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PHARMACOGNOSTIC EVALUATION OF *CURCUMA VAMANA*

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ABSTRACT

The present article deals with study of pharmacognostic analysis of *Curcuma vamana* plant. In this, microscopic analysis of *Curcuma vamana* was done by transverse sections of rhizome, root, stem and leaf. The physicochemical evaluation; ash values, namely total ash, acid-insoluble ash, water-soluble ash, and sulfated ash; extractive values, namely alcohol soluble extractive value, water-soluble extractive and chloroform soluble extractive value; and loss on drying were determined. Preliminary phytochemical screening was done, and total phenolic content was estimated by Folin–Ciocalteu method and total flavonoids content was measured with the aluminum chloride colorimetric assay. In results, transverse section of *Curcuma vamana* rhizome, root, stem and leaf revealed that the presence most of microscopic features. Physicochemical screening of the rhizome powder showed 8.33% total ash, 1% acid insoluble ash, 9.66% water soluble ash, 8.66 sulphated ash, 8% water soluble extractive, 4.8% alcohol soluble extractive, 1.04% chloroform soluble extractive and 14% loss on drying. Preliminary phytochemical screening was shown presence of carbohydrates, proteins and amino acids, glycosides, alkaloids, phytosteroids, flavonoids, phenolic compounds, saponins and tannins. The total phenolic content in the ethanolic extracts were found 20.42 ± 0.4042 mg of gallic acid equivalent weight/g of extract and total flavonoids in plant ethanol extracts of *Curcuma vamana* were found 203.2 ± 1.749 mg of quercetin equivalent weight/g of extract. This information will be helpful in standardization for quality, purity and sample identification.

Keywords: *Curcuma vamana,* Ash values, Flavonoids, Phenols, Phytochemicals

INTRODUCTION

Plant have been playing important role in curing the diseases of human being since time immemorial. The medicinal value of plants is due to some chemically active substances that produce a definite corporal action on the human body. The microscopic examination of whole plant of *Curcuma vamana* includes transverse section are made for identification[1]. Some important bioactive constituents of plants are alkaloids, tannins and flavonoids and phenolic compounds[2]. In India, plants have been traditionally used for human and veterinary health care and medicinal plants and it also play a great role in food supplements for health care as well as in personal care of the mankind. Around the world, about 35,000-70,000 species of plant have been used at one time or another for medicinal, nutraceuticals and cosmetic purpose[3].

These compounds are synthesized by primary or rather secondary metabolism of living organisms. Secondary metabolites are chemically and taxonomically extremely manifold compounds with obscure function. They are extensively used in the human therapy, agriculture, scientific research, veterinary and many other areas[4]. This can be derived from leaves, rhizome, roots, stem. Knowledge of the chemical constituents of plants is desirable because such information will be value for synthesis of complex chemical substances[5]. Endow to World Health Organization (WHO); about 80% of individuals from developed countries use traditional medicines, derived from medicinal plants. However, such plants should be investigated to better deduce their properties, safety, and efficiency[6]. Plants are used medicinally in different countries and are the source of potential and powerful drugs[7]. Now day's phytochemicals studies have attracted the attention of plant scientists due to the development of new and sophisticated techniques. Plant synthesizes different types of chemical compounds, which can be differentiated on the basis of their chemical class, functional groups and bio synthetic origin into primary and secondary metabolites[5]. *Curcuma vamana*, belongs to family *Zingiberaceae* (Ginger family) Synonyms; *Curcuma peethapushpa* (Figure 1).

Figure 1: *Curcuma vamana*

Vamana turmeric is a delicate herb with conical rhizome, pseudo stem covered basally by leafless sheath. Flowers are pale yellow on short spike with prominent cup like bracts. Leafy shoot is up to 50 cm tall. Leaves are distichous, 4-5; blade 20-25 x 6-8 cm, oblong, tip tapering, base nearly equal, closely pinnately nerved, hair less; ligule small; leaf-stalk 20-30 cm long. Inflorescence is central, 15-22 cm long, on a 10-18 cm long stalk, concealed within the leaf sheaths, light green, hairless. Spike is condensed 2-4 x 2 cm, distinct coma absent; bracts 4-8, loosely arranged, about 3 x 3 cm, ovate to obovate, tip pointed, slightly re curved,

each subtending 2-4 flowers. Flowers are shorter than the bracts, 1.8-2 cm long. Calyx flat, 4 mm long, deeply 3-lobed, white, hairless, persistent. Flower-tube is 8 mm long; petals almost equal, about 5 x 4 mm, hairless, yellowish-white. Lip is about 8 x 7 mm, tip notched, lobe rounded, margin crisped, golden yellow, hairy at middle. Style is long, thread-like; stigma slightly protruding above the anther. Fruit is obovoid, about 10 x 8 mm, with persistent calyx. Vamana turmeric is endemic to Southern Western Ghats (Kerala). Flowering: May-July[8]. Curcuma is widely used in Ayurvedic, Unani and Siddha Herbal System. It is favored for treating diabetes, abdominal pains, menstrual disorder, wounds, eczema, jaundice, inflammations and as a blood purifying activity. Many species of Curcuma are traditionally used for their medicinal properties. Antifungal, Antibacterial and Anti-inflammatory activity has been reported for species such as *C. long, C. zedoaria, C. aromatica* and *C.amada*[9]. Most of the pharmaceutical indolence is highly dependent on wild population for the supply of raw material for extraction of medicinally important compounds.

The genetic diversity of medicinal plants in 36 the world are getting threatened at an alarming rate because of ruinous reaping practice and over-harvesting for production of medicines, with little or no regard to the future; also, extensive destruction of the plant-rich habitat as a result of forest degradation, agriculture encroachments, urbanization. In modern medicine, plants are used as sources of direct therapeutic agents, as model for new synthetic compounds and as a taxonomic marker for the elaboration of more complex semi synthetic chemical compounds[10]. Pharmacognosy is a simple and reliable tool by which complete information of the crude drug be obtained[11]. Today, with the current surge of interest in phytotherapeutics, the availability of genuine plant material is becoming scarce. Since crude plant drugs form the basis for the manufacture of numerous medicinal preparations, accurate determination of drug identity becomes an essential part of its study. It is extremely important to make an effort toward standardization of plant material as medicine. The process of standardization can be achieved by stepwise pharmacognostic studies[12].

MATERIAL AND METHODS

Chemicals

Folin-Ciocalteau phenol reagent, gallic acid, quercetin, anhydrous sodium carbonate, methanol, Deionised water, chloroform, benzene, ethanol, Sodium nitrite, aluminum trichloride, sodium hydroxide and all other chemical of laboratory grade.

Plant material

The *Curcuma vamana* were collected from Thenmala forest, which is located in Palode Taluk Nedumangad District Thiruvananthapuram Pin Code: 695562, Kerala, India. The plant was authenticated by Prof. S. A Kappali, Department of Botany, Basaveshwar Science College, Bagalkot-587101, Karnataka, India and the voucher specimen has been retained in our laboratory for future reference.

Section cutting and microscopic study

Free hand sections of the plant parts were taken and soaked in water overnight. Transverse sections were cut with razor blade. The clear sections were selected, stained with safranin solution and mounted on a clean glass slide and covered with cover slip using glycerin[13].

Evaluation of physicochemical properties of powder of rhizome of *Curcuma vamana*

Physico-chemical standards in the physico-chemical evaluation, ash values viz., total ash, acid insoluble ash and water-soluble ash, sulphated ash, and extractive values viz., alcohol soluble extractive value, water soluble extractive and chloroform soluble extractive value, and loss on drying were determined[14]. The ash values represent the inorganic salts present in the drug. Extracts obtained by exhausting crude drugs are indicative of approximate measures of certain chemical compounds they contain, the diversity in chemical nature and properties of contents of drug.

Determination of total ash value

Three gram of rhizome *Curcuma vamana* was taken in a tarred platinum or silica dish previously ignited and weighed. Scatter the ground drug in a fine even layer on the bottom of the dish. Incarnated by gradually increasing the heat-not exceeding dull red heat- until free from carbon, cool and weigh. If a carbon free ash cannot be obtained in this way, exhaust the charred mass with hot water, collect the residue on an ash less filter paper, increate the residue and filter paper, add the filtrate, evaporate to dryness and ignite at low temperature. Calculate the percentage of ash with reference to the air-dried drug

Acid insoluble ash value

The total ash obtained from 3g of root powder was boiled with 25 ml of dilute hydrochloric acid for 5 minutes, collect the insoluble matter in a Gooch crucible or on an ash less filter paper, wash with hot water, ignite, and weigh. Calculate the percentage of acid- insoluble ash with reference to the air-dried drug.

Water Soluble Ash Value

The total ash obtained from 3 g of root powder was boiled with 25 ml of water for 5 minutes; collect the insoluble matter in a Gooch crucible or on an ash less filter paper, wash with hot water, and ignite to constant weight at a low temperature. Subtract the weight of insoluble matter from the weight of the ash; the difference in weight represents the water-soluble ash. Calculate the percentage of water- soluble ash with reference to the air-dried drug.

Determination of sulphated ash value

A silica crucible was heated to redness for 10 minutes, allowed to cool in desiccators and weighed. The total ash obtained from 3 g of rhizome powder was transferred to the crucible. It was ignited gently at first, until the substance was thoroughly charred. Then the residue was cooled and moistened with 1 ml concentrated sulfuric acid, heated gently until white fumes are no longer evolved and ignited at 800 ± 25°C until all black particles have disappeared. The ignition was conducted in a place protected from air currents. The crucible was allowed to cool, and a few drops of concentrated sulfuric acid were added and heated. Ignited as before, allowed to cool, and weighed. The operation was repeated until two successive weighing does not differ by more than 0.5 mg. calculate the percentage of sulphated ash with reference to the air-dried drug.

Determination of alcohol soluble extractive value

5 g of the air-dried coarse powder of *Curcuma vamana*, rhizome was macerated with 100 ml of 95% alcohol in a closed flask for 24 hours shaking frequently during the first 6 hours and allowed to stand for 18 hours. Thereafter, it was filtered rapidly. 25 ml of

the filtrate was evaporated to dryness in a tarred flat-bottomed shallow dish, dried at 105°C and weighed. The percentage of alcohol soluble extractive value was calculated with reference to the air-dried drugs.

Determination of water-soluble extractive value

Water soluble extractive value was determined using the procedure described for alcohol soluble extractive, except that water was used for maceration.

Determination of chloroform soluble extractive value

Chloroform soluble extractive value was determined using the procedure described for alcohol soluble extractive, except that chloroform was used for maceration.

Loss on drying (LOD)

LOD is the loss in weight in % (w/w) resulting from water and volatile matter of any kind that can be driven off under specified conditions. Weigh accurately about 1.5 g of the powdered drug in a tared porcelain dish and dried at 105 ºC in hot air oven to get constant weight and then weighed. From the difference in weight, the percentage loss on drying with reference to the air-dried substance was calculated.

Preparation of extract

The sieved powder was subjected to hot continuous Soxhlet extraction with ethanol for 24 hours cycle at 60-65 °C separately. Excessive solvent was removed by solvent distillation apparatus and residue was concentrated by using Lyophilizer. The 0.34 %w/w yellowish solid mass of extract was preserved in aseptic condition before performing the experiment.

Qualitative phytochemical analysis of ethanol extract of *Curcuma vamana*

The individual extracts were subjected to qualitative chemical investigations for the identification of the phytoconstituents such as saponins, tannins and phenolic compound, flavonoids, alkaloids, glycosides, proteins, carbohydrates. The Preliminary Phytochemical tests were performed for extract. One gram of the ethanol extracts of *Curcuma vamana* were dissolved in 100 ml of its own mother solvents to obtain a stock of concentration 1% (w/v). The extracts thus obtained were subjected to preliminary phytochemical screening following the standard procedure[15].

Tests for carbohydrates

Molish's test

To 2-3 ml ethanol extract, added few drops of α-naphthol solution in alcohol, shaken and added concentrated H_2SO_4 from sides of the test tube was observed for violet ring at the junction of two liquids

Fehling's test

To 1 ml test solution, equal quantity of Fehling's solution A and B was added, and solution was heated. A brick red precipitate indicates the presence of glycosides.

Tests for proteins and amino acids

Biuret test

Take 3 ml test solution then 4% NaOH and few drops of 1% $CuSO_4$ solution was added, then observed for violet or pink color.

Million's test

Mixed 3 ml test solution with 5 ml Million's reagent, white precipitate. Precipitate warmed turns brick red or precipitate dissolves giving red color was observed.

Ninhydrin test

To 3 ml test solution 3 drops of 5 % Ninhydrin solution was added and heated in boiling water bath for 10 min. It was then observed for purple or bluish color

Tests for glycosides

Hydrolysis of extract

A minimum quantity of the extracts is hydrolyzed with hydrochloric acid for few minutes on water bath and the hydrolysate is subjected to the following tests.

Legal's test

To the hydrolysate 1 ml of the pyridine, and 1 ml of alkaline sodium nitroprusside was added to obtain a blood red color.

Bontrager's test

Hydrolysate is treated with chloroform and the chloroform layer is separated. To this, equal quantity of dilute ammonia solution (10%) is added. Color changes in the ammoniacal layer shows the presence of glycoside.

Baljet's test

A test solution observed for yellow to orange color with sodium picrate.

Tests for alkaloids

Mayer's test

To the 1 ml of extract, add 1 ml of Mayer's reagent (potassium mercuric iodide solution). Whitish yellow or cream-colored precipitate indicates the presence of alkaloids.

Dragendroff's test

To 1 ml of the extract, add 1 ml of Dragendroff's reagent (potassium bismuth iodide solutions) was added to it. A reddish-brown precipitate indicates the presence of alkaloids.

Hager's test

To 1 ml of the extract, add 1 ml of Hager's reagent (saturated aqueous solution of picric acid) was added to it. A yellow colored precipitate indicates the presence of alkaloids.

Wagner's test

To 1 ml of the extract, add 1 ml of Wagner's reagent (iodine in potassium iodide solutions was added to it). A reddish-brown precipitate indicates the presence of alkaloids.

Tests for phytosterols

Small quantity of extract is dissolved in 5 ml of chloroform separately. The above obtained chloroform solutions are subjected to Salkowski and Liebermann- Burchard tests.

Salkowski test

To the 1 ml of above prepared chloroform solution few drops of concentrated sulphuric acid is added. Formation of brown ring indicates the presence of phytosterols.

Liebermann-Burchard test

The above prepared chloroform solutions are treated with few drops of concentrated sulphuric acid followed by 1 ml of acetic anhydride solution. A bluish green color solution shows the presence of phytosterols.

Test for flavonoids

Shinoda test

To 2 ml test solution, few fragments of Magnesium ribbon were added and to it conc. H_2SO_4 was added drop wise. Pink scarlet or crimson red color appears.

Ferric chloride test

Test solution with few drops of ferric chloride solution shows intense green color.

Alkaline reagent test

2 ml of 2.0% NaOH mixture was mixed with aqueous plant crude extract; concentrated yellow color was produced, which became colorless when we added 2 drops of diluted acid to mixture. This result showed the presence of flavonoids.

Lead Acetate solution test

Take 3 ml test solution, few drops of lead acetate solution (10%) was added and the formation of yellow colored precipitate indicates presence of flavonoids

Tests for saponins

Foam test

The drug extract or dry powder was shake vigorously with water. Persistent foam was observed.

Tests for tannins and phenolic compounds

To 2-3 ml of extract, add few drops of following reagents:

- **5% $FeCl_3$ solution:** deep blue-black color.
- **Lead acetate solution:** white precipitate.
- **Dilute HNO_3:** reddish to yellow color.

Quantitative phytochemical analysis of ethanol extract of *Curcuma vamana*

Determination of total phenol content

The total phenolic content of the extract was determined by the Folin–Ciocalteu method. 1 ml of aliquots and standard gallic acid (12.5, 25, 50, 100 and 200 µg/ml) was positioned into the test tubes and 5 ml of distilled water, mixed thoroughly with 0.5 mL of Folin–Ciocalteu reagent for 5 min, followed by the addition of 1.5 mL of 20% (w/v) sodium carbonate. The mixture was allowed to stand for a further 120 min at room temperature. Intense blue color was developed, and absorbance was measured at 750 nm. The extracts were performed in triplicates. The blank was performed using reagent blank with solvent. Gallic acid was used as standard. The calibration curve was plotted using standard gallic acid. The total phenolic content was calculated from the calibration curve, and the results were expressed as mg of gallic acid equivalent per g dry weight[16].

Determination of total flavonoid content

The total flavonoid content of crude extract was determined by the aluminum chloride colorimetric method. 1 ml of aliquots and 1 ml standard quercetin solution (50, 100, 200 and 400 µg/ml) was positioned into test tubes and 4 mL of distilled water and then 0.3 mL of 5% $NaNO_2$ solution; 0.3 mL of 10% $AlCl_3$ solution was added after 5 min of incubation, and the mixture was allowed to stand for 6 min. Then, 2 mL of 1 mol/L NaOH solution were added, and the final volume of the mixture was brought to 10 mL with double-distilled water. The mixture was allowed to stand for 15 min and absorbance was measured at 510 nm. The total flavonoid content was calculated from a calibration curve, and the result was expressed as mg rutin equivalent per g dry weight[17-18].

RESULTS

Pharmacognostic study

The transverse sections (TS) of rhizome (Figure 2), stem (Figure 3), leaf (Figure 4) and root (Figure 5) were observed and different histological parameters determined under microscope.

Transverse section of *Curcuma vamana* rhizome

Epidermis has a single layered composed of very thick wall cells, covered with thick cuticle. Cortex has three to five layered, thick walled collenchymatous cells and ill developed endodermis. Pericycle contains well defined cells radially and compactly placed and Pith was large parenchymatous, a large number of cells are filled either with starch grains or sphaeraphides, a number of vascular traces traverse in the pith may be leaf traces. Vascular tissue contains vascular bundles which are conjoint and scattered; xylem consists of vessels and xylem parenchyma. Phloem composed of sieve tubes phloem parenchyma. Rhizome is yellow coloured, surface is covered with distinct nodes and internodes, presence axillary of buds. It grows horizontally below the soil surface. It is highly aromatic, because of oleoresins (Figure 2).

Transverse section of *Curcuma vamana* leaf

The isobilateral leaf is similar on both upper and lower epidermis with single layer and covered with cuticle. Some numbers of stomatas are present on both the sides. Mesophyll tissue is not differentiated into palisade and spongy parenchyma, conjoint, collateral vascular bundles are present (Figure 3).

Transverse section of *Curcuma vamana* root

Epiblema is single layered, consists of thick-walled cutinized cells. In old specimen the epiblema is withered and is replaced by ten layered rectangular cork cells. Cortex is heterogeneous differentiated into outer cortex which composed of parenchymatous tissue of secondary and primary cortex and middle cortex which made up of radially arranged air chambers separated by one cell. Thick partition wall is present which is trabaculae (a character of hygrophilous plant). Endodermis present which is innermost layer of the cortex, the cells are rectangular and barrel shaped. Pericycle has three to four layered, consists of rectangular cells. Vascular tissue radially arranged. Phloem patches and xylem are arranged alternately, xylem is ex arch. Pith was well developed and thick walled parenchymatous. The outermost single layer is epiblema and the cells are completely arranged with unicellular hairs. Next many layers of cortex is made up of loosely arranged parenchyma cells at the centre stele is present, consists many of radical vascular bundles (Figure 4).

Transverse section of *Curcuma vamana* stem

The outermost layer is formed of single layered epidermis and it is covered with thick cuticle. Next to epidermis, there is a presence of ground tissue. It consists of two-three layers of sclerenchyma cells outside, remaining all cells are parenchymatous in nature. The add vascular bundles are randomly distributed in the ground tissue (vascular bundles are conjoint, collateral, closed one) (Figure 5).

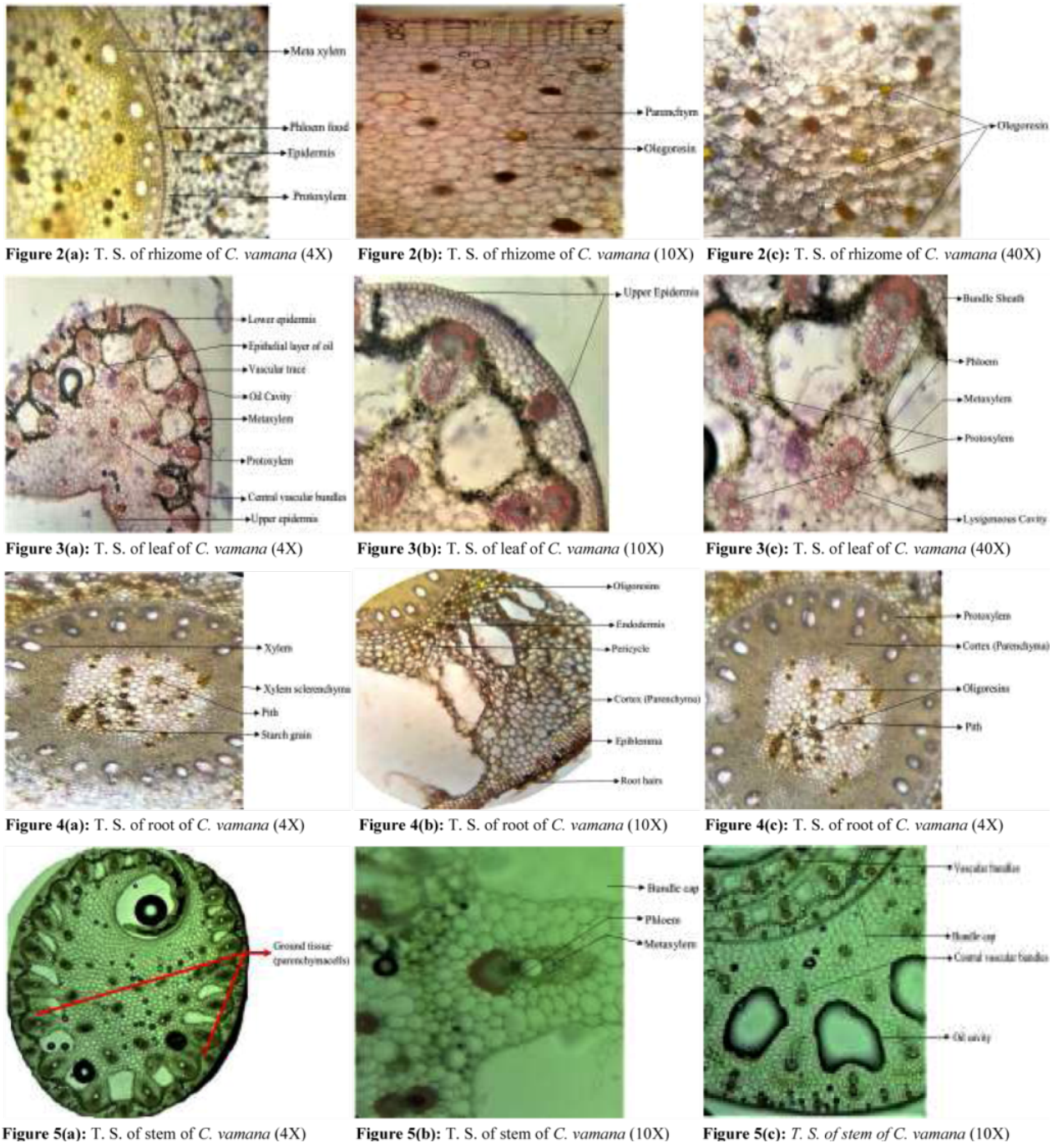

Figure 2(a): T. S. of rhizome of *C. vamana* (4X) **Figure 2(b):** T. S. of rhizome of *C. vamana* (10X) **Figure 2(c):** T. S. of rhizome of *C. vamana* (40X)

Figure 3(a): T. S. of leaf of *C. vamana* (4X) **Figure 3(b):** T. S. of leaf of *C. vamana* (10X) **Figure 3(c):** T. S. of leaf of *C. vamana* (40X)

Figure 4(a): T. S. of root of *C. vamana* (4X) **Figure 4(b):** T. S. of root of *C. vamana* (10X) **Figure 4(c):** T. S. of root of *C. vamana* (4X)

Figure 5(a): T. S. of stem of *C. vamana* (4X) **Figure 5(b):** T. S. of stem of *C. vamana* (10X) **Figure 5(c):** *T. S. of stem of C. vamana* (10X)

Figure 2, 3, 4 and 5: The transverse sections (TS) of rhizome (Figure 2), stem (Figure 3), leaf (Figure 4) and root (Figure 5) of *Curcuma vamana*

Physicochemical properties of rhizome *Curcuma vamana*

The ash values viz., total ash, acid insoluble ash, water soluble ash and sulphated ash, and extractive values viz., alcohol soluble extractive value, water soluble extractive and chloroform soluble extractive values, loss on drying were calculated and recorded. Results were summarized in Table 1.

Table 1: Physicochemical properties of rhizome of *Curcuma vamana*

Parameters	%(w/w)
Ash Value	
Total ash value	8.33
Acid insoluble ash value	1
Water soluble ash value	9.66
Sulphated ash	8.66
Extractive value	
Alcohol soluble extractive value	4.8
Water soluble extractive value	8
Chloroform soluble extractive value	1.04
Loss on dryings	14

Preliminary phytochemical analysis

Preliminary phytochemical screening to detect the different chemical principles present viz., carbohydrates, proteins, amino acids, steroids, glycosides, alkaloids, flavonoids, tannins and phenolic compounds were analyzed. Results were summarized in Table 2.

Table 2: Qualitative phytochemical analysis of ethanol extract of *Curcuma vamana*

Phytochemical constituents	Name of the test	Ethanol extract
Carbohydrates	Molish's test	Positive
	Fehling's test	Positive
Proteins and Amino acids	Biuret test	Negative
	Million's test	Negative
	Ninhydrin test	Positive
Glycosides	Legal's test	Positive
	Baljet's test	Positive
Alkaloids	Mayer's test	Positive
	Dragendorff's test	Positive
	Hager's test	Positive
	Wagner's test	Positive
Phytosterols	Salkowski test	Positive
	Liebermann-Burchard test	Negative
Flavonoids	Shinoda test	Negative
	Ferric Chloride test	Negative
	Alkaline reagent test	Positive
	Lead Acetate solution test	Negative
Saponins	Foam test	Positive
Tannins and Phenolic Compounds	5% $FeCl_3$ solution	Positive
	Lead acetate solution	Negative
	Dilute HNO_3	Positive

Total phenolic contents

The total phenolic contents in the examined ethanol extracts were found 20.42 ± 0.4042 mg of gallic acid equivalent weight/ g of extract (Table 3). Extracts contains concentration of phenols. The total phenolic contents in plant extracts of the species *Curcuma vamana* depends on the type of extract, i.e. the polarity of solvent used in extraction. High solubility of phenols in polar solvents provides high concentration of these compounds in the extracts obtained using polar solvents for the extraction.

Total flavonoid content

The concentration of flavonoids in plant ethanol extracts *Curcuma vamana* were found 203.2 ± 1.749 (mg of quercetin equivalent weight/ g of extract). Ethanol extracts contains flavonoid concentration, the concentration of flavonoids in plant extracts depends on the polarity of solvents used in the extract preparation (Table 3).

Table 3: Total phenolic and Flavonoidcontent of ethanol extract of *Curcuma vamana*

Extract	Phenolic content (mg of gallic acid equivalent weight/ g of extract)	Flavonoid content (mg of quercetin equivalent weight/ g of extract)
Ethanol extract of *Curcuma vamana*	20.42 ± 0.4042	203.2 ± 1.749

All values are expressed in Mean ± SEM

DISCUSSION

The evenness of a crude drug is of key importance in starting its proper identity, also plays a critical role in ensuring the botanical quality and clinical adequacy. Before whatever crude drug can be included in herbal pharmacopoeia, it is expedient to starts pharmacognostic parameters and standards based on the macro and microscopic evaluation as well as identification of contaminations and substituents. Nonetheless, the leaves, stems and roots of this plant were used by local people for the treatment of different disease without standardization. The study provided some basic data regarding the genuine crude drug. As the plant *Curcuma vamana* is used in the traditional medicine for the treatment of few ailments it is bare essential to standardize it for

its use as a drug. The quantitative determinations of few pharmacognostic parameters are helpful for setting standards for crude drugs. The detection of errors or contamination in handling of the drug based upon the identification of essential parameters like physical constants. The purity of the drug i.e. the presence or absence of foreign inorganic matter can be indicated by the assorted ash values. Ash value is useful in determining authenticity and purity of sample and also these values are important qualitative standards. The total ash, acid insoluble ash, water soluble ash and sulphated ash was identified to be 8.33%, 1%, 9.66% and 8.66%. This percentage apparently indicates that the rhizome is best for drug action and effects.

The Water-soluble extractive value plays an important role in identification of crude drugs. Low extractive value indicates addition of disabled material, contaminated or erroneous processing along drying or storage. The alcohol soluble extractive value was likewise indicative for the same purpose as the water-soluble extractive value. The water-soluble extractive value proved to be higher than alcohol soluble, chloroform extractive value. It was found to be 8%. This shows that the constituents of the drug are more extracted and soluble in water as compared to alcohol and chloroform. Moisture is one of the important aspects responsible for the decline of the drugs and formulations. Low moisture content is always desirable for higher stability of drugs. But high moisture content is always not enticing for higher stability of drugs the moisture content of the crude drug was found below 14%. Phytochemical and microscopic analysis is of paramount importance in identifying new source of therapeutically and industrially most valuables compounds having medicinal plants have been chemically investigated[19]. The current study was carried out on the *Curcuma vamana* to standardize its components, it affirms the presence of different active phytochemical constituents and these constituents were qualitatively and quantitatively evaluating using different analytical and spectroscopic methods. The phytochemical screening of Rhizome of *Curcuma vamana* and EECV showed that this contains; carbohydrates, proteins, amino acids, steroids, glycosides, alkaloids, flavonoids, tannins and phenolic compounds are present in ethanol extract. The variations in phytochemical contents of the plant are due to number of environmental factors such as climate, altitude, and rainfall etc[20].

Essentially, these different phytoconstituents distributed in various parts of the plants are resources for developing therapeutic agents and continue to assume exponential increase[21] in the treatment of various diseases and disorders in different healthcare settings both in developing and developed countries[22]. Phenolic and flavonoid (flavones, flavanols and condensed tannins) compounds act as antioxidants by inactivating free radicals and studies have shown a correlation between the antioxidant activity and phenolic and flavonoid content. They act as reducing agents and antioxidants by donating hydrogen ion of their hydroxyl groups, the estimation of total phenolic and flavonoid concentration could be used as a rapid screening test for antioxidant activity[23-25]. Aforesaid instruction of the pharmacognostical evaluation may be helpful for identity of *C. vamana* may act as reference information and produce a solid basis for proper identification, authentication, collection and investigation of the plant material. Further, it will be helpful for detecting contaminations and substituent's for maintaining the quality, reproducibility and efficacy of natural drugs.

CONCLUSIONS

The pharmacognostical and phytochemical analysis carried out with a focus on bringing out diagnostic characters will be of immense help in the proper identification and standardization of botanical species of the curcuma plant *Curcuma vamana*. It will also help in carrying out further research and revalidation of its use in Ayurveda.

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