are mentioned in ayurvedic texts-

1. Rama or green leaf tulsi *(O. gratissimum).*

2. Shyama or Krishna or purple leaf tulsi *(O. sanctum).*

3. Vana or wild leaf tulsi *(O.canum).*

1.3.1. SCIENTIFIC CLASSIFICATION *(USDA- Natural resources conservation service)*

Kingdom	Plantae
Clade	Angiosperms
Clade	Eudicots
Clade	Asterids
Order	Lamiales
Family	Lamiaceae
Genus	*Ocimum*
Species	*O. basilicum*

Sweet Basil *(Ocimum basilicum L.)* is used as a spice, perfume, cosmetics, fly repellent, medicine and also grown as an ornamental *(Olof Ryding., 1994).*They are also traditionally used in so many different formulations for the treatment of cough, cold, flu, headache etc. But now days it is also incorporated in the medicines for the treatment of wide disorders including mouth, throat, lungs, heart, blood, liver, kidney digestive system, and reproductive system.

Basil is sensitive to cold, thus it grows best in hot and dry areas. For the growth, it need less amount of water but if its leaves get wilted from lack of water, it will recover. If

yellow leaves are present towards the bottom of the plant then it means plant has been stressed and it needs less water, or less or more fertilizer.

1.3.2. Disease in Basil plant (Heather rhoades – article)

Basil plant suffers from various types of diseases caused by plant pathogens.

Fusarium wilt disease- It is a soil borne fungal diseases that can kill the younger basil plants.

***Pythium*-** This microbe is responsible for the killing of seedlings.

Gray mold- This type of disease is caused by *Botrytis cinerea.* It can cause infectin even after the harvesting of plant and is capable of killing of entire plant.

Black spot- It can be seen on basil foliage which is caused by a fungi genus *Collectotrichum.*

1.4. ALOE VERA

Aloe vera extract is widely used in medicine and cosmetic industries. It provides smoothening, moisturizing, to the skin and also contains healing properties which can helps to heal the wound fastly and also helps in preventing from infection.

There are over 250 species of *Aloe* grown in the world but only two species are grown commercially

1. *Aloe barbadensis.*

2. *Aloe aborescens.*

Common names of *A. vera*:-

- Chinese Aloe.
- Indian Aloe.
- True Aloe.
- Barbados Aloe.
- Burn aloe.

1.4.3. SCIENTIFIC CLASSIFICATION *(USDA- Natural resources conservation service)*

Kingdom	Plantae
Class	Liliopsida
Sub class	Lilidae
Order	Asparagales
Family	Asphodelaceae
Subfamily	Asphodeloideae
Genus	*Aloe*
Species	*A. vera*

It is a perennial herb which contains 30-50 cm long and 3-10 cm broad at the base. It is pea-green in colour and contain bright yellow tubular flower of 25-35 cm in length in as lender loose spike; stamens frequently projected beyond the perianth tube. *A. vera* plant is intolerant to heavy frost and snow climate. This plant is easily grow in low water area, rocky surfaces and dry places. Due to the presence of succulence this species is able to survive in low natural rain fall areas.

A*loe vera* is a widely grown ornamental plant throughout the world. The *A. vera* is also considered as a medicinal plant.*A. vera* is widely cultivated throughout the world. Basically *A. Vera* is considered to be native only to the Southeast Africa. But now is has been naturalized in north Africa, China, India Southern Spain. This species were introduced in China and various parts of southern Europe in 17^{th} century.

Table No.2: Nutritional composition of Aloe vera gel *(Ahmed et al., 2013)*

Constituents	In g/100g
Crude fiber	0.12 ± 1.20
Protein	0.12 ± 0.01
Fat	0.01 ± 0.02
Carbohydrates	0.66
Ascorbic acid	0.004 ± 0.05

1.5. Mint *(Mentha viris, Linn.)*

It is a herbal plant which is closely related to the variety of oil yielding plants. It falls under the family of *Labiatae* and genus *Mentha* spp. Mint is specially cultivated in temperate zones of Australia, Eurasia and South Africa.

The names of most common mint varieties are: -

1. Peppermint.
2. Spearmint.
3. Wild mint.
4. Curled mint.
5. American mint.

Since ancient times mint is used by the human beings for improving their health. It prvides relief from common cold, fever, flu, indigestion, motion sickness.In industries it is also used in cuisines, medicaments and cosmetics, toothpaste, chewing gum industry.

PROBLEM BACKGROUND CHAPTER 2

According to the study of present scenario people are moving towards herbal products because of its nutritional components and health benefits. Present study is to utilise the nutritional benefits of basil, mint and aloe vera and incorporating to make herbal ice-cream for better acceptability along with health benefits.

OBJECTIVE CHAPTER 3

1.To standardize the formulation for preparation of ice cream using different types of herbs.

2. To study the physiochemical, microbiological, sensory and nutritional properties of ice cream.

3. To study the shelf life of formulated product.

Characterization of Aloe Vera

Miranda et al.(2009) investigated influence of temperature on physicochemical and nutritional properties and antioxidant capacity of *Aloe vera* (*Aloe barbadensis* Miller) gel and reported drying temperature of 80 and 90 °C resulted in significant variation in and/or loss of the physicochemical and nutritional properties and antioxidant capacity of the gel. They also reported that these effects were also observed as a result of a lengthy drying period (i.e., 810 min at 50 °C).

Castillo et al.(2011) added *Aloe vera* gel at several concentrations on potato dextrose agar (PDA) to test its efficacy on inhibiting mycelium growth of two common fungi responsible for fruit decay (*Penicillium digitatum* and *Botrytis cinerea*) and reported for both fungi, the inhibition of mycelium growth rate increased with *Aloe* concentration.

Srisukh et al.(2006) incorporated aloe in the form of gel, at 25% by weight; other ingredients included sweetening, coloring, and flavoring agents. Sensory evaluations were carried out, using 9-point Hedonic Scale method. Pandan-flavored aloe ice cream obtained the score of 7.43 (“like moderately” to “like very much”). Coated table grapes(Vitis vinifera L. cv. Crimson Seedless) wth Aloe vera gel according and the stored for 35 days at 1 ^{o}C, and the subsequent shelf life (SL) was monitored at 20 ^{o}C.

*Serrano et al. (*2006*)* They reported uncoated clusters showed a rapid loss of functional compounds, such as total phenolics and ascorbic acid and on the contrary, table grapes coated with aloe vera gel significantly delayed the above changes, such as the rentention of scorbic acid during cold storage or SL. Consequent, Aloe vera gel coating, a simple and non contaminating treatment, maintained the functional properties during post stoage of grapes.

Boudrew et al. (2006) reported aloe vera products contain multiple constituents with potential biological and toxicological activities, yet the active components elude definition. Ingestion of Aloe Vera is associated with diarrhoea, electrolyte imbalance, kidney dysfunction, and conventional drug interactions; episodes of contact dermatitis, erythema, and phototoxicity have been reported from topical applications.

Soltanizadeh et al. (2015) investigated the effects of different concentrations of Aloe vera on the quality of this food product and reported that Aloe vera contributed to some extent to decreased cooking loss and diameter reduction in the burgers. Increased concentrations of Aloe Vera led to improvements in the water absorption and texture of the burgers as well as their lipid stability. However, a concentration level of 3% led to the most acceptability of the product to the panellists.

Elbandy et al.(2014) studied effect of different addition levels of Aloe Vera gel (5, 10, 15, 20 and 25%) on the physical, microbial and chemical properties such as total soluble solids, total acidity, pH, ascorbic acid content, total sugars, reducing sugars, viscosity, total bacterial counts and sensory properties and reported high concentrations of Aloe vera gel (20 and 25%) resulted in a dramatic fall in the levels of total bacterial counts. They further reported the mango nectar supported with Aloe vera gel showed good quality attributes and good stability during storage for six months and recommend the supplementation with 20-25% Aloe vera gel to produce high quality functional mango nectar containing natural preservative ingredients.

*Xianqun et al. (2001)*developed aloe-beancurd and reported the optimum rate between soybean milk and Aloe juice is 6:2 and the product developed was having excellent colour and flavor with health and skin caring functions and product may have a very optimistic market perspective.

Characterization of basil leaves *(Ocimum)*

Javanmerdi et al. (2002) studied characteristics, including quantitative and qualitative traits along with the chemical variation of phenolic acids, of 23 accessions of basil *(Ocimumbasilicum L.)* from Iran and reported that cosmarinic acid is the predominant phenolic acid present in both flower and leaf tissues.

*Lee et al. (2004)*identified aroma constituents of basil which were linalool, estragole methyl cinnamate, eugenol and 1,8-cineole. The major aroma constituents of thyme were thymol4-isopropyl-2-methylphenol (carvacrol; 0.681 mg/g), linalool (0.471 mg/g), a-terpineol (0.291 mg/g), and 1,8-cineole (0.245 mg/g). They examined twelve aroma constituents of basil and thyme for their antioxidant activities using the aldehyde/carboxylic acid assay and reorted Eugenol, thymol, carvacrol, and 4-allylphenol showed stronger antioxidant activities than did the other components tested in the assay.

Kwee et al. (2011) studied 15 different basil varieties for phenolic and antioxidant composition and reported Rosmarinic, chicoric and caffeic acid concentrations were affected by cultivar, although caftaric acid levels were not. They also reported nine of the cultivars in this study contained chicoric acid in higher concentrations than rosmarinic acid and individual phenolic acid composition was found to be an important factor influencing the measured antioxidant capacity.

Hakum et al. (2007) found osmarinic acid as the predominant phenolic acid in all callus extracts in comparison with field grown plant parts or holy basil (Ocimim sanctum Linn.) and at the same concentration, the callus extracts echibited higher antioxidant activity in all of the testing system than the extract obtained from field-grown plant parts.

Study on development of ice cream

H. Douglas Goff (1997). stated that ice cream is consists of fat globules, ice crystals and an unfrozen scum phase along with the incorporation of air. The size of ice crystals usually ranges from 20-50 μm. The serum phase consists of sugars and high molecular weight polysaccharides in a freeze- concentrates solution.

*C. Pandiyan et al., (2014).*showed that herbal ice cream was prepared by incorporating phyllanthus niruri dried powder at different percent constituent. The difference between the treatments and coliforn count was found to be not significant and were with in the limits by standard plate count method. It was also found that there is no significant difference between control and treatment in the total sensory scores. Hence it was concluded that phyllanthus niruri incorporated up to 1.5% level and can be incorporated into ice creams to increase its medicinal benefits.

*Jaya Gade et al., (2015).*studied that Extract of Fenugreek seeds was obtained by using methanol as a solvent and the extract of fenugreek seeds, was entrapped in the inner aqueous phase of W/O emulsion. The formulation was made in the aqueous phase containing the extract of fenugreek seeds. The herbal formulation showed good spreadibility, good consistency, and homogeneity.

Study on medicinal properties of ice cream

*Durga Singh et.al (2017).*It was conducted that the Stevia contains many medicinal properties like it prevents diabetes, helps in loses weight, increases digestion and also helps in preventing tooth decay. The Kulfi is one of the famous desserts in India. By adding Stevia in proper amount, herbal ice cream is prepared.

Ayyavoo Preamnath Manoharan et al., (2013). investigated that diabetics is increasing year by year and people are looking for alternative of sugar, herbal ice cream is prepared with artificial sweetners and natural color beetroot juice for strawberry flavour to assess its acceptability. Other constituents such as aloe vera pulp nand natural color beetroot were added at different levels to analyse its sensory attributes. It was concluded that the product can be stored at -29°C and sensory score were studied.

Study on designing and application of ice cream

Christos Soukoulins et al., (2014). studied that, many applications related to the design and development of functional ice cream have been documented, including products containing probiotics, prebiotics, synbiotics, dietary fibers, natural antioxidants such as polyphenols, essential and polyunsaturated fatty acids, and low glycemic index blends and blends fortified with mineral or trace elements.

*Gerla C.B.Chinelate et al., (2003).*It was studied that in order to associate a functional ice cream formulation based on buffalo milk supplemented with flaxseed and chitosan, in order to obtain products with an alternative source of fiber, analyzing the physical and chemical interactions, chemical and microbiological.

Study on physiochemical property of ice cream

M. R. Muse et al., (2014). It was studied that, ice cream mixes were analyzed for viscosity and finished ice cream were analyzed for air cell and ice crystal size, to check the overrun and fat destabilization. These aspects along with the consistency coefficient of the mix affected the melting rate of ice cream.

5.1. Procurement of raw material:

All the raw materials were procured from the local markets and nursary of Phagwara, Punjab, India and were stored at refrigerated temperature. Good quality of raw materials were selected, cleaned and graded accordingly which were introduced in preparation of herbal ice-cream. The extract and juice of mint, basil and aloe vera is used in the preparation of ice cream.

5.2 Formulation nd preparation of ice cream

The preparation of ice cream was done by using the method given by *Offia olua et al.,* in *"*Incorporation of Papain into ice cream: the impact on pawpaw" in (2016). The method was slightly modified. The ice cream was prepared by incorporating at various rates of Aloe Vera, Basil and Mint.

Flow chart of preparation of ice cream

Mixing of ingredients (egg, milk, sugar, fat)

↓

Homogenization (to produce uniform texture)

↓

Resting or ageing (to blend flavors)

↓

Addition of Aloe Vera, Mint and Basil (5g)

↓

Store at low temperature (-20 ^{o}C)

↓

Ice cream is prepared

5.3. Determination of fat content:

Fat content is observed by using Gerber method given by Bradley *et al*. (1992). 10 ml of sulphuric acid (density 1.815 gm/ ml at 20ºC) were poured into clean dry Gerber tubes which already contains 5 gm ice cream. To this mixture 1 ml amyl alcohol and 5 ml distilled water was added at 20ºC and the contents of the tube were mixed till no white particles were seen. The tubes were then centrifuged at 1100 revolutions per minutes (rpm) for 5 minutes. The tubes were transferred to a water bath at 65ºC for 3 minutes, after which the fat content was immediately read.

5.4. Determination of protein content:

The protein content was adopted from AOAC (1990), Using Kjeldahl method. In a Kjeldahl flask, l0 gm ice cream sample were placed followed by addition of Kjeldahl tablets (each tablet contained 1gm Na2SO4 and the equivalent of 0.1mg Hg). Twenty five milliliters of concentrated sulphuric acid (density 1.86gm/ ml at 20°C) were added to the flask and the mixture was then digested on a digestion heater until a clear solution was obtained (3 hours), the flasks were then removed and left to cool. The digested samples were poured in volumetric flasks (100 ml) and diluted to 100 with distilled water. Five milliliters were taken and neutralized using 10 ml of 40% NaOH. The distillate was received in a conical flask containing 25 ml of 2% boric acid and 3 drops of indicator (bromocresol green + methyl red). The distillation was continued until the volume in the flask was 75 ml. The flasks were then removed from the distillator and the distillates were titrated against 0.1N HCl until the end point was obtained (red colour).

Protein content was calculated as follows:

$$\text{Nitrogen (\%)} = \frac{T \times 0.1 \times 20 \times 0.014 \times 100}{\text{Weight of sample}}$$

$$\text{Protein (\%)} = \text{Nitrogen (\%)} \times 6.38$$

Where:

T: Titration figure.

0.1: Normality of HCl.

0.014: Atomic weight of nitrogen/ 1000.

20: Dilution factor.

5.5. Determination of total solids content:

Total solids content of ice cream sample were determined according to the modified method of AOAC (1990).

Take two grams of ice cream sample in a clean dried flat bottomed aluminium dish. The dishes were heated on a steam bath for 10-15 minutes and then the dishes were transferred to an air oven for 12 hours at 50°C. The dishes were placed into desiccator to cool and then weighed. Heating, cooling and weighting were repeated several times until the difference between two successive weightings was less than 0.5 mg. the total solids content was calculated as follows:

$$\text{Total solids (\%)} = \frac{W1 \times 100}{W0}$$

Where:

W1: Weight of sample after drying.

W0: Weight of sample before drying.

5.6. Determination of ash content:

The ash content was determined according to AOAC (1990). Take two grams of ice cream into a clean dry crucible. Evaporated until it gets dry on a steam bath. The crucibles were placed in a muffle furnace at 550°C for 1.5-2 hours, cooled in a desiccator and weighted. The ash content was calculated as follows:

$$\text{Ash \%} = \frac{W1 \times 100}{W0}$$

Where:

W1 = Weight of ash.

W0 = Weight of sample.

5.7 Determination of total sugars content:

Total sugars were assessed according to Lane and Eynon micrometric method AOAC (1984). Ten grams of ice cream sample were transferred to a 250 ml volumetric flask. A 100 ml of distilled water were carefully added and then neutralized with 1.0N NaOH to a pH 7.5-8.0. About 2 ml of lead acetate were added and the flask was then shacked and left to stand for 10 minutes. Then 2 grams of sodium oxalate were added to remove the excess lead. Distilled water was again added to make the volume to mark (250 ml). The solution was then filtrated and 50 ml of its filtrated were pipetted into a 250 ml volumetric flask. To the new mixture, 50

g citric acid and 50 ml distilled water were slowly added. The contents of the flasks were boiled gently for 10 minutes to invert to sucrose and when cooled a few drops of phenolphthalein were added. In order to neutralize the mixture, a 20% NaOH solution was continuously added until color turned pink. Immediately 1.0N HCl was added until the color of the mixture disappeared and the volume was made to mark before titration. Standard method of titration: Ten ml of mixed solution of Fehling (A) and (B) were pipetted into a conical flask. A burette was filled with the clarified sugar solution and running the whole volume required to reduce the Fehling's solution so that 0.5-1.0 ml was still required to complete the titration. The contents of the flasks were mixed and then heated to boiling for 2 minutes. Three drops of methylene blue indicator were added. Then the titration was completed until the color has completely disappeared.

Calculation:

$$\text{Mg total sugar in 100 ml (\%)} = \frac{\text{Factor} \times 100}{\text{Titer}}$$

$$\text{Total sugar (\%)} = \frac{\frac{\text{mg}}{100\text{g}} \times \text{dilution} \times 100}{1000 \times \text{wt.taken}}$$

Factor = mg of invert sugar corresponding to 10 ml of Fehling's solution. (The factor is obtained from the table of invert sugar).

5.8. Determination of reducing sugars content:

In case of juices, the reducing sugars is very low, so that filtrate can be used directly for titration according to AOAC (1984) using the following equation for calculation:

$$\text{Reducing sugar (\%)} = \frac{\frac{\text{mg}}{100\text{g}} \times \text{dilution} \times 100}{1000 \times \text{wt.taken}}$$

(The factor is obtained from the table of glucose).

5.9. Estimation of total phenolic content in peel extract:

Total phenolic content of the methanolic extracts was determined accoding to Gat *et al*., 2015 using colorimetric method.0.5 ml sample was taken and mixed with Folin–Ciocalteu reagent (0.5 ml).Mix the mixture by shaking for 15–20 s and after 3 min, add 0.50 ml of saturated sodium carbonate solution and dilute the solution to 5 ml with water. Incubate the mixture in dark at room temperature for 2 hours and absorbance was measured at wavelength 765 nm. calibration curve was preparedwith gallic acid standard (2–10 mM).

5.10. Estimation of total flavonoid content in peel extract. *(Gat et al., 2015)*

Total flavonoids were measured using a colorimetric method. **P**roperly diluted peel extract (2-10 mg) were mixed with 4ml of distilled water followed by addition of 0.3ml of (5%w/v) NaNo2 and after 5 min, 0.3ml of (10%w/v)Alcl3 was added.At 6 min, 2ml of 1 M sodium hydroxide was added to the mixture. Dilute the mixture by adding 2.4 ml of distilled water.Take O.D at 510 nm.

5.11. Antioxidant activity (DPPH Assay): *(Wang et al., 2016)*

Different methanolic extracts concentrations were prepared to which 1mL of a 0.2 mmol/L DPPH methanolic solution was added. Shake the mixture properly and keep at ambient temperature for 30 min. Take O.D at 517nm.

5.12. Reducing power ability: *(Jayanti et al., 2011)*

The 0.5 ml extract was diluted to 1.0 ml with distilled water and then mixed with 2.5 ml phosphate buffer (0.2 M, pH 6.6) and 2.5 mL, 1% potassium ferricyanide [$K_3Fe(CN)_6$] followed by addition of 2.5 ml of 10% trichloroacetic acid and the mixture was incubated at 50 °C for 20 min and centrifuged at 5000×g. After centrifugation 2.5 ml of clear aliquot was taken and mixed with 0.5 ml, 0.1% $FeCl_3$. The OD of mixture was measured at 700 nm.

5.13. *β*-Carotene Bleaching Test (*Koleva et al., 2002)*

The2 mg of *β*-carotene was dissolved in 20 mL chloroform from this solution 4 ml was taken to which 40 mg of linoleic acid and 400 mg ofTween 40 were added. The mixture was kept undervacuum at 40°C for the evaporation of chloroform. After evaporation 100 mL of water was added and vigorously shaken. This methanolic solutions of the samples (10 μL) was mixed to an aliquot (150 μL) of the *β*-carotene/linoleic acid emulsion. Emulsion was incubated at 50°C for 120 min and the OD was taken at 470 nm. BHT was used as standard. The antioxidant activity (%) of the peelextract is measured in terms of per cent inhibition using the following formula:

$$\% \text{ Inhibition} = \frac{A_T - C_T}{C_O - C_T} X\ 100$$

Where A_T and C_T are the absorbance values measured for the sample and control, respectively, after incubation of 120 min, and C_O is the absorbance value for the control measured at zero time during the incubation.

EXPECTED OUTCOMES CHAPTER 6

Preparation of an ice cream using herbal ingredients is a kind of newness added to the product which is going to increase the nutritional value as it is a kind of dessert liked by all group of people. The addition of herbal ingredients enhance the overall quality of an ice cream.

7.1 Proximate analysis of raw materials

7.1.1 Proximate analysis of Full Cream Milk

The estimated chemical composition of full cream milk (containing 6% fat) was found to be 0.63 ± 0.06 ash, 5.9± 0.06 total fat, 84.83 ± 0.6 moisture, 0.15 ± 0.04 titrable acidity. Similar results were reported by *Melfesan et al. (2010).*

S.No.	Name of Experiment	Sample	Result (N=3)
1.	Moisture content	Milk (6% fat)	84.83 ± 0.6
		Coconut milk	73.86 ± 0.29
		Soya Milk	86.56 ± 0.15
2.	Ash content	Milk (6% fat) (Verka)	0.63 ± 0.06
3.	Titrable Acidity	Milk (6% fat) (Verka)	0.15 ± 0.04
		Milk (6% fat) (Super)	0.11 ± 0.02
4.	Gerber test (Fat)	Milk(6% fat)	5.9 ± 0.06
5.	Rosalic Test	Milk(6% fat)	Negative
6.	Hydrogen Peroxide Test	Milk(6% fat)	Negative
7.	Sugar test	Milk(6% fat)	Negative
8.	Detection of starch	Milk(6% fat)	Negative
9.	Detection of Formalin	Milk(6% fat)	Negative
10.	Detection of glucose	Milk(6% fat)	Negative
11.	Detection of urea	Milk(6% fat)	Negative
12.	Detection of salt	Milk(6% fat)	Negative

Table 7.1: Proximate nutrient composition of full cream milk

7.1.2 Proximate analysis of Aloe Vera

The estimated chemical composition of Aloe vera juice was found to be 0.89 ± 0.65 crude fibre content, 3.25 ± 0.15 protein content and 0.68 ± 0.02 ash content. Similar results were reported by *Jorge M. Vieira et al., (2016)*.

S.No.	Name of Experiment	Results (%)
1.	Crude fibre	0.89 ± 0.65
2.	Protein	3.25 ± 0.15
3.	Ash	0.68 ± 0.02

Table 7.2: Proximate nutrient composition of Aloevera:-

7.1.3 Proximate analysis of Mint Leaves

The estimated chemical composition of mint leaves was estimated to be 41.76± 0 Antioxidant activity, 50.4±1.2 Ascorbic acid, 31.4±0.5 Crude fibre, 6.8±0.4 protein and 0.9±0.2 fat content. Similar results were reported by *Anju et al., (2012)*.

S.No.	Name of Experiment	Results (%)
1.	Antioxidant Activity	41.76± 0
2.	Ascorbic acid	50.4±1.2
3.	Crude fibre	31.4±0.5
4.	Protein	6.8±0.4
5.	Fat	0.9±0.2

Table 7.3: Proximate nutrient composition of Mint.

1. Ahmed, M., & Hussain, F. (2013). Chemical composition and biochemical activity of Aloe vera (Aloe barbadensis Miller) leaves. *Int. J. Chem. Biochem. Sci*, *3*, 29-33.
2. BahramParvar, M., & Goff, H. D. (2013). Basil seed gum as a novel stabilizer for structure formation and reduction of ice recrystallization in ice cream. *Dairy Science & Technology*, *93*(3), 273-285.
3. Blitz, J. J., Smith, J. W., & Gerard, J. R. (1963). Aloe vera gel in peptic ulcer therapy; Preliminary report. *Journal AOA*, *62*.
4. Carocho, M., Barros, L., Barreira, J. C., Calhelha, R. C., Soković, M., Fernández-Ruiz, V., ... & Ferreira, I. C. (2016). Basil as functional and preserving ingredient in "Serra da Estrela" cheese. *Food chemistry*, *207*, 51-59. KEEP ET AL
5. Dudonné, S., Vitrac, X., Coutiere, P., Woillez, M., & Mérillon, J. M. (2009). Comparative study of antioxidant properties and total phenolic content of 30 plant extracts of industrial interest using DPPH, ABTS, FRAP, SOD, and ORAC assays. *Journal of agricultural and food chemistry*, *57*(5), 1768-1774. KEEP ET AL
6. Gade, J., More, S., & Bhalerao, N. (2015). Formulation and characterization of herbal cream containing Fenugreek seed extracts. *Int J Sci Res*, *5*, 1-4.
7. Goff, H. D. (1997). Colloidal aspects of ice cream—a review. *International Dairy Journal*, *7*(6-7), 363-373.
8. Gülçin, I., Elmastaş, M., & Aboul-Enein, H. Y. (2007). Determination of antioxidant and radical scavenging activity of Basil (Ocimum basilicum L. Family Lamiaceae) assayed by different methodologies. *Phytotherapy research*, *21*(4), 354-361.
9. Hussain, A. I., Anwar, F., Sherazi, S. T. H., & Przybylski, R. (2008). Chemical composition, antioxidant and antimicrobial activities of basil (Ocimum basilicum) essential oils depends on seasonal variations. *Food chemistry*, *108*(3), 986-995.
10. Javed, S. (2014). Aloe vera gel in food, health products, and cosmetics industry. In *Studies in Natural Products Chemistry*(Vol. 41, pp. 261-285). Elsevier. ????????
11. Jothi, D. (2009). Experimental study on antimicrobial activity of cotton fabric treated with aloe gel extract from Aloe vera plant for controlling the Staphylococcus aureus (bacterium). *African journal of microbiology research*, *3*(5), 228-232.
12. Kim, H. J., Jang, A., Ham, J. S., Jeong, S. G., Ahn, J. N., Byun, M. W., & Jo, C. (2007). Development of ice cream with improved microbiological safety and

acceptable organoleptic quality using irradiation. *Journal of Animal Science and Technology*, *49*(4), 515-522. KEPP ET AL

13. Kumar, S. W. A. S. H. A. N. K. H., Rai, D. C., & Singh, D. I. N. K. E. R. (2012). The functional, rheological and sensory attributes of Tulsi (Holy Basil, Ocimum sanctum) extract based herbal ice-cream. *The bioscan*, *8*(1), 77-80.
14. Manoharan, A. P., Ramasamy, D., & Gnanalaksshmi, K. S. (2013). Studies on Sensory Evaluation of Aloe Vera Ice Cream with Artificial Sweeteners and Natural Caramel Colour. PAGE NO
15. McKay, D. L., & Blumberg, J. B. (2006). A review of the bioactivity and potential health benefits of peppermint tea (Mentha piperita L.). *Phytotherapy research*, *20*(8), 619-633.
16. Moore, D. E., & McAnalley, B. H. (1995). *U.S. Patent No. 5,443,830*. Washington, DC: U.S. Patent and Trademark Office. PAGE NO
17. O'connell, J. E., & Fox, P. F. (2001). Significance and applications of phenolic compounds in the production and quality of milk and dairy products: a review. *International Dairy Journal*, *11*(3), 103-120.
18. Pinto, S., TRIVEDI, V., PINTO, S., & DARJI, V. (2014). Use of basil (tulsi) as flavouring ingredient in the manufacture of ice cream. *American International Journal of Contemporary Scientific Research*, *1*(3), 47-62.
19. Politeo, O., Jukic, M., & Milos, M. (2007). Chemical composition and antioxidant capacity of free volatile aglycones from basil (Ocimum basilicum L.) compared with its essential oil. *Food Chemistry*, *101*(1), 379-385.
20. Rajpal, V. R., Rao, S. R., & Raina, S. N. (Eds.). (2016). *Gene Pool Diversity and Crop Improvement* (Vol. 1). Springer.
21. Ramachandra, C. T., & Rao, P. S. (2008). Processing of Aloe vera leaf gel: a review. *American Journal of Agricultural and Biological Sciences*, *3*(2), 502-510.
22. Ryding, O. (1994). Notes on the sweet basil and its wild relatives (Lamiaceae). *Economic botany*, *48*(1), 65-67.
23. Scala, K. D., Vega-Gálvez, A., Ah-Hen, K., Nuñez-Mancilla, Y., Tabilo-Munizaga, G., Pérez-Won, M., & Giovagnoli, C. (2013). Chemical and physical properties of aloe vera (Aloe barbadensis Miller) gel stored after high hydrostatic pressure processing. *Food Science and Technology (Campinas)*, *33*(1), 52-59. KEEP ET AL

24. Schaller-Povolny, L. A., & Smith, D. E. (1999). Sensory attributes and storage life of reduced fat ice cream as related to inulin content. *Journal of Food Science*, *64*(3), 555-559.
25. Schulz, H., Schrader, B., Quilitzsch, R., Pfeffer, S., & Krüger, H. (2003). Rapid classification of basil chemotypes by various vibrational spectroscopy methods. *Journal of agricultural and food chemistry*, *51*(9), 2475-2481.
26. Singh, D., Rai, D. C., Bhinchhar, B. K., & Choudhary, B. L. (2017). Effect of Stevia on the Chemical Composition of Low Calorie Herbal Kulfi. *Int. J. Curr. Microbiol. App. Sci*, *6*(8), 1190-1196.
27. Sofjan, R. P., & Hartel, R. W. (2004). Effects of overrun on structural and physical characteristics of ice cream. *International Dairy Journal*, *14*(3), 255-262.
28. Soukoulis, C., & Fisk, I. (2016). Innovative Ingredients and Emerging Technologies for Controlling Ice Recrystallization, Texture, and Structure Stability in Frozen Dairy Desserts: A Review. *Critical reviews in food science and nutrition*, *56*(15), 2543-2559.
29. Su, F., & Lannes, S. C. (2012). Rheological evaluation of the structure of ice cream mixes varying fat base. *Applied Rheology*, *22*(6), 63871.
30. Tiwari, D. K., & Deen, B. H. A. G. W. A. N. (2015). Prepration and storage of blended ready-to-serve beverage from bael and aloe vera. *The bioscan*, *10*(1), 113-116.
31. Vieira, J. M., Flores-López, M. L., de Rodríguez, D. J., Sousa, M. C., Vicente, A. A., & Martins, J. T. (2016). Effect of chitosan–Aloe vera coating on postharvest quality of blueberry (Vaccinium corymbosum) fruit. *Postharvest Biology and Technology*, *116*, 88-97.
32. Wojdyło, A., Oszmiański, J., & Czemerys, R. (2007). Antioxidant activity and phenolic compounds in 32 selected herbs. *Food chemistry*, *105*(3), 940-949.
33. Deosarkar S.S, Kalyankar S.D, Pawshe R.D, Khedkar C.D (2016); Ice cream composition and health effects; Encylopedia of food and health, 3:385-390.
34. Vimol Srisukh, Walla Tungrugsasut, Nuntavan Bunyapraphatsara, Somchai Khuwattanasil, Somsak Wongpoomchai. Aloe ice cream and sherbet . Thai Journal of Phytopharmacy Vol. 13(2) Dec. 2006 - 15(1) Jun. 2008 PAGE NO
35. M.A. Elbandy, S.M. Abed, S.S.A. Gad and M.G. Abdel-Fadee. Aloe vera Gel as a Functional Ingredient and Natural Preservative in Mango Nectar. Journal of Dairy & Food Sciences 9 (2): 191-203, 2014 ISSN 1817-308X

36. Nafiseh Soltanizadeh ∗, Hossein Ghiasi-Esfahani. Qualitative improvement of low meat beef burger using Aloe vera Meat Science 99 (2015) 75–80

37. S.CastilloD.NavarroP.J.ZapataF.GuillénD.ValeroM.SerranoD.Martínez RomeroAntifungal efficacy of *Aloe vera in vitro* and its use as a preharvest treatment to maintain postharvest table grape qualityPostharvest Biology and Technology. 57, Issue 3 2010, Pages 183-188

38. MARY D. BOUDREAU &FREDERICK A. BELAND. An Evaluation of the Biological and Toxicological Properties of *Aloe Barbadensis* (Miller), Aloe Vera Pages 103-154 | Published online: 06 Feb 2007.Journal of Environmental Science and Health, Part C Environmental Carcinogenesis and Ecotoxicology Reviews Volume 24, 2006 - Issue 1

39. María Serrano[‡], Juan Miguel Valverde[†], Fabián Guillén[†], Salvador Castillo[†], Domingo Martínez-Romero[†], and Daniel Valero. Use of *Aloe vera* Gel Coating Preserves the Functional Properties of Table Grapes *J. Agric. Food Chem.* 54, 11, 3882-3886 KEEP ET AL

40. Luo Xianqun. Development of aloe beancurd with nutrition and health function《Science and Technology of Food Industry》 2001-01

41. F. Lukmanul Hakkim, C. Gowri Shankar, and S. Girija. Chemical Composition and Antioxidant Property of Holy Basil (*Ocimum sanctum* L.) Leaves, Stems, and Inflorescence and Their in Vitro Callus Cultures **J. Agric. Food Chem.*, 2007, *55* (22), pp 9109–9117

42. Eileen M.KweeEmily D.NiemeyerVariations in phenolic composition and antioxidant properties among 15 basil (*Ocimum basilicum* L.) cultivarsFood ChemistryVolume 128, Issue 4, 15 October 2011, Pages 1044-1050

43. Seung-Joo Lee, Katumi Umano, Takayuki Shibamoto, Kwang-Geun Lee Identification of volatile components in basil (Ocimum basilicum L.) and thyme leaves (Thymus vulgaris L.) and their antioxidant properties Food Chemistry 91 (2005) 131–137

44. Offia olua, B.I., Eluwa, Q. C. & Abuajah,C. Incorporation of papain into ice cream: Impact on pawpaw *(Carica papaya)* ice cream quality. International journal of biology Vol. 1, Issue 1, jun-jul 2016, pages 7-18