A COMPLETE REVIEW ON GUAVA LEAF EXTRACTION PROCEDURES

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ABSTRACT
Psidium gujava Linn [Guava] is used in the traditional medicine in tropical and subtropical areas all over the world with various pharmacological effects. It is wondrous that one forth of world population using traditional medicine to avoid the side effects which are causing due to allopathic medicines. From the immemorial times the traditional medicines are the main source to cure the human diseases. They are naturally considered for their bio-friendly and eco-friendly purpose. Many countries adopting the plant-based medicines to avoid the major types of health-related factors. During the forecast timeline till 2022 the herbal medicines increased rapidly. The fruit has the ability in nutrition in human body. It has unique flavour and different health benefits. Guava compresses some chemicals such as guajanoic acid, saponins, carotenoids, pentacyclic triterpenes, ellagic acid, uvaol etc. Different solvents are been using for the extraction like water, ethanol, methanol. the leaves are widely used in the treatment of diabetes, several heart diseases, gastro intestinal problems, oral ulcers etc. the chemical composition have a wide range of proteins and galactose about 13-29%. The guava leaf containing different kinds of phytochemical constituents among them Quercetin has remarkable features. They have various biological activities like anti-microbial, anti-inflammatory, antifungal, anti-hyper lipidemic and also for the treatment of gastrointestinal problems guava leaf has great potential. The different extractions procedures i.e., maceration, percolation, solid liquid extraction, ultrasound extraction, steam distillation, sonication is used for the extraction with various solvents and cosolvents. Many comparative studies are done for the guava leaf extracts to check their activity with various pharmacological effects.
KEYWORDS: Herbal medicines, phytochemical constituents, biological activities, nutrition, comparative study.

INTRODUCTION
The article is related to Guava [Psidium guajava] leaves

Traditionally plants are the natural sources of various bioactive substances. They are used in many plant-based preparations from ancient times as cosmeceuticals, pharmaceuticals, Neutra-pharmaceutical, nanotechnology, also as the transdermal preparations and many industries are still working on new preparations with the pure form of phytoconstituents which is composed of many health benefits. Their dried leaves are rich in Neutra-pharmaceuticals and also in latest oral preparations.

Guava is a tropical fruit which is grown in all tropical and subtropical regions. Guava is a small tree of myrtle family (Myrtaceous). It has many medicinal uses Million tonnes of guavas were produced worldwide. The different parts of Guava tree i.e., roots, bark, leaves, stem and fruits are having several advantages in the treatment of diabetes, diarrhoea, stomach-ache, and other health deceases throughout many years. The guavas are more frequently eaten species, and simply referred as Apple guava. They have dark heavy leaves which are opposite, simple, ovate, elliptic grown 5-15 centimetres long. It possesses white flowers with five petals and numerous stamens. Globally Bangladesh Is considered as largest guava producing country and from food and agricultural organisation reports they ranked 8th in guava fruit production worldwide. Among studies they resulted in various leaves diseases such as canker, nutrition deficiency, dot, wilt diseases, white-fungus, mummification are considered as challenging approach for their growth and development. To address such deficiencies and alter the challenges the integration of computer vision along with pattern recognition algorithms and classification tools shown outstanding results in detecting guava leaf diseases.[21]

Chemical composition

Proximate composition
Guava leaves are rich sources of micro and macronutrients and also other bioactive substances which contains 82.47% of moisture, 18.53% of protein, 3.64% of ash, 12.74% of carbohydrates, 103 mg ascorbic acid, 29.41% of galactose, 142.55mg/100mg of ascorbic acid.
Phytochemicals
Phytochemicals are potentially helpful in plant related foods Guava possess phytoconstituents i.e.

Quercetin, Avicularia, Apigenin, Kaempferol, Hyperin, Gallic acid, Chlorogenic acid, Epigallocatechin, Caffeic acid.[17]

Proteins
Proteins plays a major role in growth and maintenance of bio-catalysts, they are very important for metabolism. Proteins work for structure, function and regulation of body tissues and organs. Now a days plant-based nutrient. Guava leaves contain 9.73% of protein on dry bases. They play major role in growth and maintenance, cell signalling, enzyme regulation. These leaves are estimated by Lowry’s and Ninhydrin method. This fruit is rich in vitamin C and ascorbic acid contents.

Vitamins and minerals
Guava contains vitamins and minerals like sulphur, sodium, iron, boron, magnesium, calcium and vitamin B. They are used for nutritionist source for humans and prevent micronutrient deficiency for animals. The study showed the concentration of phosphorous, magnesium, ferrous, calcium and vitamin B had showed higher in guava leaves than in guava fruit. The higher content of vitamin C help in maintenance of greater immunity which result in maintenance of health of blood vessels.

Oil and fatty acids
Guava leave oil is used in the cosmetic product and oral problems like mouth ulcer. This oil is rich source of beta-carotene, vitamin A, vitamin C, selenium, copper, linoleic acid and Fatty acids like lauric acid of <1.5%, myristic acid <1.5%, palmitic acid 8-10 %, Linolic acid 65-75%, unsaturated fats 86%, saturated fats 14%. They use chromatography and mass spectroscopy methods. Ecuadorian contains higher number of monoterpenes. In present research they are notes as 64 different compounds were determined.

Phenolic compounds
Guava leaves are traditionally characterized for their anti-hyperglycaemic effect. They also contain proteins, polysaccharides, lipids, vitamins, essential oils and minerals. The secondary metabolites of guava leaves include alkaloids, glycosides, flavonoids triterpenoids,
sesquiterpenes and saponins. Phenolic compounds regulate various physiological processes like enzyme activity, cell proliferations, cellular redox potential. Among all phenolic compounds quercetin is regarded as major bioactive compound among the guava leaves.

**Biological activities of guava leaves**

**Anticancer activity**

Cancer is a disorder is developed by cell proliferations causing apoptosis. It is caused by several endogenous and exogenous factors which helps in production of reactive oxygen species. Flavonoids and terpenoids exhibit antitumor effect also regulate immune system. With guava leaf extract a study has been done for anticancer and antiangiogenic against with that of angiogenesis-dependent colorectal cancer. The guava is responsible to treat prostate cancer, colon cancer, cervical cancer, gastric cancer. The beta caryophyllene possess antiangiogenic property resultant interaction with HIF-1α Factor which help in regulating various biological pathways related to tumour metastasis, hypoxia, tumour-mediated angiogenesis and mediate transcription of vascular endothelial growth factor in presence of β-caryophyllene.[20]

**Antidiabetic Activity**

Diabetes is considered as a major chronic disease about worlds 10% of world population is suffering from blood glucose metabolic disorder which is gradually characterized by hyperglycaemic condition. This condition is characterized by insufficient secretion of insulin from β-cells.in the year 2017 The international Diabetic Federation has been stated that 451 billion people were affected by these diabetes mellitus which result in 5 million deaths.by the year 2045 the global prevalence according with diabetes is subjected to rise 693 million cases and it prolonged increase of the hyperglycaemia leads to rise in standards of dyslipidaemia which effect cellular damage and other health complications. The flavonoids aciculum and gujaverin extract are associated with improve the function of β-cells of pancreas. The Gujaverin helps in suppressing the activity of blood glucose enzyme dipeptidyl-peptidase. And Avicularin helps in inhibition of intracellular lipid aggregation.

**Antidiarrhoea Activity**

Diarrhoea is a root cause in children of age group 0-5 years. many discoveries are done for decreasing its side effects with other drugs. All the pharmaceutical companies are formally engaged in new drug discoveries. Many therapeutic treatments are combines with synthetic drugs which has many side effects for humans like bronchospasm, constipation, intestinal
obstruction, vomiting etc. these is the reason for formulating the medicine with medicinal plants as they have great potency in the treatment. In many studies they stated that guava leaves have greater antidiarrhea activity. The guava leaves are used to decrease the diarrhoea symptoms like wetness of faecal dropping and decrease in occurrence of defecation.

**Antimicrobial Activity**

The microbes and disease-causing stains are very danger concerns so many novel evaluations must be conducted for discovery of new pharmaceuticals. The systemic microbial infections such as urinary tract infections, pneumonia, meningitis, septicaemia and other gastric effects. Staphylococcus is a causing agent for food-borne diseases. Plant based ingredients have remarkable benefits for antimicrobial activity as they inhibit the microbial cell wall development. The guava leaves also posses’ antimicrobial properties against microorganisms like pseudomonas aeruginosa, staphylococcus aureus, Escherichia coli, bacillus subtitis. Some of studies concluded that they also have antiproliferative and also antioxidant activity. The components of guava leave having the property of inhibiting ergosterol which inhibit the fungal cell membrane, glucosamine act as fungal growth cell indicator and have mechanism of actions like hampering oxidative phosphorylation, withholding substratum and also extracellular enzyme inhibition.[13]

**Hypertensive and Hypolipidemic**

Guava is highly useful for the treatment of hypertension and heart diseases. Guava leaf contain minute quantity of potassium which relaxes blood vessels there by control Blood Pressure. Guava fruit is rich in Fiber. The pectin present in guava results in significant reduction of blood lipids thereby cause high content of potassium and Fibers. The pectin in guava significantly reduces the blood lipids by delaying absorption of food which helps in reducing the risk of cardiovascular diseases. Quercetin helps in the decrease in mortality in heart patients and decrease the risk of hypertension and hyper-lipidaemia. It lowers the cholesterol by moderating the level of potassium.

**Gastrointestinal Problems**

The flavonoids in guava leaves like quercetin is reported as significant in the treatment of various gastrointestinal diseases. The gastroenteritis caused by the pathogens is controlled by the presence of alkalinity in the guava fruit. Guava also treat diarrhoea result in defecating of loose stool by inhibiting microbial growth and produce excessive mucus. Guava tea has tremendous role in maintaining the consistency of stool. Guava contain vitamins and minerals
like carotenoids, vitamin C and potassium. Several other Future studies are going for various other gastric problems associated with many infections and microbial growth in the gastrointestinal tract and stomach.

**Uses of Guava Leaves**

- Guava leaves are used to treat respiratory diseases related to gastrointestinal tract.
- It is used in curing cough, increasing the platelet count in dengue patients.
- Most commonly used in anti-inflammatory, anti-diabetic, antidiarrheic, antihypertension, anti-obesity.
- The flavonoids which are present in guava leaves have great antibacterial activity. Guava leaves have one of the unique and tremendous flavonoids called quercetin which exhibit antidiarrheal activity, which is used as a intestinal muscle relaxing effect helps in preventing bowel contractions.
- Used for the isolation of potent anti-tumour, anti-cancer, cytogenic agents.
- It is used as a hepatoprotective agent.

**Determination of Anti-Bacterial Property**

Guava leaves extract was used to determine anti-bacterial activity against proteus vulgaris, *streptococcus mutans, staphylococcus aureus* followed by disc diffusion method. These nutrients agar is maintained on slant is at 37 °C for about 24 hrs. The inoculum is furtherly spread over the surface of the nutrient agar plate and allowed for drying. The sterile disc was loaded with 60 µL of guava leaf extract and placed on the inoculum agar plate before incubating at 37 °C. It is used as antagonistic effect for aqueous leaf extracts which is continuously recording for 24 hrs for incubating. The double distilled water is used for extraction of Ampicillin used as negative and also positive controls. The diameter is measured by vertically and horizontally. Anti-bacterial activity of jelly was prepared by with or without guava leaf extract was determined.

**Determination of Anti-Oxidant Activity**

Guava leaf extract was primarily dissolved in DMPO mixed with FeSO₄ and H₂O₂ in the phosphate buffer solution and also filled with quartz tube. The Radical concentration is quantified after 120s in an electron spin resonance spectrometer.[16]

Radical scavenging ability (%) = (H₀−H)/H₀×100
Various extraction procedure

1. Maceration
2. Percolation.
3. Solid liquid extraction
4. Microwave assisted extraction
5. Microcapsule spray drying
6. Supercritical fluid extraction
7. Soxhlet extraction
8. Ultrasound extraction
9. Steam distillation

1. Maceration

Maceration is an oldest Technique. It is one of the cost-effective ways which is considered as solid-liquid extraction. In this method the powder is placed in a closed container and solvent is added and kept for shaking for long time. This process is takes place by molecular diffusion. Maceration is a time taking process it can be continued till some days and weeks. The extraction is accelerated by ultrasound or Microwave by increasing temperature. It is simplest technique to extract bioactive compounds. The critical issues like extraction time, chemical alteration due to long-term extraction. The method is best suitable for Thermolabile substances.

In the maceration process the powdered plant material is placed in a stoppered container and suitable solvent is added and kept for agitation until soluble material dissolved for a time period of three days. The purpose of these process is to release the plant phytochemicals. Then the solvent is strained and filtered.

2. Percolation

Percolation is the method of extraction of active ingredient by filtering them. It is a narrow cone shaped vessel which is opened at both the ends. Percolation is continuous process in which saturated solvents are being replaced with fresh solvent. Percolation sometimes leads to partial loss of active ingredients. Percolator is used in this process in which dried and powdered material were placed and moistened with suitable solvent. In this the quantity of solvent is very high and mixture is kept for 4 hr and subject them to percolator for which lower end is closed and continued the process for 24 hr. The extract is collected in a separate
container process is stopped when the solvent reached to 75% of its total content. Then the extract is filtered and kept for drying in hot plate or rota apparatus.

3. Solid liquid extraction
It is a popular technique currently available for rapid and selective sample preparation. It is a powerful tool for isolation and concentration of trace analysis in various extracting solvents. The main objective of the solid liquid Extraction includes reduce the level of interferences in sample, it helps to minimize the final sample volume to maximize analyte sensitivity and also provide the analyte fraction in a solvent where it is compatible with the analytical measurement technique. This extraction is considered as single equilibrium stage. The principle of solid liquid extraction explains that SPE is an efficient separation process than liquid-liquid extraction. The retention mechanism is based on van der Waals forces, hydrogen bonding, Dipole-Dipole forces, cation-anion interactions. Solid liquid extraction can be performed in batch or continuous. In batch extraction procedure the solid is treated with separate solvent either by immersion or percolation. Batch process is easy to operate. It is mainly used for extraction of plant materials, protein from oil seeds but the main drawback of this is limited capacity and discontinuous output. In continuous process multistage extraction system is used in this continuous movement of solids from one stage to another stage.

4. Microwave-Assisted Extraction
Microwave-Assisted extraction is a automated technique have many advantages like reduction of extraction time and consumption of solvents. This technique is used in 1990 for organic residual extraction. it is simply approach which involves placing the samples in a specialized container and heating up to microwave energy. This process is rapid than Soxhlet also reduce solvent consumption. The selection of solvent is very important as it may result for explosions if precautions are taken properly. As it is a conventional technique which help to extract bioactive components from medicinal plants. The Dielectric constant, sample material, solvent mixture are the factors of Microwave-Assisted Etraction. The microwaves in this technique disrupt the cell membrane by which the lipids release organic solvents. This process has remarkable properties with fats and polysaccharides from various sources. This technique provides.

5. Microcapsule spray drying
Spray drying is a technique of microencapsulation which is considered as a dehydration process take place for heat sensitive food ingredients. The spray drying is first developed for
manufacturing of dried milk. The technique had great impact on stability against microbial growth by reducing the water content thereby protect the product from biological and chemical degradation. The process had four steps firstly preparation, homogenization, followed by Automation and dehydration. The wall materials for microencapsulation includes polysaccharides, proteins, lipids etc. the mixture is primarily induced in spray dryer then Automized using Nozzle. The water that remained is evaporated as hot air. The capsules which are dried are collected from the separator. In this process the liquid and air are sprayed in same direction. The outlet temperature ranges from 140-220 °C.

6. Supercritical fluid extraction
This is a process of separating one component from another by using supercritical fluids for extracting solvent. Extraction is done for both solids and liquids. Carbon-dioxide is widely used as supercritical fluid or modified with ethanol or methanol. The temperature is maintained above critical temperature such as 31℃ and 74 bar critical pressure is maintained. Extraction time is 10 to 60 minutes respectively.

The system consists of Co₂ pump a pressure cell which hold the sample. The liquid is pumped in a heating zone heated Up to supercritical condition then the liquid passes to the extraction vessels where it rapidly diffuses to solid matrix. The dissolved materials are removed from extracted cell into a separator and here the materials settled out. Here the Carbon-dioxide is cooled, recycled and recompressed or can be discharged into atmosphere.

7. Soxhlet extraction
The Soxhlet extraction is also known as continuous hot extraction procedure. the technique is widely used to produce very high-quality extracts from different plant materials.it is mainly used for the extraction of active ingredients of plant substitutes. The arrangement and the method are quite easy as compared to another extraction techniques. The extraction method is primarily containing hot plate and above it round bottomed flask is placed, which consist of solvent a distillation tube is fixed which connects RBF and condenser. It should assemble the way by which cool water is allowed in and out. Here the solvent is heated up to a particular temperature, the chamber containing the plant material is slowly drawn it active material into the RBF. This process should be continued up-to 48 hrs. after many cycles the concentrated product of sample is collected in the distillation flask. Then finally the solvent is removed and furtherly kept for rotary evaporator to yield the extracted compound.
8. Ultrasound extraction (Sonication)
The ultrasound Assisted extraction is performed by PEX05 Sonifier with capacity of 500Ml. the double layer mantle is present to control temperature by maintaining the constant heating and cooling. The procedure involves the use of ultrasound with high frequencies ranging from 20khz to 2000khz. Large scale manufacturing is reduced due to its higher cost. Then the resultant mixture is formulated as free radicals.

9. Steam distillation
Steam distillation is used for the extraction of essential oils with wide bioactive compounds. it is a energy efficient process used in the large scare extraction process. It showed as a promising role in maintaining the quality of plant material after extraction of oils. The hot steam is passed over the extract by the huge force thereby it releases the aromatic components of plants. The molecule of the essential oils is escaped from the plant material and slowly evaporate into steam. The temperature should be in controlled manner as it must be sufficient for the plant to let go essential oils. If the temperature exceed it may burn out the plant material. The steam should be higher than the atmosphere and boils above 100 degrees. These facilitates the higher yield of essential oils which are reproducible furtherly.

Applications
- The guava has various applications as it can be consumed as fresh or dried form of leaves. They also consumed in variety of drinks. The guava tea has the calming effect.
- Guava leaves reduces cholesterol level in blood, decreases inflammation, enhance digestion and these leaves has antiviral activity thereby boost immune system.
- They have great potential in the skin care products in treating against infections and provide better wound healing property.
- The leaves are used in treatment of kidney related problems and malaria as it has anti-inflammatory activity.
- The guava plants have renewable resources. So, it served for sustainable supply and cheaper in cultivation.
- The processing and cultivation procedures are ecofriendly without any biomedical hazards.
- The leaves are also used in the treatment of vaginal discharge, rheumatism and menstrual-pain. [12]
Detection of Plant Leaf Diseases
The detection is done by the various tools they are artificial intelligence, machine learning, CV, deep learning techniques which helps to accurately detect the plant diseases. Deep learning is a subset of CV which help in capturing of image or video in the agriculture lands. This approach shown better results in detecting the ripening of fruit, determination of harvesting time, sorting of plant, yielding, quality of fruit, production value etc., this CV approach gained the major advantages in agriculture sector for the best quality fruits, large scale field maintenance, Eradicating the loss of crop. By undertaking this process, it helps as cost effective, time-saving, easy to adopt.

The unmanned aerial vehicles (UAV) and digital cameras are the frameworks integrated with digital cameras with smartphones. This mobile network has prominent approach in detection of leaf diseases. Mobile network is serving as convolution neural network for its low processing capabilities and less weight. The CNN based DL method developed by AL Haque et al performed efficiently to identify the leaf diseases such as rot, canker, anthracnose with 95% accuracy. Later a novel approach deep CNN shown 98% accuracy proposed by Howlader.

Formulations of guava leaf
Formulation of herbal guava tea
Herbal tea is formulated by dried and crushed leaves of guava plant. This tea is consumed in many parts of the world for its efficient health aspects. In this the toxic and volatile components are neutralized by Antioxidants. The herbal tea has much importance in health promoting properties by increasing taste, aroma and also served for its commercial improvement. The standardization of guava leaves carefully inspected and foreign materials are washed thoroughly and removed. In an ordinary process guava leaves are spread thinly on aluminium trays of cabinet drier. Then kept for drying at 60°C for 6 hrs. and furtherly subjecting to steaming at 90°C for 3 min. The herbal tea infusion bag is prepared by taking 3 g of herbal tea powder in 150ml of boiling water for about 3 Min continued for analysis for its bioactive and Antioxidant property by filtering the solution through Whatman filter paper than samples were extracted with 80% ethanol under centrifugation at 3000 rpm for 20 minutes. The supernatant is collected and stored at 4° C. the evaluations are done for total phenolic compounds with gallic acid, total flavonoid compounds with quercetin equivalent, furtherly tested for Antioxidant activity. The results were shown that guava have greater
importance in bioactive components for the treatment of cardiovascular diseases, Diabetes, obesity, atherosclerosis. It is also consumed as the beverage for all age group of peoples.

**Formulation of pharmaceutical aqueous gel of powdered guava leaves**

The herbal medicines are not only used as medicinal but also economically preferred as low-cost medicines. The present investigation deals with the treatment of mouth ulcers with the guava leaves. Guava has greater impact in treating the oral problems as it has potential importance in preventing the infections. The herbal gel is prepared by taking required quantity of Carbopol 934 which is dispersed in distilled water and kept for stirring then add propyl paraben and methyl paraben after cooling the propylene glycol of require quantity should be added. In this mixture guava leaf powder is added then they are furtherly kept under stirring and lastly triethanolamine amine is added to adjust the pH in between 6.8-7. The compositions are kept under three batches G1,G2,G3.

<table>
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<th>Ingredients</th>
<th>G1</th>
<th>G2</th>
<th>G3</th>
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<tbody>
<tr>
<td>Guava leaf powder</td>
<td>2%</td>
<td>1%</td>
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</tr>
<tr>
<td>Propyl paraben</td>
<td>0.01%</td>
<td>0.01%</td>
<td>0.01%</td>
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<tr>
<td>Methyl paraben</td>
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<tr>
<td>Triethanolamine</td>
<td>Quantity sufficient or pH 6.5-7</td>
<td>Quantity sufficient or pH 6.5-7</td>
<td>Quantity sufficient or pH 6.5-7</td>
</tr>
<tr>
<td>Propylene glycol</td>
<td>5ml</td>
<td>5ml</td>
<td>5ml</td>
</tr>
<tr>
<td>Carbopol 934</td>
<td>2%</td>
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The evaluations are done for their physical appearance, homogeneity, pH, viscosity, Extrudability, spread ability, gel strength, stability, antifungal activity. The prepared gel shown better homogeneity and gelling property and compatible with skin pH. The rheological behaviour is in between 2.292-3.111. The study shown that with an increasing viscosity the spread ability decrease. Extrudability is done by pressing with thumb. The gelling strength is found suitable for all the three batches. All the batches shown antifungal activity with the aspergillus aureus and candida albicans these are the microorganisms responsible for mouth ulcer infections.

**Guava Leaf Extract To Inhibit Upper Respiratory Tract Infections**

The upper respiratory tract infections are mainly transmitted through airborne respiratory droplets while coughing and sneezing. The most found bacteria are streptococcus pyrogens and pseudomonas aeruginosa which are found in the patients of URTI. In this formulation the hard candies were prepared with high sugar content which helps in enhancing the flavour
greatly. This research shown better benefits of antibacterial activity for the URTI patients as they are easy to consume and palatable. The materials used in this study are lemon grass oil, citric acid, glucose syrup, granulated sugar and chemicals like nutrient agar, nutrient broth, brain heart infusion agar, aluminium chloride, gallic acid, sodium carbonate, gaseous nitrogen. The extraction is done with three different solvents ethyl acetate, ethanol, hexane then filtered with Whatman filter paper each extract is analysed for its antibacterial activity. The preparation of heard candy was done by taking required quantity of granulated sugar, glucose, water kept under stirring at 150-degree C. then a apn is kept for heating and add citric acid, guava leaf extract, lemon grass oil. Immediately the mixture is poured in silicon moulds and left for room temperature until it completely hardened. Then the hardened candy was used for the evaluation of antibacterial activity. The results shown that the ethanol extract has higher yield. The hard candy has the inhibition diameter of 11.92 towards staphylococcus pyrogens and pseudomonas aeruginosa and this study is furtherly increasing standards for commercial manufacturing.

**Formulation of Herbal Tooth Paste**

Herbal toothpaste with guava leaf possesses antibacterial activity and prevent from tooth decay by keeping mouth fresh. The plaque and gingivitis are related to many oral problems. The herbal chewing sticks are widely used from ancient times. The traditional therapy leads importance for the betterment of oral hygiene and prevent infections. The present research is a comparative study between marketed and herbal formulation of guava extract. The chemical used in the study are calcium carbonate, Para hydroxy benzoic acid, sodium chloride, sodium lauryl sulphate, honey, camphor. The herbs used in this are babul, guava, neem. All herbs were triturated finely in a domestic mixer. The weighed quantity of ingredients is taken in mortar, to this mixture the calcium carbonate, water, SLS, methyl cellulose was added. The formed solution is added dropwise in the mortar in which herbal ingredients placed. Then they collectively triturated until the paste consistency is formed.

The evaluations are done to this paste for its homogeneity, composition, pH, foamability, extrudability, determination of moisture content, spread ability, stability studies and antibacterial activity.
<table>
<thead>
<tr>
<th>S.NO</th>
<th>parameters</th>
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<tr>
<td>2</td>
<td>Odour</td>
<td>characteristic</td>
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<tr>
<td>3</td>
<td>Taste</td>
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<td>4</td>
<td>smoothness</td>
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<tr>
<td>5</td>
<td>pH</td>
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<tr>
<td>6</td>
<td>Spread ability</td>
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<tr>
<td>7</td>
<td>Homogeneity</td>
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<tr>
<td>8</td>
<td>Foaming strength</td>
<td>10 (good)</td>
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<tr>
<td>9</td>
<td>Abrasiveness</td>
<td>good</td>
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<tr>
<td>10</td>
<td>stability</td>
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The invitro antibacterial studies were done by disc diffusion method in triplicate manner by Mukker Higton agar medium against the bacteria staphylococcus aureus. The antibacterial studies were performed by incorporating the herbal paste disc on the surface of bacterial plates at 37°C for 24 hrs. The diameter of zone inhibition (ZOI) is measured in millimetres. The formulation shown impressive ZOI and concluded that the formulated herbal tooth paste has potential anti-bacterial activity. The formulated herbal paste is greenish brown in appearance. Due to the absence of lumps showed good homogeneity and it potentially exhibiting antimicrobial activity.

The formulated herbal toothpaste shown capable to treat the oral hygiene and more acceptable for dental research with safer and minimum side effects when compared to the synthetic preparation. It shown equal patronizing with the marketed preparations. So, it has great scope in future natural dental remedies.

**Formulation of Herbal Hair Oil**

A common hair problem most of the people suffering from is dandruff. Its impact is on all age group people from children to adults. It seems to be like white flaky substance across the
scalp. Based on the duration and amount of infection it may leads to chronic after time changeover. Mostly seen in oily and greasy hair people. This dandruff furtherly leads to scalp redness, itching, pimples, hair loss etc. among the study guava leaves shown better improvement in treating the hair related problems as in the form of hair pack, serum, oil or intaking as tea. It cures every hair related issue. The present study is related to herbal hair oil the materials used in this are Aloe vera pulp, Tulsi powder, hibiscus powder, guava leaf powder, fenugreek powder, almond oil, jasmine oil, coconut oil.

The preparation is done by taking required quantities of guava leaf powder, Tulasi powder, hibiscus powder, Aloe vera pulp added into a beaker. Then the fenugreek seeds and camphor are crushed and added into the beaker. Afterwards the 15 ml of almond oil and 6.5 ml of coconut oil is kept for boiling for 15 minutes. This oil is filtered through muslin cloth. Add 100ml of coconut oil and few drops of jasmine oil for aroma. Then the oil is stored in an ambered coloured container. The evaluation studies were performed for sensitivity, microbiological studies. Through this study they concluded that guava have promising role in treating the hair problems efficiently and nourishing the skin of scalp.

**Guava Leaf as Herbal Chewing Gums**

Mouth ulcers majorly occur on the mucous membrane of oral cavity. It is not considered as a serious cause but may cause severe pain while brushing, eating, and drinking. The major causes are deficiency in iron, hormonal imbalance, mechanical injuries, stress, infection, constipation, food allergies etc. aphthous is another name for mouth ulcers. The three types of ulcers they are Minor ulcers: 2-8mm in diameter. Cures with in 10 to 12 days.

Major ulcers: this kind of ulcers are deeper and bigger takes several days to cure and sometimes based on their infection they may leave scars in mouth.

Herpetiform ulcers: This are formed like clusters and dozens and takes months to cure.

The formulation of medicated chewing gums is recently addressed as novel drug delivery system based upon their various pharmacological effects for local and systemic oral problems. The medicated chewing gum (MCG) can be a solid or semi solid dosage form in which one or more than one active ingredient compressed and incorporated into a water insoluble base. Basically, chewing gums are used for freshness and good breath in many countries along with India. The medicated chewing gums are considered as the nutraceuticals
with higher potential. MCGs are better patient compliance and tremendous for acute medication. It prevents from candidiasis and also dry mouth.

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