"DEVELOPMENT OF GALACTOBAR – A GALACTOGOGUES RICH PRODUCT"

PROJECT WORK

SUBMITTED TO DEPARTMENT OF PG STUDIES IN FOOD SCIENCE AND NUTRITION,

BESANT WOMEN'S COLLEGE, MANGALORE

IN THE PARTIAL FULFILMENT OF REQUIREMENT FOR THE AWARD OF THE DEGREE OF MASTER OF SCIENCE IN FOOD SCIENCE AND NUTRITION

Submitted By,

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October 2021

CERTIFICATE

This is to certify that the project work entitled ***"DEVELOPMENT OF GALACTOBAR – A GALACTOGOGUES RICH PRODUCT"*** is an authentic record of independent research work done by ***Mrs. AIYSHA NEELOFER (Reg.no:193041960)*** under my supervision during the period of **April 2021 to OCTOBER 2021**, submitted to Mangalore university for the partial fulfillment for the award of the degree of ***Master Of Science In Food Science And Nutrition*** and the present work has not been previously formed the basis for the award of degree, diploma, fellowship, associateship or other titles.

Place: BEKAL, KASARGOD

DATE: 30th October 2021

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CERTIFICATE

This is to certify that the project work entitled ***"DEVELOPMENT OF GALACTOBAR – A GALACTOGOGUES RICH PRODUCT"***, submitted to the ***Department of PG Studies in Food Science and Nutrition, by Mrs. AIYSHA NEELOFER (Reg.no:193041960)*** towards the partial fulfillment of the degree of ***Master Of Science In Food Science And Nutrition***, is a faithful record of original work carried out by her in the academic year ***2020-2021.***

Place: BEKAL, KASARGOD

DATE: 30th October 2021

HEAD OF THE DEPARTMENT

EXAMINERS:

1.

2.

DECLARATION

I, ***AIYSHA NEELOFER,*** hereby declare that project work entitled ***"DEVELOPMENT OF GALACTOBAR – A GALACTOGOGUES RICH PRODUCT"*** is a bona fide record of research work done by me under the supervision of ***Ms. ASIYAMATH SHAHDA FIRHATH .M.A.,*** **Assistant professor , Department of PG Studies In Food Science and Nutrition, Besant Women's College, Mangalore.**

The information depicted in the current report is the result of my own work, except where the reference is made. The information provided in the report is authentic as per my knowledge.

The results embodied in the project work have not been submitted to any other university or institution for the award of any degree, diploma, associateship, fellowship or similar titles.

Place: BEKAL, KASARGOD

DATE: 26 SEPTEMBER 2021

AIYSHA NEELOFER

ACKNOWLEDGEMENT

The following project work became reality with the kind support and help of many individuals and I would extend my hearty thanks to each one of them.

Firstly, I would thank the ***Almighty God***, for all the wisdom and patience he vouchsafed on me, along with my mother ***Mrs. SOUDHA NASIR*** ,my father ***Mr. ABDUL NASIR*** , my husband ***Mr. ABDUL SAMAD*** and my entire family for always being my pillar of support so that all my efforts turn fruitful.

It gives me immense pleasure to thank ***Dr. SATHISH KUMAR SHETTY.P***, ***Principal, Besant Women's College,Mangalore*** for his enormous support and encouragement to successfully complete the project work.

The project work would not have been successful without the valuable guidance and meticulous supervision of my guide ***Ms. ASIYAMATH SHAHDA FIRHATH .M.A., Assistant professor ,*****at** ***Department of PG Studies in Food Science and Nutrition, Besant Women's College, Mangalore.*** I would extend my unfeigned gratitude towards her.

It will always give me a great sense of gratification to ***Mrs. SHWETA SINGH, lecturer, at Department Of PG Studies in Food Science and Nutrition, Besant Women's College, Mangalore.***

I am very much privileged to portray my gratefulness towards the faculty of Department Of PG Studies in Food Science and Nutrition, ***Mrs. INDIRA BADYA, Ms. ROOPA RAO, lecturer at Department Of Food, Nutrition and Dietetics, Besant Women's College, Mangalore.***

I am very much grateful to my senior *Ms.* ***NIREEKSHA.V*** and my beloved friends.

Finally I would render my heartiest thankfulness to each and every unnamed who helped me out in various ways to complete my research work successfully.

Place: BEKAL, KASARGOD

DATE: 30th October 2021

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LIST OF ABBREVIATIONS

%	Percentage
g	Grams
mg	Milligrams
ml	Milliliter
kJ	Kilo joule
kcal	Kilo calorie
°C	Degree Celsius
cfu	Colony forming unit
F1	Formulation
F2	Formulation
F3	Formulation
F4	Formulation
F5	Formulation

ABSTRACT

Breast milk is considered the optimal food source for newborns through 1 year of age. less depleted as Lactation raises nutrient needs, mainly because of the loss of nutrients, first through colostrum and then through breast milk. Many factors influence overall maternal production, including maternal pain, illness, balance of time when returning to work, anxiety , or emotional stress. This study aims to develop a galactogogues rich product to improve the breast milk production. Project covers every piece of information about the raw materials used, the processing methods and their analysis. A cross-sectional study with purposive sampling including 40 mothers was conducted. Participation of the mother in the study was voluntary. A survey was done through social media where multiple-choice questions were given to mothers of age group between 19 to 40 years, who consumed galactagogues during their breastfeeding period. Survey showed Approximately 77.5% uses galactogogues and 22.5% do not uses galactagogues. The product was developed accordingly using Ingredients such as Chickpea, Oats, Fenugreek seed, Fennel seed, Sesame, and Almond to provide the maximum benefit of galactagogues to breastfeeding mother. The results represented that the galactagogues rich product- galactobar contains high amount of protien , iron and calcium based on proximate analysis, which is best for lactating women.

CHAPTER 1

INTRODUCTION

Mother's milk or breast milk is milk produced by mammary glands that is located in the breast of human female. Breast milk is the primary source of nutrition for new-borns which containing carbohydrates, fats, protein, vitamins and minerals. Breast milk should assurance the abundant nutrition of the infant as a continuation of intrauterine nutrition, and both the mother's nutritional status and her diet may influence breast milk composition. Nutritional requirements are higher in infancy than in any other stage of development, and there is evidence that the configuration of breast milk changes with time to adjust to the changing needs of the child. Though there is a vast body of literature on the physiology and disease of lactating women, the professionals that care for them often lack adequate knowledge about their nutritional requirements. The nutritional needs of women increase during pregnancy and lactation. During lactation, the mammary glands have a degree of metabolic autonomy that assure abundant milk composition. All mothers can produce milk inappropriate amounts and of appropriate quality , Unless they are extremely malnourished,.

1.0 INTRODUCTION

1.1 galactagogue

A **galactagogue** is the substance that can help a breastfeeding mother to raise her breast milk supply. The word itself is a union of the Greek terms "galact- & -ogogue". The meaning of “galact- is milk, and the meaning of "-ogogue" is promoting or leading. Lactating mothers are often disturbed or worried about an inadequate quantity of breast milk, designated as deficient milk supply. Many lactating mothers will seek out to increase the amount of breast milk production by using prescription drugs or herbs and foods called galactogogues. Galactogogues are defined simply as materials that promote lactation. The most common suggested galactogogues are domperidone, metoclopramide, metformin, and oxytocin. Many common foods and herbals have been traditionally used as galactogogues. Herbs are commonly used to boost low milk supply, but certain actions, medications and food can help a breastfeeding mother to make more breast milk.

Benefits of galactogogues:-

Galactogogues may be considered for deficient milk supply when nonpharmacologic mediation do not aid in raising milk supply. Galactogogues typically develop the prolactin levels and thus brgin the breast milk letdown reflex but also sometimes aid in breast milk ejection.there may be multiple mechanisms. Synthetic galactogogues comprise dopamine antagonists including domperidone and metoclopramide; antipsychotics like chlorpromazine, trifluoperazine, sulpiride, reserpine and thioridazine; hormones such as growth hormone, oxytocin, and recombinant human prolactin; and miscellaneous agents such as metformin.1-3 Domperidone, oxytocin metoclopramide, and metformin, are the most commonly used synthetic galactogogues due to their relative safety and efficacy in lactating women.

Although many lactating mother worry about making enough breast milk, most lactating mother will not need to use a galactagogue. If baby has a nice latch, and mother breastfeeding on demand at least every 2 to 3 hours, that mother can make sufficient breast milk for baby. However, there are some condition when a galactagogue is helpful.

When a Galactagogue Can Help:-

Struggling with a poor breast milk supply can be difficult and annoy. A galactagogue may help to stimulate the production of breast milk if

1.2 Lactations:-

Lactation describes the secretion of milk from the mammary glands and the period of time that the child is fed by lactating mother. The process naturally occurs with all post-pregnancy female, In humans the process of feeding milk is also called breastfeeding or nursing. Lactation is the period following pregnancy when the women nourishes a fully developed and a rapidly growing baby with breast milk. Most of the nutrients required by the baby are supplied by the breast milk. All the nutrients contained in the breast milk are derived from the mother body. Location therefare makes a considerable nutritional demand on the women. Infact, it improves great strain on the women even more than in pregnancy. The mother's diet and the state of nutrition influence the composition and output of the milk produced. Extra nutrients should be provided during lactation, so as to help the mother secrete enough milk and adequate level of nutrients.

1.3 Why galactogogue is used:-

Galactagogues are herbs, foods, or medications that may help to increase breastmilk supply typically by increasing prolactin levels. The use of a galactagogue requires consultation with a lactation consultant and/or medical adviser. While there are many materials or things that have been used by many mothers for centuries that are helped them make more breastmilk. There is less scientific evidence to prove their effectiveness. Many cultures have special foods that are thought to increase milk production. These vary and may hold active ingredients to fulfil this purpose. However, they have not been formally studied.

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1.4 Maternal Stress and Lactation:-

Lactating women interact more positively with their babies, and lactating mothers are more wish to describe low anxiety and positive mood states. Successful lactation require the oxytocin-mediated milk ejection reflex and neuroendocrine adaptations of the HPA and gonadal axes. The breast-feeding women who has decreased plasma ACTH, cortisol, glucose responses to treadmill stress tests, AVP, and epinephrine, advises that, under normal conditions, during

lactation there is a selective inhibition of the hypothalamic stress response (stress hyporesponsive period). Central actions of oxytocin have been connected as a cause of the downregulation of HPA axis reactivity. On the other hand, it has long been known that stress and hormonal products of the HPA axis can influence the release and actions of oxytocin. Milk ejection is discouraged by stressful experiences, suggesting that oxytocin secretion in women could also be inhibited by stress

1.5 Maternal anaemia:-

Lactating mothersor breast feeding mothers are vulnerable to anaemia. During the period of lactation, lactating mothers are susceptible to anaemia because of blood loss and maternal iron depletion during childbirth. Although breast milk is not a good source of iron, the iron concentration in breast milk is independent of maternal iron status, quality of breast milk is maintained at the expense of maternal stores(.2 3). In lactating mother, Postpartum anaemia is seen highest range who are anaemic during pregnancy.(4)moreover, breast feeding mothers are highly susceptible to iron depletion if the nutrient and the energy intake is inadequate in their diets. Breast feeding mother begin the postnatal period after having iron depleted through the continuum from pregnancy to childbearing.(5)

1.6 Chickpea

Chickpeas, or garbanzo beans , are a common legume used in Middle Eastern cooking and Mediterranean. Lactating women have been eating chickpeas to make adequate breast milk since the ancient Egyptian times. Chickpeas are a nutritious food that is protein rich .Chickpeas provide 20% of daily intake of protein, folate, fiber, phosphorous and iron . They also contain other nutrients like magnesium, zinc, Thiamin,and vitamin B6. Chick peas contain plant estrogens that may be responsible for its use as a galactagogue.

Chickpeas are natural galactagogues, a substance that encourage lactation. In addition, adequate protein is crucial for producing enough breast milk for new born baby. Chickpeas have one of the more protein availability of any legume or plant, improving the quantity and quality of breast milk. Chickpeas are full of Nutrients and Galactagogue,they are promoter of Lactation. It is more nutritious,and it is easily available and is a great tool for making healthy eating effortless. Chickpeas are readily available at any store, and they are very cheap, too.

1.7 Oats

Whole grains are very nutritious for lactating mothers . They are having properties that hold up the hormones accountable for making breast milk. So, eating whole grains may develop breast milk supply.

Whole oats provide carbohydrates,protein and soluble and insoluble dietary fiber .Oats have several important and required micronutrients, including vitamin E, vitamin B6, iron, folic acid, zinc, copper, and magnesium (5). These nutrients can help in postpartum recovery and also supporting the baby's health through breast milk (6).The whole grain is a good source of iron (iron content in half a cup of dry oats is almost close to 2 mg, or around 20%of what lactating mother require per day), and. It is accepted to have lactogenic properties that boost breast milk supply. Traditionally in many cultures, oats is used as a galactagogue. Lactation mothers and old aged people believe that oats may increase the oxytocin hormone production, which can help increase the production of breast milk (2). However, there is no proof or conclusive scientific evidence that oats can increase breast milk. it can also Improves digestive health, oats contain fiber, that could improve bowel movement, thus avoiding or easing constipation. it may also promote gut microbiota, which may improve digestive issues, like irritable bowel syndrome (1). Consumption of fiber-rich foods by lactating mother , such as oats, may improve composition of breast milk and promote infant health (7).

1.8 Almonds:-

Raw almonds contain full of calcium and protein. They are healthy. Many lactating mothers select to drink almond milk or eat almonds to increase the sweetness, creaminess, and amount of their breast milk. Almonds are protein rich, fibre, vitamin E, calcium, magnesium, copper, and riboflavin. Almonds are also good a source of iron, potassium, zinc and the thiamine, B vitamins, niacin, and folate. .high amount of proteins present in the almonds helps in the brain and IQ developmental process of baby. 30grams of almonds contain almost 13g of healthy unsaturated fats and 1g of saturated fat. Mixing dry fruit to postnatal diet can help to boost and increase baby's immunity and pace of recovery. It also keeps infant more healthy and active. They are also able to build up immune power in the body naturally. Consuming almonds during breastfeeding benefits for lactation and hair fall problems after pregnancy. Proteins rich almonds will take good care of post pregnancy hormonal balance and hair fall.

1.9 Fenugreek:-

Fenugreek has been known to have good galactogenic properties that having unique character that boost the supply of breast milk and also improves the quality of breast milk. Fenugreek is basically an herb, and it is the seeds of herbs that are used to enhance the milk supply. Diosgenin is the main ingredient in the fenugreek seed, that helps in enhancing and developing the milk flow,improve the quality and quantity of milk . The herb has been used by mid-wives, mothers and dayimaas for centuries to help to increase the breast milk supply.

The healthy nutritional profile of Fenugreek seeds is containing a high amount of minerals and fiber, iron and magnesium.One tablespoon (11.1 grams) of whole fenugreek seeds contains 35 calories and nutrients like Protein(3 grams), Fiber(3 grams), Carbs(6 grams),Fat (1gram), Iron(20% of the Daily Value),Manganese (7% of the daily value),Magnesium(5% of the Daily value). Fenugreek acts as a galactagogue, a materials that promotes lactation. Fenugreek also provides some plant chemicals that are close to female sex hormone, estrogen. Consumption of fenugreek seed must be in moderate amount.

1.10 Fennel Seeds (Saunf):

It is believed that fennel seeds are used to enhance the milk supply in lactating mothers. Although there is no proof and no direct evidence for this but it is justified by the fact that it is a good source of phytoestrogens,which leads the growth of breast tissue. Consumption of fennel seeds must be in moderate amount.because It is effective diuretic. These are rich in vitamin C. It contain sodium, potassium,vitamin A, dietary fiber , calcium and megnessium. it is zero free from cholesterol.

1.11 Sesame:-

Black sesame seeds are known to increase milk supply in lactating mothers. Sesame seeds are a lactogenic food, meaning they help to enhance and develop the breast milk production. Sesame seeds are calcium rich and healthy polyunsaturated fats, omega 6 fatty acid, and minerals, which may explain some of their effects on breast milk.they provide good amount of iron too and sesame seed also contains estrogen like plant properties.

Calcium intake is especially important during lactating mother and pregnancy for the bone health of the breast feeding mother and baby. High in calcium and estrogen-like plant properties, lactating mothers use sesame seeds to increase the breast milk supply .

1.12 Jaggery:-

Jaggery is an good source of iron.. A single serving may contain nearly 10% of needed iron intake for the day. Iron is critical for carrying healthy blood cells. It is rich in calories, fat, carbohydrates ,protein, fiber, and sugar . Jaggery also contains more minerals and vitamins than many other sweeteners.

Iron deficiency is one of the most common nutrient deficiencies seen in lactating period. Iron is more important for the formation of healthy muscle cells and blood and can cause fatigue and muscle weakness for both mother and baby. Jaggery is an good source of plant-based iron. While a single serving of jaggery is not enough to meet daily iron requirement , replacing refined sugar with jaggery will add more iron to diet and help to decrease the risk of developing anemia.

Breast feeding has countless positive health suggestion for lactating mothers and children. Therefore, breastfeeding is recommended for all willing and able mothers and infants. Yet there are many barrier to successful breastfeeding, even with the most motivated mothers. One major obstacle is the prevalence of insufficient milk supply, which may be as high as 15% in new mothers.(3)The causes are many, and all possible causes should be investigated and considered. As part of this consultative evaluation, the selection and use of galactogogues can be a reasonable and usable choice. Information presented in this study can be the basis for making objective and informative decisions.

CHAPTER 2

REVIEW OF LITERATURE

Developing a new product is a complex process. This requires knowledge of ingredients, processing methods, consumer demands and preferences etc. Having knowledge of these aspects helps one to make the right decision. This study focuses on developing a galactobar burfi which is galactogogues rich product . In this study, oats, chickpea, almond, fenugreek, fennel, and sesame have been used as the base because these shows galactogogue properties. Review of available literature provides the foundation for the product development process.

2.0 REVIEW OF LITERATURE:-

2.1 Galactagogues

Tin Fei Sim *et al.*, (2015) studied on the importance the potential psychological benefits of herbal galactagogues, and its effect on breast feeding adequacy, through In-depth semi structural interviews with women using herbal galactagogues. The qualitative research methodology was used for relevant, rich and in depth information. The study declared that herbal galactagogues were very effective in terms of enhancing breastfeeding adequacy.

Ainun Syuhada Mahasan *et al*., (2019) described the knowledge and practice of Galactagogues consumption among breastfeeding mothers in Kuantan, Pahang. The study determined the relationship between the effects of galactagogues on milk production and socio-demographic data, lactation period, complementary breastfeeding or exclusive breastfeeding training, problem with breastfeeding, and frequency of consumption. 120 mothers were selected through cross-sectional study, and the questionnaire consists of 61 questions, divided into 4 sections, where section C includes questions about the consumption experience of galactogogues, including which type of galactagogues taken by mothers on food, herb or drug , the frequency of galactogen consumption, the brand of galactagogues taken, milk production, side effects, the importance of galactagogues, and the influence of galactagogues on breastfeeding and galactagogues. Data s were collected and qualitatively analyzed. The research claims there is a significant relationship between the consumption of galactogogue in milk production and the concluded as there was a good knowledge and training on galactagogues consumption among breastfeeding mothers in Kuantan.

Alessandra N Bazzano *et al*., (2017) analyzed maternal experiences and sources of information with Galactagogues to support breastfeeding. She mentioned the use of herbal galactagogues among lactating mothers in the US is on the rise in the market, and the issue of how to provide a better support and information on the use of galactagogues, especially in the limited availability and the steady rate of breastfeeding globally, Found out using online questionnaires format with 188 breastfeeding mothers. Most mothers responded by using galactagogues to increase

breastfeeding. The results claimed that most women learned about galactagogues from the internet or by words of mouth through friends, and counseling support was inadequate.

Lisa Marasco (2008) Described about increasing milk supply with galactagogues. She mentioned mothers who think their babies do not have enough milk, which is why mothers give formula to their babies. , There is little research on how many foods and herbs increase milk, and it is easy to learn about drugs. She explained when a person should try galactagogues, the best food, herbs or drugs, And galactagogues are not magic, cannot boost milk supply if milk is regularly taken out of breast by breastfeeding or pumping, and taking milk out more times tells body to make milk faster, and taking galactagogues along with better breastfeeding for every 2 to 3 hours help to boost milk supply.

Husna Zaki *et al*., Evaluated the galactogogues consumed by breastfeeding women in the Sunni Muslim community, and determined the nutritional composition of galactogogues used by the Sunni Muslim community. Data collections done by interview cum questionnaire method and The questionnaire was developed to gather the necessary information about galactagogues and their composition. The nutritional value of galactagogues was calculated using the nutritional value of Indian foods. The study claims that breastfeeding mothers in the Muslim community are given a variety of foods to increase milk production, Such as Achwani, Battisa laddu, harila, nuts, chickpea, almond, fennel etc. The study declared that galactagogue are drugs that promote adequate milk production. Milk production is a complex process in which nutrients interact with structural hormones and behavioral influences.

Neha kaje *et al*., (2014) evaluated how traditional food effect the nutritional status of the breastfeeding mother and the growth of their babies to gain weight in first six months after delivery. Datas are collected by collecting the Samples of 125 Indian breastfeeding mothers were evaluated within 6 months after anthropometry and Diet by 24 hour recall on three random days, along with socioeconomic factors, lactation history and infant's birth weight and current weight. The study claimed that traditional foods contain 50% calcium, 33% iron, 38% zinc and 13% vitamins. Mothers who ate traditional foods showed significantly higher levels of fat than mothers who did not have traditional foods. And study concluded that higher weight gain was seen in traditional food supplements mother and infant of traditional food supplements mothers.

Higher weight gain is more seen in mothers on traditional dietary supplements, and in infants of mothers on traditional dietary supplements.

2.2 Breast Milk

Edward. R. Newton (2004) mentioned that, it is a common misconception among physician and the public that artificial breast milk is equivalent to human breast milk. Artificial breast milk has a very different chemical composition than human breast milk, and human breast milk is biologically suitable and remains the best source of nutrition for the human baby. Breast milk provides the necessary support to the developing immune system, breast milk provides all the essential nutrients in the right proportions, protects against allergies, obesity and disease, protects against diseases such as cancer and diabetes, and protects against infections. He explained about basic components of newborn nutrition, he done the comparison of water-soluble vitamins and fat soluble vitamins in various milk sources, and mentioned the content of selected minerals in various milk sources. The study concluded that breast milk was uniquely designed to accommodate the biological needs of the human baby, the unique human need for brain development, and the immune system.

2.3 Calcium

Ann prentice *et al*., (1995) Described that the recommended amount of calcium for women during lactation is high, and breastfeeding mothers secrete 200 mg of calcium into breast milk every day. The highest recommended dietary allowance is 1200 mg of calcium per day, and it is recently to increase calcium by 400 -600 mg/d compared to non pregnant and non lactating women. The study claims that breastfeeding women engage in a low-calcium diet, making temporary changes in renal and skeletal physiology that provide a significant proportion of the calcium needed for breast milk production and that an increase in current calcium does not affect breast milk calcium concentration.

Ann Prentics (2000) reviewed his understanding of calcium and bone metabolism during human pregnancy and lactation, and discussed the relation to the calcium nutrition of the mother. He mentioned that Pregnancy and lactation are distinguished by physiological adaptive processes,

which, free from maternal calcium intake, provide the calcium needed for breast milk production and fetal growth and without requiring an increase in maternal calcium. He explained about calcium nutrition in pregnancy, maternal calcium, bone marrow, fetal blood pressure, fetal growth, and bone mineralization during pregnancy. He noted that the average calcium transfer between mother and baby during full breastfeeding is 200 mg per day. A mother who is breastfeeding for more than 3 to 6 months will transfer more calcium through the breast milk during one lactation period than will be transferred throughout the placenta throughout pregnancy.

Hanna Olausson *et al*., (2012*)* discuss the pregnancy and lactation are times when calcium is needed more. Calcium is transferred throughout the placenta for skeletal mineralization of the fetus, and is distributed to the mammary gland for secretion into breast milk. In principle, these extra maternal needs can be met by the accumulation of calcium from the skeleton, the efficiency of intestinal calcium absorption, renal calcium retention, or an increased dietary intake of calcium. The extent to which any or all of these are applicable, the underlying biological systems, and the potential consequences of motherhood are the focus of the current review on short- and long-term infant bone health. The study claims that human pregnancy and breastfeeding are changes in calcium and bone metabolism that support the transfer of calcium between mother and baby. Changes generally appear to be independent of maternal calcium distribution, with calcium intake close to current recommendations. And Evidence suggested that these processes are physiological in humans and provide the calcium needed for fetal growth and breast milk production, without relying on increased calcium in the diet or compromising long-term maternal bone health.

Christopher. S. Kovacs (2005) Mentioned that the mother has significant needs regarding pregnancy and breastfeeding to provide adequate calcium for the fetus and newborn, and Women lose 300 to 400 mg of calcium per day through breast milk, and 5 to 10% of skeletal minerals are lost within 6 months of breastfeeding. Most importantly, the lost minerals are completely restored within a few months of weaning, which mean that breastfeeding women do not have a long-term deficiency of bone mineral salts.

2.4 Protein and Energy

Kathryn G. dewey (1997) mentioned that the breastfeeding woman needs extra energy about 670 kcal / day. If one is to allow for gradual weight loss, the net gain requires 500 kcal per day. There is ample evidence of energy-sparing adaptations to basal metabolic rate or diet-induced thermogenesis during breastfeeding, although, physical activity may decrease during the postpartum period. In women with adequate fat reserves, a moderate negatives energy balance is more likely to affect breastfeeding. It is recommended to consume protein at this time. Breastfeeding is estimated to be 15 g per day based on the protein concentration of one milk and 11 g per liter. However, considering its protein price, non-protein nitrogen in human milk, the increase in protein is about 20 grams per day, and Breastfeeding women's energy needs are calculated using a factorial method that takes into account breast milk volume, milk energy concentration, and the efficiency with which breast energy is converted into breast milk. Study suggested there is an increase of about 30% for energy and 40% for protein for exclusively breastfeeding women compared with the need for normal women.

2.5 Iron

J. Haidar *et al.*, (2004) determined the Effectiveness and social efficacy of a daily and weekly iron supplements for the treatment and prevention of iron deficiency in anemic mothers. The study, which compared the daily versus weekly iron supplementation schedule before and after the intervention of the seven urban slum communities in Techlehimanot Verda, Ethiopia, has a longitudinal character. The weekly supplementary group (n = 68) received one tablet per week every Monday, and the daily supplementary group (n = 71) received 60 mg of elemental iron, containing 300 mg of ferrous sulfate and 400 µg folic acid from Monday to Friday, and in the controlled group (n = 68) was not advised to take the medication without the investigator's knowledge, and Concentration of Heamoglobin and serum ferritin were compared before and after the intervention. At the end of the study, hemoglobin levels increased significantly, with the anemia rate is decreasing from 6.9% to 1.6% in daily, weekly supplemented group from 6.7% to 1.7% , and the control group from 6.7% to 6.1%. The study concluded that the weekly supplement was simpler and more economical advantageous compared to the daily supplement.

K.K. Sharma (2003) Explained how the National Tenth Plans aims to control iron deficiency anemia by increasing the bioavailability of iron in Indian food through dietary approaches such as food fortification, dietary diversification, folic acid , and iron supplementation, along with programs to control parasites in the agricultural sector. Factors such as non-home iron, phytate, polyphenols and calcium are known to reduce the bioavailability of iron. The study claimed that consumption of ascorbic acid (reduces ferric iron to a more absorbed form by 75-98%), production and distribution of more iron-rich foods; Increases the bioavailability of iron, and their use in combination with fermentation, germination, and mating of legumes and grains to reduce phytate levels and increase ascorbic acid.

2.6 Product development for lactating women

Kulsum Jan *et al.*, (2012) she described fortified nutribar are popular food which provide nutrition to different age groups widely recommended for consumption by pregnant, lactating women which effective for enhancing their nutrition. Despite its interesting nutritional value, the Nutrition Bar also offers some medicinal properties such as neutral, carminative, nutrient rich, lactogenic, and rubefacient. And mentioned, traditional ingredients such as fenugreek, dried ginger and gum acacia can be added to Nutribar to increase breast milk production. And other ingredients such as almonds, etc. Chemical characteristics Moisture, ash, and fat levels were determined according to the AOAC 2000 methods, the protein content was determined by the Kjeldhal method, the protein content was obtained using the conversion factor and the dietary fiber and carbohydrate content was also differentiated. The growth of yeast, mold, and salmonella were examined by microbiological analysis at different intervals at different temperatures. Sensory assessment was evaluated. Proximate composition of the nutribar samples resulted in a gradual increase for protein, ash, carbohydrate, and dietary fiber. The study claimed that galactagogues and fortification of nutrients increases the nutrition and the health benefits of nutribar. Microbial analysis showed that the bar is safe for consumption.

2.7 Chickpea

Biletska.Y *et al*., (2020) analyzed the content of phytoestrogen and isoflavonoids using grains and flour of chickpea and soybeans .The study of phytoestrogen and isoflavonoids are

determined by method of differential spectrophotometry . The study estimated the content of phytoestrogen is more in native chickpea grain compared to during germinating, drying.

A.K.Jukanti *et al., (*2012*)* found out the nutritional important of chickpea and its role in improved nutrition and health. He Stated that the chickpea is higher protein bioavailability, dietary fibre content and protein digestibility of chickpea are higher than other pulses , oil content is less in chickpea and it has nutritionally & medical benefit tocopherol, sterol and tocotrienol. Chickpea provides minerals like zinc, iron, magnesium, calcium and essential vitamins. He concluded as it is essential that the scientific community continues to find mechanism in the prevention of disease and determining dietary bioactive from food such as chickpea can influence human health. The study claims that more research has been done, especially well, to provide clear evidence of health benefit of chickpea consumption.

Lovemore Nkhata Malunga *et al., (2014)* described that the childhood malnutrition is common disease in developing countries. He explored the possibility of using chickpea in infant formula in formula production, contrary to the requirement of the World health organization/ FA on complementary foods and EU rules on the follow on – formula. Methods are used to determine the protein content was AOAC method, HPLC method to find out amino acid content, disaccharides (sucrose and maltose) and glucose. Boiled, dried and dehull the chickpea to reduce associated anti- nutrition factor after the 72 hours of germination. He found increased in protein content for processed chickpea and the study claimed that resulting flour (infant follow on-formula) was similar to the requirement of amino acid and protein contents of the reference of protein(0-24 months children) of WHO/FAO. He concluded chickpea is rich in carbohydrates & proteins; it is affordable for developing countries without compromising the nutrition quality.

2.8 Oats

Kelly Bonyata *et al.*, (2017) mentioned that eating a bowl of oatmeal is healthy for the mother, is a simple way to increase the milk supply. Oats are good sources of iron, which can treat maternal anemia and increase the milk supply. Oats can reduce the cholesterol level, and eating oats everyday can see an increase in the milk supply. The study claimed that oats are a comfortable food for many women.

Apeksha A. Gulvady (2013) Mentioned nutritional structure of oats, micro and macro nutrients between oats and other grains. The study explained the 100gram of oats contain 58.7g of carbohydrates, 14g of protein, 9g of dietary fiber. Oats have high lipid content, 2.2g monounsaturated fat, 1.2g saturated fat, 2.5g polyunsaturated fat (0.11g alpha linolenic acid, 2.4g of linoleic acid. The study concluded that oats contain wide of nutrients which is benefits for human health, and Oats have a high amount of protein, micro nutrients, and water-soluble fiber content in the form of bita glucan.

Vita sterna *et al.*, (2015) Described A healthy diet rich in fiber, fat-soluble vitamin E, beta glucan and polyunsaturated fats. He aimed to study the structure and nutritional value of oat grains. The oats samples were tested for infratec analyzer, enzymatic gravimetric method using fibertex filtration module used to determine dietary fibre composition, liquid-chromatography methods were used to find the content of fatty acids, amino acids and alpha- tocopherol and statistical analysis was also done. The study concluded that oats are rich in biologically significant substances, and that their consumption in the human diet is beneficial to human health

2.9 Almond

A.Josephine carmel ravi *et al.*, (2016) She learned to evaluate the effectiveness of almond powder while breastfeeding among postpartum mother. She said the amount of milk produced depends on how often the mother breastfeeds. Datas are collected by both experimental and control group.One of the main reasons given by mothers for early termination of breastfeeding is their perception of inadequate milk supply.30 g of dry and powdered almonds mixed with 100 ml of milk were tested in the postpartum mother for 5 days. the data were analyzed using descriptive statistic such as mean, standard deviation , frequency and percentage and inferential statistic like paired "T" and unpaired "T" test , chi square test. The results revealed that the experimental mothers had adequate 86.7% breast milk secretion and a 100% satisfactory level in the control group. Differences between pretest and posttest scores, Average variance and mean variance were analyzed. This difference shows the effectiveness of almond powder in increasing the amount of breast milk, which is statistically significant in the experimental group. The study concluded the almond powder has increased adequacy of breast milk secretion.

2.10 Sesame

Arafa Elgorashi Musa abdulla (2014) Aimed to test the effects of roasted sesame diet as a natural source of iron in certain hematological parameters in pregnant women and a daily dose of 100 grams of sesame seeds were given to determine their iron content. Questionnaires and two laboratory tests were used for data collection. The results claimed that hemoglobin levels increased significantly and serum iron levels increased, and the study suggested the use of sesame seeds because it contains a high percentage of iron, which meets the daily requirement of iron during pregnancy and has no side effects of any kind.

Makinde, F. M *et al*., (2013) determined the proximate composition, vitamins, minerals, and anti-nutritional factors of the whole seeds, hulls and dehulled seeds. And effect of germination, soaking, roasting, autoclaving, cooking on the anti-nutritional factors were found for dehulled and whole seeds. Two type of sesame (white and black) were used in study. The study found that moisture (4.81-5.41%) , protein (21. 9 – 23.6%) ,fat (45. 6 – 46.1%), ash (6. 16 – 7.34%), carbohydrates (10. 8 – 17.0%)and crude fibre (4.70 – 7.15%)range of proximate composition for whole sesame, And fat (47.7 to 49.9%), protein (25.3 to 26.8%), and carbohydrates (9.7 to 12.4%) range of proximate composition for dehulled sesame. The hulls have fewer amounts of fat, protein and carbohydrates. Calcium (473.6 to 521.9 mg/100g) was highest, phosphorus (466.0 to 482.8 mg/100g) , and potassium(465.7 to 468.8 mg/100g) in whole seeds. Calcium, phosphorus, potassium are less in dehulled seed and hulls, And whole seeds contain high amount of anti-nutrients level, also contains thiamine (0.71 to 0.83 mg/100g) and riboflavin (0.36 to 0.38 mg/100g).

CHAPTER 3

MATERIALS AND METHODOLOGY

After analyzing the findings and conclusions so far with the help of a literature review, the method for the development of the product was selected. This section covers every piece of information about the raw materials used, the processing methods and their analysis. A cross-sectional study with purposive sampling including 40 mothers was conducted. Participation of the mother in the study was voluntary. A survey was done through social media where multiple-choice questions were given to mothers of age group between 17 to 40 years, who consumed galactagogues during their breastfeeding period. Their feedback regarding galactagogues was noted and the product was developed accordingly to provide the maximum benefit of galactagogue to the breastfeeding mother.

3.0 MATERIALS AND METHODOLOGY

3.1 MATERIALS

3.1.1 Ingredients

The raw ingredients required for Galactobar preparation (oats, chickpea, almond, fenugreek, fennel, sesame, jaggery and ghee) were purchased from the local wholesale retailer in Uppala..

Table 3.1.1: *Ingredients Used For Galactobar preparation.*

INGREDIENTS	**COMPOSITION OF GALACTOBAR (100g)**
Oats *(Avena sativa)*	25g
Chickpea *(Cicer arietinum)*	25g
Almond *(Prunus dulcis)*	20g
Fenugreek *(Trigonella foenum)*	2g
Fennel *(Foeniculum vulgare)*	2g
Sesame *(Sesamum indicum)*	3g
Jaggery , **cane** (*Saccharum officinarum)*	13g
Ghee, (cow)	10g

Plate 3.1.1:- *Ingredients Used For Galactobar Preparation*

3.2 METHODOLOGY

3.2.1Quality assessment of ingredients:

All the raw materials (oats, chickpea, almond, fenugreek, fennel, sesame, jaggery and ghee) were subjected to adulteration tests.(FSSAI)

Table 3.2.1: *Adulteration Tests for Quality Analysis.*

INGREDIENTS	**ADULTERANT TESTED**	**TEST**
Oats	Extraneous matter (dust, stone, straw, insect, hair)	To 2-3 g of sample were placed in a petridish and were visually examined

Chickpea	Extraneous matter (dust, stone, straw, insect, hair)	To 2-3 g of sample were placed in a petridish and were visually examined
Almond	Extraneous matter (dust, stone, straw, insect, hair)	To 2-3 g of sample were placed in a petridish and were visually examined
Fenugreek seed	Little stones or grit	To 2-3 g of sample were placed in a petridish and were visually examined
Fennel seed	Malachite green dye	Easity identified by bitter taste
Sesame	Extraneous matter (dust, stone, straw, insect, hair)	To 2-3 g of sample were placed in a petridish and were visually examined
Jiggery	Washing soda	To 1g of melted sample, few drops of concentrated hydrochloric acid (HCl) were added. Mixed well

	Chalk powder	To 1g of melted sample, few drops of concentrated hydrochloric acid (HCl) were added. Mixed well
	Metanil yellow colour	To 1g of melted sample, 3ml of alcohol and few drops of concentrated hydrochloric acid (HCl) were added. Mixed well
Ghee	Coal tar dyes	To 1ml of melted sample, 5ml of concentrated sulphuric acid (H_2SO_4) was added in a test tube, shaken well.
	Vanaspati/ margarine	To 1ml of melted sample 1ml of concentrated hydrochloric acid (HCl) and a pinch of sugar was added . Mixed well.

	Starch	To 1ml of melted sample, 0.1N iodine solution was added and mixed well.

3.2.2 EQUIPMENTS AND GLASSWARES

Analytical balance (Essae Model No FB-6000), Hot air oven (Lab tech Universal Hot Air Oven Model No BD150), Muffle Furnace (Roteck Muffle Furnace), Desiccator, Spectrophotometer (Double beam Spectrophotometer Model No 2375), Centrifuge (Remi model No R-8C), Water bath (Labtech Serological Water bathmodel No 57).
Petri plates (80 × 17), crucibles (infuse), burette (borosilicate glass 3.3), conical flask (boro 3.3), standard flask (borosilicate 3.3), micropipettes(daytech), test tubes (borosilicate3.3), cuvettes (glass square cuvette, light path10 mm), glass tube, spatula.

3.2.3 CHEMICALS USED

Medilise chemicals, Kerala:
Sulphuric acid (CAT No MS1332), Sodium hydroxide pellets (CAT No MS336)

Changshu Hong Sheng Fine Chemicals Colimited, China:
Ethanol (18- 06 – 30)

Indus Labs, Hassan:
Distilled water (CAS No 7732-18-15)

Sisco Research Laboratories Private Limited, New Mumbai:

Potassium permanganate (73-53-9), potassiumpersulphate, potassium thiosulphate solution.

3.2.4 Standardisation

3.2.2 (a) Soaking

The raw chickpea seeds (about 25g) were subjected to soaking in a bowl with tap water for 12 hours at room temperature with the lid closed.

3.2.2 (b) unsoaked

The raw chickpea seeds (about 25g) were used directly.

3.2.2 (c) Unroasted and Powdered

The fennel seeds, fenugreek seeds and sesame seeds were used directly without roasting and then powdering it.

3.2.2 (d) unroasted and unpowdered

The fennel seeds, fenugreek seeds and sesame seeds were used directly without roasting and without Powdering.

3.2.2(e) roasted and powdered

The fennel seeds, fenugreek seeds and sesame seeds were subjected to dry roasting and Powdering.

3.2.5 Sensory evaluation of processed sample

The sensory evaluation for the processing methods was carried out using 9 point hedonic scale rating (Peryam,1957).

3.2.6 Processing of bulk sample

3.2.4 (a) Oats

About 2kg of oats was dry roasted and were powdered using mixer grinder. The powdered flour was stored in an airtight container until used.

3.2.4 (b) Chickpea

About 2kg of chickpea seeds were soaked in 20 liters of filtered (RO) water for 12 hours, after soaking the water was drained and the seeds cooked for 3 visil in the cooker and were drained completely and the sample were sundries for 5 hours and were powdered using mixer grinder. The powdered flour was stored in an airtight container until used.

3.2.7 Nutritional estimation

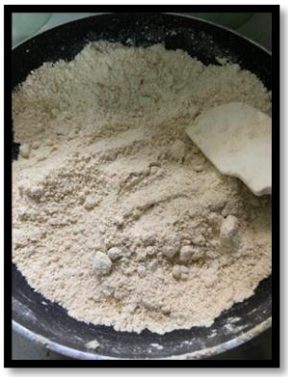
The nutritional estimation for the processing methods was carried out

Table 3.2.5:- *The nutritional estimation for the processing methods*

Menu	**Ingredients**	**Amounts (gm./l)**	**Energy (Kcals)**	**Protein (g)**	**Fat (g)**	**Carbo hydrates (g)**	**Iron (mg)**	**Calcium (mg)**
Galactobar	Oats							
	Chickpea							
	Almond							
	Fenugreek seed							
	Fennel seed							
	Sesame							
	Jiggery							
	Ghee							

3.2.8 Preparation of galactobar

Plate 3.2.6: *preparation of the galactobar*

 heat the pan , add ghee	 add the oats flour+chickpea flour	 mix well and roast on low flame	 row flavour disappears and colour get changes
 add dryroasted and powdered fennel seed, fenugreek seed and sesame	 add jaggery powder.	 Mix well and cook until it combine well	 add almonds pieces and mix well
 transfer the combined mixture to a setting bowl	 allow to set	 Cut it in desired shape	

The standardized proportion of raw ingredients as depicted in Table 1 was used for preparation of galactobar. The pan was heated to which ghee was added followed by the oats and chickpea flour blend which was roasted on low flame until the raw flavour was eliminated and the mixture started to ooze ghee. Added dry roasted and powdered fennel seed, fenugreek seed and sesame and add jaggery powder. The powdered jaggery was added and mixed well and cooked until it combined well. Added almond pieces and combined well, then mixture was transfer to a setting bowl and press well. Allow to set and Cutted into desired shape with a knife.

3.2.9 Sensory evaluation of Galactobar:-

A sensory evaluation of all the galactobar was carried out. The galactobar were rated on a 5-point hedonic scale by 50-panel members. The panel members were selected by random sampling. Out of the five type of galactobar ,the most acceptable galactobar burfi was subjected to proximate analysis and shelf-life study. The galactobar burfis were rated from 5 to 1, keeping 5 for like a lot and 1 for dislike a lot as per the method given in (PDST, Sensory Analysis Teacher's Manual, Dublin, 2017).

The scores were assigned as follows:

5-like a lot

4-like a little

3-neither like nor dislike

2-dislike a little

1-dislike a lot

3.3 PROXIMATE ANALYSIS

Proximate analysis of the product was done using the methods described by AOAC 2000 (estimation of total ash, protein) (estimation of iron content, calcium)

Note: For the purpose of proximate analysis, the galactobar burfi samples were powdered and stored in an air tight container until further use.

The methods used for proximate analysis were modified as with respect to the food product aa mentioned in the FSSAI, lab manual. The tests were performed thrice in number and mean value was taken.

3.3.1 Determination of total ash by general method (AOAC,2000) 3g of powdered sample was taken in a crucible whose weight was previously noted. The triplicates of sample were taken in crucible which was placed in a hot-air oven for 3-4 hours at 1000 C. The crucibles were charred by heating on the direct flame of Bunsen burner till the contents turned black. The crucibles were transferred to the Muffle furnace that was pre-heated at 5000 C and left for 6-8 hours. The crucibles were cooled in the desiccator for 30 minutes and weighed (B1). The crucibles were again placed in the Muffle furnace for an hour, cooled in the desiccator for 30 minutes and weighed again (B2). The average of the weights was taken and the total ash was calculated by substituting in the formula.

Ash (%) can be calculated as;

$$\frac{\textbf{(weight of the crucible + sample after drying)(g) – (weight of empty crucible)(g) x100}}{\textbf{Weight of the food sample (g)}}$$

$$\frac{\textbf{(B-C) x 100}}{\textbf{A}}$$

Reagents used and preparation:

1. PREPARATION OF ASH SOLUTION

• Concentrated hydrochloric acid

• Double distilled water

3.3.2 Determination of protein by Lowry's method.

1 gram of powdered sample was mixed with 4ml of potassium phosphate buffer (pH 7.4) and was centrifuged at 5000rpm for 15 minutes. The supernatant (1 ml) was used for protein estimation. The standard sample was prepared using bovine serum albumin of 200µg/mL concentration, with aliquots of 0.2-1.0ml which were made up to 1.0ml with distilled water.5ml of alkaline copper sulphate solution was added and the test tubes were allowed to stand for 10 minutes, later 0.5ml of Folin Ciocalteau reagent (FCR) was added and all the test tubes were incubated in dark for 30 minutes. The absorbance was read at 660nm and the concentration was determined using spectrophotometer.

Reagents used and preparation:

- Standard protein solution:

20mg of bovine serum albumin was weighed and transferred to a 100ml standard flask. The standard flask was filled up to mark with distilled water. The concentration of the protein solution was 200µg/ml.

- Alkaline copper sulphate solution:

The alkaline copper sulphate solution was prepared by mixing 50ml of solution A and 1ml of freshly prepared solution B.

- 0.1N sodium hydroxide solution:

0.4 g of sodium hydroxide pellets were transferred to a 100ml standard flask. It was mixed with distilled water and shaken well till it was completely dissolved. The standard flask was filled to the mark with distilled water.

• Solution A:

✓ 2% Sodium carbonate solution: 2 g of sodium carbonate was transferred to a 100ml standard flask. The standard flask was filled up to mark with 0.1N sodium hydroxide solution.

• Solution B:

✓ 1% sodium potassium tartarate solution: 1 g of sodium potassium tartarate crystals were transferred to a 100ml standard flask. It was filled up to mark with distilled water (it was freshly prepared).

✓ 0.5% Copper sulphate solution: 0.5g of anhydrous copper sulphate was transferred to a 100ml standard flask. It was made up to mark with 1% sodium potassium tartarate solution.

 Folin- ciocalteau reagent:

25ml of Folin-ciocalteau reagent was added to a 50ml measuring cylinder and it was filled up to mark with 25ml distilled water.

 Potassium phosphate buffer (pH 7.4):

3.03g of di-potassium hydrogen phosphate crystals and 1.035g of potassium dihydrogen phosphate crystals are weighed and transferred to a 250ml standard flask. It was filled up to mark with distilled water. The pH was adjusted sing a pH meter. The pH was adjusted with 0.1N sodium hydroxide (if pH less than 7.4) or with 0.1M hydrochloric acid (if pH more than 7.4).

3.3.3 Estimation of iron by Wong's method (Wong, 1928)

1ml of the ash solution was used as the test sample to detect the iron content in the food sample. The standard iron solution was prepared using Mohr's salt of 100µg/ml concentration and 1to 5ml was used which was made up to 5ml using distilled water. The blank was prepared using 5ml of distilled water and 1ml of ash solution was made up to 5ml with distilled water. To all the test tubes, 1ml of 30% sulphuric acid and 1ml of 7% potassium per sulphate solution and 1ml of 40% potassium thiocyanate solution was added. The test tubes were kept at room temperature for 10 minutes and the absorbance was read at 490nm.

Reagents used and preparation:

1. PREPARATION OF ASH SOLUTION

• Concentrated hydrochloric acid

• Double distilled water

2. IRON ESTIMATION BY WONG'S METHOD

- 30% sulphuric acid solution

30ml of concentrated sulphuric acid was taken in a 100ml standard flask which was made up to mark with double distilled water.

- 7% potassium per sulphate solution

7gms of potassium per sulphate crystals were weighed in the analytical balance and were transferred to 100ml standard flask using funnel which was made up to mark with double distilled water.

- 40% potassium thiocyanate solution

40gms of potassium thiocyanate was weighed in the analytical balance and were transferred to 100ml standard flask using funnel which was made up to mark with double distilled water.

- Concentrated potassium permanganate solution

10gms of potassium permanganate was weighed in the analytical balance and transferred through a funnel to the 100ml standard flask and was made up to mark with double distilled water.

- Standard iron solution

0.702gms of crystalline ferrous ammonium sulphate (Mohr's salt) was weighed in the analytical balance and dissolved in 100 ml of double distilled water and 50ml of concentrated sulphuric acid and was warmed slightly.2-3 drops of concentrated potassium permanganate solution was added until the solution turned permanent pink colour. The solution was transferred to 1000ml standard flask and made up to with double distilled water. The concentration of the solution was 1mg/ml. 10 ml of stock solution was taken in a 100ml standard flask which was made up to the mark with double distilled water. The concentration of standard iron solution was 100µg/ml.

3.3.4 Estimation of calcium by EDTA method(AOAC, 2000)

The burette was rinsed and filled up to the mark with 0.1M EDTA solution. The standard calcium solution was taken for standardisation. 25ml of standard calcium solution

was taken in the conical flask to which 10 ml of ammonium buffer and 20 ml of double distilled water was added followed by 2 drops of Erichrome Black T(EBT) indicator. The contents of Erlenmeyer's flask were titrated against the EDTA solution until the endpoint with blue coloured solution was obtained. For estimation of calcium in the food sample, 5ml of ash solution was taken in 250ml of standard flask and made up to the mark with double distilled water. 50ml of the aliquot was taken to which 10ml of ammonium buffer and 2 drops of EBT indicator was added and titrated against EDTA solution until the endpoint was reached. Hence, the calcium content was calculated.

Reagents used and preparation:

- 0.1M EDTA solution

3.72gms of disodium EDTA dehydrate was weighed in the analytical balance and transferred to 1000ml plastic bottle. 100ml of double distilled water was added and stirred well until the contents dissolved. 700ml of double distilled water was added and mixed well, it was made up to and was kept for a day before using.

- EBT indicator

0.2gm of Erichrome black T was weighed in the analytical balance and was transferred to a 100ml beaker, 20ml of absolute alcohol was added and dissolved well. It was stored in the dropper bottle.

- Standard calcium solution

1gm of calcium carbonate was weighed in the analytical balance and was dried in the hot air oven for 2 hours at 800C and then cooled in the desiccator for 1 hour. 0.5 GMS of the cooled calcium carbonate was weighed using the analytical balance and transferred to a 250ml standard flask and was made up to mark with double distilled water. 25ml of this solution was taken and added to a 250ml standard flask and 5ml of concentrated hydrochloric acid was added and left for 3-4 minutes for the carbon-dioxide to evolve. The contents were transferred to 500ml standard flask and were made up to mark with double distilled water.

- 8.5M ammonium buffer

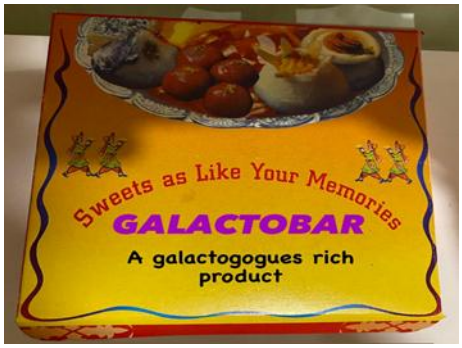
16.9gms of ammonium chloride was dissolved in 143ml of concentrated ammonium solution which was transferred to 250ml standard flask and was made up to mark with double distilled water.

3.5 SHELF-LIFE STUDY OF THE PRODUCT

3.5.1 Packaging of food product

The galactobar burfi prepared were packaged in 250ml capacity cardboard container. The food samples were stored in two variations; the first set was stored in refrigerator and the second one kept at room temperature. Both the set were studies a time period of 30 days.

Plate 3.5: *Packaging of food product*



3.5.2 Sensory evaluation of the food product

The food product was subjected to sensory evaluation using 9-point hedonic scale rating on the overall acceptability for the time period of 30 days with 5 sessions of analysis on day 1,7,14,21 and 28.(Choi, 2002).

CHAPTER 4

RESULTS AND DISCUSSION

The methodology used for the analysis of Galactobar has been tested and the results of the experiment are represented in the Results section. A cross-sectional study was performed with samples including 40 mothers. The survey was conducted on social media with multiple choice questions for those who consumed galactagogues during breastfeeding period.

Their feedback regarding Galactagogues was noted and the product was developed accordingly to provide the maximum benefit of galactagogues to breastfeeding mother. Approximately 77.5% use galactogogues and 22.5% do not use galactagogues. The data obtained from the results and discussion section provided a clear picture of the originality of the product along with the accuracy of the experiments performed. The results represented that the galactagogues contains high amount of protien , iron and calcium based on proximate analysis, which is best for lactating women.

4.1SURVEY

I have conducted a survey to know and to gather information about galactogogues like if people are aware of galactogogues or if they are dependent on galactogogues and to understand the effect of galactogogues on lactating mothers. There were 40 participants.

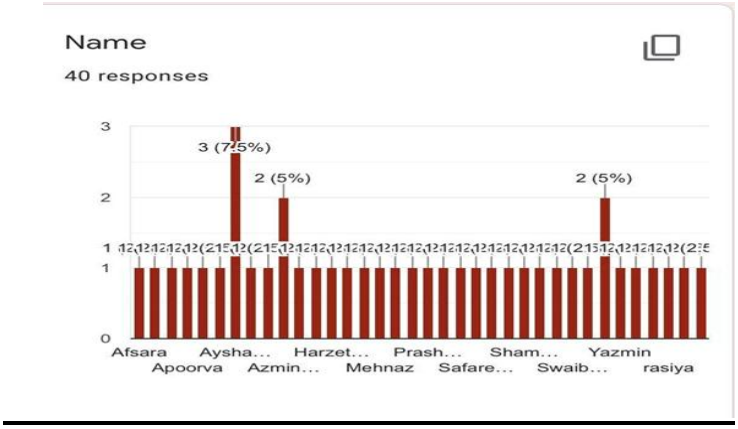


Figure 4.1. 1:- A cross-sectional study was performed with samples including 40 breast feeding mothers

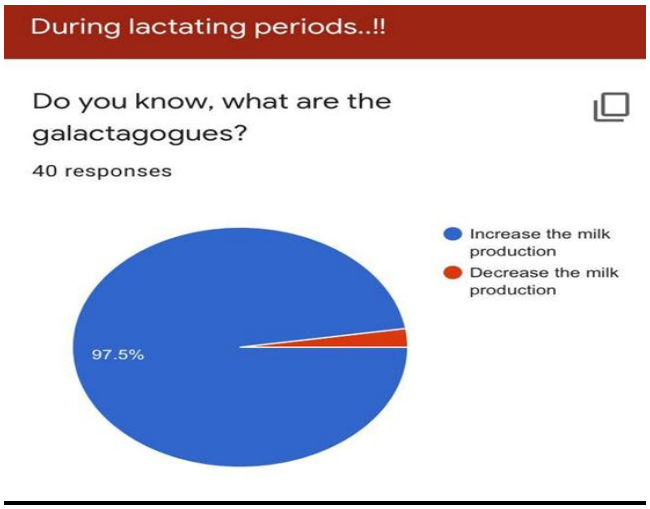


Figure 4.1.2:- showed that 97.5% peoples were aware of galactogogues, whereas remaining 2.5% peoples were unaware of the galactogogues. So this shows that most of the population know about galactogogues.

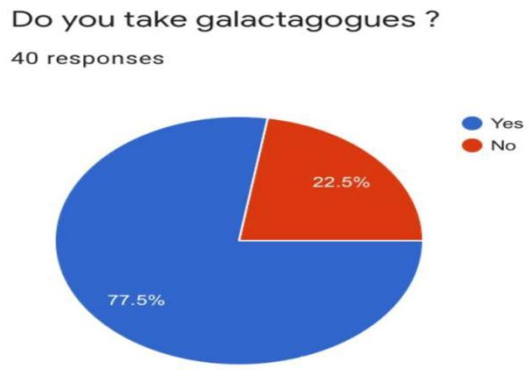


Figure 4.1.3 :- showed that 77.5% of the people consume galactogogues , whereas 22.5% of the people donot consume galactogogues, this shows that most of the participants depends on galactogogues for milk production.

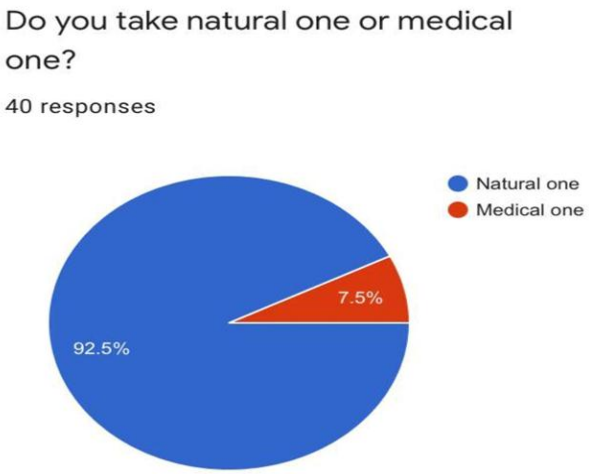


Figure 4.1.4:- showed that 92.5% of the people were prefer natural type of galactogogues, whereas remaining 7.5% of the people were prefer medical one. This shows that people prefer more natural galactogogues.

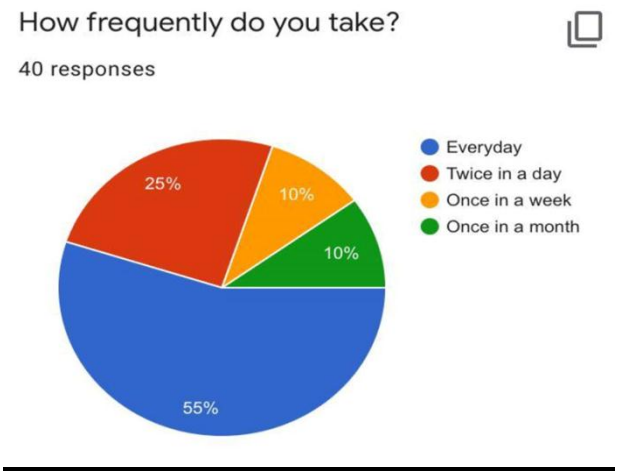


Figure 4.1.5:- showed that 55% of the people were prefer to consume galactogogues everyday vice , whereas 25% of the people were prefer to consume twice in a day ,10 % of people were prefer to consume once in a week and 10% of the people were consume once in a month. This shows that people prefer more to consume galactogogues everyday vice .

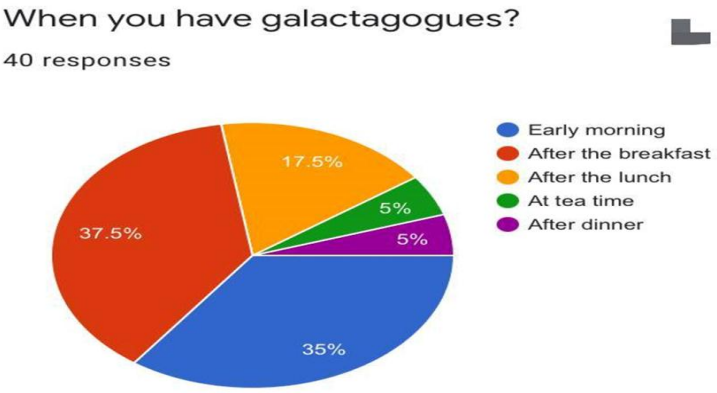


Figure 4.1.6:- showed that 37% of the people were prefer to consume galactogogues early morning , whereas 35% of the people were prefer to consume after the breakfast ,17.5 % of people were prefer to consume after the lunch ,5% of people were prefer to consume after the tea and 5% of the people were consume after the dinner This shows that more people prefer to consume galactogogues early morning and after the breakfast. .

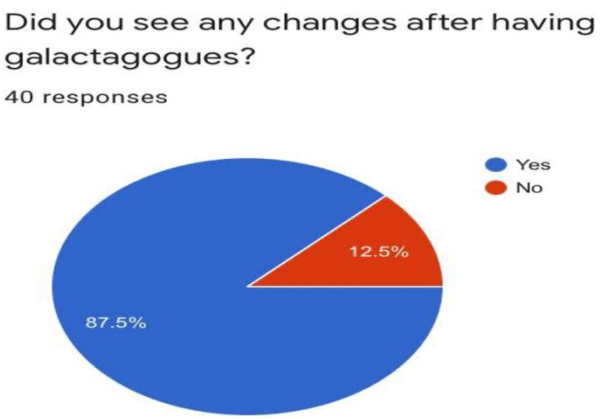


Figure 4.1.7:- showed that 87.5% of the people sees the changes after consuming galactogogues, whereas remaining 12.5% of the people got negative result. This shows that gaactogogues provides benefits and positive result on lactating mothers.

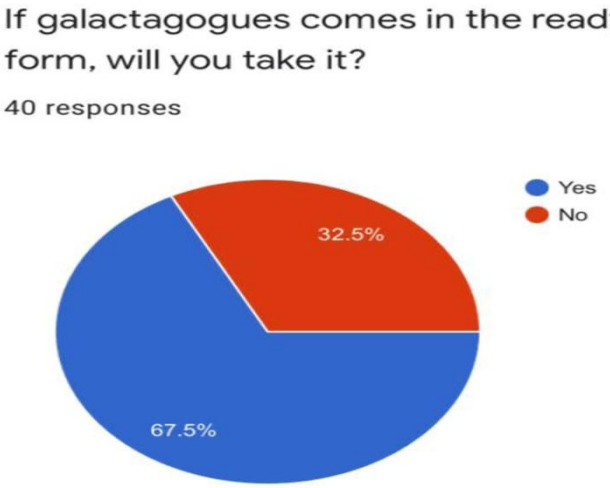


Figure 4.1.8:- showed that 67.5% of the people were ready to take if galactogogues comes in the ready form. Whereas remaining 32.5% of the people were not ready to take if galactogogues comes in the ready form. This shows that more people prefer to consume galactogogues in the ready form.

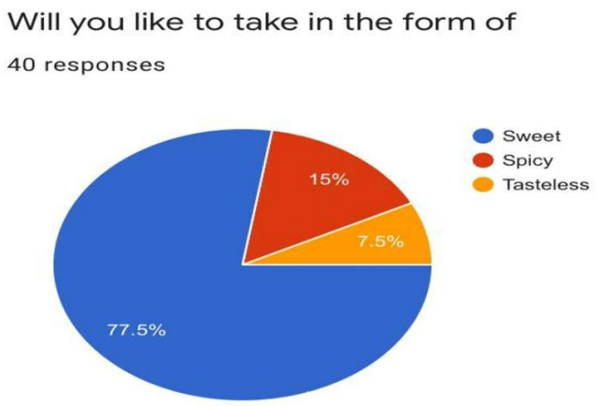


Figure 4.1.9:- showed that 77.5% of the people were ready to take if galactogogues comes in the ready sweet form, whereas remaining 15% of the people were like to consume in spicy form and 7.5% of people were like to consume in tasteless form. This shows that more people prefer to consume galactogogues in the sweet form.

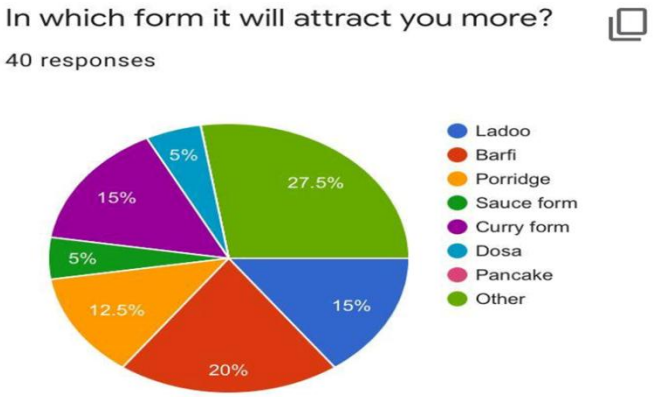


Figure 4.1.10:- showed that 20% of the people were ready to take if galactogogues comes in the ready sweet burfi form , and 27.5% in other form , whereas remaining 15% ,12.5%, 5% of the people were like to consume in the form of curry , ladoo form, porridge form sauce form, dosa form spicy form respectively. This shows that more people prefer to consume galactogogues in the burfi form.

I have conducted a survey to know and to gather information about galactogogues like if people are aware of galactogogues or if they are dependent on galactogogues and to understand the effect of galactogogues on lactating mothers. There were 40 participants. A cross-sectional study was performed with samples including 40 breast feeding mothers. So this survey showed that most of the population know about the galactogogues, most of the participants depends on galactogogues for milk production, people prefer more natural galactogogues, also they prefer more to consume galactogogues everyday vice, also people prefer to consume galactogogues early morning and after the breakfast, and also gactogogues provides benefits and positive result on lactating mothers, more people prefer to consume gactogogues in the ready form and also in the sweet form, many people prefer to consume gactogogues in the burfi form. And I have developed a product based on the like and dislike of the people and according to the response of the people I developed a burfi in sweet form. And the burfi called as "GALACTOBAR"

4.2 QUALITY ASSESSMENT OF THE INGREDIENTS THROUGH ADULTERATION TEST

The raw materials were checked for adulterants in order to make sure that the ingredients used for the preparation of Galactabar are of good quality.

Table 4.2 : *Adulteration Tests for Quality Analysis.*

INGREDIENTS	ADULTERANT TESTED	OBSERVATION	RESULT
Oats	Extraneous matter (dust, stone, straw, insect, hair)	No extraneous matters were observered.	Oats sample was not adulterated.
Chickpea	Extraneous matter (dust, stone, straw, insect, hair)	No extraneous matters were observered.	Chickpea sample was not adulterated.

Almond	Extraneous matter (dust, stone, straw, insect, hair)	No extraneous matters were observered.	Almond sample was not adulterated.
Fenugreek seed	Little stones or grit	No extraneous matters were observered.	Fenugreek seed sample was not adulterated.
Fennel seed	Malachite green dye	No Malachite green colour	Fennel seed sample was not adulterated.
Sesame	Extraneous matter (dust, stone, straw, insect, hair)	No extraneous matters were observered.	Sesame sample was not adulterated.
Jaggery	Washing soda	No effervescence was observed.	The jaggery sample was not adulterated
	Chalk powder	No effervescence was observed.	
	Metanil yellow colour	The solution did not turned blood red in color	
Ghee	Coal tar dyes	On addition of concentrated sulphuric acid(H2SO4) the solution did not turn	

		red in color	
	Vanaspati/ margarine	On addition of concentrated hydrochloric acid (HCl) the solution did not turn red or pink in color and the sample did not separate into two different layers.	The ghee sample was not adulterated
	Starch	On addition of 0.1N iodine solution the solution did not turn blue or violet in color.	The ghee sample was not adulterated

Table 4.2: indicates the purity of raw materials used for preparation of the galactobar . It is evident from the table that the raw materials are of good quality and are free from adulteration.

4.3. Standardisation

The processing methods were standardized in order to make sure that the raw materials are subjected to the processing methods gives acceptable outcomes in terms of sensory characteristics.

Table 4.3: *Processing Method Used On Sample*

PROCESSING METHOD	TEST	OBSERVATION	INFERENCE
Soaking	The raw chickpea seeds (about 25g) were subjected to soaking in a bowl with tap water for 12 hours at room temperature with the lid closed.	The soaked chickpea sample was acceptable in terms of sensory characteristics such as appearance, odor, and color.	The chickpea samples were suitable for the process of Soaking.
unsoaked	The raw chickpea seeds (about 25g) were used directly	The unsoaked chickpea sample was unacceptable in terms of sensory characteristics because it had row smell, and taste.	The chickpea samples were not suitable for the process of unsoaking.
Unroasted and Powdered	The fennel seeds, fenugreek seeds and sesame seeds were used directly without roasting and then Powdering it.	The Unroasted and Powdered fennel seeds, fenugreek seeds, sesame seeds samples were unacceptable in terms of sensory characteristics because it had row smell, and bitter taste.	The fennel seeds, fenugreek seeds and sesame seeds samples were not suitable for the process of Unroasted and Powdered form.

unroasted and unpowdered	The fennel seeds, fenugreek seeds and sesame seeds were used directly without roasting and without Powdering..	The Unroasted and unpowdered fennel seeds, fenugreek seeds, sesame seeds samples were unacceptable in terms of sensory characteristics because it had row smell, and bitter taste.	The fennel seeds, fenugreek seeds and sesame seeds samples were not suitable for the process of Unroasted and unpowdered form.
roasted and powdered	The fennel seeds, fenugreek seeds and sesame seeds were subjected to dry roasting and Powdering.	The roasted and powdered fennel seeds, fenugreek seeds, sesame seeds samples were unacceptable in terms of sensory characteristics in terms of colour, appearance, odour, and taste.	The fennel seeds, fenugreek seeds and sesame seeds samples were suitable for the process of roasting and Powdering form.

Table 4.3 represents the outcome of standardisation. From the table it is represented that on the basis of sensory characteristics. This sensory characteristics is done by using the 9- scale hedonic scale rating (n=10). The chickpea was subjected to soaking and the fennel seeds, fenugreek seeds and sesame were subjected to dry roasting and powdered form.

4.4 Nutritional estimation

The nutritional estimation for the processing methods was carried out

Table 4.4.1:- *The nutritional estimation for the processing methods*

Menu	**Ingredients**	**Amounts (gm/l)**	**Energy (Kcals)**	**Protien (g)**	**Fat (g)**	**Carbo hydrates (g)**	**Iron (mg)**	**Calcium (mg)**
Galactobar	Oats	25	93.5	3.4	1.9	15.7	0.95	12.5
	Chickpea	25	91	4.75	1.5	15.25	1.0775	14.25
	Almond	20	131	4.16	11.78	2.1	1.018	46
	Fenugreek seed	2	6.6	0.524	0.116	0.882	0.13	32
	Fennel seed	2	0.62	0.024	0.004	0.146	0.3708	23.92
	Sesame	3	16.89	0.549	1.299	0.75	0.279	43.5
	Jiggery	13	49.79	0.052	0.013	12.35	0.3432	10.4
	Ghee	10	90	---	10	---	----	----

Galactobar (100gm) contains:-

Energy: 479.4 Kcals

Protein: 13.459 g

Fat: 26.612 g

Carbohydrates: 47.178 g

Iron: 4.1685 mg

Calcium: 153.77 mg.

- Nutritional estimation shows that 100 grams of galactobar contains 479.4Kcals of energy. It provides around 20%+ of energy per 100 grams of galactobar for lactating women.

- Nutritional estimation shows that 100 grams of galactobar contains 13.459 grams of protein. . It provides around 25%+ of protein per 100 grams of galactobar for lactating women.

- 100 grams of galactobar provides 26.612g of fat, which means that 95% fat which is required for lactating women gets from 100 grams of this product.

- 100 grams of galactobar burfi product provide 47.178 g of carbohydrates.it provides around 30.43% of carbohydrates which is required for a lactating women gets from 100 grams of this product

- Nutritional estimation shows that 100 grams of galactobar contains 4.1685 grams of iron. It provides around 26%+ of iron per 100 grams of galactobar for a lactating women (lactating mothers need 16mg of iron.).

- 100 grams of galactobar provides 153.77mg of calcium, which means that 15% of calcium which is required for lactating women gets from 100 grams of this product (lactating mothers need 1000mg of calcium).

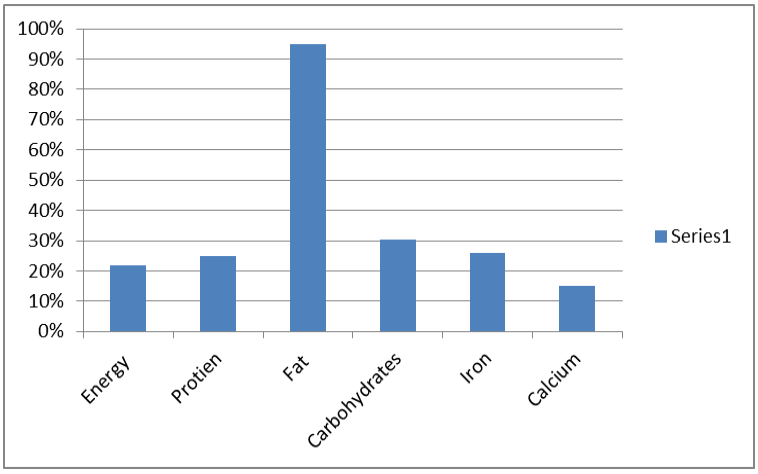


Figure 4.4.1 : *The nutritional estimation for the processing methods*

4.5 Sensory evaluation of Galactobar:-

Sensory evaluation is a process whereby, the quality of food is judged by a panel of judges. When a product is developed for the consumers from the viewpoint of health, one must make sure that the taste and other characteristics of the food are also well accepted by the consumers. Only then, will people choose a healthy product over any other unhealthy food. The color, taste,

texture, flavor etc., are some of the factors that determine the overall acceptability of the product. The panel members were asked to taste each galactobar burfi and rate the overall acceptability. The overall acceptability was rated on a 5-point hedonic scale. The scores for the 5 different formulated galactobar burfis is given below in the table *

Table 4.5.1: *Sensory evaluation of different formulation of Galactobar*

Galactobar	5-Point Hedonic Scale rating
F1	**3.6 ± 1.14**
F2	**3.26 ± 1.26**
F3	**3.84 ± 0.96**
F4	**3.26 ± 1.26**
F5	**4.72 ± 0.30**

(mean± S.D, n=50), F = formulation

Figure 4.5.1 : *Sensory evaluation of different formulation of Galactobar*

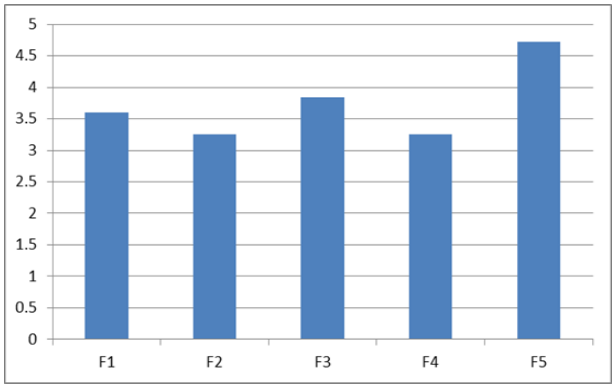
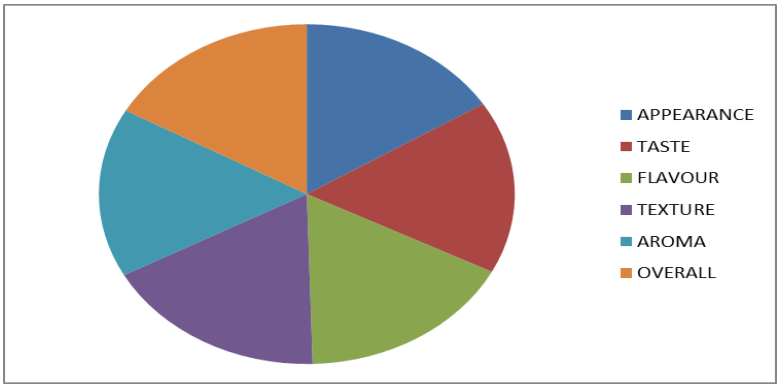


Figure 4.5.2: *Sensory evaluation of Galactobar burfis using 5-point Hedonic scale rating*



4.6 PROXIMATE ANALYSIS

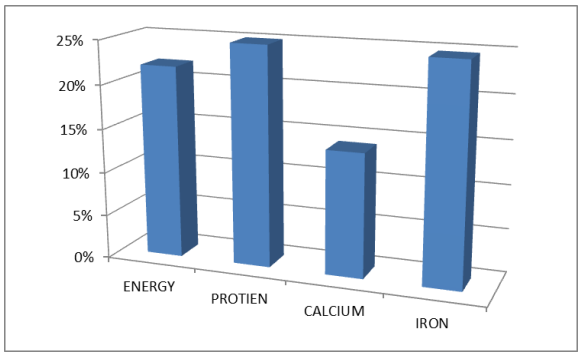
The proximate composition of galactobar burfis per 100grams is illustrated in the Figure 4.6.1 and found the values of total ash, total protein, total calcium, and total iron in the galactobar burfi product.

Table 4.6.1: *proximal analysis of galactobar*

PARTICULARS	COMPOSITION (100grams)
ENERGY	474.4 Kcals
TOTAL PROTIEN	11.89g
TOTAL CALCIUM	140.96 mg
TOTAL IRON	3.95 mg
TOTAL ASH	2.8g

- Energy is the calorific composition of the food which determines the nutrient intake and the Galactobar contain 474.4 kcals/100grams of sample of energy. Each Galactobar comprises of 20+% of calories.
- The Galactobar has a total protein value of 11.89 g/100 grams of sample. Each Galactobar comprises of 30%+ of protein.
- 100 grams of galactobar contains 140.96 mg of total calcium.. It provides 14.096% of calcium / 100 grams of galactobar for a lactating women (lactating mothers need 1000mg of calcium).
- 100 grams of galactobar contains 3.95mg of total iron. It provides 24.68% of iron per 100 grams of galactobar for a lactating women (lactating mothers need 16mg of iron.).

Figure 4.6.1: *proximal analysis of galactobar*



4.7 SHELF-LIFE STUDY OF THE PRODUCT

Each product has a shelf life. Shelf life study is an important aspect of product development. sensory evaluation and microbial testing help to determine shelf life of a product.

4.7.1 Packaged food product

The galactobar burfi prepared were packaged in 250ml capacity cardboard container. The food samples were stored in two variations; the first set was stored in refrigerator and the second one kept at room temperature. Both the set were studies a time period of 30 days. The first set was was fresh and had not lost its minimal moisture, but second one was little sticky and the flavor and odors were changed.

4.7.2 Shelf life:

The galactobar burfis which were stored in refrigerator had a shelf life of 24 days. And the galactobar burfis which were stored at room temperature had a shelf life of 7 days, Fungal growth was observed on the galactobar burfis by the 8th day.

4.7.3 Sensory evaluation of the food product

The food product was subjected to sensory evaluation using 9-point hedonic scale rating on the overall acceptability for the time period of 30 days with 5 sessions of analysis on day 1,7,14,21 and 28.(Choi, 2002). The burfi was evaluated for its appearance, colour, texture, aroma, taste, and overall acceptability. The galactobar burfis which were stored in refrigerator had a shelf life of 24 days. And the galactobar burfis which were stored at room temperature had a shelf life of 7 days; Fungal growth was observed on the galactobar burfis by the 8th day.

Formulation 5 galacobar was accepted based on its for its appearance, colour, texture, aroma, taste, and overall acceptability.

Figure 4.7.3 : (a) *Sensory evaluation of the galactobar burfis which were store in refrigerator on 1 ,7,14,21, 28 day*

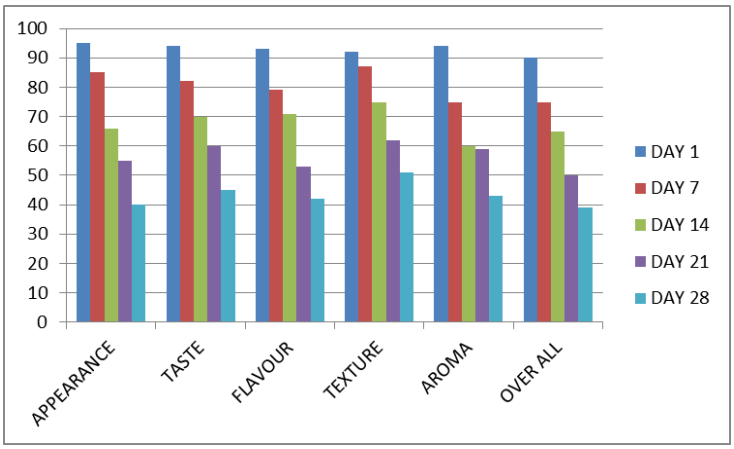
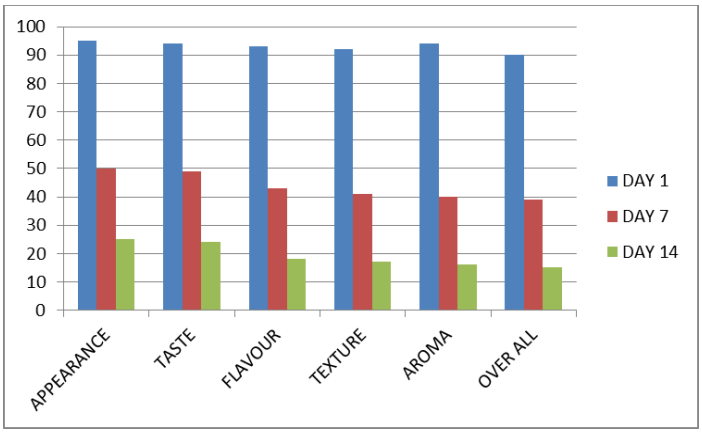


Figure 4.7.3 : (b) *Sensory evaluation of the galactobar burfis which were stored in room temperature on 1 ,7,14 day*



Chapter 5

SUMMARY AND CONCLUSION

This section gives an insight into the outcome of this study. The Galactobar bufi developed was best for the lactating mother. A galactogogue is the substance that can help a breastfeeding mother to raise her breast milk supply. The galactobar burfis which were stored in refrigerator had a shelf life of 24 days. And the galactobar burfis which were stored at room temperature had a shelf life of 7 days, Fungal growth was observed on the galactobar burfis by the 8th day. Hence, this galactobar provides average amount of energy, protein, fat, carbohydrates, and high amount of iron and calcium. A galactogogue helps to stimulate the production of breast milk.

5.1. SUMMARY

- Survey was conducted to know and to gather information about galactogogues like if people are aware of galactogogues or if they are dependent on galactogogues and to understand the effect of galactogogues on lactating mothers.

- There were 40 participants .A cross-sectional study was performed with samples including 40 breast feeding mothers. So this survey showed that most of the population know about the galactogogues, most of the participants depends on galactogogues for milk production, people prefer more natural galactogogues, also they prefer more to consume galactogogues everyday vice, also people prefer to consume galactogogues early morning and after the breakfast, and also gactogogues provides benefits and positive result on lactating mothers, more people prefer to consume gactogogues in the ready form and also in the sweet form, many people prefer to consume gactogogues in the burfi form.

- And have developed a product based on the like and dislike of the people and according to the response of the people and developed a burfi in sweet form. And the burfi called as "GALACTOBAR"

- The product was developed based on the survey, to stimulate the production of breast milk.

- The raw ingredients required for Galactobar preparation (oats, chickpea, almond, fenugreek, fennel, sesame, jaggery and ghee) were purchased from the local wholesale retailer in Uppala, and All the raw materials (oats, chickpea, almond, fenugreek, fennel, sesame, jaggery and ghee) were subjected to adulteration tests and found that the raw materials are of good quality and are free from adulteration

- The standardization was done by subjected for five variations like (i) soaking and (ii) unsoaking the chickpeas, by using the fennel seeds, fenugreek seeds and sesame seeds as (iii) Unroasted and Powdered , by subjecting the fennel seeds, fenugreek seeds and sesame seeds as (iv) Unroasted and unpowdered and using the fennel seeds, fenugreek seeds and sesame seeds as (v) roasted and powdered form. And the soaked chickpea and

roasted and powdered fennel seeds, fenugreek seeds and sesame seeds were suitable for the development of the product.

- Processing of bulk sample was done to produce bulk amount of galactobar. The nutritional estimation for the processing methods was carried out , and found that Galactobar (100gm) contains 479.4 Kcals of energy, 13.459g of protein, 26.612g of fat, 47.178g of carbohydrates , 4.1685mg of iron and 153.77mg of calcium. It means that It provides around 20%+ of energy, 25%+ of ptotien , 30.43% of carbohydrates , 26%+ of iron , 15% of calcium which is required for a lactating women gets from 100 grams of this product .

- Sensory evaluation is a process whereby, the quality of food is judged by a panel of judges. The color, taste, texture, flavor etc., are some of the factors that determine the overall acceptability of the product was rated on a 5-point hedonic scale. The scores for the 5 different formulated galactobar burfis and 5^{th} formulation was accepted one.

- Proximate analysis was conducted to determine the values of total ash, total protien, total calcium, and total iron in the galactobar burfi product. And the Galactobar contain 474.4 kcals of energy, 11.89 g/100 grams of protein, 140.96 mg of total calcium, 3.95mg of total iron and --- of total ash.

- Shelf life study is an important aspect of product development, The food product was subjected to sensory evaluation using 9-point hedonic scale rating on the overall acceptability for the time period of 30 days with 5 sessions of analysis on day 1,7,14,21 and 28.

- The burfi was evaluated for its appearance, colour, texture, aroma, taste, and overall acceptability. The galactobar burfis which were stored in refrigerator had a shelf life of 24 days. And the galactobar burfis which were stored at room temperature had a shelf life of 7 days, Fungal growth was observed on the galactobar burfis by the 8th day.

Study on knowledge and practice of galactogogues consumption and development of galactogogues product, had revealed that the knowledge of galactogogues consumption among breastfeeding mothers was at a satisfactory level. More than75% of the mothers had a good

knowledge while the rest of others had moderate knowledge of galactogogues consumption. Moreover, the practice was highly prevalent among them. A galactogogue is the substance that can help a breastfeeding mother to raise her breast milk supply. A galactogogue helps to stimulate the production of breast milk.

A cross-sectional study was performed with samples including 40 breast feeding mothers, And have developed a product based on the like and dislike of the people and according to the response of the people and developed a burfi in sweet form. And the burfi called as "GALACTOBAR"

100g of the galactobar approximately fulfills half of the recommended dietary allowances which is required for a lactating mother. It means that It provides around 20%+ of energy, 25%+ of ptotien , 30.43% of carbohydrates , 26%+ of iron , 15% of calcium which is required for a lactating women gets from 100 grams of this product and it is a nutritious product for a lactating mother.

The galactobar is in the sweet form, so almost all the lactating mother would like its taste. it is a healthier and safer option than supplements.

5.3 RECOMMENDATIONS

The total iron and calcium provided from the product is bit low, can be increased further by replacing with other ingredient or adding other ingredients.

The galactobar burfis which were stored in refrigerator had a shelf life of 24 days. And the galactobar burfis which were stored at room temperature had a shelf life of 7 days, Fungal growth was observed on the galactobar burfis by the 8th day. So galactobar should store at refrigerator. Or else should not produce in bulk quantity.

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APPENDIX

APPENDIX-1

SURVEY

EMAIL :_____

NAME :_____

AGE :_____

DURING LACTATING PERIOD….!!

I would like to know about your genuine opinion during lactating period…

1) Do you know, what are the galactogogues?
    - Increase the milk production
    - Decrease the milk production

2) Do you take galactogogues?
    - Yes
    - No

3) Do you take natural one or medical one?
    - Natural one
    - Medical one

4) How frequently do you take?
    - Everyday
    - Twice in a day
    - Once in a week
    - Once in a month

5) When you have (consume) galactogogues?
    - Early morning
    - After the breakfast
    - After the lunch
    - At tea time
    - After dinner

6) Did you see any changes after having galactogogues?
    - Yes
    - No

7) If the galactogogues comes in ready form, will you take (buy) it?
    - Yes
    - No

8) Will you like to take in the form of?
    - Sweet
    - Spicy
    - Tasteless

9) In which form it will attract you more?
    - Ladoo
    - Barfi
    - Porridge
    - Sauce form
    - Curry form
    - Dosa
    - Pancake
    - Other

APPENDIX-2

SENSORY EVALUATION OF GALACTOBAR BURFI USING 5-POINT HEDONIC SCALE

FORM 1:-

NAME: _____

AGE: _____

Taste each of the following samples and tick how much you like it or dislike it.

Instructions: Rinse your mouth with water and have a piece of cracker before tasting each sample.

	F1	F2	F3	F4	F5
Like a lot	_____	_____	_____	_____	_____
Like a little	_____	_____	_____	_____	_____
Neither like nor dislike	_____	_____	_____	_____	_____
Dislike a little	_____	_____	_____	_____	_____
Dislike a lot	_____	_____	_____	_____	_____

SIGNATURE: _____

DATE: _____

FORM 2:-

NAME: _____

AGE: _____

You are receiving a set of samples of galactobar burfies. Kindly taste each of from the set and drink water provided before tasting the next sample. Evaluate them by numbering on the basis of attributes given below.

ATTRIBUTES	Galactobar burfis				
	F1	F2	F3	F4	F5
APPEARANCE					
COLOUR					
TEXTURE					
AROMA					
TASTE					
OVERALL ACCEPTIBILITY					

(9-Like Extremely,8-Like Very Much,7-Like Moderately,6-Like Slightly,5-Neither Like nor Dislike,4-Dislike Slightly,3-Dislike Moderately,2-Dislike Very Much,1-Dislike Extremely.)

SIGNATURE: _____

DATE: _____

APPENDIX -3

1. ESTIMATION OF PROTIEN BY LOWRY'S METHOD

Observation table

PARTICULARS	Blank (B)	STANDARD PROTEIN SOLUTION					TEST SAMPLE (T)
		S1	S2	S3	S4	S5	
Volume of standard protein solution (ml)	_	0.2	0.4	0.6	0.8.	1	_
Concentration of standard protein solution (μ/ml)	_	40	80	120	160	200	_
Volume of test sample (ml)	—	—	—	—	—	—	1
Volume of distilled water (ml)	1	0.8	0.6	0.4	0.2	0	_
Volume of alkaline copper solution (ml)	5	5	5	5	5	5	5
Volume of Folin-ciocalteau reagent (ml)	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Incubate in dark for 30 minutes							
Optical density at 660nm							

2. ESTIMATION OF IRON BY WONG'S METHOD

Observation table

Aliquots of standard solution	Blank (B)	STANDARD PROTEIN SOLUTION				
		S1	S2	S3	S4	S5
Volume of standard iron solution(ml)	_	1.0	2.0	3.0	4.0.	5.0
Concentration of standard iron solution (μ/ml)	_	100	200	300	400	500
Volume of distilled water(ml)	5	4	3	2	1	0
Volume of 30% sulphuric acid solution(ml)	1.0	1.0	1.0	1.0	1.0	1.0
Volume of 7% potassium per sulphate solution(ml)	1.0	1.0	1.0	1.0	1.0	1.0
Volume of 40% potassium thiocyanate solution(ml)	1.0	1.0	1.0	1.0	1.0	1.0
Incubate at room temperature for 10 minutes						
Optical density of standard solution at 490nm						

3. ESTIMATION OF CALCIUM BY EDTA METHOD

Burette : 0.1M EDTA solution

Conical flask: 10ml of diluted ash solution+4 ml of ammonium buffer + 8 ml of double distilled water + 2 drop of Erichrome Black T(EBT) indicator.

End point: blue coloured solution

Trial number	Initial burette reading (cm3)	Final burette reading (cm3)	Mean burette reading (cm3)

APPENDIX-4

SHELF LIFE STUDY OF GALACTOBAR BURFI USING 9-POINT HEDONIC SCALE

NAME :_____

AGE :_____

Taste each sample given and rate the characteristics given below on a scale of 1 to 9.

9-Like extremely
8-Like very much
7-Like moderately
6-Like slightly
5-Neither like nor dislike
4-dislike slightly
3- dislike moderately
2- dislike very much
1- dislike extremely

GALACTOBAR BURFI STORED AT REFRIGERATOR:-

Sensory characteristics	Day 1	Day 7	Day 14	Day 21	Day 28
Appearance					
Color					
Texture					
Aroma					
Taste					
Overall accepatabilty					

GALACTOBAR BURFI STORED AT ROOM TEMPERATURE:-

Sensory characteristics	Day 1	Day 7	Day 14	Day 21	Day 28

Appearance					
Color					
Texture					
Aroma					
Taste					
Overall accepatabilty					

SIGNATURE: _____

DATE:

DAY 1 _____

DAY 7 _____

DAY 14 _____

DAY 21 _____

DAY 28 _____