



# RELATIVE INVESTIGATIVE STUDY OF PHYSICOCHEMICAL ASSESSMENT OF DIVERSE PLANT PARTS OF *PHYLLANTHUS RETICULATUS* (POIR) OF BARDA HILLS, GUJARAT

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**Abstract:** *Phyllanthus reticulatus* (Family: Euphorbiaceae) is commonly a condensed deciduous shrub through a distinctive fragrance. Subsequently centuries, the shrub has been utilized for the cure of innumerable ailments. Present investigation deals with the evaluation of the physicochemical activity of extracts of vegetative parts leaves, stem and root of *Phyllanthus reticulatus* (Poir) rendering to the ordinary techniques. Consumption of the plant for remedies of countless diseases is stated in Ayurvedic book alike Charaka Samhita. Nevertheless there was no enough information concerning about all organs of the plant. Therefore the existing comparative analysis was planned and accompanied to estimate the physicochemical evaluation of stem, leaf and root of *Phyllanthus reticulatus* (Poir). The present experiment exposed to the bio searching of diverse plant parts of leaf, stem and root of *Phyllanthus reticulatus* (Poir) for several therapeutic ideologies in addition to properties.

**Index Terms -** *Phyllanthus reticulatus*, Physicochemical evaluation, Extract, Leaves, Stem, Root.

## I. INTRODUCTION

The medicinal uses in India are conceivably the furthestmost primordial spanning practice the prehistoric times. It is natural to look upon the *Vedic* literature as a channel through which this continuous medical tradition reached down to the earliest systematizes. *Vedic Samhitas* contain abundant references, relating to both diseases and drugs of plant source. Consistent with Ayurveda and additional customary system of remedy there are almost 1250 Indian medicinal plants that used in preparing of therapeutic medicine (Mills *et al*, 2000).

Immense variety of organic configuration provides by natural sources, showing of collections of ordinary yields seems to be worthy. Around 250,000 species of phanerogamy plants and nearby 30 million species in entire; utmost of these have not been analyzed for biological activity. *Phyllanthus reticulatus* belongs to Family Euphorbiaceae commonly known as kamboi in Gujarat is amongst the unsurpassed significant plant. It is usually a dense deciduous shrub or small tree with a distinct smell that is emitted by the minute flowers when they open towards the early evening. Kamboi is a several branched shrub, occasionally moderately climbing, generally 2-5 m tall, or a dwarf branched tree that nurtures up to 8 m in height. The bark is well-lit reddish-brown through furry stems when undeveloped, which converted into smooth with oldness. The venation of leaves is alternate beside slight twigs. Length of leaves is up to 25 cm and seems as leaflets of large pinnate leaves. The leaves are finely surfaced, generally hairless. They have a obvious reddish net-veining which is further noticeable dorsally than ventral. Literature survey reveals that the whole plant is astringent, sweet, cooling, diuretic, alternant, stomachic, constipating and attenuant. It is reported to be useful in vitiated condition of *pitta*, burning sensation, strangury, gastropathy, ulemorrhagia, ophthalmodynia, sores, bums, suppuration, diarrhea, skin eruption and obesity (Nadkarni, K.M. and A.K. Nadkarni, 1976, ICMR, 1987, Orient Longman, 2003). Understanding the physicochemical properties of a compound is essential so that the product process can be rational and streamlined. Hence present study was performed for different types of physicochemical parameters in different plant parts of *Phyllanthus reticulatus*.

## II. RESEARCH METHODOLOGY

### 2.1 Plant Material:

Mature fresh plant materials required for present investigations were collected in winter season locally from Barda Hill, Gujarat (Western India) in December 2020. The taxonomic identification of the plant was confirmed by Dr. N. K. Odedara, Department of Botany, Porbandar, BKNM University, Gujarat. Identification of plant was done by considering the morphological characteristics and reproductive features of plant specimens. Subsequently the collection of plant specimens was documented for recording the data.

### 2.2 Preparation of the Extract:

The collected plant parts were washed thoroughly under tap water to make them free from dust or any other adhering substance and separate all the part viz. root, stem, leaves. All the samples were dried for one week by air dry to reduce chemical and biological changes to a minimum. The shaded dry homogenized powder was stored in an airtight container and kept in a cool, dark and dry place until analysis commenced. 50g of powdered sample was successively extracted with different suitable solvents. The extracts was concentrated under reduced pressure using a rotary evaporator and stored at 4°C for further studies.

### 2.3 Determination of Physicochemical analysis

Determinations of Physicochemical parameters were done in different plant parts of *Phyllanthus reticulatus* (Poir) by standardized procedures of *Ayurvedic Pharmacopoeia*, Part 1, Vol. 8 (2011) and *I.S.I. Handbook of Food Analysis*, Part 2 (1984).

### 2.4 Determination of Foreign Matter

The sample had be taken from a vessel and spread in a thin film in a appropriate tray and eliminate impurities. It was calculated by following formula.

$$\text{Foreign Matter (\%)} = \frac{(\text{Initial weight of the sample in gm} - \text{Final weight of the sample in gm}) \times 100}{\text{Initial weight of the sample in gm}}$$

### 2.5 Determination of Total Ash

Incinerated about 2 to 3 g accurately weighed, of the ground drug in a tarred platinum or silica dish at a temperature not exceeding 600° C until free from carbon, cool and weigh. The percentage of ash was calculated with reference to the air-dried drug.

$$\text{Total Ash (\%)} = \frac{\text{Weight of crucible with Ash} - \text{Weight of empty crucible} \times 100}{\text{Weight of sample}}$$

### 2.6 Determination of Acid Insoluble Ash

To determined acid insoluble ash, 25 ml of dilute hydrochloric acid was added to the crucible containing total ash. Stir for several minute and filtered with ashless Whatman filter paper no. 41. Insoluble matter was collected on filter paper. Washed with hot water until the filtrate was neutral. The filter paper containing the insoluble matter was transferred to the original crucible, dried on a hot-plate and burned to constant weight. Admissible the residue to cool in desiccators for 30 minutes. Weighed without delay. The content of acid-insoluble ash was calculated with reference to the air-dried drug.

### 2.7 Determination of Water Soluble Ash

Take 10g ash in beaker filled with 25 ml of water and boiled for 5 minutes; Filter the solution, collected insoluble matter kept in a Gooch crucible and burnt at a temperature not surpassing 450°C for 15-20 minutes. Calculate the difference of weight between the total ash and insoluble matter; the variance in weight represents the amount of water-soluble ash. With reference to the air-dried drug, the percentage of water-soluble ash was calculated.

### 2.8 Determination of Sulphated Ash

Heated Silica crucible for 10 minutes and kept in desiccator to cool and weigh. Accurately weighed 1 to 2 g of the substance was kept into the crucible, ignited gradually at first, until the material was thoroughly charred. Moistened the charred residue with 1 ml of sulphuric acid and heated moderately till snowy fumes were no longer comes out. Burned at 800° ± 25° C till all black particles had vanished. Allowed the crucible to cool, further add little drops of sulphuric acid and heated. Kindled as formerly, allowed to cool and weighed. There was repetitive the procedure until two consecutive weighing did not varied by more than 0.5 mg.

$$\text{Sulphated Ash (\%)} = \frac{\text{Weight of crucible with Ash} - \text{Weight of empty crucible} \times 100}{\text{Weight of sample}}$$

### 2.9 Determination of Alcohol Soluble Extractive

Coarsely powdered 5 g of the air dried drug were taken and soaked with 100 ml of alcohol in a closed flask for a day, stunned often throughout six hours and allowed to position for eighteen hours. Filtered quickly, precautions were taken in contradiction of loss of solvent, vaporized 25 ml of the filtrate to dryness in tared plane bottomed surface plate, and dried at 105° C to persistent weight and weighed. With reference to the air-dried drug, the percentage of alcohol soluble extractive was calculated.

$$\text{Alcohol Soluble Extractive (\%)} = \frac{\text{Weight of dried dish with filtrate} - \text{Weight of empty dish} \times 100 \times 4}{\text{Weight of sample}}$$

### 2.10 Determination of Water Soluble Extractive

Coarsely powdered 5 g of the air dried drug were taken and soaked with 100 ml of water in a closed flask for a day, stunned often throughout six hours and allowed to position for eighteen hours. Filtered quickly, precautions were taken in contradiction of loss of solvent, vaporized 25 ml of the filtrate to dryness in tared plane bottomed surface plate, and dried at 105° C to persistent weight and weighed. With reference to the air-dried drug, the percentage of alcohol soluble extractive was calculated.

$$\text{Water Soluble Extractive (\%)} = \frac{\text{Weight of dried dish with filtrate} - \text{Weight of empty dish} \times 100 \times 4}{\text{Weight of sample}}$$

### 2.11 Determination of Ether Soluble Extractive (Fixed Oil content)

Take a appropriately weighed amount of the air-dried, powdered drug to an extraction protector, extracted with solvent ether (or petroleum ether, b.p. 40° to 60° C) in a constant extraction apparatus (Soxhlet extractor) for 6 hours. Filtered the extract quantitatively into a tared evaporating dish and vaporized the solvent by kept on a water bath. There was dried the residue at 105° C to constant weight. With reference to the air-dried drug, the percentage of ether soluble extractive was calculated.

$$\text{Ether Soluble Extractive (\%)} = \frac{\text{Weight of dried dish with filtrate} - \text{Weight of empty dish} \times 100}{\text{Weight of sample}}$$

### 2.12 Determination of Moisture content

Dried the evaporating dish for 20 min. Add 10 g of powdered ingredients exactly weighed in a tared evaporating dish. Kept the dish in the drying chamber and set temperature 105° C for 3 hours. Drying was persistent and weighed at half an hour interval till variance between two consecutive weighing resembled to not more than 0.25 per cent.

$$\text{Moisture content (\%)} = \frac{\text{Weight of bottle with sample} - \text{Weight of empty bottle} \times 100}{\text{Weight of sample}}$$

### 2.13 Determination of Water Insoluble Matter

Weighed 10 g of sample was taken in beaker and 200 ml distilled H<sub>2</sub>O was poured and carried to boiling for 30 minutes. Beaker was kept to cool at room temperature. There was filtered over a tared gooch crucible filled with a bed of asbestos. Washed the residue with warm water until the filtrate became sugar free (perform Molisch test). The gooch crucible was dried at 135 ± 20° C and weighed and noted as % insoluble matter.

$$\text{Water Insoluble Matter (\%)} = \frac{\text{Weight of crucible with sample} - \text{Weight of empty crucible} \times 100}{\text{Weight of sample}}$$

### 2.14 Total Soluble Solids in water

Accurately weighed 1 g of sample was taken and dissolved in water in 100 ml volumetric flask, heated on water bath, cooled and diluted with water. Mixed and speedily pipetted out 25 ml sample solution to a tared glass plate and evaporated. There was centrifuged the remaining 75 ml liquid for 20 min at 5000 rpm. Pipetted out 25 ml of the supernatant gained successively centrifugation to a tared glass plate and evaporated. There was placed the glass dishes in oven at 105° C to dry to a constant weight, after evaporation of solvent.

$$\text{Total Soluble Solids in water (\%)} = \frac{\text{Weight of dried dish with filtrate} - \text{Weight of empty dish} \times 100 \times 4}{\text{Weight of sample}}$$

### 2.15 Determination of Solubility in water

Accurately 100 ml of distil water was taken in a Nessler cylinder and air dried, coarsely powdered drug added up to saturation. The sample was stirred constantly by twisting the spatula swiftly. Subsequently 1 minute, filtered the solution by Hirsch funnel, vaporized the filtrate to dryness in a tared plane bottomed surface plate and dried at 105° C to constant weight and calculated the solubility of the drug in water.

$$\text{Solubility in water (\%)} = \frac{\text{Weight of dried dish with filtrate} - \text{Weight of empty dish} \times 100}{\text{Weight of sample}}$$

## III. RESULTS AND DISCUSSION

Natural products are widely used to treat a plethora of acute and chronic diseases ranging from the common cold to complex human diseases all over the world. Understanding the physicochemical properties of a compound is essential so that the product process can be rational and streamlined. *Phyllanthus reticulatus* is commonly used pharmaceutical plant ever since prehistoric time and entirely the plant parts are used as ordinary medicines. Physicochemical parameters like Foreign matter, Total ash, Acid insoluble ash, Water soluble ash, Alcohol soluble extractive, Sulphated ash, Water insoluble matter, Total soluble solids in water, Water soluble extractive, Ether soluble extractive (fixed oil content), Total soluble solids in hydro-alcoholic and Solubility in water, Volatile oil and Moisture content were evaluated for different plant parts of *Phyllanthus reticulatus* (Poir) found out the notable results. Physicochemical analysis result was concise in Figure 1, 2 and Table 1.

The sample should be free from noticeable mould growth, stickiness, adulteration by insects and other animal and animal products including animal excreta or any other harmful foreign matter. Foreign matter consists of any organism, part or product of an organism, other than that named in the definition of the product and mineral admixtures, such as soils, stones, sand and dust. It shall also include other than official parts of organism beyond their specified limits. Foreign matter was observed between 0.15%-1.08 % (Table 1, Figure 1). Maximum foreign matter was detected in stem and lowest was observed in leaves.

Ash values are supportive in defining the quality and pureness of crude medicines, particularly in powder form. Acid insoluble ash, Water soluble ash, Total ash were observed greater in root in compare of stem and leaf (Table 1, Figure 1). Sulphated ash was evaluated and concluded that in the range of 0.53% - 1.14%. Lowermost Sulphated ash was observed in Leaf (0.53%) and maximum Sulphated ash was observed in root (1.14%). Moisture study is significant for a number of diverse motives. The moisture content of foods is significant cause to retain quality, preservation, and confrontation to deterioration. Moisture content was measured in the predehydrated plant parts of *Phylanthus reticulatus* (Poir). It was found between the ranges of 6.8%-9.4%. Advanced result value was found in stem and nethermost was observed in root. (Table 1, Figure 2).

Study of Water insoluble matter is providing us idea regarding insoluble matter which is present in material but couldn't be dissolved. Water Insoluble Matter value found greater in roots (85.4%) and lowest in leaves (77.12%) correspondingly. Water solubility is a measure of the amount of chemical substance that can dissolve in water. Contents that are water soluble are more likely to be absorbed by our body and can be useful. Solubility in Water value was relatively advanced in root in compare of stem and leaf (Table 1, Figure 2). Total Solids in water and Foreign matter was observed less and as per recommended by *Ayurvedic Pharmacopoeia of India* in all plant parts of *Phylanthus reticulatus* (Poir).

Volatile oils commonly comprise active ingredients. Volatile oil have been used in innumerable cultures for medicinal and wellbeing purposes. Volatile oil usages range from aromatherapy, domestic washing products, individual beauty care and natural medicine treatments. Volatile oil content value found greater in leaves (0.37%) and lesser in roots (0.19). Total soluble solid is the vital factor which indicates its value of soluble constituents existing in crude drugs. Total soluble solids in water and hydro-alcoholic were estimated. A total soluble solid in hydro-alcoholic value was observed higher in stem than leaf and root of *Phylanthus reticulatus* (Poir). Similar results were found during study of physicochemical parameters of different plant parts of *Operculina Turpethum* L (S J Makwana and BA Jadeja, 2016).

Table : 1 Physicochemical parameters of different plant parts

PHYSICOCHEMICAL PARAMETERS	PLANT PARTS		
	LEAF	ROOT	STEM
Foreign matter	0.15%	0.39%	1.08%
Total ash	8.25%	11.5%	9.34%
Acid insoluble ash	0.73%	1.16%	0.76%
Water soluble ash	1.44%	2.31%	1.62%
Sulphated ash	0.53%	0.75%	1.14%
Alcohol soluble extractive	16.04%	13.1%	11.6%
Water soluble extractive	21.9%	18.42%	24.96%
Ether soluble extractive (fixed oil content)	1.04%	0.37%	1.7%
Moisture content	7.25%	6.8%	9.4%
Water Insoluble Matter	77.12%	85.4%	82.65%
Volatile Oil	0.37%	0.19%	0.22%
Total soluble Solids in water	24.6%	18.74%	26.18%
Total soluble Solids in hydro-alcoholic	14.70%	16.2%	19.32%
Solubility in Water	20.63%	23.15%	18.67%

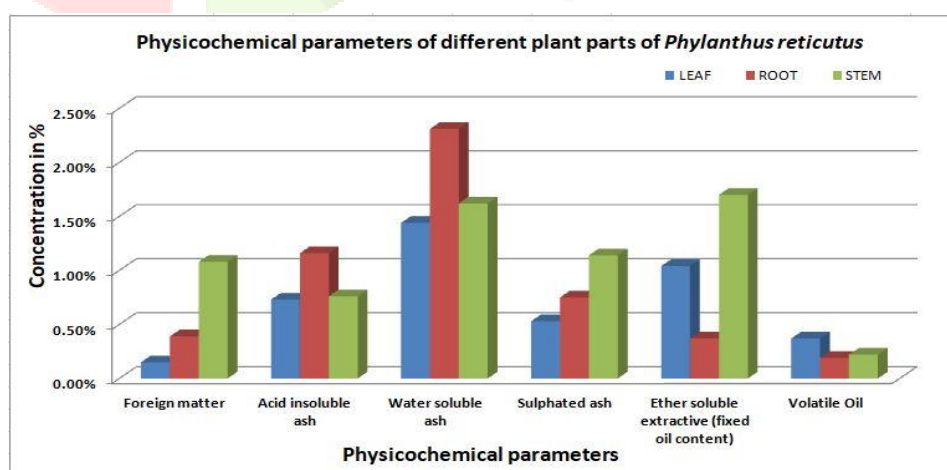


Figure 1 : Physicochemical parameters of different plant parts

Extractive values are useful for evaluation of crude drugs and give an idea about the nature of chemical constituents present in them. The amount of extractive a drug yields to a given solvent is often an approximate measure of a certain constituent or group of related constituents the drug contains. In some cases the amount of a certain constituent or group of related constituents the drug contains, in some cases the amount of drug soluble in a given solvent is an index of its purity. The solvent used for extraction should be in a position to dissolve quantities of substances desired. Alcohol, water and ether soluble extractive value were performed. Ether soluble extractive (fixed oil content) values were relatively



advanced in stem in compare of root and leaf (Table 1, Figure 1). Alcoholic extractive value was notified higher in leaf and Water soluble extractive was notified in stem than other plant parts of *Phyllanthus reticulatus* (Poir) (Table 1, Figure 2).

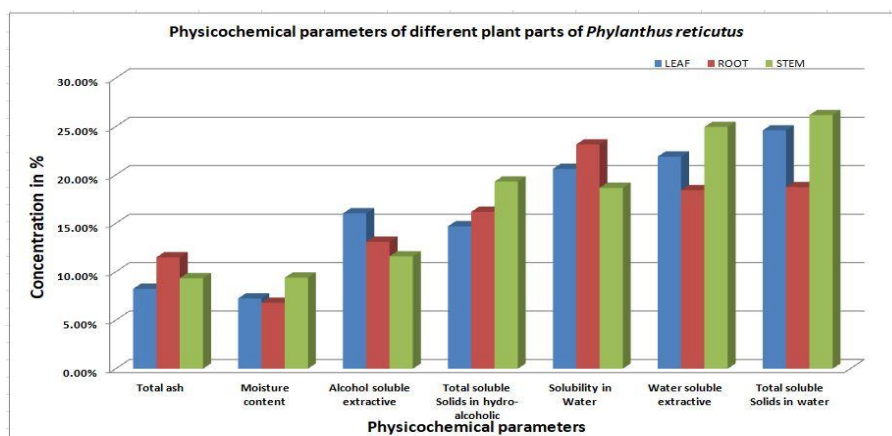


Figure 2 : Physicochemical parameters of different plant parts

#### IV. CONCLUSION

A greater knowledge of the physical properties of plants is important for future applications, as well as for improvements in product development of that is currently available (Siddig *et al* 2004). For the pathological besides pharmacological finding of innovative drugs, the crucial information concerning the chemical ingredients is mostly provided by the phytochemical showing of plant extracts. In the current research work, quantifiable experiments for all plant parts displayed noteworthy sign about the existence of bioactive combinations. This outcome of phytochemicals is worthy sufficient to reflect their significance. There is a necessity for documentation of investigation effort carried out on traditional drugs (Dahanukar, 2000) and similarly it becomes tremendously significant to make an effort towards standardization of the plant substantial to be used as drug. The method of standardization can be accomplished by stepwise physicochemical studies. These research work benefit in quality promise of the preparatory materials is a vital prerequisite to confirm reproducible quality of herbal drug which will contribute to its welfare and effectiveness. The present study practices modest apparatuses such as physicochemical investigation of *Phyllanthus reticulatus* L., an important traditional drug.

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