Phytochemical Profiling And Pharmacognostical Evaluation Of Ornamental Plant *Rhaphidophora Aurea* (Money Plant)

Mr. Rajat Yadav[1*], Dr. Kratika Daniel[2]

[1]Research scholar, Oriental University, Indore M.P. Phone no: 7906575824, Email: yadavm.pharm@gmail.com*
[2]Professor, Oriental University, Indore M.P.

KEYWORDS
Rhaphidophoraaurea, Phytochemical Screening, Pharmacognostical Evaluation, Standardization Parameters, Herbal Drug Quality

ABSTRACT
The present study aims to investigate the phytochemical and pharmacognostical attributes of *Rhaphidophoraaurea* (Money Plant), an ornamental plant with potential medicinal properties. A detailed pharmacognostic evaluation was conducted, including macroscopic and microscopic examination, powder analysis, and physicochemical characterization, to establish a comprehensive reference for academic and commercial applications. The phytochemical screening involved methanol (80%), ether, and chloroform extracts, which were analyzed for the presence of secondary metabolites such as alkaloids, glycosides, tannins, proteins, amino acids, and terpenoids. The determination of ash values played a crucial role in standardizing the crude drug and assessing the presence of extraneous matter.
Furthermore, qualitative screening for saponins, tannins, alkaloids, terpenoids, anthraquinones, flavonoids, and glycosides was performed to authenticate the medicinal potential of the plant. The study provides critical physicochemical parameters necessary for ensuring the quality and purity of the plant material, thereby contributing to its standardization. These findings serve as a scientific basis for future research and potential applications in herbal medicine, supporting the establishment of pharmacopoeial standards for *Rhaphidophoraaurea*.

1. Introduction:

Medicinal plants have been extensively studied for their bioactive compounds, contributing significantly to traditional and modern medicine. Among them, *Rhaphidophoraaurea* (commonly known as the Money Plant) is an ornamental plant widely cultivated for its aesthetic appeal and air-purifying properties. However, its phytochemical composition and potential pharmacognostical significance remain underexplored. The phytochemical constituents of medicinal plants are responsible for their therapeutic effects, making phytochemical screening essential for identifying bioactive compounds that may have pharmacognostical relevance (Gurib-Fakim, 2014).

The genus *Rhaphidophora*, belonging to the family Araceae, is known for its diverse phytoconstituents, including flavonoids, alkaloids, tannins, and saponins, which have been reported in related species (Kumar et al., 2020). These secondary metabolites play a crucial role in plant defense and may offer beneficial properties such as antioxidant and antimicrobial activities (Singh et al., 2019). While *Rhaphidophoraaurea* is primarily recognized for its ornamental value, its potential medicinal attributes remain largely unexplored. Hence, comprehensive phytochemical profiling and pharmacognostical evaluation are imperative to establish its therapeutic significance.

Pharmacognostical evaluation involves a detailed investigation of a plant's macroscopic, microscopic, physicochemical, and phytochemical characteristics. Standardization parameters such as moisture content, extractive values, ash values, and fluorescence analysis provide essential quality control data, ensuring consistency in herbal formulations (Kokate et al., 2019). Additionally, microscopic analysis of leaf structures, stomatal arrangement, and trichome morphology aids in plant identification and authentication, preventing adulteration and substitution in herbal medicine (Trease & Evans, 2016).

Given the increasing global interest in natural products and herbal therapeutics, this study aims to perform a detailed phytochemical screening and pharmacognostical evaluation of *Rhaphidophoraaurea*. This research will contribute to the standardization of this species and provide scientific validation for its potential inclusion in herbal medicine formulations.

2. MaterialandMethodology:

2.1. Collectionand Plantauthentication

The leaf of the climber was possessedfrom the herbal plant garden of Shri Ram Murti SmarakCollege of engineering and Technology Pharmacy, Bareilly, Uttar Pradesh (India). The PlantauthenticationwasdonebyDr.AlokKumarShrivastav, Department of Botany,M.J.PRohilkhand University,

Bareilly Uttar Pradesh, Indiaand was identified as ***Rhaphidophoraaurea*(MoneyPlant)**holdingreferenceletter no.RU/PS/2023/07dated april 5th 2023.

2.2. Macroscopic and Microscopic Evaluation:

2.2.1 Macroscopic Analysis:

The macroscopic characteristics of the leaves, such as shape, size, color, texture, venation pattern, and surface features, were recorded following standard protocols (Kokate et al., 2019).

2.2.2. Microscopic Analysis:

Transverse sections of the fresh leaves were prepared and stained with safranin and iodine-potassium iodide (I2KI) for anatomical studies. The microscopic features, including epidermal cells, stomatal type, trichomes, and vascular bundles, were observed under a compound microscope (Trease & Evans, 2016). Powder microscopy of dried leaf powder was performed using chloral hydrate and phloroglucinol-HCl staining to identify lignified tissues and starch grains.

2.3. SEMimageof leaf surfaceofthemoneyplantdrypowder(MLDP):

The prepared sample was placed in the SEM chamber, and imaging was conducted under high vacuum conditions using an accelerating voltage of 5-20 kV, following standard SEM protocols for plant samples (Bozzola& Russell, 2020). Magnifications ranging from 500x to 5000x were used to capture the detailed microstructure of the leaf powder, focusing on epidermal features, trichomes, and stomatal patterns. Previous studies on SEM imaging of plant powders have demonstrated that high-magnification analysis allows for distinguishing between species based on surface morphology and microstructural characteristics (Medeiros et al., 2021).

2.3. Powdermicroscopy:

The fresh leaves of *Rhaphidophoraaurea* were collected, washed with distilled water, shade-dried at room temperature for 10-12 days, and finely powdered using a mechanical grinder. The powder was then sieved through a 60-mesh sieve to obtain a uniform consistency and stored in an airtight container for analysis.A small amount of powdered leaf sample was mounted on a clean glass slide, and the following staining procedures were performed to detect different cellular components:

- **Lignified Tissues:** A drop of 1% phloroglucinol solution was added to the powder, followed by a few drops of concentrated hydrochloric acid. The slide was observed under a microscope for pink to red-stained lignified elements.
- **Starch Grains:** The powder was treated with iodine solution, and the presence of starch was confirmed by the appearance of blue-black coloration.
- **Calcium Oxalate Crystals:** The powder was mixed with a few drops of glycerin and observed for birefringent crystals under polarized light.
- **Oil Globules:** The powder was stained with Sudan III, which imparted a red color to the oil droplets.
- **Cellulose and Parenchyma Cells:** The powder was stained with safranin, and the structural details of parenchymatous cells and fibers were examined.

Figure 1: Powder Of *Rhaphidophoraaurea* Leaves

2.3. Physicochemicalevaluation:

2.3.1. Determination of Moisture Content:

Loss on drying (LOD) refers to the percentage (w/w) of weight loss due to evaporation of waterandothervaporescentsubstancesunderspecificconditions.Asampleof1gramofdried*Rhaphidophoraaurea*is placed in a hollow vialand weighed. The specimen is then uniformlyspread and dehydrated in hot air oven at 105°C for one hour with the bungleft removed. Afterthis period, the bung is sealed, and the bottle is left to be levelheadedto surrounding temperaturebeforebeingweighedagain(Indian Pharmacopoeia, 2021).

2.3.2. Determination of Ash Values:

2.3.2.1. Total Ash Value:

The total material left after incineration of the powdered drug at temperature 400°C to remove allcarbonatomsisdetermined.Accurately weigh 2-3 g of finely powdered *Rhaphidophoraaurea* leaf sample.Place the sample into a previously ignited, cooled, and tarred crucible to ensure no pre-existing residue affects the weight measurement (Trease & Evans, 2016).Gradually heat the sample on a low flame using a hot plate until all moisture is removed and the material is charred without flaming. This prevents excessive loss of volatile inorganic constituents.Transfer the crucible to a preheated muffle furnace and incinerate the sample at 500-600°C for 4-6 hours or until a constant weight is obtained.Ensure that the ash is white or grayish-white, indicating complete oxidation of organic matter (Kokate et al., 2019).Remove the crucible from the furnace using tongs and place it in a desiccator to cool to room temperature.Weigh the crucible accurately and record the weight of the ash.

The total ash content is expressed as a percentage using the formula:

Total Ash (%)=(Weight of Ash Residue/Weight of Sample Taken)×100

Figure 2: Total Ash

2.3.2.2. Watersolubleash:

Accurately weigh 2-3 g of finely powdered *Rhaphidophoraaurea* leaf sample and transfer it into a previously ignited and tarred crucible.Incinerate the sample in a muffle furnace at 500-600°C until a constant weight is obtained, ensuring complete combustion of organic matter.Cool the crucible in a desiccator and weigh the total ash obtained.Add 25 mL of distilled water to the total ash residue in a 100 mL glass beaker.Stir well and allow the mixture to stand for 10-15 minutes to ensure the complete dissolution of water-soluble inorganic salts (Kokate et al., 2019).Filter the solution through an ash-free filter paper into a pre-weighed sintered crucible or porcelain dish.Rinse the filter paper with hot distilled water to ensure maximum recovery of soluble constituents.The filtrate is evaporated to dryness on a hot plate and further dried at 105°C in an oven until a constant weight is achieved.The dried residue represents the water-soluble ash fraction.Cool the crucible in a desiccator and weigh the final water-insoluble residue.

The percentage of water-soluble ash is calculated using the formula:

Water-Soluble Ash (%)= [(Total Ash Weight−Water-Insoluble Ash Weight) / Weight of Sample Taken] ×100

2.3.2.3. Acid Insoluble Ash:

Acid-insoluble ash represents the portion of total ash that remains undissolved when treated with dilute hydrochloric acid. This fraction primarily includes silica, sand, and other earthy materials that may have been

incorporated into the plant sample during cultivation, handling, or processing (Trease & Evans, 2016). Accurately weigh 2-3 g of finely powdered *Rhaphidophoraaurea* leaves and transfer it to a previously ignited and tared crucible.Incinerate the sample in a muffle furnace at 500-600°C until free from carbon (i.e., a white or grayish-white ash is obtained).Cool the crucible in a desiccator and weigh the ash. This represents the total ash value.Moisten the total ash residue with a few drops of distilled water.Add 25 mL of dilute hydrochloric acid (6N) to the crucible and cover it with a watch glass to prevent loss by splashing.Heat the mixture on a hot plate for 5 minutes, stirring occasionally to ensure thorough digestion of soluble ash components.Filter the solution through an ash-free filter paper into a pre-weighed sintered crucible or porcelain dish.The residue collected on the filter paper is washed thoroughly with hot distilled water to remove any soluble impurities.The washed residue is then transferred back to the crucible and ignited in a muffle furnace at 500-600°C for about 1 hour until a constant weight is obtained.The crucible is cooled in a desiccator and weighed.
The acid-insoluble ash percentage is determined using the formula:

Acid-Insoluble Ash (%)= [(Weight of acid-Insoluble residue)/Weight of sample taken]×100

Figure 3: Acid-insoluble Ash

2.3.3. Extractive Values:
Theextractivevalueoftheherbaldrugascertainsthequantityoffunctioningcontentsextirpated with solvent froma fixed quantity of medicinally potent herb, providing acumen intothepresent chemicalingredients present.

2.3.3.1. Alcohol-Soluble Extractive Value:
Weigh accurately 5 g of the finely powdered plant material and transfer it into a 250 mL conical flask.Add 100 mL of ethanol to the flask and shake the mixture well.Allow the sample to macerate for 24 hours at room temperature, shaking occasionally to ensure uniform extraction.After 24 hours, filter the extract through Whatman No. 1 filter paper into a pre-weighed evaporating dish to remove undissolved residues.The filtrate is evaporated to dryness using a water bath at 60°C until a constant weight is obtained.The dried extract is cooled in a desiccator and weighed.
The alcohol-soluble extractive value (%) is calculated using the formula:
Alcohol-Soluble Extractive (%)=(Weight of dried extract/Weight of sample taken)×100

2.3.3.2. Water-Solubleextractivevalue:
Weigh accurately 5 g of the finely powdered plant material and transfer it into a 250 mL conical flask.Add 100 mL of distilled water to the flask and shake the mixture well.Allow the sample to macerate for 24 hours at room temperature with occasional shaking.After 24 hours, filter the solution through a Whatman No. 1 filter paper into a pre-weighed evaporating dish to remove insoluble residues.The filtrate is evaporated to dryness in a water bath at 60°C until a constant weight is obtained.The dried extract is cooled in a desiccator and weighed.
The **water-soluble extractive value (%)** is calculated using the formula:
Water-Soluble Extractive (%)=(Weight of dried extract/Weight of sample taken)×100

2.4. ExtractPreparation:
The Leaves of the plant were segregated, washed thoroughlywith common water to make themfree from dust particles and other unwanted materials accumulated on leaves from environment,leaves of the plant were shade

dried for 10-12 days (23–27˚C) and homogenized to the plantmaterialwasgroundintoacoarsepowderusingagrinder.Aftergrinding,thepowderedmaterials were stored in a plastic bag for extraction. The coarse powder was then filtered throughan80-meshsieve.Atotalof250gofpowdered*Rhaphidophoraaurea*plantmaterialwasextracted by using petroleum ether, chloroform, and 80% methanol with the help of Soxhletapparatus.Alltheobtainedextractsweresubsequentlyanalyzedforthepresenceofphytoconstituentsto determinetheircomposition.

2.5. Phytochemical Screening:

2.5.1. Alkaloid Detection assay:

Mayer's Test: 2 ml portion of the liquid was mixed with 2N HCl, and the resulting waterfusible layer being decanted.Potassiomercuric Iodide solution was then mixed to this layer. Theappearanceof acreamy-colored pptindicatedand confirmedtheexistenceof alkaloids.

Dragendroff's Test: Similar being to Mayer's assay, 2 ml portion of liquid herbal decant being mixed with Dragendroff's reactant. The appearanceof reddish-brown precipitate withPotassiumbismuthiodidesuggested alkaloid content.

Wagner's Test: Another method involved mixing a 2 ml portion of the liquid with Iodo Potassiumiodide reagent. The appearance of a reddish-brown settled ppt. confirmedalkaloid.

Hager's Test:2 millilitresportioned liquid was combined with Picric acidreagent. Thedevelopedyellow precipitate markedalkaloid content.

Figure 4: Alkaloid Detection

2.5.2. GlycosideDetectionTest:

Fehling's Solution Test: A 2 ml portion of the liquid was mixed with Fehling's Solution A andFehling's Solution B in equal amounts, the mixture was warmed up. The appearance of a brick-redcolored precipitatemarked existenceofglycosides.

Legal'sexamination:Thesamplewasmixedwitha2mlsolutiontowhichbasicsodiumnitroprussideand pyridinewasadded, resultingin abloodedredcolor.

2.5.3. Flavonoiddetectiontest:

Shinoda method: A few pieces of magnesium ribbon were added to the 2 ml sample,followedbytheadditionofconcentratedsulfuricaciddropbydrop.Theadditioncausedachangein colorto either pink scarlet orcrimsonred.

Zinc chloride reduction assay: An admixtureof zinc dust with strong hydrochloric acidwasstirred into the2 ml sample,and over time,ared colorappeared.

Alkaline indicator test: Adding sodium hydroxide solution to the 2 ml sample led to acolorchange, turningyellow orred.

2.5.4. Tanninidentification:
Gelatinprocedure:A0.01%gelatinsolutionmixedwith10%sodiumchloridewasaddedtothe2 ml sample, resultingin awhite solidsettlingppt.
Ferricchloridereaction:Whenferricchloridewasintroducedtothe2mlsample,itresultedin a blue-greencolor.

Figure 5: Tannin Identification

2.5.5. Proteinsandaminoacidanalysis:
Millon'sindicator:TheadditionofMillon'sreagenttothe2mlsampleinitiallyproducedawhite precipitate, which turned red when heated.
Ninhydrin assay: Combining the 2 ml sample with a 0.2% ninhydrin solution and heatingproducedplumviolet color, indicatingtheexistence ofproteinsas wellasamino acids.

2.5.6. Fattests:
Stain test: A little portion of sample being placedintermediary in filter paper sheets, andanyoil stain obtained onfiltersheet exclaimed theexistence ofnon-volatile oils.
Saponificationanalysis:Addingsmallquantityof0.5Normalpotassiumhydroxide(alcoholic) to the sample, phenolphthalein a small drop, and heating it withwater bath for almost 2 hours resulted in the development of soap or the near completeannulmentof thebase, indicatingtheexistence offats andnon-volatileoils.

2.5.7. Sterolscreening:
Liebermann-Burchardmethod:By adding3-4dropsofaceticanhydride,boiling themixture, cooling, and then adding 3 drops of conc. sulphuric acid with the help of adropper,thebrownringformedat the confluence,indicatingtheexistenceofsteroids.

2.5.8. Triterpenoiddetection:
Salkowski assay: When a 2 ml portion of chloroform was mixed withsome drops ofconcentrated H2SO4 and thoroughly shaken, reddish-brown color in the underneath bandsuggestedtheexistenceofsteroids,whileyellowcolorinloftierbandaffirmedtheexistenceof triterpenoids.

2.5.9. FoamingIndexVisualization:
TheVisualizationofFoamingIndexassessesthepresentsaponinsifany,whicharehighmolecular weight phytoconstituents known for their detergent properties. Some medicinal plantsare having saponins that can produce stable foam, when their hydrous decoction is agitated. Thelathering capacity of the plant material and its extracts is quantified using a foaming index. Aprecise weight of 1 gram of coarse powder of *Rhaphidophoraaurea*is used for this measurement.

Figure 5: Foaming Index

2.5.10. SwellingIndex:

Some herbal drugs possess therapeutic or pharmaceutical value due to their swelling properties,particularly gums and those with mucilage, pectin, or hemicelluloses. The swelling index wasmeasured in ml. Accurately weighted 1g of *Rhaphidophoraaurea*powder was transferred to a50ml measuring cylinder. 25 ml of water was added successively, and mixture was shakedvigorously at every 10 minutes for 1 hour. Allow the mixture to stand for 4 hours at roomtemperature. volume in mlwas measured that occupied by the plant material, including anystickymucilage.

Figure 6: Swelling Index

2.6. Sterilitytestoftheplantextracts:

Theplant'smethanolicextractunderwenttestingformicrobialgrowth.Thisinvolvedinoculating 0.5ml of each sample on sterile Mueller Hinton Agar and then incubating them over37˚C for almost 24 hours. Fungal growth was assessed on Sabouraud Dextrose Agar over a 4-dayperiodat25˚C.Theplatesweremonitoredforanytypeofbacterialorfungalgrowth.Ifnosignof growth was observed in the extracts after incubation, it suggests sterility and was furtherassessedfor antimicrobial activityfollowingCLSI guidelines.

Figure 7: Sterility Test of Plant Extracts

3. Results:

3.1. Macroscopic and Microscopic Evaluation

3.1.1 Macroscopic Analysis:

The macroscopic evaluation of *Rhaphidophoraaurea* leaves provided distinct morphological characteristics, aiding in the authentication and identification of the plant material. The observed characteristics are summarized as follows:

- **Leaf Shape:** Broadly ovate to heart-shaped with an acuminate apex and entire margins.
- **Size:** Average leaf size measured 10-15 cm in length and 6-10 cm in width.
- **Color:** Fresh leaves exhibited a vibrant green color with yellow variegation, while dried leaves appeared pale green to brownish-green.
- **Texture:** The leaves were smooth, glossy, and leathery with a slightly waxy cuticle.
- **Venation Pattern:** Pinnate venation with a prominent midrib and secondary veins running parallel to the leaf margin.
- **Surface Features:**
  - **Adaxial (Upper) Surface: Shiny, with a slightly thickened cuticle.**
  - **Abaxial (Lower) Surface: Slightly rough with visible stomatal openings and scattered trichomes.**

These macroscopic features correlate with the general characteristics of the Araceae family, facilitating plant identification (Kokate et al., 2019).

Figure 8: Macroscopic Features

3.1.2 Microscopic Analysis:

The transverse section of *Rhaphidophoraaurea* leaf revealed the following microscopic structures:

Epidermis: The leaf exhibited a single-layered epidermis covered with a thick cuticle.The adaxial (upper) epidermis contained compactly arranged cells with less stomata.The abaxial (lower) epidermis had a higher density of paracytic stomata, characteristic of the Araceae family.

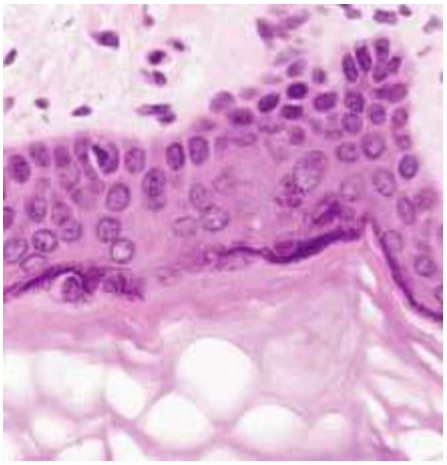

Figure 9: Microscopic Image of epidermis

Trichomes: Non-glandular unicellular trichomes were present on the lower epidermis.The trichomes were thin-walled and elongated, aiding in protection and reducing water loss.

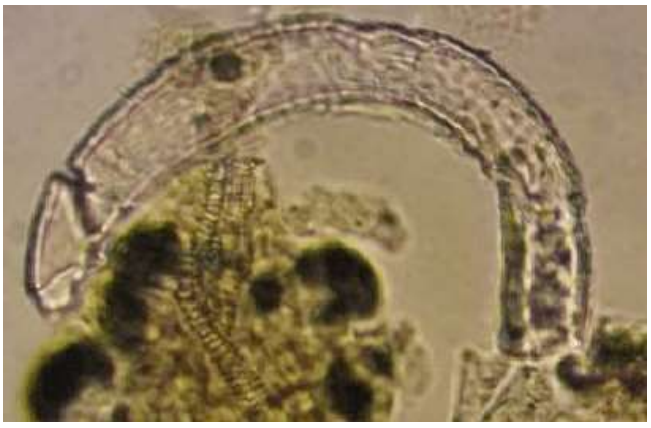

Figure 10: Microscopic Image of Trichome

Mesophyll: The mesophyll was differentiated into palisade and spongy parenchyma.The palisade parenchyma was columnar, tightly packed, and contained abundant chloroplasts for photosynthesis.The spongy parenchyma consisted of loosely arranged cells with prominent intercellular spaces, assisting in gaseous exchange.

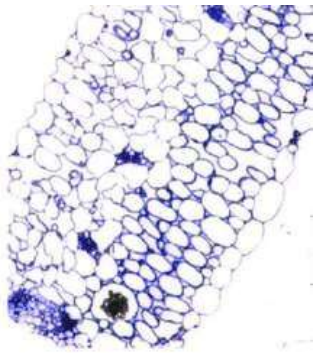

Figure 11: Microscopic Image of Mesophyll

Vascular Bundles: The vascular system was collateral, with xylem facing the adaxial surface and phloem toward the abaxial side.Xylem vessels were lignified, providing mechanical support.Phloem was composed of sieve elements and companion cells, facilitating nutrient transport.The vascular bundles were surrounded by a bundle sheath of parenchymatous cells.

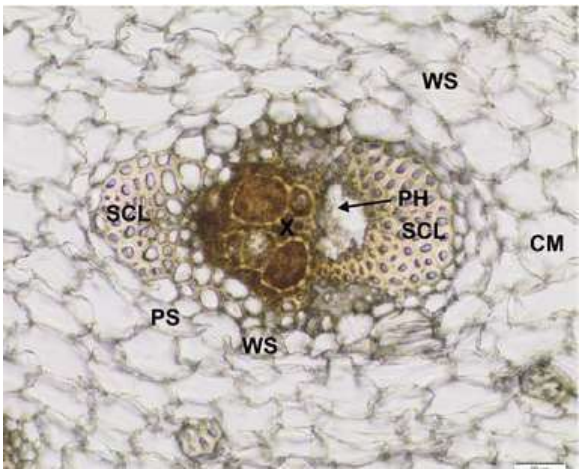

Figure 12: Microscopic Image of Vascular Bundles

B. Powder Microscopy

The powdered leaf sample exhibited various diagnostic characters under microscopic examination:

- **Epidermal Cells:** Polygonal, with thickened walls and a cuticular layer.
- **Stomata:** Predominantly paracytic stomata, commonly found in monocot plants of the Araceae family.
- **Trichomes:** Few scattered unicellular trichomes, observed on the abaxial epidermis.
- **Lignified Xylem Vessels:** Spiral and annular thickening patterns were visible with phloroglucinol-HCl staining, indicating lignification.
- **Calcium Oxalate Crystals:** Prismatic and rosette-shaped calcium oxalate crystals were identified, confirming the characteristic feature of Araceae family plants.
- **Starch Grains:** Oval to polygonal starch grains, confirmed by iodine-potassium iodide (I_2KI) staining, indicating carbohydrate storage.

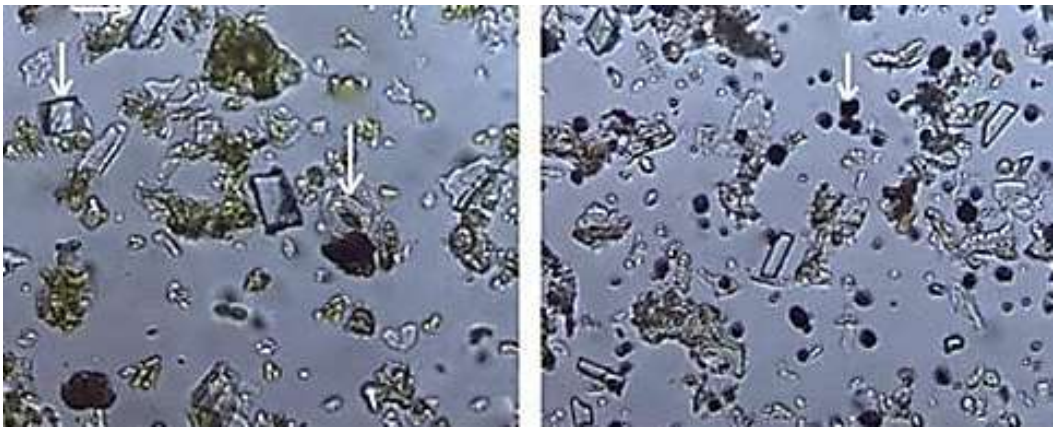

Figure 13: Powder Microscopic images

3.2. SEM Analysis:

The SEM analysis of *Rhaphidophoraaurea* leaf powder revealed key micromorphological features critical for plant identification and quality control. The presence of paracytic stomata, unicellular trichomes, vascular elements with spiral xylem thickening, and calcium oxalate crystals strongly supports the plant's pharmacognostical identity. The observations align with previous reports on the Araceae family, confirming the diagnostic characteristics essential for standardization and authentication of *Rhaphidophoraaurea* in herbal formulations.

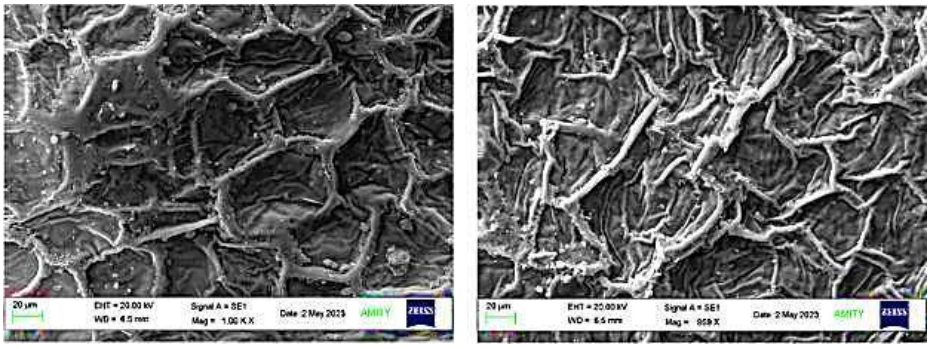

Figure 14: SEM images *Rhaphidophoraaurea* leaf

3.3. Physicochemical Evaluation:

The physicochemical evaluation of *Rhaphidophoraaurea* leaf powder was conducted to establish **standardization parameters** and ensure **quality control** of the plant material. The results obtained from various physicochemical tests, including **moisture content, ash values, and extractive values**, are summarized below in Table 1.

Table01:Ash value of *Rhaphidophoraaurea*bysoxhletextraction method

Sr.no.	Physicalcontents	Value(%w/w)
1	Moisture Content	5.42 ± 0.13
2	TotalAshvalue	9.68 ± 0.21
3	Acidinsolubleash	1.74 ± 0.09
4	Watersolubleash	3.87 ± 0.15

The moisture content of *Rhaphidophoraaurea* was determined using the Loss on Drying (LOD) method at 105°C for one hour.The low moisture content suggests that the plant material has a longer shelf life with minimal microbial contamination risk.The total ash content, which represents the total amount of inorganic matter present in the sample after complete incineration. A higher total ash value may indicate the presence of minerals, but excessive ash content could suggest contamination with extraneous matter such as soil, sand, or inorganic adulterants. The water-soluble ash content, representing the portion of the total ash that is soluble in water. Water-soluble ash indicates the amount of bioavailable inorganic components, such as potassium, calcium, and sodium salts, which may contribute to the plant's medicinal properties. A low water-soluble ash value suggests limited mineral content in the plant, confirming minimal contamination by water-soluble extraneous matter.The acid-insoluble ash value, which indicates the amount of siliceous matter. A low acid-insoluble ash value suggests minimal contamination with siliceous matter.

3.4. Extractivevalue:

The extractive values of *Rhaphidophoraaurea* leaf powder were determined using alcohol and water as solvents to assess the presence of soluble bioactive compounds. These values provide insights into the quantity of phytochemicals extracted from the plant material and help in standardization and quality control as shown in table 2.

Table 02: The Extractive values obtainedfrom the leaf powder of *Rhaphidophoraaurea*by soxhletextractionmethod:

Sr.no.	Extract	Values(%w/w)by soxhlet Extraction
1	Alcohol−SolubleExtract	11.32 + 0.18
2	Water−SolubleExtract	9.54 + 0.20

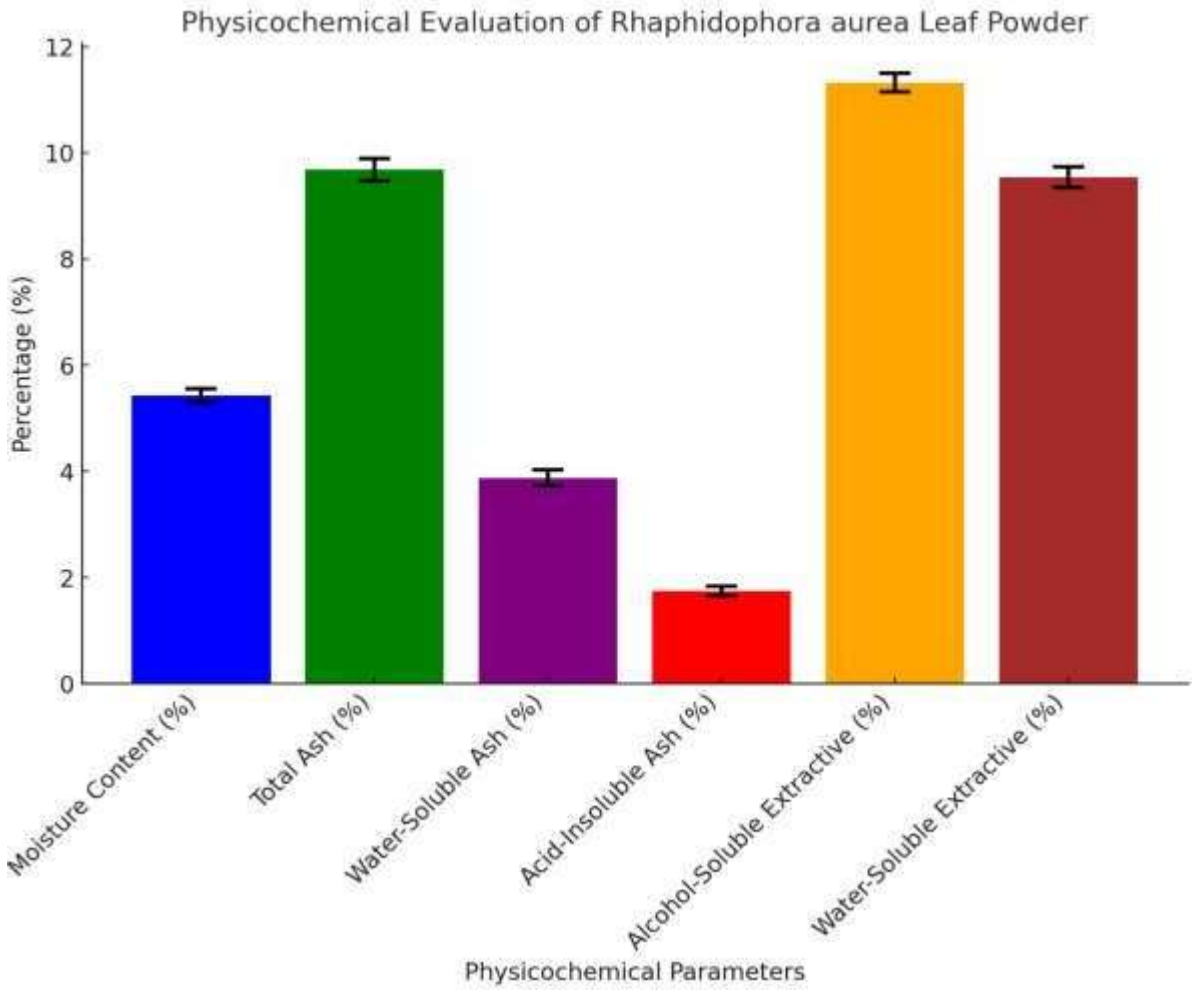

Figure 15: Physicochemical Parameters Analysis

3.5. Phytochemical Analysis:

Chemical Test	Inference	Methanol (80%)	Chloroform	Petroleum Ether
Mayer's test	Cream coloured	+	+	+
Dragendroff's test	Reddish brown precipitate	+	+	+
Wagner's test	Reddish-brown	+	+	+
Hager's test	Yellow coloured precipitate	+	+	+
Fehling's test	Brick red precipitate	-	-	-
Legal's test	Blood red colour	-	-	-
Shinoda test	Pink scarlet	+	+	+
Zinc Chloride reduction test	Red colour	+	+	+
Alkaline reagent test	Yellow colour	+	+	+
Gelatin test	White precipitate	+	+	+
Ferric Chloride test	Blue green colour	+	+	+
Millon's test	No White sediment	-	-	-
Ninhydrin test	Violet Colour	-	-	-
Liebermann-Burchard test	Brown Ring Appears	+	+	+
Salkowski test	No colour	-	-	-

The presence of alkaloids was confirmed in all three solvent extracts (Methanol, Chloroform, and Petroleum

Ether) through Mayer's, Dragendroff's, Wagner's, and Hager's tests.Flavonoids were detected in all extracts using Shinoda, Zinc Chloride Reduction, and Alkaline reagent tests.Tannins were confirmed through Gelatin and Ferric Chloride tests.Sterols were present in all extracts as indicated by the Liebermann-Burchard test.Glycosides were absent in all extracts.Terpenoids were not detected in any of the extracts.Proteins and amino acids (Millon's and Ninhydrin tests) were absent in all extracts.

4. Discussion:

The present study extensively evaluates the pharmacognostical, physicochemical, and phytochemical attributes of *Rhaphidophoraaurea* (Money Plant), an ornamental plant that has demonstrated potential medicinal properties. The results contribute to scientific standardization, authentication, and possible therapeutic applications. Each analytical aspect of the study was designed to ensure the quality, purity, and botanical reliability of the plant material, facilitating its future inclusion in herbal pharmacopoeias.

The macroscopic examination of *Rhaphidophoraaurea* confirmed its characteristic ovate to heart-shaped leaves, glossy surface, prominent pinnate venation, and thick leathery cuticle. These features align with those observed in members of the Araceae family, reinforcing its botanical classification. The leaf dimensions, surface texture, and color variations provide vital identification markers for plant authentication and differentiation from potential adulterants.

The microscopic analysis, including transverse sections of the leaf and powder microscopy, provided insights into the plant's anatomical structure. The epidermis displayed a single-layered arrangement with a thick cuticle, which is known to aid in water retention and protection against environmental stress. The presence of paracytic stomata, a distinguishing feature of the Araceae family, was confirmed primarily on the abaxial surface, supporting gas exchange and transpiration processes.

Furthermore, the vascular bundles were found to be collateral, with xylem vessels exhibiting lignified spiral thickening. This characteristic ensures the plant's structural integrity and efficient transport of nutrients and water. The presence of unicellular non-glandular trichomes, particularly on the lower epidermis, suggests that the plant possesses natural defense mechanisms against herbivory and environmental stress. Additionally, the identification of calcium oxalate crystals, starch grains, and mucilage cells further strengthens its botanical characterization. These findings establish the plant's micromorphological uniqueness and serve as diagnostic markers for its pharmacognostical standardization.

The physicochemical evaluation of *Rhaphidophoraaurea* was performed to establish quality control parameters, ensuring the plant's purity and safety for potential medicinal applications.The moisture content was determined to be 5.42 ± 0.13%, which falls within acceptable limits as per World Health Organization (WHO) standards for herbal drugs. A moisture content below 10% is considered suitable for long-term storage since it minimizes the risk of fungal and microbial contamination. This result confirms that *Rhaphidophoraaurea* is relatively stable and can be preserved without significant degradation over time.The total ash value was found to be 9.68 ± 0.21%, indicating a moderate presence of inorganic residues. The water-soluble ash value (3.87 ± 0.15%) signifies the proportion of bioavailable minerals such as potassium, sodium, and calcium, which may contribute to the plant's nutritional and therapeutic properties. Additionally, the acid-insoluble ash value (1.74 ± 0.09%) suggests minimal contamination from siliceous matter such as soil, sand, or dust. These values confirm the plant material's purity and suitability for medicinal use, ensuring compliance with pharmacopoeial quality standards.The extractive values help determine the amount of bioactive compounds present in the plant material. The alcohol-soluble extractive value was found to be 11.32 ± 0.18%, indicating a high presence of ethanol-soluble phytoconstituents such as flavonoids, alkaloids, and steroids. These compounds are known for their antioxidant, anti-inflammatory, and antimicrobial properties, making alcohol-based extracts of *Rhaphidophoraaurea* valuable in herbal medicine.Similarly, the water-soluble extractive value (9.54 ± 0.20%) indicates the presence of hydrophilic compounds such as glycosides, tannins, and carbohydrates, which are often responsible for the astringent, antimicrobial, and immunomodulatory effects of medicinal plants. The relatively high extractive values suggest that *Rhaphidophoraaurea* contains a significant proportion of bioactive compounds, making it suitable for both aqueous and ethanol-based herbal preparations.

The phytochemical analysis of *Rhaphidophoraaurea* confirmed the presence of various secondary metabolites, which contribute to its medicinal potential.All four alkaloid detection assays (Mayer's, Wagner's, Dragendroff's, and Hager's tests) confirmed the presence of alkaloids in methanol, chloroform, and petroleum ether extracts. Alkaloids are well-known for their analgesic, neuroprotective, and antimicrobial properties, indicating that *Rhaphidophoraaurea* may have pharmacological relevance in these domains.The Shinoda test, Zinc chloride reduction test, and Alkaline reagent test confirmed the presence of flavonoids in all extracts. Flavonoids are potent antioxidants known for their anti-inflammatory, anti-cancer, and cardiovascular benefits. This result strengthens the argument for *Rhaphidophoraaurea* as a potential source of natural antioxidant

compounds.Tannins were detected in all extracts through Gelatin and Ferric chloride tests, suggesting astringent and antimicrobial activity. Tannins are commonly used for wound healing, gastrointestinal protection, and antimicrobial treatments.Sterols were confirmed in all extracts via the Liebermann-Burchard test, indicating their membrane-stabilizing and anti-inflammatory properties. However, terpenoids were not detected, suggesting a lesser role in the plant's medicinal profile.Glycosides and proteins were not detected in any of the extracts, indicating that these compounds do not contribute significantly to the plant's therapeutic properties.

The **SEM analysis** provided insights into the **micromorphological features** of *Rhaphidophoraaurea*, confirming:

- **Paracytic stomata with distinct guard cells**, aiding in respiration.
- **Unicellular trichomes**, which protect against external stressors.
- **Well-developed vascular bundles**, with **spiral xylem thickening**, supporting efficient nutrient transport.
- **Calcium oxalate crystals**, which serve as diagnostic markers for the **Araceae family**.

These observations validate the **anatomical identity of *Rhaphidophoraaurea***, strengthening its pharmacognostical standardization.

The results of this study establish pharmacognostical markers that can be used to authenticate and standardize *Rhaphidophoraaurea* for medicinal use. The presence of flavonoids, tannins, sterols, and alkaloids indicates its therapeutic potential in herbal formulations. Furthermore, the low moisture content and optimal ash values ensure its suitability for long-term storage and formulation stability.

While *Rhaphidophoraaurea* has been widely recognized for its air-purifying benefits, this study highlights its medicinal attributes, paving the way for its inclusion in traditional and modern herbal pharmacopoeias.

5. Conclusion:

The comprehensive evaluation of *Rhaphidophoraaurea* confirms its botanical identity, purity, and bioactive potential. The study establishes quality control parameters, supporting its safe and effective use in herbal medicine. Further studies should focus on quantifying specific bioactive compounds and evaluating pharmacological activities to unlock the full medicinal potential of this plant.

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