PROCESSING AND PRESERVATION OF FRUIT JUICES USING NATURAL PRESERVATIVES FOR THEIR SHELF LIFE EXTENSION

Submitted in partial fulfillment of the requirements for the award of Bachelor

Of Technology Degree in Biotechnology.

By

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of PUNATI SRAVYA **(37230062)** who carried out the project entitled **"PROCESSING AND PRESERVATION OF FRUIT JUICES USING NATURAL PRESERVATIVES FORTHEIR SHELF LIFE EXTENSION"** under my supervision from January 2021 to March 2021.

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DECLARATION

I **PUNATI SRAVYA (37230062)** hereby declare that the Project Report entitled **"PROCESSING AND PRESERVATION OF FRUIT JUICES USING NATURAL PRESERVATIVES FOR THEIR SHELF LIFE EXTENSION"** done by me under the guidance of Dr. M. Masilamani Selvam, Associate Professor is submitted in partial fulfillment of the requirements for the award of Bachelor of Technology degree in Biotechnology.

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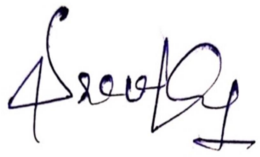

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SIGNATURE OF CANDIDATE

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ABSTRACT

Processing and preservation of fruit juices using natural preservatives to reduce the spoilage, dirt and to increase the shelf life period of fruit juices. The preservation of fruit juices was carried out using honey and along with the combination from the extraction of *Syzygium aromaticum* (Clove), *Cinnamomum verum* (Cinnamon), *Citrus limon* (Lemon), *Phyllanthus emblica* (Indian gooseberry), *Plecetranthus amboinicus* (Indian borage), *Zingiber officinale* (Ginger), *Piper nigram* (Black pepper) under room temperature. Two batches of juices were preserved with both natural and chemical preservatives. Chemical preservatives were also studied along with the natural preservative for the comparative study in shelf life extensions of fruit juices. Commonly used chemical preservatives are Sodium benzoate, Citric acid. The result revealed that the juice maintained its color, aroma and taste in the concentration of 1% to 3% of all the natural preservatives and it shelf-life extended up to 60 days under room temperature. The pH was checked during every intermediate time of storage under room temperature.

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LIST OF SYMBOLS AND ABBREVATION

SYMBOLS	ABBREVATION
ºC	Degree Celsius
μg	micro gram
ºBx	Degree brix
Conc H2SO4	Concentrated sulphuric acid
g	grams
min	minutes
ml	milli liter
NaOH	Sodium hydroxide
pH	Power of hydrogen
nm	nano meter
mg	milli gram
OD	Optical density
Na	Sodium
K	Potassium
Ppm	parts per million
H2O2	Hydrogen peroxide
Mm	millimetre
UV	Ultra violet

CHAPTER 1

INTRODUCTION

Fruit juices are produced and consumed for nutritional qualities of having rich in vitamins and minerals and having regulatory functions to the body systems, such as by adding alkaline to the blood and proper functioning of blood vessels and also including capillary vessels, permeability and fragility as result of containing falconoid. Juices increase the body retention of calcium, magnesium, nitrogen and also provide good sources of quick energy.

Fruit juices are important commodities in the market by providing huge possibilities for new value added products to meet consumers demand for their convenience, nutrition and health. The challenges of today's food processing industry are enhancement of shelf-life stability and food safety for which chemical preservatives are used to prevent spoilage due to microbial contamination. If the drink is made using fruit concentrate it is labeled as fruit drink, beverage or cocktail. Fruits and vegetables are important nutrition to human beings and these foods not only have the quantitative needs to meet some extent but also supply vitamins and minerals which improve the quality and maintain health. However, the excessive consumption of certain types of food such as fat, sugar and salt, is harmful to health and skin. Chemically, food products consist of water, fat, carbohydrates, protein and small amounts of organic compounds and minerals, it will promote the growth of microbial since all these compounds are the source energy for microbial to grow. Preservation is defined as a method used to maintain an existing condition and to prevent damage to be brought about by chemical (oxidation), physical (temperature, light) or biological (microorganisms) factors. Preserving food, done it possible to have food available from harvest to next year. The main function of preservation is to make slow the foodstuffs spoilage and to prevent all alterations in the taste and their appearance. This can be done in various ways, through processing methods including canning, dehydration , smoking and freezing, the use of packaging; and the use of food additives such as antioxidants or other preservatives. During harvesting, handling, processing and storage bacteria, yeast and molds infects the food.

1.1 PERMANENT METHODS OF FOOD AND BEVERAGE PRESERVATION:

The principle used in the permanent preservation is to delete or eliminate complete and to prevent the activities of organisms for destroying the products. Food preservation are the substance that are used in the process of treating and handling of fruits to stop or greatly slow down spoilage (loss of quality, edibility or nutritive value) caused or accerlated by microorganisms. It also includes process to inhibit natural ageing and discoloration that can occur during food preparation such as that enzymatic browning reaction in apples which causes browning when apples are cut. (Jean, 1994).The three approaches for the preservation of fruit juices is carried through traditional (thermal pasteurization), non-traditional, chemical method and natural food preservative methods. The traditional thermal pasteurization is most widely used in food processing industry. The two methods used in traditional thermal pasteurization are Low temperature long time and High temperature short time. The nontraditional methods are the most effective method during the last couple decades, including high hydrostatic pressure,high pressure homogenization ,pulse electric field and ultrasound.In non-thermal process it provides “fresh-like” and safe fruit juices with prolonged shelf life.

1.2 SPOILAGE OF FRUIT JUICE

Fruit juices are spoiled mainly due to rapid increase of acid tolerant and osmophilic micro flora. There is also risk of food borne microbial infections which is correlated with the consumption of fruit juices. In order to reduce out breaks, fruit juices are preserved by various techniques. Preservation of fruit juices by fruit juice industries is used economically by Thermal pasteurization but results in loss of required nutrients and changes in physicochemical and organoleptic properties.

Food products can be decayed by a various pathogenic and spoilage micro biota, causing foodborne diseases and causing huge commercial losses for the food industry due to undesirable results on the food properties. Microbial food spoilage is also a huge concern in the food industry. It is estimated that as 25% of all food produced is lost after harvest due to microbial activity. The increase of spoilage in microbiota in foods is not harmful for the human health and bad effect of shelf-life, textural characteristics, and

overall quality of the finished products, affects the consumer choices, and results in important commercial losses. The factors responsible for spoilage of food. These are:

- Infection by microorganisms,
- Action of enzymes,
- Mechanical damage,
- Characteristics and storage conditions of food,
- Damage by insects, parasites and rodents.

1.3 ROLE OF PRESERVATION IN FOOD PROCESSING INDUSTRY:

Food preservatives has became a most required thing nowadays, this plays an significant role during food transportation. This will store the food for a long duration from the spoilage. Every packaged food items has some preservatives, without them the food doesn't survive longer time. Radioactive materials like cobalt-30 is used as food preservative. Latest packaging techniques which includes vacuum and hypobaric packaging also acts as preservation techniques for storing. Food preservatives aim to preserve the appearance of food, preserve the food characteristics like taste, odor and food is preserved for a long time. Preservation is the process of prolonging the shelf-life stability of the products.The word preservative is considered a bad word by many consumers. Preservative are be added to food to prevent the growth of fungi. Food additives are used alone and also in conjunction with other methods of food preservation. Preservatives are still necessary to ensure the safety and variety of various foodstuffs available. They function through extending the spoiling of foodstuffs and preventing many alterations in the taste or appearance. Their assessment and use in foodstuffs is strongly controlled at both the European and the international level. Food preservatives play a important role in preventing food deterioration, protecting against spoilage from yeast, mold and other organisms which cause food poisoning. By longer time, preservatives reduces food cost, improve convenience, increase shelf life and reduce food waste. The preservation process takes place through either physical, chemical or sometimes in both combinations.

Classification of preservatives:

Preservatives are used food and beverages for the extension of shelf-life period of the food products. Preservatives are classified as:

Natural Preservatives: Natural food preservatives are essential to our health. They do not harm our health. Natural preservatives are salts, sugar, vinegar and rosemary extracts. Known preservative techniques are boiling, refrigerating, pickling and dehydrating are used in kitchens.

Artificial Preservatives: These are the chemical substance that cease the growth and activities of the microorganisms and helps to preserve the foods for a longer time without affecting its natural characteristics. It includes Antimicrobial agents and Antioxidants. To prevent the action of micro organisms, Antimicrobial agents are used. Certain antimicrobial agents are nitrites, benzoates, sorbates, calcium propionate EDTA and sodium benzoates. To prevent the oxidation caused in the food material, Antioxidants are used. Certain antioxidants are BHT, BHA, formaldehyde and ethanol.

Microbial preservatives: Microbial preservatives are the preservatives which inhibit the growth of bacteria and fungi, or anti-oxidants such as oxygen absorbers, which inhibit the oxidation of food constituents.

1.4 CHEMICAL PRESERVATION PROCESS:

A food additive can be defined as a chemical or mixture of chemicals, other than food stuffs is added to either during production, storage or packaging directly or indirectly to improve and maintain nutritional value, enhance quality and consumer acceptably, improve quality and check spoilage caused by microbes and enzymes and facilitates preparation. Chemicals are used as the food additives for the preservation process as they are more effective for a longer shelf-life extension as they will stop or delay the growth of bacteria, supress the reaction when the food is in contact with O2 or heat. Chemical additives has been used to prevent the survival and proliferation of microorganisms, but their safety and effect on human health. To delay the spoiling of foodstuffs by microorganisms, anti-microbial substances which inhibit, delay or prevent

the growth and proliferation of bacteria, yeasts and molds chemical preservatives are added to avoid the production of toxin substance. The commonly used chemical preservatives are Sodium benzoate, Sulphur di oxide, Citric acid, Monosodium glutamate, Benzoic acid, Ascorbic acid, Sorbic acid, boric acid, borax, Salicylic acid and Sodium-meta-sulphite.

Sodium benzoate: Sodium benzoate also known as E211, is added to fruit juices and other food items. It is a salt which is tasteless, odorless and effective is small quantity. It is used in the preservation of fruit juices and squashes.

Citric acid*:* Citric acid is used as a flavoring agent, preservative and cleaning agent. They supplement antioxidant potential. It also gives a cool taste and maintains **carbonation.**

1.4 CLASSIFICATION OF FOOD ADDITIVES:

ACIDS: Food acids are added to make flavors, and also act as preservatives and antioxidants. Common food acids include vinegar, malic acid, and lactic acid, citric acid,.

Acidity regulators: To change and control the acidity and alkalinity of foods, Acidity regulators are used.

Anticaking agents: Anticaking agents use powders such as milk powder from caking or sticking.

Antifoaming agents: To reduce or prevent foaming in foods, Antifoaming agents are used.

FOOD COLOURING: Colouring is added to food and beverages to replace colour that are being lost during the thermal process. Food colouring are also added to food to look more attractive.

1.5 EFFECTS OF CHEMICAL PRESERVATIVES:

Artificial preservatives are considered safe, but several has negative and life threatening side effects. Nitrates are converted to nitrites that reacts with hemoglobin to produce methemoglobin, a substance that cause loss of consciousness and death, especially in infants. Sulphite containing food preservatives cause severe allergic reactions and asthma. The toxic chemicals are used along with methylchloroisothiazolinone and methylisothiazoline.

Artificial preservatives are chemical substances that cause health Issues. Awarenessis creating about the harmful effects of these chemicals in food, cosmetics and pharmaceuticals is increasing. The majority of chemical preservatives are related to health problems to the nervous and endocrine systems. Nitrates are used in preservation gets converted into nitrites and reacts with haemoglobin to produce methemoglobin, a substance that causes consciousness and deaths in infants. Sodium benzoate preservative is very unsafe for consumption, because it can cause asthma attack, high blood pressure, and also cause a person to develop kidney disease. It also cause severe, life threatening allergic reactions and it also causes children's to become hyperactive. Monosodium glutamate causes migraines, brain and it overstimulates nerve cells, sweating, redness of skin, nausea, weakness and also causes depression. High levels of exposure to toxins like these cause DNA damage to sperm. Artificial preservatives are mainly responsible for causing health problems to respiratory tract, blood, heart, and other.

1.6 NATURAL PRESERVATIVES:

Consumers are increases their demand and ready-to-eat food products with a fresh like quality, and containing only natural ingredients. Natural preservatives are non-toxic substances which are used in preservation of food and beverage industries. These natural preservatives are used in extending the shelf life period of the product causing no harm to the consumers in any way. Natural preservatives help keep foods fresh and good taste and prevent them from rotting or deteriorating quickly. These natural preservatives offer greater advantage over their non-toxic nature along with a wide range of health benefits. In order to maintain good health people nowadays are opting for products containing natural preservative. As natural preservative contains more heal beneficial activity. Nowadays people are falling back to the traditional knowledge of plant for their health care. Natural food preservatives have been used since long time. These are used in raw as well as cooked food to increase the shelf life of food so that aroma, taste and the food itself can be stored for a longer period of time. Also food decomposition is prevented by them. Apart from the preservatives pickling, deep frying freezing, salting and smoking also come. So to reduce the side effects of chemical preservative the juice is replaced along with the natural preservative in the place of chemical preservative as natural preservative has more natural beneficial properties for the human consumption. Natural preservatives has great advantages of their artificial parts due to non-toxic nature along with a wide range of health benefits.

1.7 BENEFITS OF USING NATURAL PRESERVATIVES:

As natural preservative has no toxic it is used more in preservation process of food, beverages and is also used in pharmatheutical industry. Natural preservative have more beneficial properties like it improves cholesterol level which may lower the risk of heart disease. They are safe the additives are found to be safe and has no adverse effect are approved by the Government. Natural preservative lowers blood sugar levels and has a powerful anti-diabetic effect, treats peptic ulcer, anti-inflammatory effects can help with osteoarthritis, may promote weight loss and fat reduction. Some of the natural

preservative are good for nerve function, reduces inflammation, may help fight or protect against cancer and reduces the risk of kidney stones. Due to these many beneficial properties natural preservative is used in the place of chemical preservative to increase the shelf life period of products and to inhibit many microorganisms.

Plants for preservation:

The plants in the wild do not go moldy. Living plants resist the natural forces of disintegration. It is found that in many cases the plants are extracted and those extracts are capable not only of resisting certain food spoilage microorganisms but in some cases can actively act to destroy them. Many plants have antibacterial, bactericide, and antibiotic activities. Some of the most commonly used natural preservatives and their health benefits are listed below.

i) CINNAMON:

Cinnamon is rich in essential oils like cinnamaldehyde and eugenol which has the property to inhibit microbial growth.they contain tannins and possess the antibacterial activity

ii) CLOVE:

Clove in particular has attracted the attention due to the potential antioxidant and antimicrobial properties standing out among the all other spices .Clove consist of phenolic compounds such as flavonoids, hidroxibenzoic acids, hidroxicinamic acids, and hidroxiphenyl propens . Clove is one of the very interesting plant with a potential as food preservative and has a rich source of antioxidant compounds. It has also been proved clove has more medicinal properties too.

iii) INDIAN GOOSEBERRY:

This fruit is important to contain huge amounts of vitamin C (ascorbic acid) and has bitter taste that derived from a high density of ellagitannins. Consist of polyphenols such as flavonoids, kaempferol, ellagic acids and gallic acids .It is more abundant in antioxidant properties.

iv) LEMON:

Microbial stability increased by lemon. The antimicrobial effect of lemon extract against some food spoilage microorganisms was conducted. Lemon are used in industries to produce synthetic citric acid and development of fermentation based process. Lemon is good source of vitamin C. lemon contains so many phytochemicals which including poluphenols, terpenes and tannins.

v) PEPPER:

Pepper consist of vitamin K, iron, and manganese with the trace amounts of other essential nutrients, proteins and dietary .It has antibacterial properties, black pepper helps to fight against infections and insect bites.

vi) HONEY:

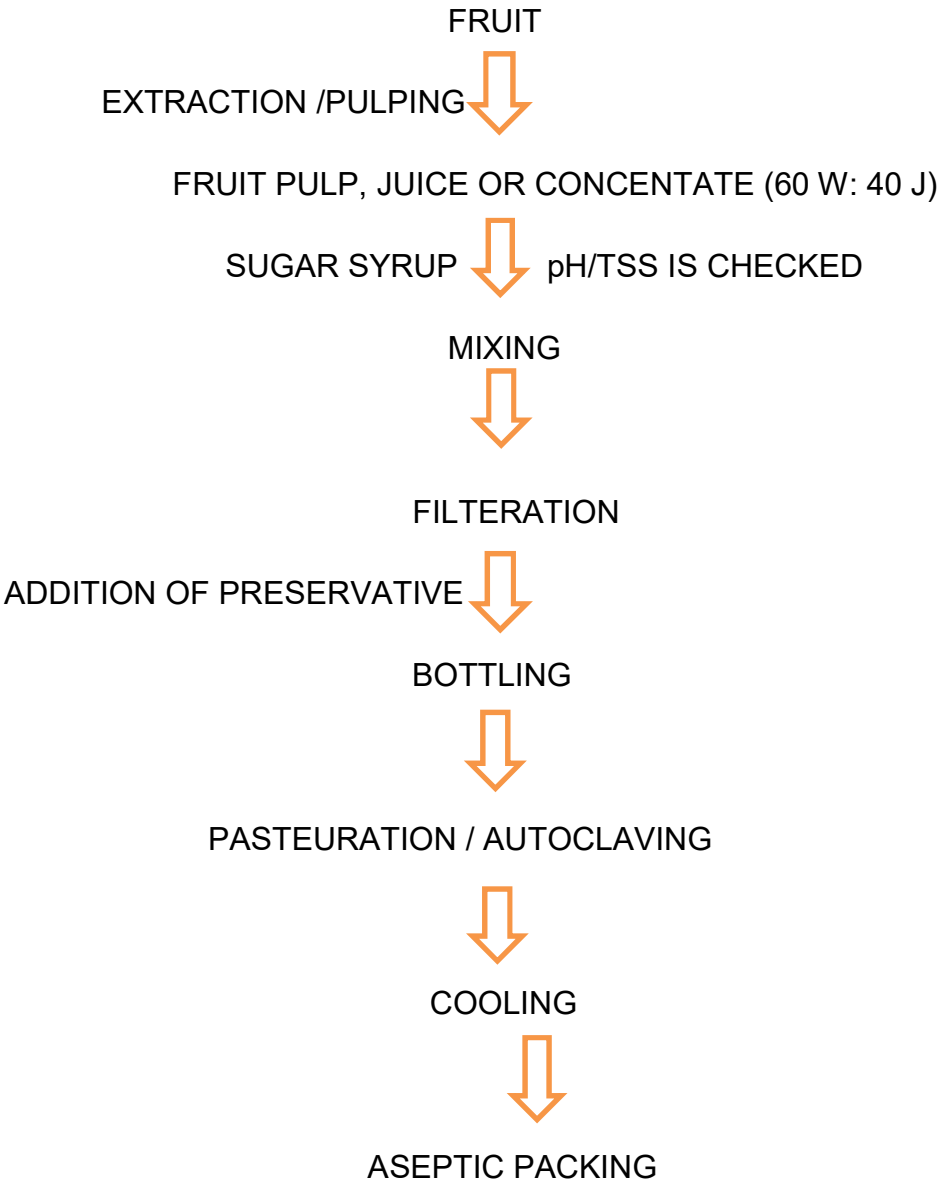
Honey - a sweet food from by bees using nectar from flowers. Its is not an diluted form, it is a rich source of nutrients and is self-preserving. It is a natural energy-booster, that builds immunity and is a good natural remedy for many ailments.

vii) GINGER:

It is categorized by the U.S. Food and Drug Administration as a food additive but has been studied as a treatment for nausea and vomiting, as well as for arthritis. Ginger

has been studied extensively in both animal and in vitro models, resulting to speculation for its use as an antioxidant, antimicrobial, antifungal, antineoplastic, and antihypertensive agent. However, none of these potential uses have been studied in humans Ginger can be consumed as a fresh or dried root and is often prepared in teas, soft drinks and breads

1.9 OUTLINE OF THE PROJECT:



CHAPTER 2

LITERATURE SURVEY

Aneja et al., (2014), their work was carried on complete studies on various emerging preservation technique that are responsible for controlling spoilage and pathogenic microorganisms in fruit juice. In this studies apart from the emerging techniques, preservative from natural source have also been shown. It has also discussed about the various prevention methods to control the growth of spoilage and pathogenic micro flora to increase the shelf-life of fruit juice.

Barba et al., (2013), their work was based on physio-chemical and nutritional characteristics of blueberry juice after processing in high pressure. They investigated the impact of high pressure processing (HPP). Total ascorbic acid, total phenolic, anthocyanin stability and total antioxidant capacity were also studied at various parameters such as pH, brix and colour.

Bhatt et al., (2013), their studies was based on the Indian borage. This work evaluates the total phenolic contents, total flavonoids and other major phytochemical components. It showed the great biological activity and presence of biomolecules in plant extract. It has also indicated that it can be used as the ingredient and nutraceuticals in food preservation process.

Conte at al., (2009), their work shows the complete feasibility of using lemon extracts as food preservative. The microbial quality of the fruits and juices were addressed. The lemon extract had antibacterial, antifungal properties. It has been used as natural preservative in fruit beverage and foods.

Corbo et al., (2009) their work is based on prolonging microbial shelf-life of foods through the use of natural compounds and non-thermal approaches. It proposes a review of alternative approaches for stabilization and shelf-life extension of food. It gives the detailed study on natural antimicrobial studies.

Cortes-Rojas etal, (2014), their studies has proven that clove (Syzygium aromatium) can be used as food preservative. It also emphasis that clove has antioxidant and antimicrobial activity. Further pharmacokinetics and toxicological studies on clove was also studied.

Cserhalmi et al., (2006) their study investigates about the effectiveness of PEF (Pulse Electric Field) treatment, applied on physical and chemical properties of freshly squeezed citrus juices (grape fruit, lemon, orange, tangerine) was performed in a continuous system and studied. The main aim of the work is to find the effect of PEF (Pulse electric field) technology over fresh fruit juice. Were juice samples are treated by 50 pulses at 28KV/cm and processed temperature was less than 34˚C.

Davidson et al.,(2013) this chapter talks about the traditional and naturally occurring antimicrobial compounds. In their investigation it gives detailed study on the importance of antimicrobial and natural food antimicrobials that are more important tools for food preserving process. It also gives detailed study on the efficacy of antimicrobial compounds in food products at concentration that do not change the adverse sensory effect.

Ejechi et al., (1998), their work carried with the usage of preservative in combination at concentration that extends the shelf-life stability of food without impacting sensory value. Their main objective was to extend the shelf-life period of mango juice by using natural preservative in combinations of ginger and nutmeg at low concentration as preservatives.

Gattuso et al., (2007) their work is based on the survey of the methodology employed in Citrus juices analysis was done. It focuses on analytical techniques for the characterization of citrus fruit juices regarding their flavonoid content (LCMS and LC-MS-MS) method.

Lanjhiyana et al., (2008), this work is based on the “studies on effect of chemical preservative on physic-chemical change of beverages from lime and ginger juice with their combination. Their main aim of investigation was to find out the best and effective

preserving chemicals for prolonging storage under ambient normal room temperature of fresh fruit juices as well as Ready-TO-Serve beverage.

Mishra et al., (2011), their work was about the shelf-life extension of sugarcane juice using preservatives and gamma radiation processing. In this studies the developed preservation method which can control microbial growth in raw sugarcane juice and maintain its freshness was studied.

Narendra Narain et al., (2008), their work was based on the complete study of pineapple juice. They have observed the change in the quality of pineapple juice flavor during processing. The final product was evaluated under sensory analysis and was distinguished with the other sample for comparative study. They resulted that there were no major changes in the pineapple juice quality during their study of processing operation.

Ozvural (2016), the aim of the journal is to provide a valuable resource for food scientists, nutritionists, food procedure, the public health sector and governmental and non-governmental agencies with an interest in food quality. It is regarding the food safety may be considered the comprehensive evaluation of a food product or technology is reported.

Roghini et al., (2018) their work was based on the evaluation of phytochemicals by using both qualitative and quantitative analysis of flavonoids and minerals in ethanolic extracts of citrus paradisi. Their further study showed that ethanloic extracts of fruit extract was found to have more constituents by quantitative method.

Rufai et al., (2015), their work gives the complete study on utilization of natural product waste fruit such as the fruit of Citrus aurantium var. further details on exploration and collection of ethobotanical information, chemical studies and screening for medicinal properties.

Rupasinghe et al., (2012) their work was on emerging methods on preservation of fruit juices and beverages. This studies provides a review of traditional and non-traditional

food preservation approaches including physical, chemical and their combination for the studies of extension of the shelf-life stability of fruit juices and beverages.

Saravana et al., (2014), their studies are based on the antimicrobial activity of Coleus Amboinicus. Which showed that it had more medicinal properties. The ethanolic extracts of Coleus Amboinicus leaf extract showed highest antibacterial activity in Salmonella typhi at a concentration of 100ug/ml.

Shan et al., (2007), their work gives the complete study on Cinnamomum burmannii which has the bioactive components that has the potential for application as natural preservative for food. This study has shown the antibacterial property and major behavior in bioactive components of cinnamon stick. These cinnamon sticks have the activity against food borne pathogenic bacteria.

Srinivastava and Sanjeev Kumar (2014) it gives the complete studies on fruit juices and vegetable processing and preservation methods. It also gives the detailed study on important properties of enzymes in fruits and vegetables, quality control in food processing industry, preservatives used in food industry and thermally processing food products.

Stone et al., (1993) this work focuses on the new and changing role in sensory evaluation in food industry. It gives the detailed studies on sensory evaluation of processed and preserved food.

Yougui chen et al., (2013) their work emphasis on the effect of thermal and nonthermal pasteurization on the microbial inactivation and phenolic degradation in fruit juices. This review proposes the combination of UV and PEF exposure for extending the shelf-life and liquid food preservation.

CHAPTER 3

AIM AND SCOPE

AIM:

The present study is to process and preserve the apple juice using natural preservatives to enhance shelf-life.

SCOPE:

- To extend the shelf-life period of the apple juice using natural preservatives.
- To reduce the microbial growth in the juice using natural preservatives.
- To make a product and replace the chemically preserved commercial products with naturally preserved products.

CHAPTER 4

MATERIALS AND METHODS

4.1 METHODOLOGY:

The materials that are used for the process are:

EQUIPMENTS:

Glass bottles (100ml), glass beakers, juice extractor,knives,metal mesh, squeeze, measuring cylinder, test, ph paper, autoclave, pH paper, non-absorbent cotton ,mortar and pestle and distilled water.

CHEMICALS PRESERVATIVE UTILIZED:

Sodium benzoate, citric acid

NATURAL PRESERVATIVES USED:

Clove, Cinnamon, Ginger, Lemon, Honey, Pepper, Indian gooseberry, Apple fruit.

4.2 PRELIMINARY PROCESS:

4.2.1 Selection of fruits*:*

- The maturity and variety of the fruit and cultivation location influence the flavour and keeping quality of the juice. Fruits should be absolutely fresh, ripe, but firm and uniformly mature. All fruits are not suitable for the processing.
- Over ripe, unripe and green fruits should be avoided, if used, adversely affects the quality of the juice.
- The selected fruits must be free from dirt, damage, blemishes, insect damage and mechanical damages.
- The apple fruit was selected for the study on processing and preservation with natural preservative.

4.2.2 Grading*:*

- Diseased, damaged and decayed fruits are mostly removed by grading. The fruits are graded according to their size and colour to obtain good quality of products.
- Apple is usually graded with hand or sometimes after cutting into pieces or slices.

4.2.3 Washing:

- The washing process is done to remove the pesticide spray residue, dust from the fruits, and to remove spores so it is essential to wash the fruits (apple) with water. Washing the fruits is the most important and a necessary process

4.2.4 Peeling and cutting:

- Apple was peeled at the corner for the stalk using cutting knife.
- The Apple fruit were cut into small pieces and was further processed.

4.2.5 Blanching:

- Blanching is a cooking process in which a food, usually a fruit or vegeatable is scalded in boiling water.
- The prepared Apple was blanched into a hot water (80℃) for 3min to remove the dirt. This process reduces number of microorganisms

4.2.6 Cooling:

- After blanching these fruits are dipped into cold water for 2min for better handling and keeping them in good condition.

4.2.7 Juice extraction:

- Generally juice is extracted from fresh fruits by crushing and pressing them. The apple juice was extracted using a juice extractor.

4.2.8 Straining and filtration:

- Fruit juices always contain different amounts of suspended matter consisting of fruit tissue, seed, pectin substances and protein in colloidal suspension.
- Seeds and pieces of pulp and skin has affect the quality of juice and is removed by straining through metal mesh. The juice extract was retained for the further process.

4.3 EXTRACTION OF CRUDE NATURAL PRESERVATIVES:

4.3.1 Preparation of lime extract:

Fresh lemon was bought from local market. The juice was squeezed using the squeezer and the extract was used fresh as preservative.

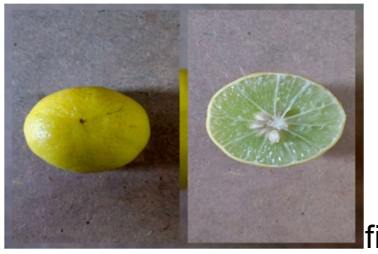


fig 4.3.1

4.3.2 Preparation of ginger extract:

Fresh ginger was brought from local market. It was grated and squeezed. Then the extract was filtered and used fresh for preservative.


fig 4.3.2.

4.3.3 Preparation of Indian gooseberry extract:

Indian gooseberry was washed and cut into pieces. It was finely grinded using mortar and pestle. The extract was filtered using filter paper and the final extract was used fresh for the preservation.


fig 4.3.3

4.3.4 Preparation of clove extract:

Clove extract was prepared by making the clove into fine powder and then weigh 0.25g of clove and add 25ml of distil water. Then allow it to boil at 80℃ for 10min. The aqueous solvent was filtered using the filter paper and the filtrate is used fresh.


fig 4.3.4

4.3.5 Preparation of cinnamon extract:

Cinnamon extract was prepared by dissolving 0.5g of cinnamon powder in 5ml of distil water. Then allow it to boil at 80℃ for 10min. filter the aqueous solvent using the filter paper and use is used fresh for the preservation process.

 fig 4.3.5

4.4 PROCESSING AND PRESERVATION OF FRUIT JUICE USING CHEMICAL PRESERVATIVES:

PURPOSE:

This method is used for the comparative study of shelf-life extension stability between natural preservative and chemical preservative.

METHOD:

- The pH of apple juice were observed and recorded.
- The filtered apple juice were taken in a clean and sterile glass bottles (200ml). The juice was mixed along with the distil water in the dilution rate (60% water: 40% fruit juice).
- After dilution, pH was checked. Then 3g of white sugar was added for both the juice samples.
- Then both the juice samples were allowed to boil for 80℃ for 2-3mins in micro oven and then allowed to cool down.
- Once the juice sample is bought down to room temperature then the samples were autoclaved at 121℃, 15lbs for 20 min.
- After the autoclave process add 1g/100ml of sodium benzoate and 1g/100ml of citric acid to the juice samples.

- After the addition of chemical preservatives, check for pH, then the samples was bottle and the samples were stored and observed under room temperature.

4.5 PROCESSING AND PRESERVATION OF FRUIT JUICES USING NATURAL PRESERVATIVES:

- The apple juice was filtered and used.
- The pH of the filtered apple juice were observed and recorded.
- The filtered apple juice was taken in a clean and sterile glass bottles (100ml). The juices were mixed along with the distil water in the dilution rate (60% water: 40% fruit juice).
- After dilution the pH was checked. Then the various preservatives were added as tabled below:

Table 4.1: Concentration of the natural preservatives per 100ml of apple juice.

Preservative Black Pepper	Preservative Clove	Preservative Ci	Preservative Lemon
1%	1%	2%	3%

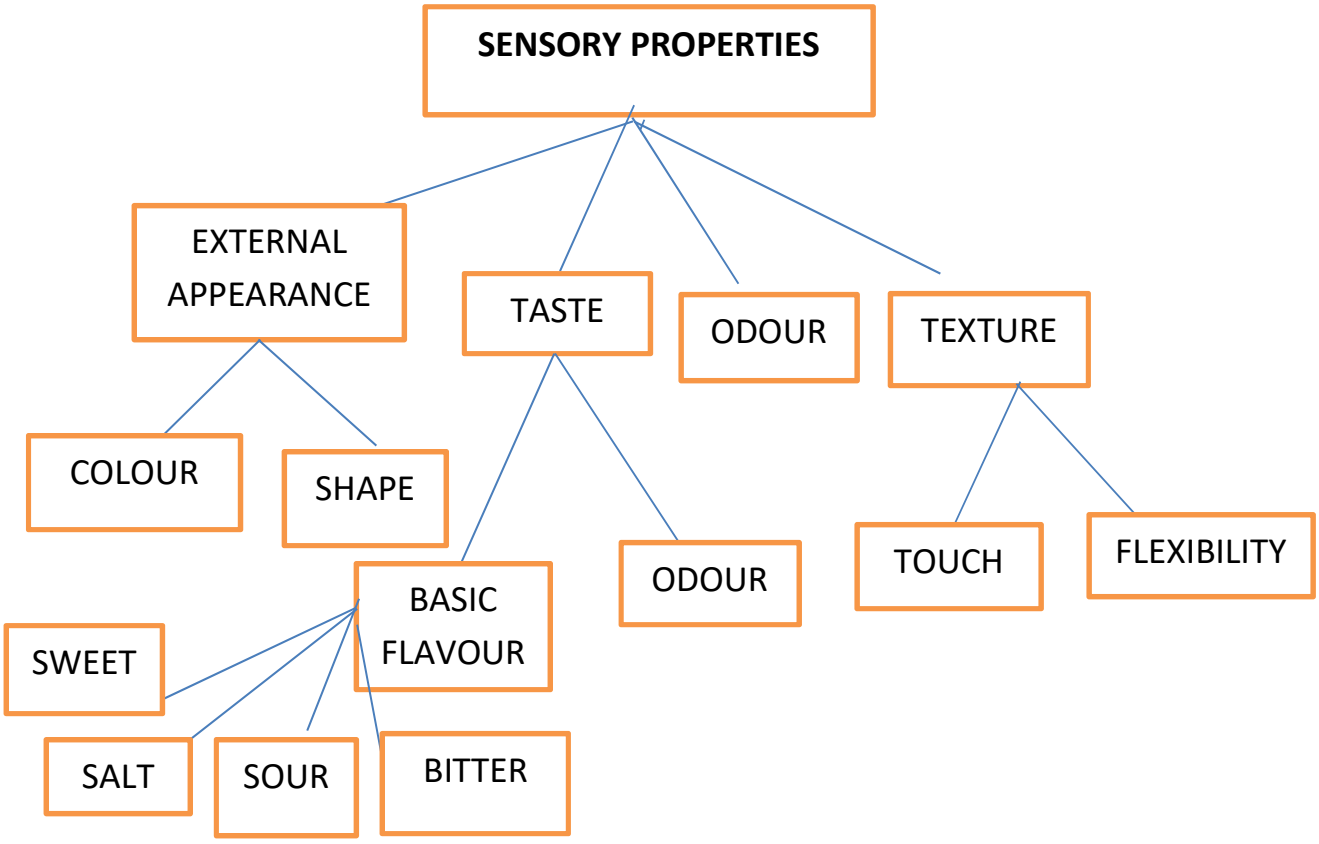
- After the addition of preservatives then, the juice sample was boiled @ 80℃ for 2min and it was bottled and then sealed.
- The bottled sample were autoclaved @121℃, 15lbs for 20min, then it was stored and studied under the room temperature for the microbial growth analysis.
- The pH of the preserved juice sample were observed during the interval time of storage.

4.6 DETERMINATION OF PH:

Purpose: The pH level of the fruit juice with chemical preservative and fruit juice with natural preservative was checked using pH paper during the storage period of time and was recorded.

4.7 SENSORY EVALUATION:

PURPOSE: To determine the the degree of compliance with the legal requirements and consumer habits and food quality characteristics is done by sensory evaluation and The aim of sensory testing is to describe the product, distinguishing two or more products, are there any difference between the qualities. For the sensory analysis the ranking procedure was used.



PROCEDURE:

- The panellists test the food and judge it. A panellist can be one or more. It is depending on the type of the sensory method.
- In this method there are three or more sample, which were were presented at the same time.
- They were coded, and no information about the sample was given.

Colour

- Colour detection.
- Colour laying ability – colour intensity ranking.

Odour

Olfactory ability, odour recognition.

Taste

- Taste recognition.
- Taste threshold.
- Concentration difference.
- Taste ranking was done.

Table 4.2 The human senses

BEHAVIOUR	EYE	NOSE	TONGUE	FINGER
COLOUR	✓			
TASTE		✓	✓	
ODOUR		✓		
AROMA		✓		
HARDNESS			✓	✓
ROUGHNESS			✓	✓
APPEARANCE	✓			

CHAPTER 5

RESULTS AND DISCUSSION

5.1 PRELIMINARY PROCESS:

The preliminary process was performed and the juice was extracted for the further processing and preservation.

Fig. 5.1 preliminary process

5.2 PROCESSING AND PRESERVATION OF FRUIT JUICES USING CHEMICAL PRESERVATIVE AND NATURAL PRESERVATIVE:

Apple juice was autoclaved and the chemical preservative such as sodium benzoate, citric acid was added. Then the preserved fruit juice was stored under room temperature. 0.3 % of preservatives were added.

Natural preservative method was also processed and stored under room temperature; where the chemical preservative fruit juice sample was autoclaved first and then preservatives were added once the temperature was bought down) The natural preservative fruit juice was autoclaved after the addition of natural preservatives.

CHEMICAL PRESERVATIVE:

Fig:5.2: Chemical preservative

NATURAL PRESERVATIVE:

Fig: 5.3: Natural preservative

5.3 pH ANALYSIS:

Table 5.3.1 PH – Natural preservative process

At the initial stage the pH of Apple juice was 4 and the pH was maintained the same till 50 days of storage and there was a change in pH at 60 days sample (Fig. 5.5). The decrease in the pH value indicates that the juice has become acidic which results as the process of fermentation as more acidic is been produced. Then, the pH for apple juice at initial was 4 and it maintained the same pH till 60 days of storage.

NO.OF DAYS	BLACK PEPPER	CLOVE	CINNAMON	LEMON
0	4	4	4	4
15	4	4	4	4
30	4	4	4	4
60	3.7	3.5	3.4	3.2

BLACK PEPPER:

Fig 5.3.1

CLOVE:

Fig 5.3.2

CINNMAON:

Fig 5.3.3

LEMON:

Fig5.3.4

Table 5.3.2 PH ANALYSIS OF CHEMICALLY PRESERVED APPLE JUICE:

At initial stage PH of apple juice is 4, and also PH maintained same for 15 days and 30 days of storage period and change in PH occurs for 60 days.

NO.OF DAYS	PH(CITRIC ACID)
0	4
15	4
30	4
60	3.2

5.4 SENSORY ANALYSIS:

5.4.1 Sensory analysis of naturally preserved juice sample

The juice samples were tasted and all the characterization and attributes were recorded. The samples had good taste and aroma. The juice samples were not spoiled over 60 days of storage under room temperature. The sensory analysis was performed for Apple juice sample and their taste characterization and attributes were record. The sensory analysis are as follows:

Table 5.4.1.1 BLACK PEPPER PRESERVATIVE:

Characterization and attributes	Excellent	Very good	Good	Satisfactory	Unsatisfactory
Appearance	✓				
Aroma		✓			
Taste			✓		
Color			✓		
Flavor		✓			
Mouth feel		✓			

Table 5.4.1.2 CLOVE PRESERVATIVE:

Characterization and attributes	Excellent	Very good	Good	Satisfactory	Unsatisfactory
Appearance		✓			
Aroma			✓		
Taste			✓		
Color			✓		

Flavor	✓
Mouth feel	✓

Table 5.4.1.3 CINNAMON PRESERVATIVE:

Characterization and attributes	Excellent	Very good	Good	Satisfactory	Unsatisfactory
Appearance	✓				
Aroma			✓		
Taste			✓		
Color			✓		
Flavor		✓			
Mouth feel			✓		

Table 5.4.1.4 LEMON PRESERVATIVE:

Characterization and attributes	Excellent	Very good	Good	Satisfactory	Unsatisfactory
Appearance		✓			

Aroma		✓
Taste		✓
Color		✓
Flavor		✓
Mouth feel	✓	

Table 5.4.2 SENSORY ANAYSIS OF CHEMICALLY PRESERVED APPLE JUICE

The chemically preserved apple juice had good taste, flavor, aroma and appearance. The chemically preserved and thermally processed apple juice was stored under room temperature and was analyzed for sensory scoring and for comparative study with naturally preserved Apple juice.

Characterization and attributes	Excellent	Very good	Good	Satisfactory	Unsatisfactory
Appearance	✓				
Aroma		✓			
Taste		✓			
Color		✓			

Flavor	✓
Mouth feel	✓

Table- 5.4.3 Taste analysis of apple juice

S.NO	TASTE	APPLE JUICE
1	**SOUR**	**MEDIUM**
2	**BITTER**	**NIL**
3	**SALTY**	**LOW**
4	**SWEET**	**HIGH**

5.5 SHELF- LIFE ANALYSIS OF JUICE

5.5.1 Chemically preserved juice sample*:*

The fruit juice sample with chemical preservatives showed no changes in taste, color, flavor and aroma. The chemically preserved and processed fruit juice had clear appearance with no contamination and was not spoilt in apple juice over 60 days of storage period.

The chemical preservative used for preservation was Sodium benzoate, Citric acid. The chemical preservative in apple juice had more effect in shelf life extension of fruit juices.

5.5.2 Natural preservative juice sample

Apple juice sample was preserved with natural preservative and was thermally processed. The processed fruit juice sample was stored for 60 days for shelf life study of natural preservatives in fruit juice sample. The preserved fruit juice samples maintained good characteristic and attributes. The juice samples were fresh and retained its flavor over the storage period. The apple juice had no contamination over 60 days of preservation. The natural preservative has more effect in apple juice samples.

5.6 DISCUSSION

Permanent Preservation of Fruits and Vegetables:

The permanent preservation principle is to delete complete or to neglect the activities of the organisms capable for destroying the product. The major methods used for permanent preservation are

(i) Sterilization or Processing*:*

The preserving foods by heat fundamental principle is known as “Processing or Sterilization”. Sterilization by heat means the complete destroy of all living forms of life in the product. To avoid spoilage, contamination, sterilized products must be sealed in such a manner that any of the live microorganism from outside cannot enter into it. In economic practice, all the canned food is unsterile but even that they are not spoiled as the conditions of inside can are not favorable for growth of microorganisms i.e. lack of oxygen. This process of heating done by lack of oxygen is termed as “Processing”. The temperature and time is to sterilized to different product varies. The product that is difficult to sterilize is low in acid and high in protein and contain spore bearing bacteria, requires optimum temperature and longer time for processing.

Fruits which are naturally acidic nature and the having more acid vegetables like tomatoes is to be satisfactory preserved at boiling water temperature 100°C for 30 minutes. Vegetable products needs very high temperature to kill the spore forming organisms and not acidic and containing more starch than sugar. Continuous heating for 30 – 90 minutes at 240degree F is essential for their sterilization. Using empty cans and bottles, should be sterilized about 30 minutes by keeping them in boiling water.

(ii) Preservation by Antiseptics:

Food was preserved permanently by addition of antiseptics like sugar, salt and vinegar and chemicals enough concentration to prevent the growth of microorganisms either by osmosis.

Sugar: If the concentration of sugar in the preserved material like Jellies is increased about 66%, the water content is decreased to such an extent that the multiplication of microorganisms is checked .

Salt: Strong salt solution doesn't allows the microorganism to grow in products which are preserved. It acts both osmosis and as a poison and it is much effective than sugar. A brine solution of 10 to 15% is sufficient for permanent preservation of most of the products such as Pickles and Canned Vegetables

Vinegar*:* Acetic acid of vinegar is more effective than sugar and salt and acts as poison to microorganisms. A solution of about 2% of acetic acid prevents most of the products (Pickles and Sauces) from spoilage.

(iii) Preservation by Food Additives i.e. Chemical Preservatives:

A food additive is defined a mixture of chemicals, and other food stuff that is added either during production, storage, processing, or packaging directly or not directly to improve or maintain nutritional value, maintain quality and consumer acceptability, improve keeping quality and check spoilage caused by microbes and enzymes and facilitates preparation".

Common types of food additives are salt, sugars, acids, species, essential oils, buffers, bleaching agents, emulsifying and thickening agents, food flavour, colour, preservatives, antioxidants, clarifying agents and humectants. Use of food additive is another effective approach for preserving fruits and vegetables. Some check microbial activity and, enzymatic and non-enzymatic browning of the preserved products during storage. Acids reduces the pH and behave as antimicrobial agents like chemical preservatives. They have bacteriostatic and bactericidal properties. The permitted preservatives used for various products are benzoic acid including salts (sodium benzoate) and sulphurous

acid including salts and sulphurous acid including salts or combination of these. They are used alone or in combination to check spoilage and contamination in fruits and vegetables and their products and to increase their shelf life by keeping proper nutritional value. Preservation method is cheap and very easy and best suited for its application in the developing countries to preserve perishable commodities.

Chemical Preservatives: For example peaches, plums, mango, apricot, apple juice, litchi, citrus fruits, pineapple, carrot, tomato, etc, can easily be preserved and stored after heating them to 80-85°C. Fruits pulp and juices from fruits and vegetables and then by adding chemical preservative and acid. Potassium-meta-bisulphite is used to preserve the pulps. Sodium benzoate is used for colored juices with citric acid. The acid and preservative was added and later dissolve them separately in a small quantity of water. These juices was stored in jars or glass bottles. Whenever required, one bottle of pulp was opened and made into 3-4 bottles of squash or about a kg of jam by standard recipes. Fruit jam is mixed and also be made by mixing juice of various fruits and cooking them to thick consistent having 68-80 0 Brix. Preserved fruit and pulps of vegetable or juices are used to prepare chutneys and sauces.

Preservatives: Preservative which is capable of inhibiting, reducing or arresting the process of fermentation or decomposition of food. Chemical preservatives are used in small quantities to check the microorganism and is most effective than salt, sugars, and vinegar. Benzoic acid, Sulphorous acid and their salts. E.g. Sodium-meta-bi-sulphite and Potassium-meta-bisulphite, Sodium benzoate are permitted by chemical preservatives. Formaldehyde, Borax, Boric acid Salicylic acid has prohibited to use them as preservative due to their toxic effect. Sodium Benzoate prevents spoiling of most acid food products. For example, squashes preserved in 670 of SO2 or 600 ppm of Benzoic acid. Jam and jellies preserved in 50 ppm SO2 or 500 ppm Benzoic acid.

There are two important preservatives viz. Benzoic acid and Sulphur dioxide.

- **Sodium Benzoate***:* It is salt and it has no taste, odourless and strong is small quantity. Sodium benzoate preservation of fruits juices and squashes. Sodium benzoate 180 times more soluble than benzoic acid. The addition of Sodium

Benzoate depends on the nature of juice exactly its acidity and the type of infection to be overcome. For acidic fruit juices, 0.08 to 0.19 percent Sodium Benzoate is sufficient. The preservative a of Benzoic acid increases the presence of co2 resulting in inhibition of growth of microorganisms. Benzoic acid is more strong against yeasts than against moulds

- **Sulphur Dioxide***:* Source of so2 is done by Potassium meta bisulphate. Dry powder is simple to use than liquid or gaseous form It distract discoloration and flavor loss due to oxidation in fruit juices and squashes by its strong effect retarding oxidation. It cannot be used in the case of naturally coloured juices such as Pomegranate juices, Jamun strawberry pulp, etc., on account of its bleaching action. It cant used in those juices which are to be stored; in tin containers, because not only does it act upon the tin of the can cause pinholes, but also forms hydrogen sulphide which has a disagreeable smell and forms a black compound with tin plate. Both are highly objectionable defects. The chemical preservatives should be added in the solid form to fruit juices and squashes. Those should be dissolved in a small amount of and the solution is added to the juice. If this not taken care, the solid preservative will suspend at the bottom of the container with the result that fermentation may start before the preservative dissolves.

Preservation by Drying:

It is the most popular of preservation. Drying of dehydration is more rapid process as artificial heat of maximum temperature was provided. The fruits and vegetables are dried to maximum extent to the moisture content is reduced and microorganism fail to survive on them and it checks the action of enzymes. Drying helps in preservation of foods. Microbes cant grow and absence of sufficient water in their environment. The enzymatic reactions are hydrolysis in nature, requiring water. Chemical reactions in food materials are slowed down when the reaction is in solid state. By removing water, it is possible to preserve them by checking the significant spoilage agents. The principle forms for dehydrated food and for osmotic, dehydration is rich in high sugar or salt acts

as a preservative. Fruits and vegetables may be dried in air, superheated steam in vacuum, in inert gases or by direct application of heat.

Harmful Health Effects of Preservatives in Fruit Juices:

Artificial juices are purchased or bought in grocery stores and they have a great taste, have some unhealthy chemicals in them. Some of the bad preservatives are foundmakes in fruit juices and other foods that can danger to human health.

*Phosphoric Acid***:** Phosphoric acid is the preservative which gives fruit juices their sharp nice taste. It prevents growth of worse bacteria in the juices themselves. This is good for the juice, but it's not so good for our health. Phosphoric acid will eat teeth like battery acid. This preservative also cause a reduction in your bone density and it is also related to kidney disease. Although these juices are sweet in taste, they can take a serious toll on your health.

Sodium Benzoate: Sodium benzoate, also called as E211, is yet another preservative that is added to fruit juices and other food items. However, this preservative is much unsafe for consumption, because it cause asthma attacks, high blood pressure, and can also cause a person to much develop kidney disease. A study publishing in Archive of Disease in Childhood in1998, showed that Sodium benzoate cause children to become hyperactive. Sodium benzoate can also cause severe life threatening allergic reactions and more allergies.

Monosodium Glutamate*:* It is major one of the preservatives in food that addup flavors such as salt. People should avoid Monosodium Glutamate more used, because it overstimulates nerve cells. People who ingest Monosodium Glutamate have been knowledge is be affects by seizures, migraines, brain lesions, and suffer from depression. Glutamate industry is aware of the health problems associated with MonoSodium Glutamate, rejects to stop using the preservative in their food products.

Aspartame: When it comes to artificial sweeteners in high sugar fruit drinks, Aspartame is the one preservative we should avoid at all costs. The Health and Human Services offices has found that there are more than 90 symptoms linked with ingesting

aspartame, some of them include, but they are not limited to anxiety, nausea, heart problems, muscle spasms, and depression.

Reasons to avoid these ill effects to our health:

Prepare or find juices and other foods that are free from these and other unhealthy preservatives. Where juices are concerned, if possible, make your own fruit juice at home, or eat the fruit itself, instead of purchasing processed juices. Some times foods need a few type of preservatives to maintain their long shelf life, it is best to study food labels carefully, and find the juices and other food items that are free from unhealthy preservatives.

Natural antimicrobials:

Aside from physical methods, some chemical preservatives are commomly used for the life span extension of fruit juices and beverages. However, consumer demand for natural origin, safe and environment friendly food preservatives is increasing. Natural antimicrobials, for example lactoperoxidase, bacteriocins and herb leaves oils, spices, chitozan and organic acids has shown viability for use in few/some food products (Gould 2001, Corbo et al. 2009). Some are contemplate as Generally Recognized As Safe (GRAS) additives in foods.

Bacteriocins: These are series of antimicrobial peptides which are readily degraded by proteolytic enzymes in the human body. Amid of them, nisin is the most usually used food preservative and the Generally Recognised as Safe (GRAS) additives permitted by the Food Additive Status List. Aside from dairy products, it has been used to preserve fruit and vegetable juices.

Lactoperoxidase: It is an enzyme that is widely distributed in colostrum, raw milk and other body liquid. It is an oxidoreductase and catalyses the oxidation of thiocyanate with the consumption of H2O2, to produce intermediate products with antibacterial properties (Corbo et al. 2009). These products has been designated to be bactericidal for some spoilage and pathogenic microorganisms and yeasts (Gould 2001). There is no much

information found on the application of lactoperoxidase in fruit juices. Recently, it has been used for the preservation of tomato juice and mongo fruits etc.

Herb, spice and flavour oils: Some herbs and spices contain essential oils, which are natural antimicrobials. The major elements of antimicrobials are phenolic compounds, including cinnamic, caffeic, ferulic and oleuropein, thymol, gallic acids, and eugenol (Gould 2001). Amid them, Salvia officinalis(sage), (Rosemarinus officinalis) rosemary, (Eugenia aromatica) clove, (Coriandrum sativum) coriander, garlic (Allium sativum) and onion (Allium cepa) were listed as potential antimicrobials for food use (Deans and Ritchie 1987). The bay leaves oil, clove, cinnamon, and thyme was also proven to be highly strong for food pathogenic microorganisms including Campylobacter jejuni, Salmonella enteritidis, Escherichia coli, Staphylococcus aureus and Listeria monocytogenes (Smith-Palmer et al. 1998). It is be the opinion that Grampositive bacteria is more sensitive to inhibition by plant essential oils compare to the Gramnegative bacteria. Cinnamon is one of the antimicrobial agent that used long time in apple juice 2005; apple cider (Ceylan et al. 2005) and fresh-cut apple slices (Muthuswamy et al. 2009). Ground cinnamon (0.2%) could inhibit the growth of Staphylococcus aureus, Y.entierocoliticas and Salmonella typhimiurium in apple juice (Yuste and Fung 2004), whereas oils of cinnamon leaf or bark inactivated Salmonella enterica and E. coli O157:H7 in apple juice (Friedman et al.2004). Ethanol extract of cinnamon bark (2% to 3% w/v) and cinnamic aldehyde (2 mm) could reduce E. coli O157:H7 and L. innocua in vitro. Ethanol extract of cinnamon bark (1% w/v) deduced popularly the aerobic growth of bacteria inoculated in fresh-cut apples during storage at 6ºC up to 12 days. It is also found that cinnamic aldehyde have greater antimicrobial activity than potassium sorbate (Muthuswamy et al. 2009). Citrus fruits extracts has been applied successfully to fruits and vegetables. For example, extract of lemon has been applied for the inhibition of some spoilage microorganisms, such as Lactobacillus spp, Bacillus licheniformis Pichia subpelliculosa, Saccharomyces cerevisiae and Candida lusitaniae, the minimum inhibition concentration is 101 to 151 ppm (Conte et al. 2007). The pathogenic bacteria growth of, Escherichia coli O157:H7, Listeria innocua and the food spoilage fungus, Penicillium chrysogenum were repressed by three phenolic compounds (catechin, chlorogenic acid and phloridzin) at 24 mm but the

growth of food spoilage yeast Saccharomyces cerevisiae was inhibited only by chlorogenic acid and phloridzin (Muthuswamy and Rupasinghe, 2009). Vanillin is the predominant phenolic compound present in vanilla beans, have shown a concentration dependent for the response and the minimal inhibitory concentration (MIC) of 6 to 18 mm for pathogenic and spoilage microorganisms

CHAPTER 6

SUMMARY AND CONCLUSION

The is a great increase in the demand of fruit juices due to the health benefits. Due to the changes in social habits and dietary intake people prefer to consume RTS (Ready – To – Serve) beverages. Were these RTS beverages are preserved with chemical preservatives have led to increase in disease outbreaks linked mainly to fresh fruit juices in recent years. So the main aim of this work is to replace the role of chemical preservatives in fruit juices with natural preservative and thermally processed method.

The natural preservatives used in the shelf life extension are found to be more effective and it inhibits the growth of microorganisms. These natural preservative has no toxic effect and increases more health beneficial advantages to the consumers. People do started preferring to consume herbal and natural products rather than toxic chemical products. These natural preservatives were added to increase the shelf life period of fruit juices. By using various concentration of preservative by trial and error the final concentration was standardized for both the juice samples. These fruit juices had no physiochemical or biological changes. In future, the combination of natural preservative and non-thermal methods would be new trend to improve the shelf-life period of fruit juices that improves microbiological quality.

The natural antimicrobial compounds in fruit juice and beverages application is in the laboratory scale.This would lead to a fast growth of scale-up and commercial application in food industry by their potential benefits of compounds. More practically, the combination of non-thermal techniques and natural antimicrobial compounds would be the future trends for fruit juice and beverages preservation, due to the proven records for effective inhibition of microorganisms and shelf-life extension of fruit juices and beverages.

CHAPTER 7

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PLAGARISM REPORT

INTRODUCTION

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PLAGIARISM SCAN REPORT

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Plagiarism	Unique	Plagiarized Sentences	Unique Sentences

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Fruit juices are produced and consumed for nutritional qualities of having rich in vitamins and minerals and having regulatory functions result of containing falconoid. Juices increase the body retention of calcium, magnesium, nitrogen and also provide good sources of quick energy.
Fruit juices are important commodities in the market by providing huge possibilities for new value added products to meet consumers demand for their convenience, nutrition and health. The challenges of today's food processing industry are enhancement of shelf-life stability and food safety for which chemical preservatives are used to prevent spoilage due to microbial contamination. If the drink is made using fruit concentrate it is labeled as fruit drink, beverage or cocktail. Fruits and vegetables are important nutrition to human beings and these foods not only have the quantitative needs to meet some extent but also supply vitamins and minerals which improve the quality and maintain health. However, the excessive consumption of certain types of food such as fat, sugar and salt, is harmful to health and skin. Chemically, food products consist of water, fat, carbohydrates, protein and small amounts of organic compounds and minerals, it will promote the growth of microbial since all these compounds are the source energy for microbial to grow. physical (temperature, light) or biological (microorganisms) factors. Preserving food, done it possible to have food available from harvest to next year. The main function of preservation is to make slow the foodstuffs spoilage and to prevent all alterations in the taste and their appearance. This can be done in various ways, through processing methods including canning, dehydration , smoking and freezing, the use of packaging; and the use of food additives such as antioxidants or other preservatives. During harvesting, handling, processing and storage bacteria, yeast and molds infects the food.
1.1 PERMANENT METHODS OF FOOD AND BEVERAGE PRESERVATION:
The principle used in the permanent preservation is to delete or eliminate complete and to prevent the activities of organisms for destroying the products. Food preservation are the substance that are used in the process of treating and handling of fruits to stop or greatly slow down spoilage (loss of quality, edibility or nutritive value) caused or accerlated by microorganisms. It also includes process to inhibit natural ageing and discoloration that can occur during food preparation such as that enzymatic browning reaction in apples which causes browning when apples are cut. (Jean, 1994).The three approaches for the preservation of fruit juices is carried through traditional (thermal pasteurization), non-traditional, chemical method and natural food preservative methods. The traditional thermal pasteurization is most widely used in food processing industry. The two methods used in traditional thermal pasteurization are Low temperature long time and High temperature short time. The nontraditional methods are the most effective method during the last couple decades, including high hydrostatic pressure,high pressure homogenization ,pulse electric field and ultrasound.In non-thermal process it provides "fresh-like" and safe fruit juices with prolonged shelf life.
1.2 SPOILAGE OF FRUIT JUICE
Fruit juices are spoiled mainly due to rapid increase of acid tolerant and osmophilic micro flora. There is also risk of food borne microbial infections which is correlated with the consumption of fruit juices. In order to reduce out breaks, fruit juices are preserved by various techniques. Preservation of fruit juices by fruit juice industries is used economically by Thermal pasteurization but results in loss of required nutrients and changes in physicochemical and organoleptic properties.
Food products can be decayed by a various pathogenic and spoilage micro biota, causing foodborne diseases and causing huge commercial losses for the food industry due to undesirable results on the food properties. Microbial food spoilage is also a huge concern in the food industry. It is estimated that as 25% of all food produced is lost after harvest

due to microbial activity. The increase of spoilage in microbiota in foods is not harmful for the human health and bad effect of shelf-life, textural characteristics, and overall quality of the finished products, affects the consumer choices, and results in important commercial losses. The factors responsible for spoilage of food. These are:

- Infection by microorganisms,
- Action of enzymes,
- Mechanical damage,
- Characteristics and storage conditions of food,
- Damage by insects, parasites and rodents.

1.3 ROLE OF PRESERVATION IN FOOD PROCESSING INDUSTRY:

Food preservatives has became a most required thing nowadays, this plays an significant role during food transportation. This will store the food for a long duration from the spoilage. Every packaged food items has some preservatives, without them the food doesn't survive longer time. Radioactive materials like cobalt-30 is used as food preservative. Latest packaging techniques which includes vacuum and hypobaric packaging also acts as preservation techniques for storing. Food preservatives aim to preserve the appearance of food, preserve the food characteristics like taste, odor and food is preserved for a long time. Preservation is the process of prolonging the shelf-life stability of the products.The word preservative is considered a bad word by many consumers. Preservative are be added to food to prevent the growth of fungi. Food additives are used alone and also in conjunction with other methods of food preservation. Preservatives are still necessary to ensure the safety and variety of various foodstuffs available. They function through extending the spoiling of foodstuffs and preventing many alterations in the taste or appearance. Their assessment and use in foodstuffs is strongly controlled at both the European and the international level. Food preservatives play a important role in preventing food deterioration, protecting against spoilage from yeast, mold and other organisms which cause food poisoning. By longer time, preservatives reduces food cost, improve convenience, increase shelf life and reduce food waste. The preservation process takes place through either physical, chemical or sometimes in both combinations.

Sources	Similarity

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Words	993	Date	April 09,2021
Characters	6896	Excluded URL	

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Plagiarism	Unique	Plagiarized Sentences	Unique Sentences

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Classification of preservatives:
Preservatives are used food and beverages for the extension of shelf-life period of the food products. Preservatives are classified as:
Natural Preservatives: Natural food preservatives are essential to our health. They do not harm our health. Natural preservatives are salts, sugar, vinegar and rosemary extracts. Known preservative techniques are boiling, refrigerating, pickling and dehydrating are used in kitchens.
Artificial Preservatives: These are the chemical substance that cease the growth and activities of the microorganisms and helps to preserve the foods for a longer time without affecting its natural characteristics. It includes Antimicrobial agents and Antioxidants. To prevent the action of micro organisms, Antimicrobial agents are used. Certain antimicrobial agents are nitrites, benzoates, sorbates, calcium propionate EDTA and sodium benzoates. To prevent the oxidation caused in the food material, Antioxidants are used. Certain antioxidants are BHT, BHA, formaldehyde and ethanol.
1.4 CHEMICAL PRESERVATION PROCESS:
A food additive can be defined as a chemical or mixture of chemicals, other than food stuffs is added to either during production, storage or packaging directly or indirectly to improve and maintain nutritional value, enhance quality and consumer acceptably, improve quality and check spoilage caused by microbes and enzymes and facilitates preparation. Chemicals are used as the food additives for the preservation process as they are more effective for a longer shelf-life extension as they will stop or delay the growth of bacteria, supress the reaction when the food is in contact with O2 or heat. Chemical additives has been used to prevent the survival and proliferation of microorganisms, but their safety and effect on human health. To delay the spoiling of foodstuffs by microorganisms, anti-microbial substances which inhibit, delay or prevent the growth and proliferation of bacteria, yeasts and molds chemical preservatives are added to avoid the production of toxin substance. The commonly used chemical preservatives are Sodium benzoate, Sulphur di oxide, Citric acid, Monosodium glutamate, Benzoic acid, Ascorbic acid, Sorbic acid, boric acid, borax, Salicylic acid and Sodium-meta-sulphite.
Sodium benzoate:Sodium benzoate also known as E211, is added to fruit juices and other food items. It is a salt which is tasteless, odorless and effective is small quantity. It is used in the preservation of fruit juices and squashes.
Citric acid: Citric acid is used as a flavoring agent, preservative and cleaning agent. They supplement antioxidant potential. It also gives a cool taste and maintains carbonation.
1.4 CLASSIFICATION OF FOOD ADDITIVES:
ACIDS: Food acids are added to make flavors, and also act as preservatives and antioxidants. Common food acids include vinegar, malic acid, and lactic acid, citric acid,.
Acidity regulators: To change and control the acidity and alkalinity of foods, Acidity regulators are used.
FOOD COLOURING: Colouring is added to food and beverages to replace colour that are being lost during the thermal process. Food colouring are also added to food to look more attractive.
1.5 EFFECTS OF CHEMICAL PRESERVATIVES:
Artificial preservatives are considered safe, but several has negative and life threatening side effects. Nitrates are converted to nitrites that reacts with hemoglobin to produce methemoglobin, a substance that cause loss of consciousness and death, especially in infants. Sulphite containing food preservatives cause severe allergic reactions and asthma. The toxic chemicals are used along with methylchloroisothiazolinone and methylisothiazoline.
Artificial preservatives are chemical substances that cause health Issues. Awarenessis creating about the harmful

effects of these chemicals in food, cosmetics and pharmaceuticals is increasing. The majority of chemical preservatives are related to health problems to the nervous and endocrine systems. Nitrates are used in preservation gets converted into nitrites and reacts with haemoglobin to produce methemoglobin, a substance that causes consciousness and deaths in infants. Sodium benzoate preservative is very unsafe for consumption, because it can cause asthma attack, high blood pressure, and also cause a person to develop kidney disease. It also cause severe, life threatening allergic reactions and it also causes children's to become hyperactive. Monosodium glutamate causes migraines, brain and it overstimulates nerve cells, sweating, redness of skin, nausea, weakness and also causes depression. High levels of exposure to toxins like these cause DNA damage to sperm. Artificial preservatives are mainly responsible for causing health problems to respiratory tract, blood, heart, and other.

NATURAL PRESERVATIVES:

Consumers are increases their demand and ready-to-eat food products with a fresh like quality, and containing only natural ingredients. Natural preservatives are non-toxic substances which are used in preservation of food and beverage industries. These natural preservatives are used in extending the shelf life period of the product causing no harm to the consumers in any way. Natural preservatives help keep foods fresh and good taste and prevent them from rotting or deteriorating quickly. These natural preservatives offer greater advantage over their non-toxic nature along with a wide range of health benefits. In order to maintain good health people nowadays are opting for products containing natural preservative. As natural preservative contains more heal beneficial activity. Nowadays people are falling back to the traditional knowledge of plant for their health care. Natural food preservatives have been used since long time. These are used in raw as well as cooked food to increase the shelf life of food so that aroma, taste and the food itself can be stored for a longer period of time. Also food decomposition is prevented by them. Apart from the preservatives pickling, deep frying freezing, salting and smoking also come. So to reduce the side effects of chemical preservative the juice is replaced along with the natural preservative in the place of chemical preservative as natural preservative has more natural beneficial properties for the human consumption. Natural preservatives has great advantages of their artificial parts due to non-toxic nature along with a wide range of health benefits.

1.7 BENEFITS OF USING NATURAL PRESERVATIVES:

As natural preservative has no toxic it is used more in preservation process of food, beverages and is also used in pharmatheutical industry. Natural preservative have more beneficial properties like it improves cholesterol level which may lower the risk of heart disease.

Sources	Similarity

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Some of the natural preservative are good for nerve function, reduces inflammation, may help fight or protect against cancer and reduces the risk of kidney stones. Due to these many beneficial properties natural preservative is used in the place of chemical preservative to increase the shelf life period of products and to inhibit many microorganisms.
Plants for preservation:
The plants in the wild do not go moldy. Living plants resist the natural forces of disintegration. It is found that in many cases the plants are extracted and those extracts are capable not only of resisting certain food spoilage microorganisms but in some cases can actively act to destroy them. Many plants have antibacterial, bactericide, and antibiotic activities. Some of the most commonly used natural preservatives and their health benefits are listed below.
i) CINNAMON:
Cinnamon is rich in essential oils like cinnamaldehyde and eugenol which has the property to inhibit microbial growth.they contain tannins and possess the antibacterial activity
ii) CLOVE:
Clove in particular has attracted the attention due to the potential antioxidant and antimicrobial properties standing out among the all other spices .Clove consist of phenolic compounds such as flavonoids, hidroxibenzoic acids, hidroxicinamic acids, and hidroxiphenyl propens . Clove is one of the very interesting plant with a potential as food preservative and has a rich source of antioxidant compounds. It has also been proved clove has more medicinal properties too.
iii) INDIAN GOOSEBERRY:
This fruit is important to contain huge amounts of vitamin C (ascorbic acid) and has bitter taste that derived from a high density of ellagitannins. Consist of polyphenols such as flavonoids, kaempferol, ellagic acids and gallic acids .It is more abundant in antioxidant properties.
iv) LEMON:
Microbial stability increased by lemon. The antimicrobial effect of lemon extract against some food spoilage microorganisms was conducted. Lemon are used in industries to produce synthetic citric acid and development of fermentation based process. Lemon is good source of vitamin C. lemon contains so many phytochemicals which including poluphenols, terpenes and tannins.
v) PEPPER:
Pepper consist of vitamin K, iron, and manganese with the trace amounts of other essential nutrients, proteins and dietary .It has antibacterial properties, black pepper helps to fight against infections and insect bites.
vi) HONEY:
Honey - a sweet food from by bees using nectar from flowers. Its is not an diluted form, it is a rich source of nutrients and is self-preserving. It is a natural energy-booster, that builds immunity and is a good natural remedy for many ailments.
vii) GINGER:
It is categorized by the U.S. Food and Drug Administration as a food additive but has been studied as a treatment for nausea and vomiting, as well as for arthritis. Ginger
has been studied extensively in both animal and in vitro models, resulting to speculation for its use as an antioxidant, antimicrobial, antifungal, antineoplastic, and antihypertensive agent. However, none of these potential uses have been studied in humans Ginger can be consumed as a fresh or dried root and is often prepared in teas, soft drinks and

breads
1.9 OUTLINE OF THE PROJECT:

FRUIT
EXTRACTION /PULPING
FRUIT PULP, JUICE OR CONCENTATE (60 W: 40 J)
SUGAR SYRUP pH/TSS IS CHECKED
MIXING

FILTERATION
ADDITION OF PRESERVATIVE
BOTTLING

PASTEURATION / AUTOCLAVING

COOLING

ASEPTIC PACKING

Sources	Similarity

LITERATURE SURVEY

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Aneja et al., (2014), their work was carried on complete studies on various emerging preservation technique that are responsible for controlling spoilage and pathogenic microorganisms in fruit juice. In this studies apart from the emerging techniques, preservative from natural source have also been shown.
Barba et al., (2013), their work was based on physio-chemical and nutritional characteristics of blueberry juice after processing in high pressure. They investigated the impact of high pressure processing (HPP). Total antioxidant capacity,Total phenolic, anthocyanin stability, Total ascorbic acid, and were also studied at various parameters such as pH, brix and colour.
Bhatt et al., (2013), their studies was based on the Indian borage. This work evaluates the total phenolic contents, total flavonoids and other major phytochemical components. It showed the great biological activity and presence of biomolecules in plant extract. It has also indicated that it can be used as the ingredient and nutraceuticals in food preservation process.
Conte at al., (2009), their work shows the complete feasibility of using lemon extracts as food preservative. The microbial quality of the fruits and juices were addressed. The lemon extract had antibacterial, antifungal properties. It has been used as natural preservative in fruit beverage and foods.
Corbo et al., (2009) their work is based on prolonging microbial shelf-life of foods through the use of natural compounds and non-thermal approaches. It proposes a review of alternative approaches for stabilization and shelf-life extension of food. It gives the detailed study on natural antimicrobial studies.
Cortes-Rojas etal, (2014), their studies has proven that clove (Syzygium aromatium) can be used as food preservative. It also emphasis that clove has antioxidant and antimicrobial activity. Further pharmacokinetics and toxicological studies on clove was also studied.
Cserhalmi et al., (2006) their study investigates about the effectiveness of PEF (Pulse Electric Field) treatment, applied on physical and chemical properties of freshly squeezed citrus juices (grape fruit, lemon, orange, tangerine) was performed in a continuous system and studied. The main aim of the work is to find the effect of PEF (Pulse electric field) technology over fresh fruit juice. Were juice samples are treated by 50 pulses at 28KV/cm and processed temperature was less than 34˚C.
Davidson et al.,(2013) this chapter talks about the traditional and naturally occurring antimicrobial compounds. In their investigation it gives detailed study on the importance of antimicrobial and natural food antimicrobials that are more important tools for food preserving process. It also gives detailed study on the efficacy of antimicrobial compounds in food products at concentration that do not change the adverse sensory effect.
Ejechi et al., (1998), their work carried with the usage of preservative in combination at concentration that extends the shelf-life stability of food without impacting sensory value. Their main objective was to extend the shelf-life period of mango juice by using natural preservative in combinations of ginger and nutmeg at low concentration as preservatives.
Gattuso et al., (2007) their work is based on the survey of the methodology employed in Citrus juices analysis was done. It focuses on analytical techniques for the characterization of citrus fruit juices regarding their flavonoid content (LCMS and LC-MS-MS) method.
Lanjhiyana et al., (2008), this work is based on the “studies on effect of chemical preservative on physic-chemical change of beverages from lime and ginger juice with their combination. Their main aim of investigation was to find out the best and effective preserving chemicals for prolonging storage under ambient normal room temperature of fresh fruit juices as well as Ready-TO-Serve beverage.

Mishra et al., (2011), their work was about the shelf-life extension of sugarcane juice using preservatives and gamma radiation processing. In this studies the developed preservation method which can control microbial growth in raw sugarcane juice and maintain its freshness was studied.

Narendra Narain et al., (2008), their work was based on the complete study of pineapple juice. They have observed the change in the quality of pineapple juice flavor during processing. The final product was evaluated under sensory analysis and was distinguished with the other sample for comparative study. They resulted that there were no major changes in the pineapple juice quality during their study of processing operation.

Ozvural (2016), the aim of the journal is to provide a valuable resource for food scientists, nutritionists, food procedure, the public health sector and governmental and non-governmental agencies with an interest in food quality. It is regarding the food safety may be considered the comprehensive evaluation of a food product or technology is reported.

Roghini et al., (2018) their work was based on the evaluation of phytochemicals by using both qualitative and quantitative analysis of flavonoids and minerals in ethanolic extracts of citrus paradisi. Their further study showed that ethanloic extracts of fruit extract was found to have more constituents by quantitative method.

Rufai et al., (2015), their work gives the complete study on utilization of natural product waste fruit such as the fruit of Citrus aurantium var. further details on exploration and collection of ethobotanical information, chemical studies and screening for medicinal properties.

Rupasinghe et al., (2012) their work was on emerging methods on preservation of fruit juices and beverages. This studies provides a review of traditional and non-traditional food preservation approaches including physical, chemical and their combination for the studies of extension of the shelf-life stability of fruit juices and beverages.

Saravana et al., (2014), their studies are based on the antimicrobial activity of Coleus Amboinicus. Which showed that it had more medicinal properties. The ethanolic extracts of Coleus Amboinicus leaf extract showed highest antibacterial activity in Salmonella typhi at a concentration of 100ug/ml.

Shan et al., (2007), their work gives the complete study on Cinnamomum burmannii which has the bioactive components that has the potential for application as natural preservative for food. This study has shown the antibacterial property and major behavior in bioactive components of cinnamon stick.

Sources	Similarity

AIM AND SCOPE

MATERIALS AND METHODS

The present study is to process and preserve the apple juice using natural preservatives to enhance shelf-life.
SCOPE:
• To extend the shelf-life period of the apple juice using natural preservatives.
• To reduce the microbial growth in the juice using natural preservatives.
• To make a product and replace the chemically preserved commercial products with naturally preserved products.
CHAPTER 4
MATERIALS AND METHODS
4.1 METHODOLOGY:
The materials that are used for the process are:
EQUIPMENTS:
Glass bottles (100ml), glass beakers, juice extractor,knives,metal mesh, squeeze, measuring cylinder, test, ph paper, autoclave, pH paper, non-absorbent cotton ,mortar and pestle and distilled water.
CHEMICALS PRESERVATIVE UTILIZED:
Sodium benzoate, citric acid
NATURAL PRESERVATIVES USED:
Clove, Cinnamon, Ginger, Lemon, Honey, Pepper, Indian gooseberry, Apple fruit.
4.2 PRELIMINARY PROCESS:
4.2.1 Selection of fruits:
• The maturity and variety of the fruit and cultivation location influence the flavour and keeping quality of the juice. Fruits should be absolutely fresh, ripe, but firm and uniformly mature. All fruits are not suitable for the processing.
• Over ripe, unripe and green fruits should be avoided, if used, adversely affects the quality of the juice.
• The selected fruits must be free from dirt, damage, blemishes, insect damage and mechanical damages.
• The apple fruit was selected for the study on processing and preservation with natural preservative.
4.2.2 Grading:
• Diseased, damaged and decayed fruits are mostly removed by grading. The fruits are graded according to their size and colour to obtain good quality of products.
• Apple is usually graded with hand or sometimes after cutting into pieces or slices.
4.2.3 Washing:
• The washing process is done to remove the pesticide spray residue, dust from the fruits, and to remove spores so it is essential to wash the fruits (apple) with water. Washing the fruits is the most important and a necessary process
4.2.4 Peeling and cutting:
• Apple was peeled at the corner for the stalk using cutting knife.
• The Apple fruit were cut into small pieces and was further processed.
4.2.5 Blanching:
• Blanching is a cooking process in which a food, usually a fruit or vegeatable is scalded in boiling water.
• The prepared Apple was blanched into a hot water (80℃) for 3min to remove the dirt. This process reduces number of microorganisms
4.2.6 Cooling:
• After blanching these fruits are dipped into cold water for 2min for better handling and keeping them in good condition.

4.2.7 Juice extraction:
• Generally juice is extracted from fresh fruits by crushing and pressing them. The apple juice was extracted using a juice extractor.
4.2.8 Straining and filtration:
• Seeds and pieces of pulp and skin has affect the quality of juice and is removed by straining through metal mesh. The juice extract was retained for the further process.

4.3 EXTRACTION OF CRUDE NATURAL PRESERVATIVES:
4.3.1 Preparation of lime extract:
Fresh lemon was bought from local market. The juice was squeezed using the squeezer and the extract was used fresh as preservative.
fig 4.3.1
4.3.2 Preparation of ginger extract:
Fresh ginger was brought from local market. It was grated and squeezed. Then the extract was filtered and used fresh for preservative.
fig 4.3.2.
4.3.3 Preparation of Indian gooseberry extract:
Indian gooseberry was washed and cut into pieces. It was finely grinded using mortar and pestle. The extract was filtered using filter paper and the final extract was used fresh for the preservation.
fig 4.3.3
4.3.4 Preparation of clove extract:
Clove extract was prepared by making the clove into fine powder and then weigh 0.25g of clove and add 25ml of distil water. Then allow it to boil at 80℃ for 10min. The aqueous solvent was filtered using the filter paper and the filtrate is used fresh.
fig 4.3.4
4.3.5 Preparation of cinnamon extract:
Cinnamon extract was prepared by dissolving 0.5g of cinnamon powder in 5ml of distil water. Then allow it to boil at 80 ℃ for 10min. filter the aqueous solvent using the filter paper and use is used fresh for the preservation process.
fig 4.3.5
PROCESSING AND PRESERVATION OF FRUIT JUICE USING CHEMICAL PRESERVATIVES:
PURPOSE:
This method is used for the comparative study of shelf-life extension stability between natural preservative and chemical preservative.
METHOD:
• The pH of apple juice were observed and recorded.
• The filtered apple juice were taken in a clean and sterile glass bottles (200ml). The juice was mixed along with the distil water in the dilution rate (60% water: 40% fruit juice).
• After dilution, pH was checked. Then 3g of white sugar was added for both the juice samples.
• Then both the juice samples were allowed to boil for 80℃ for 2-3mins in micro oven and then allowed to cool down.
• Once the juice sample is bought down to room temperature then the samples were autoclaved at 121℃, 15lbs for 20 min.
• After the autoclave process add 1g/100ml of sodium benzoate and 1g/100ml of citric acid to the juice samples.
• After the addition of chemical preservatives, check for pH, then the samples was bottle and the samples were stored and observed under room temperature.
4.5 PROCESSING AND PRESERVATION OF FRUIT JUICES USING NATURAL PRESERVATIVES:
• The apple juice was filtered and used.
• The pH of the filtered apple juice were observed and recorded.
• The filtered apple juice was taken in a clean and sterile glass bottles (100ml). The juices were mixed along with the distil water in the dilution rate (60% water: 40% fruit juice).
• After dilution the pH was checked. Then the various preservatives were added as tabled below:
Table 4.1: Concentration of the natural preservatives per 100ml of apple juice.
Preservative
Black Pepper Preservative
Clove Preservative
Ci Preservative
Lemon
1% 1% 2% 3%

Sources	Similarity

RESULTS

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Using empty cans and bottles, should be sterilized about 30 minutes by keeping them in boiling water.
(ii) Preservation by Antiseptics:
Food was preserved permanently by addition of antiseptics like sugar, salt and vinegar and chemicals enough concentration to prevent the growth of microorganisms either by osmosis.
Sugar: If the concentration of sugar in the preserved material like Jellies is increased about 66%, the water content is decreased to such an extent that the multiplication of microorganisms is checked .
Salt: Strong salt solution doesn't allows the microorganism to grow in products which are preserved. It acts both osmosis and as a poison and it is much effective than sugar. A brine solution of 10 to 15% is sufficient for permanent preservation of most of the products such as Pickles and Canned Vegetables
Vinegar: Acetic acid of vinegar is more effective than sugar and salt and acts as poison to microorganisms. A solution of about 2% of acetic acid prevents most of the products (Pickles and Sauces) from spoilage.
(iii) Preservation by Food Additives i.e. Chemical Preservatives:
A food additive is defined a mixture of chemicals, and other food stuff that is added either during production, storage, processing, or packaging directly or not directly to improve or maintain nutritional value, maintain quality and consumer acceptability, improve keeping quality and check spoilage caused by microbes and enzymes and facilitates preparation".
Common types of food additives are salt, sugars, acids, species, essential oils, buffers, bleaching agents, emulsifying and thickening agents, food flavour, colour, preservatives, antioxidants, clarifying agents and humectants. Use of food additive is another effective approach for preserving fruits and vegetables. Some check microbial activity and, enzymatic and non-enzymatic browning of the preserved products during storage. Acids reduces the pH and behave as antimicrobial agents like chemical preservatives. They have bacteriostatic and bactericidal properties. The permitted preservatives used for various products are benzoic acid including salts (sodium benzoate) and sulphurous acid including salts and sulphurous acid including salts or combination of these. They are used alone or in combination to check spoilage and contamination in fruits and vegetables and their products and to increase their shelf life by keeping proper nutritional value. Preservation method is cheap and very easy and best suited for its application in the developing countries to preserve perishable commodities.
Chemical Preservatives: For example peaches, plums, mango, apricot, apple juice, litchi, citrus fruits, pineapple, carrot, tomato, etc, can easily be preserved and stored after heating them to 80-85°C. Fruits pulp and juices from fruits and vegetables and then by adding chemical preservative and acid. Potassium-meta-bisulphite is used to preserve the pulps. Sodium benzoate is used for colored juices with citric acid. The acid and preservative was added and later dissolve them separately in a small quantity of water. These juices was stored in jars or glass bottles. Fruit jam is mixed and also be made by mixing juice of various fruits and cooking them to thick consistent having 68-80 0 Brix. Preserved fruit and pulps of vegetable or juices are used to prepare chutneys and sauces.
Preservatives: Preservative which is capable of inhibiting, reducing or arresting the process of fermentation or decomposition of food. Chemical preservatives are used in small quantities to check the microorganism and is most effective than salt, sugars, and vinegar. Benzoic acid, Sulphorous acid and their salts. E.g. Sodium-meta-bi-sulphite and Potassium-meta-bisulphite, Sodium benzoate are permitted by chemical preservatives. Formaldehyde, Borax, Boric acid Salicylic acid has prohibited to use them as preservative due to their toxic effect. Sodium Benzoate prevents spoiling of most acid food products. For example, squashes preserved in 670 of SO2 or 600 ppm of Benzoic acid. Jam

and jellies preserved in 50 ppm SO2 or 500 ppm Benzoic acid.
There are two important preservatives viz. Benzoic acid and Sulphur dioxide.
• Sodium Benzoate: It is salt and it has no taste, odourless and strong is small quantity. Sodium benzoate preservation of fruits juices and squashes. Sodium benzoate 180 times more soluble than benzoic acid. The addition of Sodium Benzoate depends on the nature of juice exactly its acidity and the type of infection to be overcome. For acidic fruit juices, 0.08 to 0.19 percent Sodium Benzoate is sufficient. The preservative a of Benzoic acid increases the presence of co2 resulting in inhibition of growth of microorganisms. Benzoic acid is more strong against yeasts than against moulds
• Sulphur Dioxide: Source of so2 is done by Potassium meta bisulphate. Dry powder is simple to use than liquid or gaseous form It distract discoloration and flavor loss due to oxidation in fruit juices and squashes by its strong effect retarding oxidation. on account of its bleaching action. It cant used in those juices which are to be stored; in tin containers, because not only does it act upon the tin of the can cause pinholes, but also forms hydrogen sulphide which has a disagreeable smell and forms a black compound with tin plate. Both are highly objectionable defects. The chemical preservatives should be added in the solid form to fruit juices and squashes. Those should be dissolved in a small amount of and the solution is added to the juice. If this not taken care, the solid preservative will suspend at the bottom of the container with the result that fermentation may start before the preservative dissolves.
Preservation by Drying:
It is the most popular of preservation. Drying of dehydration is more rapid process as artificial heat of maximum temperature was provided. The fruits and vegetables are dried to maximum extent to the moisture content is reduced and microorganism fail to survive on them and it checks the action of enzymes. Drying helps in preservation of foods. Microbes cant grow and absence of sufficient water in their environment.

Sources	Similarity

CONCLUSION

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Characters	1983	Excluded URL	

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CHAPTER 6
SUMMARY AND CONCLUSION
The is a great increase in the demand of fruit juices due to the health benefits. Due to the changes in social habits and dietary intake people prefer to consume RTS (Ready – To – Serve) beverages. Were these RTS beverages are preserved with chemical preservatives have led to increase in disease outbreaks linked mainly to fresh fruit juices in recent years. So the main aim of this work is to replace the role of chemical preservatives in fruit juices with natural preservative and thermally processed method.
The natural preservatives used in the shelf life extension are found to be more effective and it inhibits the growth of microorganisms. These natural preservative has no toxic effect and increases more health beneficial advantages to the consumers. People do started preferring to consume herbal and natural products rather than toxic chemical products. These natural preservatives were added to increase the shelf life period of fruit juices. By using various concentration of preservative by trial and error the final concentration was standardized for both the juice samples. These fruit juices had no physiochemical or biological changes. In future, the combination of natural preservative and non-thermal methods would be new trend to improve the shelf-life period of fruit juices that improves microbiological quality.
The natural antimicrobial compounds in fruit juice and beverages application is in the laboratory scale.This would lead to a fast growth of scale-up and commercial application in food industry by their potential benefits of compounds. More practically, the combination of non-thermal techniques and natural antimicrobial compounds would be the future trends for fruit juice and beverages preservation, due to the proven records for effective inhibition of microorganisms and shelf-life extension of fruit juices and beverages.

Sources	Similarity