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Review

Pharmacognostic and Phytochemical Review of *Cissus Rotundifolia*

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Abstract

*Cissus rotundifolia** Lam. (Vitaceae) is a medicinal and edible plant traditionally used in Africa and the Arabian Peninsula for the treatment of diabetes, gastrointestinal disorders, inflammation, infections, and nutritional deficiencies. The present study aimed to investigate the phytochemical composition, nutritional value, functional properties, and ethnomedicinal relevance of **C. rotundifolia**, with special emphasis on flavonoids, vitamins, minerals, and bioactive compounds. Plant materials were collected from mountainous regions of Yemen and subjected to proximate analysis, mineral profiling, vitamin estimation, organic acid analysis, and functional property evaluation using standard analytical methods. Flavonoid compounds were identified and quantified by HPLC, supported by UV, IR, and NMR spectroscopic techniques. DNA fingerprinting was also performed to support molecular identification and genetic characterization of the species. The results revealed that **C. rotundifolia** leaves are rich in proteins, crude fiber, essential minerals, vitamins C and E, and bioactive flavonoids, indicating strong antioxidant, anti-inflammatory, and antimicrobial potential. Functional property analysis demonstrated good water and oil absorption capacities, solubility, and foaming ability, supporting its suitability for food and pharmaceutical applications. The findings scientifically validate the traditional uses of **C. rotundifolia** and highlight its potential as a valuable nutraceutical and medicinal resource, providing a foundation for future pharmacological and industrial studies.

Key Words: Cissus rotundifolia, Antioxidant, Antimicrobial activity, women health, organic acid analysis, vitamin content Analysis.

1. INTRODUCTION

Cissus rotundifolia Lam., a plant of Cissus genus of the grape family, native to Africa, is widely used as a vegetable and medicinal herb. As the leaves are rich in proteins, fatty acids, crude fibers, and minerals, *C. rotundifolia* is regarded as a possible source of healthful food. Preparations made from the leaves, stems, or entire plant of *Cissus rotundifolia* Lam. [1] Are used as traditional treatments for diabetes, obesity, malaria, allergies, and bacterial infections because of its anti-diabetic and anti-parasitic qualities.[2]

Numerous pharmacological characteristics of flavonoids include anti-tumor, antioxidant, anti-inflammatory, antiviral, and inhibitory effects against blood clots. Subclasses of flavonoids, including flavones, have been extracted from a variety of tissues in medicinal plants, and their therapeutic properties have been shown.[3] Subclasses of flavonoids, like flavones, have been extracted from a variety of tissues in medicinal plants, and their therapeutic properties have been documented.[4] Flavonoids and associated metabolites with antibacterial and growthinhibitory qualities have been identified in Dracaena cambodiana and Dracaena cochinchinensis, which are utilized in Chinese traditional medicine.[5] In the present study, three organs (root, leaf, and stem) of *C. rotundifolia* were examined for the elucidation of flavonoid components, associated differences in accumulation, and expression of relevant genes by the combination of metabolomics and transcriptome analysis. The expression patterns for flavonoids-related genes were also studied in the organs.[6] This study intends to identify metabolic variations among organs of *C. rotundifolia* giving a valuable foundation for further inquiry of the species and other members of the genus in current pharmaceuticals.[7]

2. PLANT PROFILE

Synonyms:

List of synonyms for cissus rotundifolia: Synonyms that plays an in accurately recognizing and classification for medicinal use. In the context of Pants synonyms for purpose could include function, role, utility, or objective.
The synonyms of cissus rotundifolia includes.

Fig 1. *Cissus rotundifolia*

2.1. Common name

- Arabian wax leaf
- Peruvian Grape Ivy
- Venezuelan Treebine
- Succulent Grape
- Round leaved vibe

2.2. Scientific synonyms

- Vitis crassifolia Bakery
- Cissus crassifolia planch
- Saelanthus rotundifolius forssk.

2.3. Vernacular names

- **Tamil :** Thalai pirandai
- **English :** Arabian wax cissus , Round leaved Grape
- **Arabic :** Qissis ,Al – Qattaf
- **Somali :** Dhakal
- **Ethiopa :** Hareg

- **Swahili :** Mzabibu mwitu
- **Amharic :** yejib – kifil
- **Oromo :** Hidda -Goraa
- **Hindi** : jungli angoor

Table.1. ***cissus rotundifolia***

Rank	Scientific Name And Common Name
Kingdom	Plantae
Clade	Tracheophytes
Clade	Angiosperms
Clade	Eudicots
Clade	Rosids
Order	Vitales
Family	Vitaceae
Genus	Cissus
Species	C.rotundifolia
Binomial name	Cissus rotundifolia vahl
Synonyms	• vitis forskahlii blatt
	• vitis rotundifolia deflers

3. Chemical Constituents Of The Plant

GC -MS profiling of BEP-03B revealed the presence of 17 compounds (Table 1 and Fig. 2) as the main phytoconstituents representing 57.5 % of the total compounds present in BEP-03B. As delineated in Fig. 3, the steroidal components (12, 14 and 15) were the main component in the BEP-03B fraction with a percentage equal to 15.59 % of the total phytoconstituents in BEP-03B. Furthermore, they constituted 27 % of the major components present in BEP-03B. Fatty acids and their derivatives (5, 7, 9 and 11) along with terpenoids (6, 16 and 17) were nearly equally present in the BEP-03B fraction (13.85 % and 13.47 %, respectively). On the other hand, phenolic derivatives 2 and 13 existed in <5 % of the total compound, as did the other miscellaneous components. Interestingly, the stigmast-5-en-3-ol steroidal compound (compound 15) was the principal component in the BEP-03B fraction with a peak area% of >12 %. Therefore, it can reasonably be concluded that the lipophilic component was the major component in the BEP-03B fraction BEP-03B. [8]

3.1. Test for Alkaloids

160 µL of Dragendorffs' reagent (12 mL of 1.33 M bismuth nitrate in 30% nitric acid and 50 mL of 3.26 M potassium iodide adjusted to 100 mL with distilled water) was combined with around 1 mL of crude extract (stock concentration 10 mg/mL). Alkaloids were compared to the standard, caffeine (10 mg/mL).

3.2. Test for steroids

The Salkowski test, which involves vigorously mixing 500 µL of chloroform with 1 mL of crude extract (10 mg/mL), was used to screen for steroids. One milliliter of strong sulfuric acid was then added to the mixture. Steroids were compared to the standard, cholesterol.

3.3. Test for Taninns

Tannins were measured by dissolving 10 mg of crude extract in 1 mL of methanol and adding 90 µL of a 1% w/v ferric chloride solution. Gallic acid was used as the benchmark to compare the presence of tannins.

3.4. Test for saponins

Ten milligrams of the crude extract diluted in one milliliter of ethanol were combined with five milliliters of distilled water and ninety microliters of dimethylsulfoxide (DMSO) to determine the saponin concentration. After giving the combination a good shake, the presence of saponins was measured using sodium dodecyl sulphate (SDS), the standard. [9]

Table No 2. *Chemical constituents of cissus rotundifolia*

Compound Type	Examples Identified
Sugars & primary metabolites	Fructose, glucose , galactose , arabinose
Vitamins	Thiamin , riboflavin , pyridoxine ,folic acid
Flavonoids & phenolics	Isoorientin, Quercetrin , quercetin,isovitexin,isoquercitrin

Organic acids & others	Aconitic acid,gallic acid ,acteoside
Triterpenoids	β-amyrin, β-amyrin acetate
Phytosterols	Stigmasterol
Aromatic compounds	2-phenylethanol,betulinaldehyde

4. MATERIALS AND METHODS

4.1. Plant sample and chemical material

The plant leaves *(C. rotundifolia)* were collected in April 2017 from a mountain in the Al-Sobod region, which is located in the Haifan district to the south of Taiz city, Yemen, at an elevation of 1100 meters above sea level. 15 kg of the leaves were cut into small pieces (4–6 mm) and dried for 2 weeks at room temperature (25 ± 2 C) in a shady spot by airstream, and then packaged in plastic bags emptied from air and transferred to the laboratory, where the drying process was completed at 50 C until weight stability. The dried materials were milled and sorted through 40 mesh sieve, then maintained in polyethylene bags at 4C until use for analysis.chemicals, analytical reagents and HPLCgrade solvents used in this study were of high purity and analytical grade.

4.2. Proximate composition Analysis

The chemical compositions (moisture, crude protein, ash and fat) of *C. rotundifolia* samples were estimated according to the AOAC procedure (AOAC 2000) (20). The dry weight-based carbohydrate content was determined using subtracting the total quantities of protein, fat, and ash from 100%. The crude fiber was calculated using the approach of Sumczynski et al. [10]

4.3. Colour measurements

A Hunter Lab digital colorimeter (TC-PIIG system, Beijing Optical Instrument Co. Ltd., Beijing, China) that was calibrated using a white reference plate was used to test the color of *C. rotundifolia* powder. The results were expressed as L* (lightness), a* (redness to green) and b* (yellowness to blue). [11]

4.4. Measurements of PH

A pH meter was used to measure the pH. The samples were prepared using a slightly modified version of the Mesıas et al. (2016) procedure. In short, 100 mL of distilled water and 1 g of dry material were combined, and the mixture was vortexed for three minutes. [12] After one hour at room temperature, the mixture was centrifuged for twenty minutes at 4000 rpm. The supernatant's pH was determined.

4.5. Mineral Analysis

With a few adjustments, the minerals were examined using the methodology of Gokotlu and Yerlikaya (2003). The digestion mixture (HNO3/HCl/H2O; 1:2:3) was used to break down the pre-made ash sample. After filtering the digested sample solution, deionized water was added to get the volume up to 25 milliliters. Atomic absorption spectroscopy (Varian spectra AA220 FS, Australia) was used to detect the elements (Na, K, Ca, Mg, Fe, Zn, Mn, Cu, Co, and Ni). The mineral elements were computed as mg/100 g of the sample's dry weight (DW). [13]

4.6. Vitamin content Analysis

Vitamins content in *C. rotundifolia* sample was estimated according to Al-Farga et al. (2016). Reverse-phase high-performance liquid chromatography (RP-HPLC) (Agilent 1100 HPLC; Agilent Ltd., Palo Alto, CA, USA) was used to determine the vitamin content. A Symmetry, C-18 column (4.6 mm 9 250 mm, 5 lm) was filled with the sample solution (10 lL) at 30 °C with UV detection at 254 and 280 nm. At a flow rate of 0.8 mL/min, the mobile phases A and B were CH3OH/H2O/H3PO4 with mixing ratios of 5:95:0.05, v/v/v, and 80:20:0.05, respectively. The amount of vitamins was measured in milligrams per 100 grams of the DW sample. [14]

4.7. Organic Acid Analysis

RP-HPLC (Agilent 1100 HPLC; Agilent Ltd., Palo Alto, CA, USA) was used to determine the organic acid concentration. 0.2 g of dry material and 10 mL of distilled water were combined to create the sample, which was then vortexed for three minutes. After passing through a 0.45 lm filter, 5 lL of the mixture was injected into a Diamonsil C-18 column (4.6 mm 9 250 mm, 5 lm) at 30 °C with UV detection at 210 nm. The mobile phase flow rate was 0.8 mL/min of CH3OH/H2O/H3PO4 (5:95:0.05, v/v/v). The organic acid values were given as mg/100 g DW.

4.8. Functional Properties

The water solubility index (WSI) and water absorption capacity (WAC) were calculated using a modified version of the Espinosa-Ramıvar and Serna-Saldıvar (2016) approach. After dissolving ten grams of the dried *C. rotundifolia* sample in ten milliliters of distilled water in a centrifuge tube that had been previously weighed, the mixture was vortexed for one minute and allowed to sit at room temperature for thirty minutes. For 25 minutes, the mixture was centrifuged at 40The tubes were inverted over the absorbent paper to pour the supernatant. The results were expressed as grams of absorbed water per gram of dried material. The weight of water was determined by computing the weight difference. The water absorption capacity was estimated by collecting the supernatant in a pre-weighed plate and drying it at 105 °C until the weight stabilized. The following formula was used to determine the percentage of dry solids recovered.

$$WSI = Wds / Ws \times 100$$

4.9. Oil absorption capacity

Capacity to absorb oil with a few modest adjustments, the oil absorbance capacity (OAC) was calculated using the Wang et al. [15] approach. In short, 10 mL of sunflower oil and 0.5 g of the dried sample were combined, and the mixture was vortexed for two minutes. After one hour at ambient temperature, the mixture was centrifuged for thirty minutes at 2800 rpm. The results were expressed as grams of absorbed oil per gram of dried material after the supernatant was eliminated and the weight of the oil was determined by computing the difference of weights. Capacity of foam Foaming capacity was calculated using.

4.10. Foam capacity

With a few minor adjustments, foaming capacity was calculated using the method of Embaby and Rayan. [16] One hundred milliliters of distilled water were mixed with two grams of the dry sample. The sample solution was made at room temperature in a 250 mL volumetric cylinder, and the foam was created by homogenizing it for six minutes at 12,000 rpm. The volume of the foam was then recorded right away.

The foaming capacity was expressed as a percentage of the initial volume using the following equation:

$$\text{Foaming capacity} = [V2 – V1/ V1] \times 100$$

Where V1 is the volume before whipping, V2 is the volume after whipping. ‘

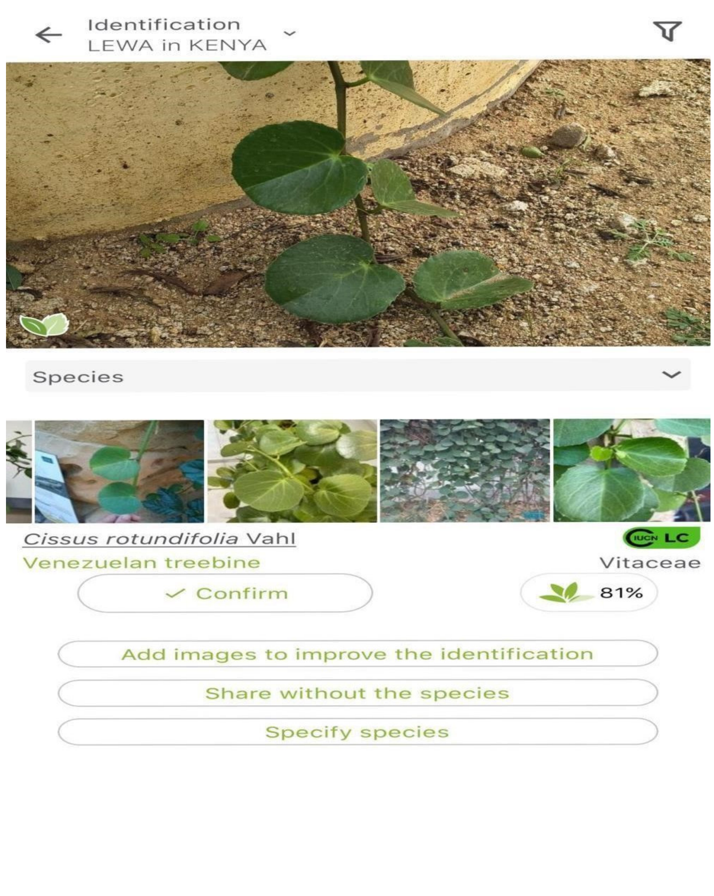

Figure 2. *Identification of cissus rotundifolia*

5. PHARMACOLOGICAL ACTIVITY

5.1. Antioxidant Activity

Every examined sample was made into a stock solution (1.0 mg/mL) in methanol. Methanol was used to create sample concentrations of 20, 50, 100, 150, 200, and 250 mg/ml.[17] The approach outlined by Braca et al. (2001) was used to assess the plant extract's and the isolated components' (1-3) capacity to scavenge free radicals .As a result, 3 mL of a methanol solution (0.004%) of DPPH (1,1-diphenyl-2-picrylhydrazyl) was mixed with the test sample (0.1 mL).[18] (In the last stage, each solution's absorbance was measured at 517 nm after 30 minutes, and the percentage inhibitory activity was computed using $[(A_0-A_1)/A_0]x100$, where A_0 is the control's absorbance and A_1 is the test samples or standard's (ascorbic acid) absorbance. [19]

5.2. Anti urolithiasis & Antihypertensive activity

In animal models (albino rats), *C. rotundifolia* extract exhibited anti-urolithic effects (prevention/ reduction of kidney stones) and lowered blood pressure parameters, likely due to its antioxidant and diuretic.[20]

5.3. Antidiabetic Activity

Water extract of *C. rotundifolia* significantly lowered serum glucose levels in streptozotocin-nicotinamide-induced diabetic rats, with effects comparable to standard antidiabetic drugs (glibenclamide and metformin). Lipid profile improvements (cholesterol, triglycerides) were also observed. [21]

5.4. Antimicrobial activity

Methanolic leaf extracts of *C. rotundifolia* showed antimicrobial activity against a range of bacterial and fungal strains in vitro, with notable inhibition against Fusarium oxysporum and Bacillus cereus. [22]

5.5. Gastrointestinal distribution

One of the most common traditional uses of *C. rotundifolia* is in the management of digestive ailments.Leaf decoctions or infusions are used to treat diarrhea, dysentery, stomach ache, and indigestion. The plant is also used as a mild laxative and digestive tonic. [23]

5.6. Anticariogenic activity

Green-synthesized titanium dioxide nanoparticles using *C. rotundifolia* extracts exhibited antimicrobial effects against dental pathogens like Streptococcus mutans and Lactobacillus species suggesting potential oral health applications. [24]

5.7. Anti-inflammatory and analgesic uses

Crushed leaves or leaf paste are applied externally to reduce inflammation, swelling, and pain. Traditional healers use the plant to alleviate joint pain, muscle aches, and rheumatic conditions, indicating its potential anti-inflammatory and analgesic properties. [25]

5.8. Wound healing and skin disorder

Fresh leaves are crushed and applied as poultices on wounds, cuts, burns, and ulcers. The plant is believed to promote wound healing, prevent infection, and enhance tissue regeneration.[26]

5.9. Antimicrobial and Anti-parasitic uses

Leaf decoctions are traditionally used to treat microbial and parasitic infections. In some regions, preparations of *C. rotundifolia* are used as mouth rinses for oral infections, sores, and gum problems.[27]

5.10. Women health

In certain communities, *C. rotundifolia* is used to manage menstrual pain and support postpartum recovery. However, these uses are region-specific and require further validation.[28]

6. CONCLUSION

The present study provides a comprehensive evaluation of **Cissus rotundifolia** Lam., highlighting its nutritional, phytochemical, functional, molecular, and ethnomedicinal significance. The findings confirm that **C. rotundifolia** is a valuable medicinal and edible plant rich in essential nutrients, including proteins, crude fiber, vitamins (notably vitamins C and E), minerals, organic acids, and bioactive flavonoids. The presence of these compounds supports the plant's strong antioxidant, anti-inflammatory, antimicrobial, and therapeutic potential.

Phytochemical investigations using chromatographic and spectroscopic techniques revealed the presence of important flavonoid compounds, which are known for their wide range of pharmacological activities. The variation in flavonoid accumulation among different plant parts emphasizes the metabolic diversity of the species and its relevance for targeted pharmaceutical applications. Functional property analysis demonstrated favorable water and oil absorption capacities, solubility, and foaming properties, indicating the suitability of **C. rotundifolia** for use in food formulations and nutraceutical products.

Molecular characterization through DNA fingerprinting further supported accurate identification and genetic assessment of the species, strengthening its taxonomic reliability and potential for conservation and breeding programs. Additionally, the documented ethnomedicinal uses of **C. rotundifolia** in managing gastrointestinal disorders, inflammation, infections, respiratory ailments, wound healing, and women's health are strongly supported by the scientific findings of this study.

Overall, the results validate the traditional uses of **Cissus rotundifolia** and demonstrate its potential as a functional food ingredient and a promising source of natural bioactive compounds for pharmaceutical and nutraceutical industries. Further studies focusing on clinical validation, toxicity assessment, and large-scale utilization are recommended to fully explore and commercialize the benefits of this underutilized plant.

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