

# Cultivation, Extraction, Identification and Various Pharmacological Activity of Guava Leaves

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**Abstract:** *There is a need for the screening more effective, affordable and readily available antimicrobial Substances from local medicinal plants or herbs as the pathogenic bacteria are developing the resistance to Common antibiotics. Guava (Psidium guajava L.) has antimicrobial activities and it is easily accessible to location Populace in tropical region. Antimicrobial properties of guava extracts are attributed to the presence of different Phytochemical constituents. The fact that phytochemicals' constituents vary as a result of geographical locations And literatures about Ethiopian guava with respect to phytochemicals' composition and content, and antimicrobial Activities are hardly available, there is a need to analyze phytochemicals and antimicrobial properties of the Ethiopian guava from Oromia Regional State, Babile and Gursum Districts against Salmonella Typhi, Shigella boydii, Staphylococcus aureus and Enterococcus faecalis.*

**Keywords:** Catechin cultivation, identification, antioxidant property, Anticancer, antioxidant, antiulcer, antidiabetic, antimicrobial

## I. INTRODUCTION

Plants produce a diverse array of secondary metabolite's, many of which have antimicrobial activities Against some pathogenic microorganisms that are Implicated in enteric infections. Some of these compounds are constitutive, existing in healthy plants in Their biologically active forms and they elicit chemotherapeutic or chemo prophylactic properties against A wide range of infectious enteric diseases [1]. Because of the pathogenic microorganisms are developing the resistance to common antibiotics, there is need for the search of new antimicrobial agents Mainly among plant extracts [2, 3]. Potential effort Has been the screening of more effective, affordable And readily available antimicrobial substances with Diverse chemical structures and novel mechanisms of Action from local medicinal plants or herbs [4, 5]. P. guajava has been used traditionally as a medicinal Plant throughout the world for a number of ailments [6,7] Guava (Psidium guajava L.), which is used as a traditional medicine, is found in countries with hot climates In areas such as South America, Europe, Africa, and Asia (Gutierrez et al. 2008). Its primary traditional use Include the alleviation of diarrhea and dehydration. Other Reported uses include treatment of gastroenteritis, dysentery, stomach pain, diabetes mellitus, and wounds. In Addition, it is known for its antioxidant, antibacterial, And anti-inflammatory properties (Qian and Nihorimber 2004; Cheng et al. 2009; Han et al. 2011a). Guava leaves Have phenolic compounds and flavonoids with high antioxidant activity. The main active substances in guava In areas such as South America, Europe, Africa, and Asia



Therefore, in this study, the phenolic compound and Flavonoid content of water, ethanol, methanol, and Hydroethanolic extracts of guava leaves were analyzed And evaluated with regard to antioxidant properties. The Best extraction solvent for use with guava leaves for high Antioxidant efficacy was selected.



Phytochemical screening of different guava extracts Has revealed numerous bioactive compounds. Guava leaf Contains broad spectrum of bioactive compounds including tannin, flavonoid, terpenoid steroid, steroids, Glycoside, cardiac glycoside, alkaloid, phlobatannin, polyphenols, saponin anthraquinones, Phytosteroid and Carbohydrate [7–11]. The spectrum of bioactive compounds detected in bark extracts include anthraquinoneAlkaloids, tannin, saponin, flavonoid, steroid, terpenoids, Cardiac glycosides, coumarin, carboxylic acid, quinine And resin [7, 12–15]. However, folklore involves the use Of plants without isolating particular phytochemical[16]. The reason is that the synergy of the combined Substances enhances the efficacy [16–18] and dilutes Toxicity [16]. But, detailed analysis of phytochemical Constituents of medicinal plants makes dosage quantifications more easy [16]. Guava is the single source of Many beneficial components (probably the highest in Number) of herbal remedies, which are edible without Any known detrimental effect [19]



Fig. 3&4. Essential oil of citrus oil.

The fact that phytochemicals' constituents vary as a Result of geographical locations and literatures about Ethiopian guava with respect to phytochemicals' compositions and content, and antimicrobial activities are Hardly available, there is a need to analyze phytochemical's and antimicrobial properties of the Ethiopian Guava From different districts for treatment of Salmonella Typhi, Shigella boydii, Staphylococcus aureus and Enterococci faecalis infections. Therefore, this study was Aimed to screen and quantify the major secondary compound's and to evaluate antibacterial activities of leaf and Bark extracts of guava collected from Gursum and Babile Districts. The two districts are part of East Hararghe Zone of Oromia, where guava is a common horticultura Crop cultivated by small scale farmers [34]. The altitude Of Babile Worde ranges from 500 to 1500 m above sea Level (m.a.s.l) [35]. Whereas, the altitude of Gursum woreda ranges from 1200 to 2950 m.a.s.l [36].

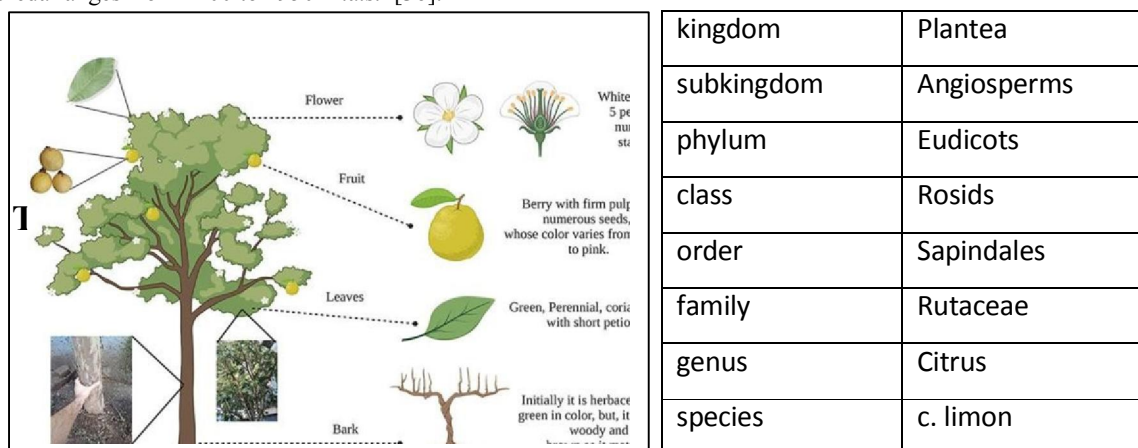


Fig.5. parts of Guava leaves

**CULTIVATION**

Climate: Tropical and subtropical regions  
 Temperature: 20-30°C (68-86°F)  
 Soil: Well-drained, fertile soil with pH 5.5-6.5  
 Water: Consistent moisture, but not waterlogged  
 Light: Full sun to partial shade

**Propagation Methods**

Stem cuttings: Take 6-8 inch cuttings from mature branches  
 Air-layering: Layer a section of stem with moistened soil  
 Grafting: Join a guava stem to a rootstock  
 Seeds: Sow seeds in nursery beds or pots

**Planting**

Plant cuttings or seedlings 12-15 feet apart  
 Dig holes 12 inches deep and 18 inches wide  
 Add organic matter (compost or manure)  
 Water thoroughly and mulch around plants

**Growth Stages:**

Germination: 1-2 weeks  
 Seedling stage: 1-2 months  
 Sapling stage: 6-12 months  
 Maturation: 1-2 years

#### Care and Maintenance

Watering: Regular watering, but avoid overwatering

Fertilization: Balanced fertilizer (10-10-10 NPK)

Pruning: Regular pruning for shape and promote fruiting

Pest and disease management: Monitor for pests and diseases

#### Harvesting

Leaves: Harvest leaves at any stage, but ideal during active growth

Frequency: Harvest leaves every 1-2 weeks

#### Tips and Precautions

Protect plants from extreme temperatures and frost

Monitor for pests (aphids, whiteflies, spider mites)

Use organic fertilizers and pest control methods

Avoid overwatering, leading to root rot

#### Common Varieties

Apple Guava (*Psidium littorale*)

Pear Guava (*Psidium guajava*)

Supreme Guava (*Psidium guajava* var. *supreme*)

#### Economic Importance

1. Guava leaves are a valuable source of antioxidants and bioactive compounds
2. Guava leaf tea is a popular herbal remedy
3. Guava leaves are used in traditional medicine and cosmetics

#### Research and Development

1. Study the pharmacological properties of guava leaves
2. Develop new products from guava leaves (e.g., supplements, cosmetics)
3. Improve cultivation practices for increased yield and quality

Fully mature and healthy guava (*P. guajava*) leaves and Barks were collected randomly from low land of area Babile and mid-land area of Gursum in May 2014. Sample authentication was carried out at the Botany Laboratory and Herbarium of Haramaya University

#### **EXTRACTION:**

#### **MATERIAL AND METHOD:**

##### Collection of plant material:

1. Choose healthy, disease-free guava plants with vibrant leaves.
2. Select leaves from the middle or upper portion of the plant for optimal quality.
3. Harvest leaves during the active growth phase, typically early morning or late afternoon.
4. Use clean, sharp tools to avoid damaging the leaves or spreading diseases.[Sheila John. Et al.2017].

##### Preparation of the Sample:

1. Cleaning: Rinse leaves with distilled water to remove dirt, dust, or debris.
2. Drying: Air-dry or oven-dry (50-60°C) leaves to prevent moisture-related spoilage.
3. Sorting: Separate leaves by size, color, and quality for uniformity.
4. Packaging: Store dried leaves in airtight containers or bags to maintain freshness. [Hemlata Karne. et al2023].



Preparation of Guava leaves extracts:

Two different solvents namely methanol and acetone were used for extraction.

5grams of lemon peel powder was soaked in 100 mL of the respective solvents for 72 hours by maceration technique.

The supernatant was filtered using Whatmann filter paper 1 and Buchner funnel and concentrated using rotary evaporator and dry residue was preserved at 5°C until further use. [Sheila John. Et al.2017].

Material/Instruments Used: The materials/instruments used for this work were round bottom flask, Basket heater, distillation unit, thermometer, measuring cylinder, conical flask, separating funnel, marcration. [D.C. Sikdar.et al2017].

Extraction of Guava leaves by Maceration Method

Definition: Maceration is a solvent-based Extraction technique where guava leaves are soaked in a solvent to release bioactive compounds.

Procedure:

- Prepare guava leaves (clean, dry, and chop)
- Choose solvent and determine ratio (1:10 to 1:20, guava leaves:solvent)
- Combine guava leaves and solvent in jar
- Seal jar and store in dark, cool place
- Allow maceration for 2-3 days (shake occasionally)
- Strain mixture through cheesecloth or filter paper
- Discard solids and reserve liquid extracts
- Concentrate extract using rotary evaporator or vacuum dry [kSathya al.2018].

Types of Maceration:

- Cold maceration: Room temperature, 2-3 days
- Hot maceration: Elevated temperature (40-50°C), 1-2 day
- Dynamic maceration: Agitation or shaking during maceration

IDENTIFICATION TEST:

Tannins:

- Mix 1g sample + 20ml distilled water
- 2. Boil 5 min, filter
- 3. Dilute 1ml filtrate to 5ml
- 4. Add 2-3 drops 10% FeCl<sub>3</sub>.
- Observe: - Bluish-black or brownish-green precipitate = Tannins present

Alkaloids:

1. Mix: - 6ml ethanolic extract- 2ml 1% HCl
  2. Heat:- 2 min in water bath- Stir continuously
  3. Cool & Filte
  4. Test with Mayer's Reagent:- 1ml filtrate + 0.5ml Mayer's Reagent
- Observe: - Cream yellow precipitate = Alkaloids present

Test for Flavonoids(Shinoda test)

1. Mix 2ml ethanolic extract + 4 drops 10% NaOH
2. Heat 10 min in water bath
3. Observe yellow color
4. Add 10 drops 1% HCl
5. Color becomes colorless

Saponins:

1. Take 0.2ml sample, add 4.8 ml distilled water.
2. heated to boil frothing showed the presence of saponins.

Test for Steroids(Salkowski test)

1. Mix 2ml chloroform + 10 drops acetic acid
2. Add 0.5ml ethanolic extract
3. Add 2ml concentrated sulfuric acid (side of tube)
4. Observe color change: red → blue → green

Test for Terpenoids:

1. Mix 5ml ethanolic extract + 2ml chloroform
2. Add 2ml concentrated sulfuric acid (carefully)
3. Shake gently
4. Observe reddish-brown coloration (inter-phase)

#### PHARMACOLOGICAL ACTIVITY:

Anticancer:

An irregular growth of cells or tissues of body is called cancer. If abnormal cells divide without control and invade nearby tissues is called malignant tumor and also known as malignancy. If the abnormal cell growth does not invade nearby tissues is called benign Apoptosis induction: Guava leaf extracts trigger cancer cell death Anti-proliferation Guava leaf compounds inhibit cancer cell growth Antioxidant activity Guava leaves Antioxidant properties reduce oxidative stress Anti- angiogenesis Guava leaf extracts inhibit tumor blood vessel formation Breast cancer: Guava leaf extracts inhibited breast cancer cell growth. Prostate cancer: Guava leaf compounds reduced prostate cancer cell proliferation. Colon cancer: Guava leaf extracts induced apoptosis in colon cancer cells. Liver cancer: Guava leaf extracts inhibited liver cancer cell growth.

Antioxidant activity:

The important sources of antioxidants are citrus juices and fruits and these antioxidants are ascorbic acid, flavonoids and phenolic compounds. The source of glycosides and phenolic compounds are citrus peels. The bioactive compounds are phenolic acids which are responsible for the antioxidant and many other biological activities. The highest antioxidant activity can be found in citrus fruits. Ascorbic acid (vitamin C) interpretations for a great proportion in some fruits can act as antioxidant. Moreover, other phytoconstituents like carotenoids, flavonoids, glutathione, and various enzyme systems may also contribute to the antioxidant activity.

Anti-ulcer activity:

The pathophysiology of peptic ulcer disease involves an imbalance between offensive (acid, pepsin, and H. pylori) as well as suspicious aspects. Indian Medicinal plants and their derivatives have been a valuable source of therapeutic agents to treat various disorders including Antiulcer diseases. Fruit aqueous excerpt also shows the antiulcer activity against gastric ulcer.

Anti-diabetic activity

Flavonoids (quercetin, campfires)Phenolic acids (gallic acid, ferulic acid)Terpenoids (uvaol, oleanolic acid Glycosides (guavan, quercetin-3-O- glucoside Mechanisms of Actio  $\alpha$ -Glucosidase inhibition Guava leaf extracts inhibit  $\alpha$ -glucosidase, an enzyme involved in carbohydrate digestion. Insulin sensitization Guava leaf compounds enhance insulin sensitivity, improving glucose uptake in cells. Antioxidant activity Guava leaves' antioxidant properties reduce oxidative stress, a factor in diabetes development. Pancreatic  $\beta$ -cell protectionGuava leaf extracts protect pancreatic  $\beta$ -cells from damage, preserving insulin production. In Vitro and In Vivo Studies Reduced blood glucose levels Guava leaf

extracts decreased blood glucose levels in diabetic rats. Improved insulin sensitivity Guava leaf compounds enhanced insulin sensitivity in human liver cells.

Antimicrobial activity:

In the present study, antibacterial activity tests were carried out using agar disc diffusion and broth dilution Methods. Agar disc diffusion method was first used to Identify sensitivity of the clinical isolates to the extracts. Once the extracts were found to have antibacterial activity through ZOI formation, broth dilution method was Used to determine MIC. The ZOI of the tested clinical Isolates. Babile and Gursum guava Extracts at concentration of 2 mg/disc showed inhibitory Effect on all tested clinical isolates. The standard antibiotic's (ciprofloxacin) showed significantly higher ZOI Against all the isolates than all guava extracts. Comparing antibacterial activity of guava extracts against each

## II. CONCLUSION

This review paper has comprehensively explored the cultivation, extraction, identification, and authentication of Guava leaves extraction We have delved into various aspects of Catechin production, from the optimal growing conditions and harvesting techniques to the diverse extraction methods available. Phytochemical analysis revealed that Babile and Gurus Guava leaf and bark extracts showed slight variation in Composition and content of phytochemicals' constituent's. The presence of various medicinally important he treatment of enteric disorders. Since the current Work is a screening of major group of phytochemicals And In vitro antimicrobial activity of crude extract, furthers investigation is required to isolate and characterize Specific phytochemicals present in the Babile and Gursum leaf and bark extracts to discover the most effective Compounds that probably encourage the future search of Novel antimicrobial agents and natural drug development from guava. Furthermore, evaluation of In vivo Antimicrobial activity and synergy investigation are important for incorporation of guava leaf and bark extracts into regiment of natural antimicrobial agents.

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