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# EXPLORING AND INVESTIGATING THE POTENTIAL PHYTOCHEMICALS OF *PSIDIUM GUAJAVA* L. STEM EXTRACTS

Shagufta A. Farooqui [* 1], S. S. Patil [2], Sayyed Javvad Ali [2] and Dhanshri Chelmelwar [3]

School of Pharmacy SRTMUN [1], Nanded-Waghala - 431606, Maharashtra, India.
Maharashtra College of Pharmacy [2], Nilanga - 413521, Maharashtra, India.
Kandhar College of Pharmacy [3], Nanded Pharmacy College Nanded - 431714, Maharashtra, India.

**Keywords:**

*Psidium guajava* L., Phytochemical Evaluation, TLC

**Correspondence to Author:**
**Shagufta A. Farooqui**

Research Scholar,
School of Pharmacy SRTMUN,
Nanded-Waghala - 431606,
Maharashtra, India.

**E-mail:** shaguftafarooqui95@gmail.com

**ABSTRACT: Objective:** This study aimed to carry out a phytochemical, pharmacognostic, qualitative, and quantitative evaluation of the medicinal plant *Psidium guajava* L., also known as guava, a member of the Mytaceae family. **Methods:** The present study provides pharmacognostic, phytochemical, and quantitative details of *Psidium guajava* L. **Results:** Plant-dried stem powder material was subjected to continuous hot extraction Soxhlet using solvents pet-ether, acetone, and ethanol. Phytochemical standardization was undertaken to detect the presence of bioactive agents along with TLC. Different physical parameters, like ash values, extractive value, loss on drying, *etc*., were evaluated for the powdered drug. The extracts were obtained from the Soxhlet method and subjected to preliminary phytochemical evaluation. **Conclusions:** The results of this study can serve as a valuable source of information for identifying this plant for future investigation and applications.

**INTRODUCTION:** The medicinal plant *Psidium guajava L*. also known as guava, is a member of the mytaceae family. It is abundantly available throughout India. The *P. guajava* tree's leaves and bark have a long history in medicine and are being used today. Although it is originally from Central America, it is now farmed and disseminated, and its fruits have improved the diets of millions of people worldwide in tropical regions. It grows to about 10 m, has spreading branches, and is tolerant of various soil types. It's also referred to as "poor man's apple" [1].

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*Psidium guajava L.* is now grown in South Florida, Bermuda, the Bahamas, Cuba, Trinidad, and down to Brazil in the West Indies.

**Morphology:** The guava is a fast growing tree that can grow to a height of three -10 m. It has a shallow root system. Guava produces low drooping branches from the base and suckers from the root. The trunk is slender, 20cm in diameter, covered with the bark. The bark is reddish brown, thin, smooth, and flasky.

The roots are extensive but only superficial. The fruit has a strong, sweet, musky odor and can be round, ovoid, or pear-shaped. The leaves are grown in pairs, opposite to each other. The flower is white in color, about 3cm in diameter, solitary or in 2-3 flower clusters borne at the axils of the newly emerging lateral shots [13].

**Flower** **Branches with Leaves and Fruits** **Fruit**

**FIG. 1: *PSIDIUM GUAJAVA***

**TABLE 1: COMMON NAME FOR *PSIDIUM GUAJAVA* L.:**

| | |
|---|---|
| Amba | Nepal |
| Amrood | India |
| Guava | Indonesia, Shri Lanka, USA, Tanzania, Mexico |
| Amrud | Fiji |
| Amrut | Fiji |

**TABLE 2: TAXONOMICAL CLASSIFICATION OF *P. GUAJAVA***

| | |
|---|---|
| Kingdom | Plantae |
| Division | Magnoliophyta |
| Subclass | Rosidae |
| Order | Myrtales |
| Family | Myrtaceae |
| Subfamily | Myrtoideae |
| Genus | *Psidium* |
| Species | *Guajava* |
| Binomial name | *Psidium guajava* |

**Photochemistry of *P. guajava:*** (Rohit Kumar Bijauliya, 2018): *Psidium guajava* is an important food crop and medicinal plant worldwide. Different pharmacological experiments in several *In-vitro* and *in-vivo* models have been carried out and identified the medicinally important Phyto-constituents.

**Fruit:** Vitamin C, Vitamin A, Iron, Calcium, Manganese, Phosphoric, Oxalic and Malic Acids, Saponin Combined with Oleanolic Acid. Morin-3-O-α-L-Lyxopyranoside and Morin-3-O-α-L-Arabopyranoside, (Z)-3-Hexen-One-Ol, 6-Methyl-5-Hepten-2-One Limonene, Octanol, Ethyl Octanoate (Pink Guava Fruit), Fiber, Fatty Acid.

**Leaves:** α-Pinene, β-Pinene, Limonene, Menthol, Terphenyl Acetate, Isopropyl Alcohol, Longicyclene, Caryophyllene, β-Bisabolene, Caryophyllene Oxide, β-Copanene, Farnesene, Humulene, Selinene, Cadinenes And Curcumene, Mallic Acids, Nerolidiol, β- Sitosterol, Ursolic, Crategolic, and Guayavolic acids, Cineol, Quercetin, 3-L4-4- Arabino furanoside (Avicularin) And Its 3-L-4-Pyranoside (Essential Oil), Resin, Tannin Eugenol, Caryophyllene, Guajavolide (2α,3 β-,6 β- ,23-Tetrahydroxyurs-12-en-28,20 β- Olide; 1) And Guavenoic Acid (2 α-,3 β-,6 β-,23-Tetrahydroxyurs-12,20(30)-dien-28-oic Acid, Triterpene oleanolic Acid, Triterpenoids, Flavinone-2,2'-ene, Prenol, Dihydrobenzo Phenanthridine And Crypto Nine.

**Bark:** Polyphenols, Resin, and Crystals of Calcium Oxalate

**Stem:** Flavonoids, Guaijavarin, Quercetin, Myricetin and Epigenin. Essential Oil Contains Hexanal, 2,4-Hexadienal, 3-Hexenal, 2-Hexenal, 3-Hexenyl Acetate and Phenol, β-Caryophyllene, Nerolidiol, 3-Phenylpropyl Acetate, Caryophyllene Oxide, Pentane-2-Thiol, 3-Penten-2-ol and 2-Butenylacetate, 3-Hydroxy-2-Butano3-Methyl-1-Butanol, 2, 3- Butanediol, 3-Methylbutanoic Acid.

**Root:** Tannin, Leukocyanidins, Sterols, Gallic Acid, Carbohydrates, Salts, Tannic Acid.

**Seed:** Proteins, Starch, Oils, Phenolic, and Flavonoid Compounds, Flavone Glycoside, Quercetin-3-O-B-D-(2''-Ogalloyglucoside)-4'-O-Vinylpropionate.

**Twigs:** Calcium, Magnesium, Phosphorous, Potassium, Sodium, Fluoride, Copper, Iron, Zinc, Manganese, and Lead. Flavonoids, Sesquiterpenes Alcohols, and Acid Triterpene.

**Traditional uses of *Psidium guajava:*** More recent pharmacological studies show that *Psidium guajava* L. is used in many parts of the world to

treat several diseases, e.g., diabetes, hypertension, caries, wounds, pain relief, and fever. Roots, barks, leaves, and immature fruits are commonly used to treat gastroenteritis, diarrhea, and dysentery. Leaves are applied to wounds, ulcers, and rheumatic pain while chewed to relieve toothache.

A decoction of new shoots is taken is taken as a febrifuge. After childbirth, a combined decoction of leaves and bark is given to expel the placenta. A water leaf extract is used to reduce blood glucose levels in people with diabetes. Guava jelly is a tonic for heart and constipation. The astringent unripe fruit, the leaves, the cortex of bark, and roots are used for washing ulcers and wounds as an astringent [13].

## MATERIALS AND METHODS:

**Collection, Identification and Authentication of Plant Material:** Based on a literature survey, fresh stems were selected for the present project. Fresh stems of *Psidium guajava* L. were collected from the local region of Nanded City and identified based on its morphological features with the help of a taxonomist. The plant was authenticated by Dr. Shrirang S. Bodke, Associate Professor and Head of Botany and Horticulture, Yeshwant Mahavidyalaya, Nanded. This has been submitted to Nanded Pharmacy College, Specimen No. NPC/M. Pharm/ Herbarium 2022-23/H-01 and authenticated as *Psidium guajava* L. (Family-Myrtaceae).


**FIG. 2: HERBARIUM SHEET OF *PSIDIUM GUAJAVA***

**Processing of Crude Drug:** The fresh stems of plant *Psidium guajava* L. were subjected to shade drying and further crushed to coarse powder. Then, the powder passed through mesh no. 14 and was stored in an airtight container for further use.

**FIG. 3: STEMS OF *PSIDIUM GUAJAVA* L.**

**FIG. 4: STEM POWDER**

## Pharmacognostic Evaluation of Plant Material:

**TABLE 3: MACROSCOPIC DESCRIPTION OF *PSIDIUM GUAJAVA* L.**

| | |
|---|---|
| Color | Yellowish cream |
| Odor | Characteristic |
| Taste | Slightly Bitter |
| Shape | Trunk is slender, 20 cm diameter |
| Size | 3-10 m |

**Stem Microscopy:** A section of the stem was stained with phloroglucinol and HCl (1:1). The microscopic study of the fresh stem section showed the presence of Epidermis, endodermis, vascular bundles, i.e., xylem and phloem, cuticle, trichomes, pith.

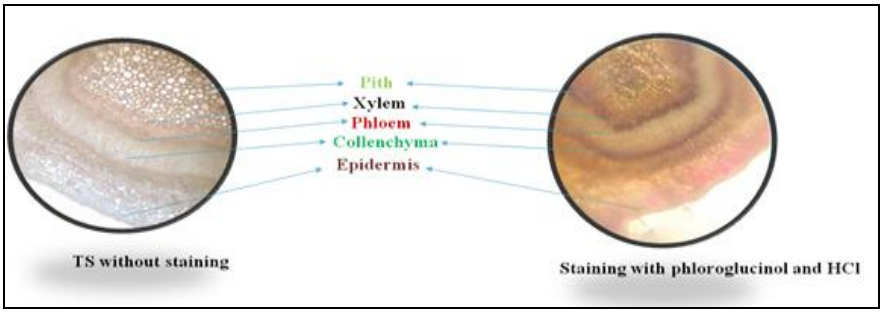
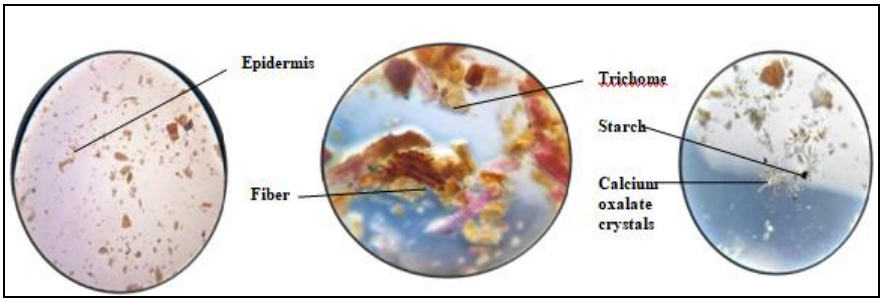



**FIG. 5: TS OF *PSIDIUM GUAJAVA* L. STEM**

**Microscopic Evaluation of Powdered Drug:** Some powder drug was stained with Phloroglucinol and HCl (1:1). It gives pink colour to fibers and vascular bundles, which was observed under a microscope with 40X lens. The powdered drug showed trichomes, fibers, Calcium oxalate crystals, and starch.




**Powder without staining with Phloroglucinol and HCl Staining with Iodine**

**FIG. 6: POWDER CHARACTERISTICS OF *PSIDIUM GUAJAVA* L. STEM**

**Preparation of Plant Extract:** Coarse powder (250 g) of *Psidium guajava* L. stem was exhaustively defatted using petroleum ether (60-80 ºC) (PP-PE) and extracted successively with acetone and ethanol using Soxhlet apparatus. All the extracts were collected, filtered through Whatman filter paper, concentrated, and stored in a tight desiccator, and the percentage yield was calculated.

**FIG. 7: SOXHLET APPARATUS**

**Physical Evaluation:** The dried stems of the plant were used for the determination of physicochemical parameters such as total ash value, acid insoluble ash value, water soluble ash value, and moisture content (LOD).

**FIG. 8: ASH VALUE DETERMINATION**

## RESULTS:

## Pharmacognostic Evaluation of *Psidium guajava* L. Stems:

## Determination of Loss on Drying (LOD):

**TABLE 4: DETERMINATION OF LOSS ON DRYING (LOD)**

| | |
|---|---|
| Weight of empty crucible (g) | 23.45 g |
| Weight of crude drug (sample) (g) | 1.5 g |
| Weight of crucible (g) + Weight of crude drug (sample) (g) | 24.95 g |
| Weight of crucible (g) + Weight of sample after drying (g) | 24.72 g |
| Loss on drying (% w/w) | 15.3% |

The percentage of loss on drying was found to be 15.3 %.

## Determination of Ash Value:

**TABLE 5: DETERMINATION OF ASH VALUE**

| Sr. no. | Standardization parameters | Wt. of crucible + ash or powder(gm) (z) | Wt. of empty crucible(gm) (x) | Wt. of drug (gm) (y) | % of ash=z x×100÷y |
|---|---|---|---|---|---|
| 1 | Total Ash value | 17.35 | 17.21 | 2 | 7 |
| 2 | Acid insoluble ash | 18.54 | 18.41 | 2 | 6.5 |
| 3 | Water soluble ash | 17.22 | 17.21 | 2 | 0.5 |

Ash values were found as, total ash 7 % w/w, acid-insoluble ash 6.5 % w/w and water-soluble ash 0.5 % w/w.

## Phytochemical Test of *Psidium guajava* L. Stems Extract:

**TABLE 6: QUALITATIVE ANALYSIS OBSERVATION**

| Chemical test | Pet ether | Acetone | Ethanol |
|---|---|---|---|
| **(A) Test for carbohydrates** | | | |
| Molisch test | + | + | + |
| Fehling's test | - | - | + |
| Benedict test | - | - | + |
| Barford's test | - | - | + |
| **(B) Test for proteins** | | | |
| Biuret test | - | - | - |
| **(C) Test for amino acids** | | | |
| Ninhydrin test | - | - | - |
| Cysteine test | - | + | - |

| | | | |
|---|---|---|---|
| **(D)Test for steroids** | | | |
| Salkowski test | - | + | + |
| **(E) Test for Glycosides** | | | |
| Legal Test | - | - | - |
| Foam Test | + | + | + |
| **(F) Test for Flavonoids** | | | |
| Shinoda Test | - | + | - |
| Sulphuric Acid Test | - | + | + |
| Lead Acetate Test | - | + | + |
| NaOH Test | - | + | + |
| Zinc Dust + HCl Test | - | + | + |
| **(G) Test for Tannins and Phenolic Compounds** | | | |
| 5% FeCl3 Solution Test | - | + | + |
| Lead Acetate Test | - | + | + |
| Bromine Water Test | - | + | + |
| K2Cr2O7 Test | - | + | + |
| Dil. KMnO4 Solution | - | + | + |
| **(H) Test for Alkaloids** | | | |
| Mayer's Test | - | + | + |
| Wagner's Test | - | + | + |
| Hager's Test | - | + | + |

**Present (+) & absent (-):** The above observation table shows the presence of phytoconstituents in the extracts. It reveals all two (i.e., Acetone and Ethanolic) extracts contain carbohydrates, glycosides, steroids, proteins, tannins and phenols, alkaloids, and flavonoids.

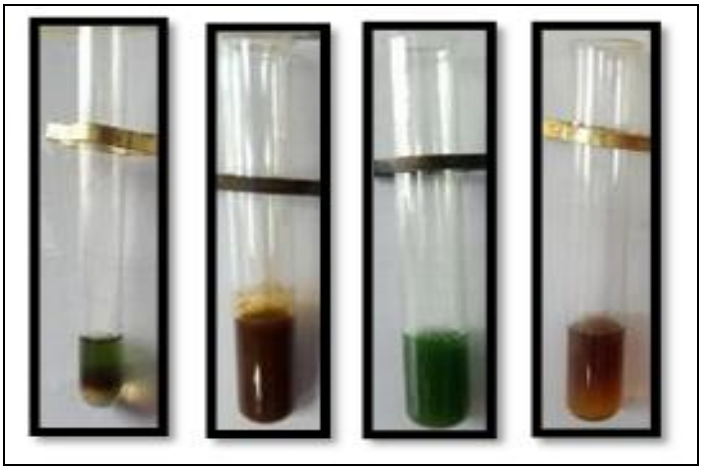


**FIG. 9: TESTS FOR CARBOHYDRATES**

**FIG. 10: TESTS FOR FLAVONOIDS**

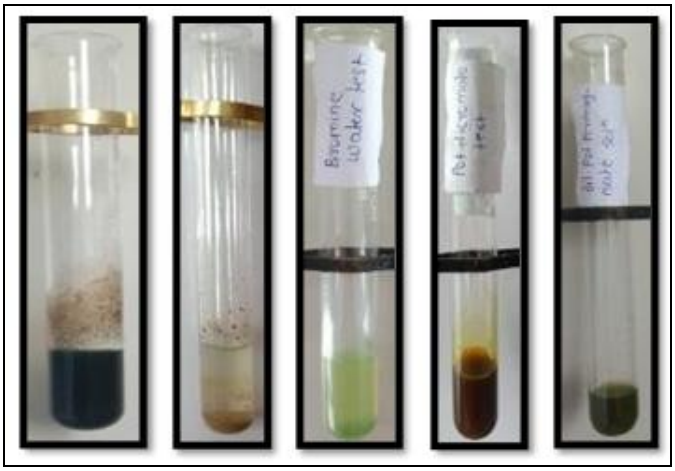


**FIG. 11: TESTS FOR TANNINS AND PHENOLS**

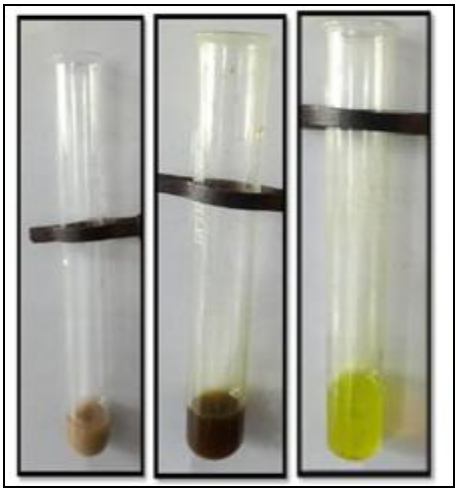


**FIG. 12: TESTS FOR ALKALOIDS**

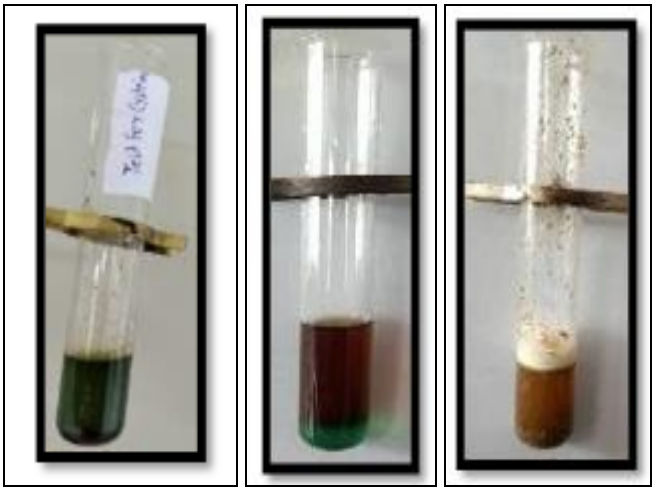


**FIG. 13: TEST FOR AMINO ACID FIG. 14: TEST FOR STEROID FIG. 15: FOAM TEST**

## Confirmation of Phytoconstituents with Thin Layer Chromatography:

**TABLE 7: R*F* VALUES OF *PSIDIUM GUAJAVA L.* (PG) STEM EXTRACTS**

| Sr. no. | Extract | Solvent System with Proportion & Spraying agent | *Rf* Value | Colour of Spot | Chemical constituent |
|---|---|---|---|---|---|
| 1 | PG- Pet-ether | Benzene: acetone: Methanol (4:4:2) 10% $H_2SO_4$ | 0.41 | Yellowish green | Chlorophyll b |
| | | | 0.50 | Green | Chlorophyll a |
| 2 | PG- Acetone | Chloroform: EA: Methanol (8:2:1) 10% $H_2SO_4$ | 0.28 | Grey | Mg-free |
| | | | 0.4 | Yellow orange | chlorophyll a |
| | | | 0.55 | Green | Flavonoid |
| | | | 0.64 | Dark purple | Flavone |
| | | | 0.81 | brown | Terpenes |
| 3 | PG- Ethanol | Chloroform: Acetone: methanol (8:1:1) 10% $H_2SO_4$ | 0.1 | Light Orange | Xanthophyll 2 |
| | | | 0.27 | Yellow | Lutein |
| | | | 0.38 | Light Red | Anthocyanin |
| | | | 0.49 | Reddish brown | Anthocyanin |
| | | | 0.73 | Light Red | Epicatechin |

The above observation table shows the presence of phytoconstituents in the extracts. It reveals all two (i.e., Acetone and Ethanolic) extracts contain carbohydrates, glycosides, steroids, proteins, tannins and phenols, alkaloids, and flavonoids. (A. M. Motwally).

## TLC Finger Printing:

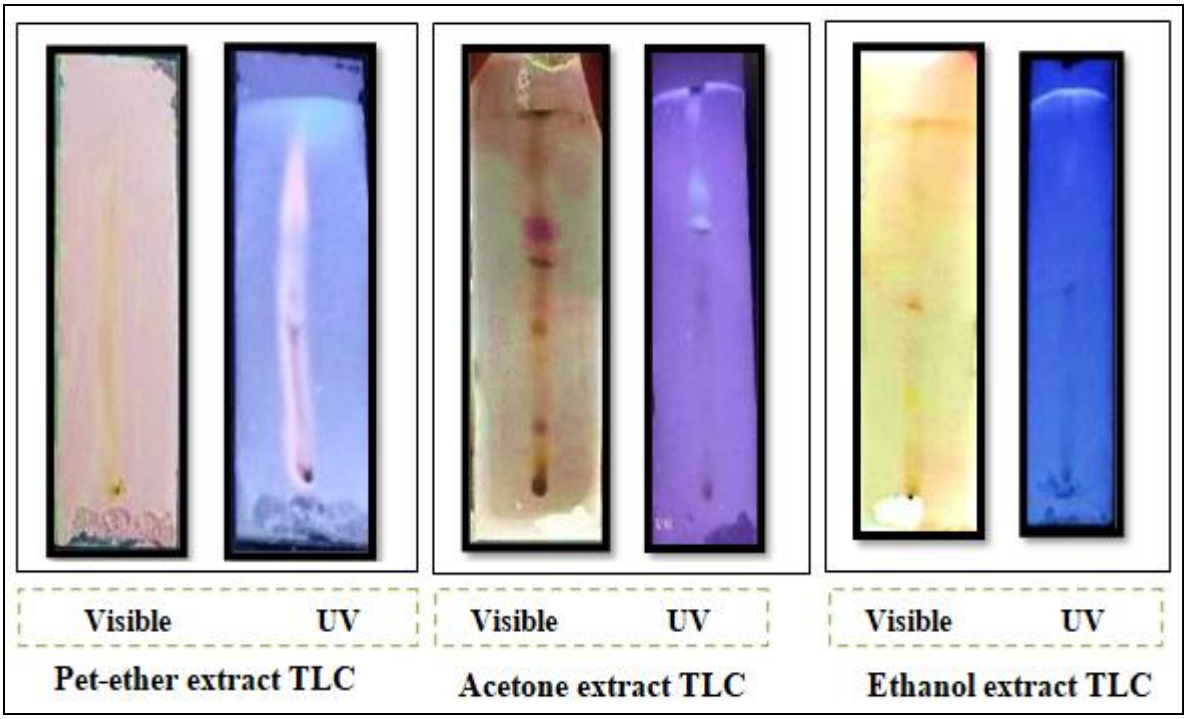



**FIG. 16: TLC OF PETROLEUM ETHER, ACETONE, ETHANOL EXTRACT**

**Determination of Total Phenolic and Total Flavonoid Content of *Psidium guajava* L. Stem Extract:**

**Total Phenolic Content:** Total phenolic content of standard gallic acid.

**TABLE 8: TOTAL PHENOLIC CONTENT OF STANDARD GALLIC ACID**

| Sr. no. | Conc. (ug/ml) | Absorbance at 666 nm |
|---|---|---|
| 1 | 2 | 0.101 ± 0.0008 |
| 2 | 4 | 0.141 ± 0.0008 |
| 3 | 6 | 0.218 ± 0.0008 |
| 4 | 8 | 0.307 ± 0.0008 |
| 5 | 10 | 0.372 ± 0.0008 |

Values represent mean ± SEM (n = 3).

The calibration curve for sequentially and independently prepared stock solution of standard gallic acid depicts the concentration of gallic acid against the absorbance. The absorbance values increased proportionally upon increasing the concentration of gallic acid from 2µg/ml to 10 µg/ml.

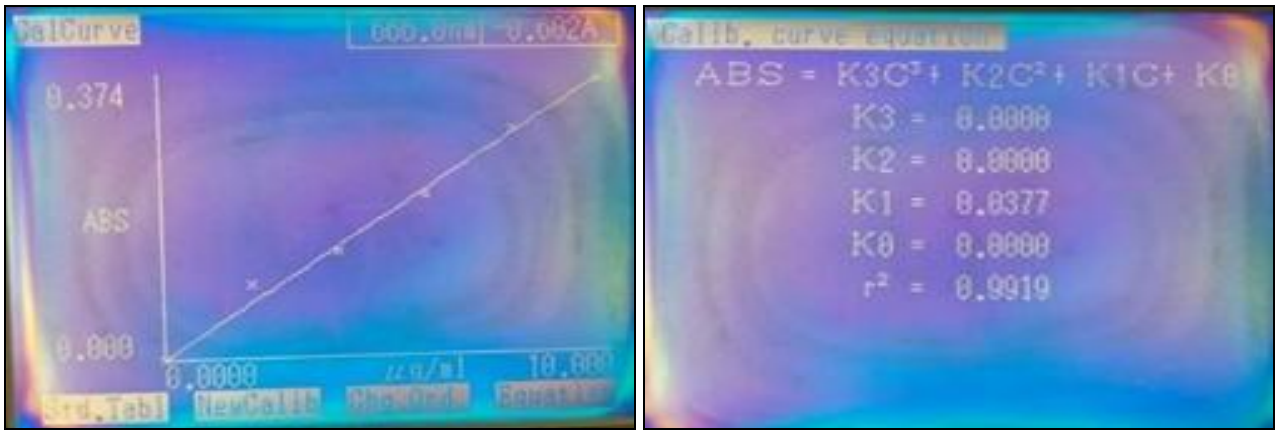



**FIG. 17: CALIBRATION CURVE FOR STD. GALLIC ACID & CALIBRATION CURVE EQUATION**

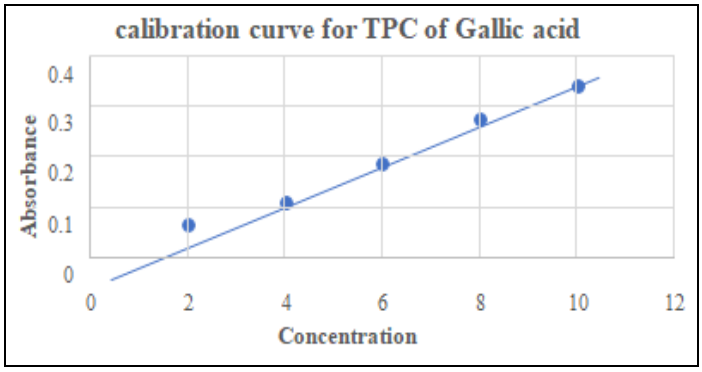



**FIG. 18: CALIBRATION CURVE OF GALLIC ACID**

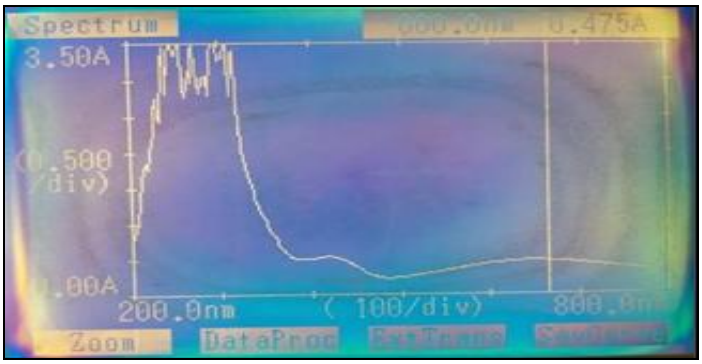



**FIG. 19: Λ MAX DETERMINATION OF STANDARD GALLIC ACID**

## Result of Total Phenolic Content of *Psidium guajava* L. Stem Extract:

**TABLE 9: TOTAL PHENOLIC CONTENT OF *PSIDIUM GUAJAVA* L. STEM**

| Sr. no. | Extract | Conc. (ug/ml) | Absorbance | TPC (mg GAE/g DW) |
|---|---|---|---|---|
| 1 | Acetone | 50 | 0.333 ± 0.0014 | 180.13 ± 0.81 |
| 2 | Ethanol | 50 | 0.312 ± 0.0017 | 168.73 ± 0.93 |

Values represent mean ± SEM (n = 3).

Note: GAE/g DW denotes Gallic Acid Equivalent per gram dry weight.

The above observation table reveals that Acetone and Ethanol have Phenolic content of 180.13 (mg GAE/g DW), and 168.73 (mg GAE/g DW), respectively.

Acetone extract shows more phenolic content than ethanol as per a comparative evaluation of the phenolic content of extracts.

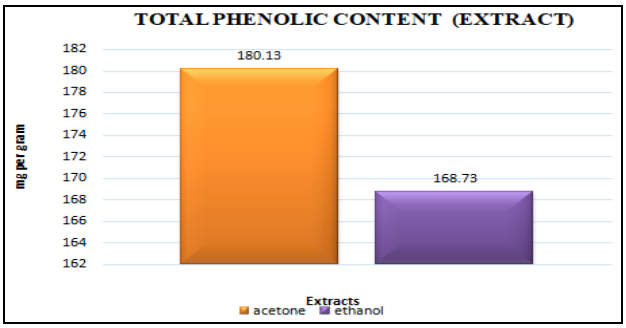



**FIG. 20: TOTAL PHENOLIC CONTENT OF EXTRACTS**

## Total Flavonoid Content:

## Total Flavonoid Content of Standard Quercetin:

**TABLE 10: TOTAL FLAVONOID CONTENT OF STANDARD QUERCETIN**

| Sr. no. | Conc. (ug/ml) | Abs at 510 nm |
|---|---|---|
| 1 | 2 | 0.0213 ± 0.0008 |
| 2 | 4 | 0.033 ± 0.0008 |
| 3 | 6 | 0.048 ± 0.0008 |
| 4 | 8 | 0.0723 ± 0.0008 |
| 5 | 10 | 0.090 ± 0.0005 |

Values represents mean ± SEM (n = 3).

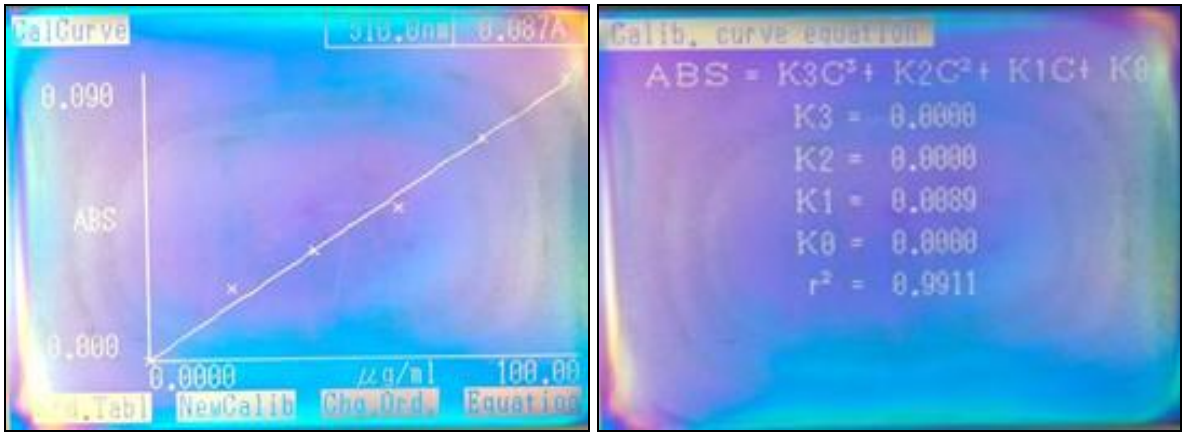



**FIG. 21: CALIBRATION CURVE FOR STD. QUERCETIN & CALIBRATION EQUATION**

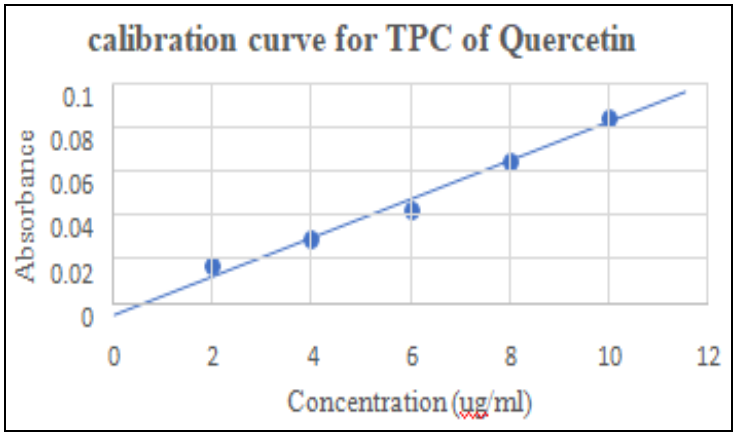



**FIG. 22: CALIBRATION CURVE FOR TFC OF QUERCETIN**

The calibration curve for quercetin's sequentially and independently prepared stock solution depicts the concentration of quercetin against the absorbance. The absorbance values increased proportionally upon increasing the concentration of quercetin from 2µg/ml to 10 µg/ml.

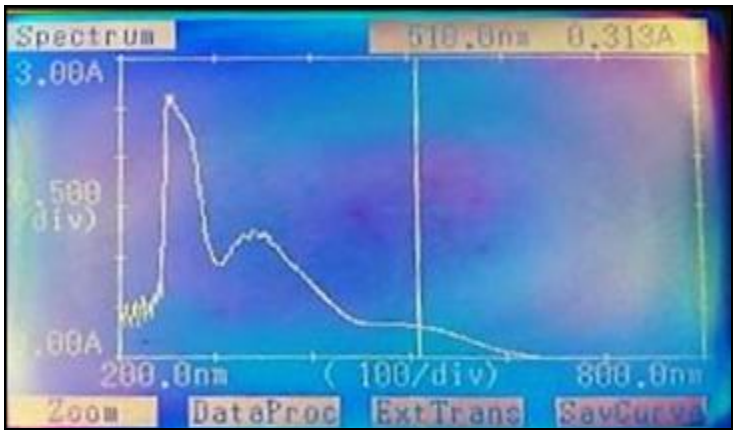



**FIG. 23: DETERMINATION OF Λ MAX OF STANDARD QUERCETIN FOR TFC**

## Result of Total Flavonoid Content of *Psidium guajava* L. Stem Extract:

**TABLE 11: TOTAL FLAVONOID CONTENT OF *PSIDIUM GUAJAVA* L. STEM EXTRACTS**

| Sr. no. | Extract | Abs | TFC In (Mg QE/g DW) |
|---|---|---|---|
| 1 | Acetone | 0.052 ± 0.001 | 117.46 ± 3.94 |
| 2 | Ethanol | 0.039 ± 0.0008 | 88.26 ± 1.99 |

Values represents mean ± SEM (n = 3).

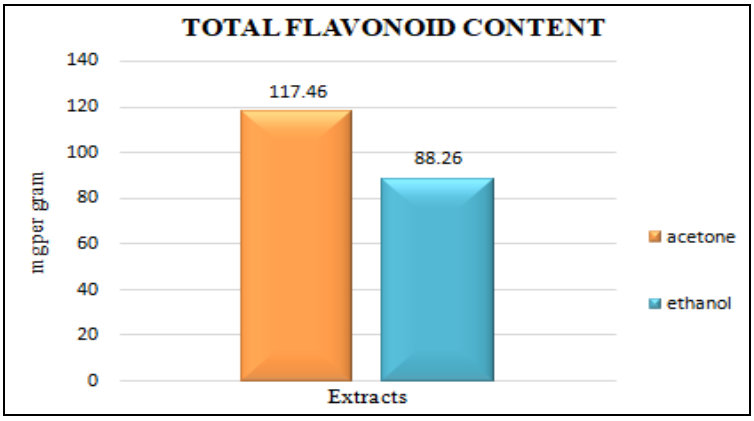



**FIG. 24: EFFECT OF FLAVONOID CONTENT OF EXTRACT**

**Note: QE/g DW Denotes Quercetin Equivalent Per Gram Dry Weight:** The above table indicates that the acetone and ethanol extracts contain flavonoids contain as like 117.46 (mg QE/g DW) and 88.26 (mg QE/g DW).

Acetone extract shows more flavonoid content than ethanol extract as per a comparative evaluation of the flavonoid content of extracts.

***In-vitro* Antioxidant Activity:** The antioxidant activity of Psidium guajava L. was determined by using the *in-vitro* method DPPH free radical scavenging assay.

The result was compared with the reference standards of gallic acid, quercetin, and rutin.

**TABLE 12: ABSORBANCE OF GALLIC ACID, RUTIN AND QUERCETIN**

| Sr. no. | Conc. (µg/ml) | Absorbance | | |
|---|---|---|---|---|
| | | Gallic acid | Rutin | Quercetin |
| 1 | 20 | 0.423 ± 0.002 | 0.251 ± 0.002 | 0.484 ± 0.02 |
| 2 | 40 | 0.380 ± 0.001 | 0.218 ± 0.001 | 0.375 ± 0.001 |
| 3 | 60 | 0.316 ± 0.002 | 0.193 ± 0.001 | 0.282 ± 0.001 |
| 4 | 80 | 0.287 ± 0.001 | 0.163 ± 0.002 | 0.194 ± 0.001 |
| 5 | 100 | 0.195 ± 0.002 | 0.150 ± 0.001. | 0.155 ± 0.002 |

Values represents mean ± SEM (n = 3).

**TABLE 13: DPPH RADICAL SCAVENGING ASSAY OF STANDARD GALLIC ACID, RUTIN AND QUERCETIN**

| Sr. no. | Conc. µg/ml | % inhibition | | |
|---|---|---|---|---|
| | | Gallic acid | Rutin | Quercetin |
| 1 | 20 | 48.30 ± 0.36 | 69.26 ± 0.28 | 44.4 ± 0.10 |
| 2 | 40 | 53.59 ± 0.21 | 73.33 ± 0.17 | 54.20 ± 0.18 |
| 3 | 60 | 61.37 ± 0.28 | 76.43 ± 0.18 | 65.56 ± 0.18 |
| 4 | 80 | 64.95 ± 0.18 | 80.09 ± 0.25 | 76.22 ± 0.17 |
| 5 | 100 | 76.14 ± 0.24 | 81.68 ± 0.13 | 88.92 ± 0.10 |

Values represent mean ± SEM (n = 3).

The standard gallic acid, rutin, and quercetin show 48.30 %, 69.26%, and 44.4 % inhibition (percent scavenging activity) at 20µg/ml conc. At 100 µg/ml concentration shows 76.14%, 81.68 %, and 88.92% inhibition, respectively. The observation reveals that quercetin shows better antioxidant activity from concentration 20µg/ml to 100µg/ml in a concentration-dependent manner, i.e., as conc. increases % inhibition of free radicals also increases.

**TABLE 14: ABSORBANCE OF QUERCETIN, *PSIDIUM GUAJAVA* L. STEM EXTRACTS (ACETONE AND ETHANOL)**

| Sr. no. | Conc. (µg/ml) | Absorbance | | |
|---|---|---|---|---|
| | | Quercetin | Acetone extract | Ethanol extract |
| 1 | 20 | 0.484 ± 0.02 | 0.482 ± 0.002 | 0.515 ± 0.002 |
| 2 | 40 | 0.375 ± 0.001 | 0.428 ± 0.005 | 0.475 ± 0.002 |
| 3 | 60 | 0.282 ± 0.001 | 0.387 ± 0.004 | 0.432 ± 0.001 |

| | | | | |
|---|---|---|---|---|
| 4 | 80 | 0.194 ± 0.001 | 0.214 ± 0.003 | 0.375 ± 0.002 |
| 5 | 100 | 0.155 ± 0.002 | 0.155 ± 0.002 | 0.293 ± 0.001 |

Values represent mean ± SEM (n = 3).

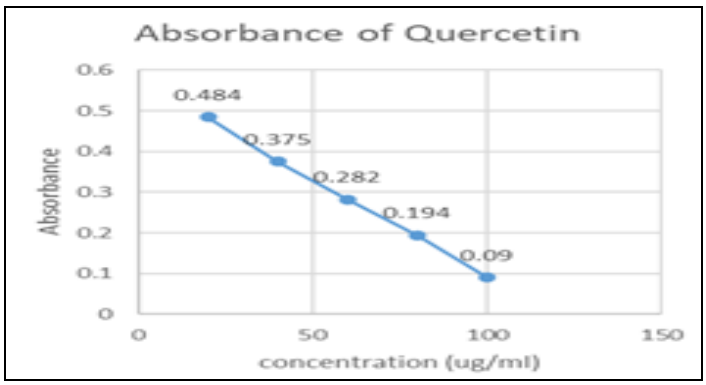



**FIG. 25: ABSORBANCE CURVE OF QUERCETIN**

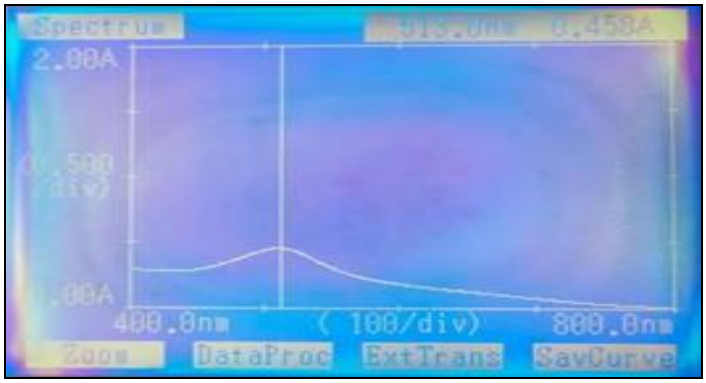



**FIG. 26: DETERMINATION OF Λ MAX OF STANDARD QUERCETIN FOR ANTIOXIDANT ACTIVITY**

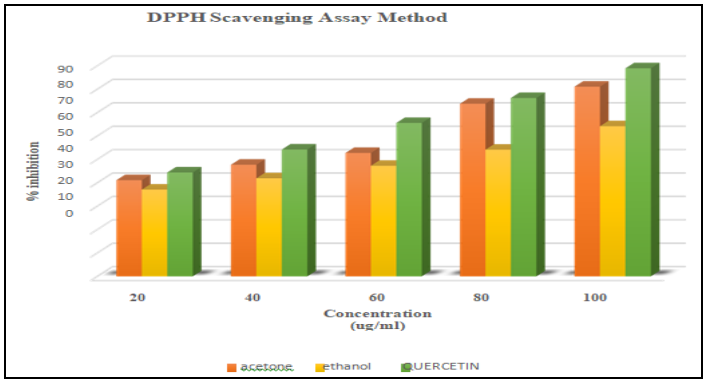



**FIG. 27: DPPH RADICAL SCAVENGING ASSAY OF TEST EXTRACTS OF *PSIDIUM GUAJAVA* L. STEM EXTRACTS**

**TABLE 15: DPPH SCAVENGING ACTIVITY OF QUERCETIN, *PSIDIUM GUAJAVA* L. STEM EXTRACTS (ACETONE AND ETHANOL)**

| Sr. no. | Conc. µg/ml | % inhibition | | |
|---|---|---|---|---|
| | | Quercetin | Acetone extract | Ethanol extract |
| 1 | 20 | 44.4 ± 0.10 | 41.1 ± 0.31 | 37.07 ± 0.24 |
| 2 | 40 | 54.20 ± 0.18 | 47.69 ± 0.70 | 41.91 ± 0.24 |
| 3 | 60 | 65.56 ± 0.18 | 52.74 ± 0.60 | 47.24 ± 0.21 |
| 4 | 80 | 76.22 ± 0.17 | 73.78 ± 0.39 | 54.12 ± 0.29 |
| 5 | 100 | 88.92 ± 0.10 | 81.07 ± 0.25 | 64.17 ± 0.17 |

Values represent mean ± SEM (n = 3).

The acetone extract of *Psidium guajava* L. shows more significant antioxidant properties than ethanolic extract.

**CONCLUSION:** In this modern world and hectic lifestyle, the graph of diseases is rising. Due to this, people are taking medicines that have a lot of side

effects and complications. So, the need for side effect-free medications is rising. There is a rising voice for side effects-free medications. From older generations, we have learned that they used plants or their parts as medicine for various diseases. In many developing countries, most people prefer traditional systems of medicine as their treatment.

India has a large geographical area, which allows us to explore different plants with different species. We have the support of knowledge of Ayurveda. The natural constituents in the plants with side effect-free treatment benefit us. Hence, we should work more towards natural products.

*Psidium guajava* L. Commonly known as the Poor man's apple plant, belongs to the Myrtaceae family. The leaves and fruits of plants have been used for many human ailments. However, a literature survey revealed no systematic and scientific study on the analgesic and anti-inflammatory activity of Psidium guajava L. stem extracts. Therefore, exploring this plant for its analgesic and anti-inflammatory activity was considered worthwhile.

A continuous hot extraction method is used for the extraction of a stem using the Soxhlet apparatus; three extracts of *Psidium guajava* L. were prepared with petroleum ether, acetone, and ethanol. The percentage yield of each extract was calculated after distillation and restoration of the solvent was done, and the extracts were stored in a container for further use.

A preliminary phytochemical investigation and TLC fingerprinting were carried out on all three extracts to determine the phytoconstituent present in the extract. The preliminary phytochemical estimation of plant extract reveals the presence of flavonoids, carbohydrates, proteins, amino acids, glycosides, tannin, alkaloids and saponin, etc. These phytochemicals were confirmed by qualitative analysis.

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**CONFLICTS OF INTEREST:** Nil

## REFERENCES:

1. Abidoye OR, Akinpelu DA, Alayande KA & Agunbiade MO: Biocidal potentials of stem bark extracts of *Psidium guajava* (linn.) on panel of bacterial strains associated with diarrhea and dysentery. Asian J Pharm Clin Res, 2020; 13(2): 84-96.
2. Alexander GC: Testimony for the record submitted to the house committee on oversight and government reform for the hearing. “Combating the Opioid Crisis” 2017.
3. Ashraf A: Research article on anti-tumor and anti-cancer activity of *Psidium guajava* leaf methanol, hexane, chloroform extract. Pharmaceutical Biology Journal 2016; 54: 10.
4. Metwally AM, Omar AA and Harraz FM: Phytochemical investigation and antimicrobial activity of *Psidium guajava* L. leaves, Pharmacognosy Magazine 2010; 6: 212-218.
5. Begum S, Hassan SI & Siddiqui BS: Two new triterpenoids from the fresh leaves of *Psidium guajava*. Planta Medica 2002; 68(12): 1149-1152.
6. Bhende YJ. Sabir: Papaver libanoticum M. Indian Journal of Pharmacy 1994; 39: 79.
7. Birdi T, Daswani P, Brijesh S, Tetali P, Natu A & Antia N: Newer insights into the mechanism of action of *Psidium guajava* L. leaves in infectious diarrhoea. BMC Complementary and Alternative Medicine 2010; 10(1): 1-11.
8. Biswas B, Rogers K, McLaughlin F, Daniels D & Yadav A: Antimicrobial activities of leaf extracts of guava (*Psidium guajava* L.) on two gram- negative and gram-positive bacteria. International Journal of Microbiology 2013; 7.
9. Biswas M, Biswas K, Karan TK, Bhattacharya S, Ghosh AK & Haldar PK: Evaluation of analgesic and anti-inflammatory activities of *Terminalia arjuna* leaf. Journal of Phytology 2011; 3(1): 33-38.
10. Biswas S, Mondol D, Jodder P, Sana S, Saleh MA, Tarafdar AK & Isla M: Evaluation of neurobehavioral activities of ethanolic extract of *Psidium guajava* Linn leaves in mice model. Future Journal of Pharmaceutical Sciences 2021; 7: 1-12.
11. Bulugahapitiya VP, Kokilananthan S, Manawadu H & Gangabadage CS: Phytochemistry and medicinal properties of *Psidium guajava* L. leaves: A rev iew. Plant Science Today 2021; 8(4): 963-971.
12. Dakappa SS, Adhikari R, Timilsina SS & Sajjekhan S: A review on the medicinal plant *Psidium guajava* Linn. (Myrtaceae). Journal of Drug Delivery and Therapeutics, 2013; 3(2): 162.
13. DASH Research Group Obarzanek Eva obarzane@ nhlbi. nih. gov Sacks Frank M Vollmer William M Bray George A Miller Edgar R III Lin Pao-Hwa Karanja Njeri M Most-Windhauser Marlene M Moore Thomas J Swain Janis F Bales Connie W Proschan Michael A. (2001). Effects on blood lipids of a blood pressure–lowering diet: the Dietary Approaches to Stop Hypertension (DASH) Trial. The American journal of clinical nutrition, 74(1), 80-89.
14. Degla LH, Olounlade PA, Amoussa AM, VB E, Azando MS & Lagnika L: Pharmacognostical, biochemical activities and zootechnical applications of *Psidium guajava* (Myrtaceae), plant with high médicinal value in tropical and subtropical parts of the World: A. Journal of Medicinal Plants 2021; 9(3): 14-18.
15. Deguchi Y & Miyazaki K: Anti-hyperglycemic and anti-hyperlipidemic effects of guava leaf extract. Nutrition & Metabolism 2010; 7(1): 1-10.
16. Delorino SB, Ogalesco ML, Rebadulla KR, Rongcales MTA, Salubre VJIA, Talacay MKS & Tuballas ZB: Wound healing efficacy of guava leaf extract. Journal of Pharmaceutical Res International 2021; 32(41): 27-35.

17. Devaraj A & Karpagam T: Evaluation of anti-inflammatory activity and a nalgesic effect of Aloe vera leaf extract in rats. Int Res J Pharm 2011; 2(3): 103-10.
18. Jangme CM: A TextBook of pathophysiology, S. vikas & Company, Punjab 2019; 132-139.
19. Ekaluo UB, Ikpeme EV, Ekerette EE & Chukwu CI: *In-vitro* antioxidant and free radical activity of some Nigerian medicinal plants: bitter leaf (*Vernonia amygdalina* L.) and guava (*Psidium guajava* Del.). Research Journal of Medicinal Plant 2015; 9(5): 215-226.
20. Emanuel LL, von Gunten CF and Ferris FD: Module 4 Pain Management the Educatio n for Physicians on End-of-life Care [EPEC]curriculum 1999; 1-37.
21. Guideline OECD: on acute oral toxicity (AOT) Environmental health and safety monograph series on testing and adjustment number 2001; 425.
22. Gupta GK, Chahal J & Arora D: *Psidium guajava* Linn.: Current Research and future prospects. J Pharm Res 2011; 4(1): 42-46.
23. Ifeanyichukwu I, Chika E, Emmanuel N, Anthonia O, Ngozi A & Agabus N: Preliminary investigation of the antibacterial activity of *Psidium guajava* extracts. European Journal of Medicinal Plants 2015; 7(1): 26.
24. John BIJU, Sulaiman CT, George S & Reddy VRK: Total phenolics and flavonoids in selected medicinal plants from Kerala. International Journal of Pharmacy and Pharmaceutical Sciences 2014; 6(1): 406-408.
25. John NR, Gala VC & Sawant CS: Inhibitory effects of plant extracts on multi-species dental biofilm formation in-vitro. Int J Pharm Bio Sci 2013; 4(2): 487- 495.
26. Kaushik D, Kumar A, Kaushik P & Rana AC: Analgesic and Anti- Inflammatory Activity of Pinus roxburghii Sarg. Advances in Pharmacological Sciences 2012; 6.
27. Kavitha A & Kensa M: GC-MS analysis of ethanolic extract of *Rivina humilis* L.(stem). Cikitusi J Multidisciplin 2019; 8(11): 108–122.
28. Khandelwal KR: Practical Pharmacognosy Nirali Prakashan. Pune 2006; 23: 7- 23.11 and 25.1-25.9.
29. Krolikiewicz-Renimel I, Michel T, Destandau E, Reddy M, André P, Elfakir C & Pichon C: Protective effect of a *Butea monosperma* (Lam.) Taub. flowers extract against skin inflammation: antioxidant, anti-inflammatory and matrix metalloproteinases inhibitory activities. Journal of Ethnopharmacology 2013; 148(2): 537- 543.
30. Kumar M, Tomar M, Amarowicz R, Saurabh V, Nair MS, Maheshwari C & Singh S: Guava (*Psidium guajava* L.) Leaves: Nutritional Composition, Phytochemical Profile, and Health-Promoting Bioactivities. Foods 2021; 10: 1-20.
31. Lozoya X , Reyes-Morales H , Chávez-Soto MA , del Carmen Martínez-García M, Soto-González Y & Doubova SV: Intestinal anti-spasmodic effect of a phytodrug of *Psidium guajava* folia in the treatment of acute diarrheic disease. Journal of Ethnopharmacology 2002; 83(1-2): 19-24.
32. Manekeng HT, Mbaveng AT, Ntyam Mendo SA, Agokeng AJD & Kue te V: Evaluation of acute and subacute toxicities of *Psidium guajava* metha nolic bark extract: a botanical with in vitro antiproliferative potential. Evidence-Bas ed Complementary and Alternative Medicine 2019; 1-13.
33. Martínez-González CL, Martínez L, Martínez-Ortiz EJ, González-Trujano ME, Déciga-Campos M, Ventura Martínez R & Díaz-Reval I: *Moringa oleifera*, a species with potential analgesic and anti-inflammatory activities. Biomedicine & Pharmacotherapy 2017; 87: 482-488.
34. Michael J: triterpenoids and lipid constituents form *Psidium guajava*. Phyto Chemistry 2019: 54(8): 835-38.
35. Molla T & Azene H: A systemic review on antioxidant and hepatoprotective effect of *Psidium guajava* leaf and fruit extract. Journal of Diseases and Medicinal Plants 2017; 3(2): 42-57.
36. Muhammad N, Saeed M & Khan H: Antipyretic, analgesic and anti- inflammatory activity of *Viola betonicifolia* whole plant. BMC Complementary and Alternative Medicine 2012; 12: 1-8.
37. Okoli CO, Ezike AC, Akah PA, Udegbunam SO, Okoye TC, Mbanu TP & Ugwu E: Studies on wound healing and antiulcer activities of extract of aerial parts of *Phyllanthus niruri* L. (Euphorbiaceae). American Journal of Pharmacology and Toxicology 2009; 4(4): 118-126.
38. Paniandy JC, Chane-Ming J & Pieribattesti JC: Chemical composition of the essential oil and headspace solid phase microextraction of the guava fruit (*Psidium guajava* L.). Journal of Essential Oil Research 2000; 12(2): 153-158.
39. Phakeovilay C, Bourgeade-Delmas S, Perio P, Valentin A., Chassagne F, Deharo E & Marti G: Antileishmanial compounds isolated from *Psidium guajava* L. using a metabolomic approach. Molecules 2019; 24(24): 4536.
40. Prabhudesai AP, Biyani DM & Umekar MJ: *Psidium guajava*: Multipurpose Medicinal Herb. Int J Pharm Sci Rev Res 2019; 59: 125-132.
41. Prabu GR, Gnanamani A & Sadulla S: Guaijaverin–a plant flavonoid a s potential antiplaque agent against Streptococcus mutans. Journal of Applied Micro Biology 2006; 101(2): 487-495.


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