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ANALYSIS OF PHYSICAL AND PHYTOCHEMICAL PROPERTIES OF VARIOUS PLANT EXTRACT OF NATURAL MEDICINAL PLANT

PARIHAR S[1*], JADHAV R[2] AND PILLAI BJ[3]

1: Assistant Professor, Deparment of Chemistry, Jai Narain Vyas University, Jodhpur (Raj.)

2: Assistant Professor, Department of Chemistry, ISLE, IPS Academy Indore, (M.P)

3: Department of Chemistry, ISLE, IPS Academy, Indore, (M.P)

***Corresponding Author: Sangeeta Parihar: E Mail: sp.ch@jnvu.edu.in**

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ABSTRACT

India has a broad spectrum of biodiversity in natural medicinal plants. Numerous medicinal properties are observed in these plants. Naturally extracted medicine from plants with remedial properties is extensively used to cure and prevent deadly diseases **[1]**. These medicinal plants consist of essential oils, many photochemical constituents, physicochemical properties and produce numerous chemicals that are biologically active substances and manifest numerous antioxidants, antimicrobial, antibacterial, antifungal activities **[2]**. Phytochemical products extracted from ethnomedicinal plants for the treatment of diseases have become the nature channel to show the correlation between man and nature. In this present research work, preludial phytochemical analysis for alkaloids, glycosides, flavonoids, phenols, saponins, tannins, and triterpenoids and quantitative phytochemical evaluation for alkaloids, total phenolics, total flavonoids, tannins, saponins, and ascorbic acid were made by following quotidian procedures comparative study of the phytochemical properties and physical properties are carried out and the presence of many constituent like, flavonoid, alkaloids, phenol, polysaccharide, tannin, etc were analysis. The physicochemical properties such as total ash, water-insoluble ash, acid insoluble ash, and loss on drying parameters were also determined.

Keywords: Phytochemical properties, medicinal plant, potency, saponin, flavonoids, bioactive substance

INTRODUCTION

The environment is known to be the reservoir of natural herbal plants. These natural plants give the most valuable substance to mankind to extract, discover and develop the new drugs from the natural active constituent present in them. These phytochemical bioactive constituents have high potency to fight against various types of infectious diseases **[3]**. The various part of the plant like leaves, roots, seeds, fruits, flowers, bark consist of very complex chemical constituents. These Bioactive compounds are obtained by using various isolation and extraction processes **[4]**. These medicinal herb plants have many medicinal values and content bioactive plant ingredients with very high potency and at a cheaper cost which can be explored to cure diseases among mankind **[5]**.

In today's scenario, much new technology of extraction methods is introduced and rapidly in use. These methods had enhanced the isolation and analysis of phytochemical properties from this natural plant **[6]**. These all phytochemical constituents can explore a very effective antibiotic, antifungal, antibacterial, anticancer, and antimicrobial agent with a very high rate of effectiveness at a cheap cost compared to synthetic medications. All the drugs discovered from the natural constituent has the merest side effect **[7]**.

The medicinal value of herbal medicinal plants rests on the presence of one or more bioactive elements that hold some of the other physiological or pharmacological movements. These natural plants have pharmacological properties and contain secondary bioactive metabolites in them like alkaloids, flavonoids, carbohydrates, amino acids, terpenoids, phenol, tannins, saponin, and much more use against the treatment of several infections **[8-13]**.

This research work deals with the leaf part of seven medicinal plants for the determination and analysis of numerous physicochemical and phytochemical parameters of the fundamental flora.

Emblica officinalis or Phyllanthus emblica is also known as emblic/emblic myrobalan/ myrobalan/ Indian gooseberry/ Malacca tree or amla derived from the Sanskrit word “amalaki”, a broadleaf/ hardwood tree of the family Euphorbiaceae. The plant species is indigenous to India, besides been thriving in Sri Lanka, Uzbekistan, South East Asia, and China **[14-15]**.

Bacopa monnieri is a perennial, creeping herb of the family Scrophulariaceae. It is inherent to the wetlands of southern and

Eastern India, Australia, Europe, Africa, Asia, and North and South America. It is also called water hyssop, Brahmi, thyme-leafed Graciela, herb of grace, and Indian pennywort **[16-17]**. *Lawsonia inermis* is also known as Hina, the henna tree, the mignonette tree, and the Egyptian privet. It is a flowering plant, belongs to the family of Lythraceae **[18]**. *Hemide smus indicus* or the *Indian sarsaparilla* is a species of plant that is the inhabitant of South Asia. It is a slender/ tenuous, laticiferous, twining/ wreathe, irregularly prostrate or semi-erect shrub of the family Asclepiadaceae. It occurs across most of India, from the upper Gangetic plain eastwards to Assam and in some places in central, western, and South India. *Embelia ribes* also known by the name false black pepper, white-flowered Emelia, vidanga, vaividang, or vavding is a species in the family Myrsinaccea. It can be spotted throughout India **[19]**. Careya arborea is a tree in the Myrtaceae family that belongs to the Indian subcontinent, Afghanistan, and Indochina. It is widely known as wild guava, Ceylon oak, patana oak. Careya arborea is a deciduous tree that grows up to the height of 15 meters. The color of the leaves reddens in the cold season **[20]**. *Murraya koenigii* or *Bergera koenigii* is the scientific name of curry leaf tree. It is a tree that usually grows in tropical to sub-tropical regions in the family Rutaceae and is indigenous to Asia. The plant is otherwise known as sweet neem in certain sections, although M. koenigii is in a distinct family to neem, *Azadirachta indica* **[21]**.

The physicochemical parameter considered are total ash, water-soluble ash, acid-soluble ash, and the loss on drying or moisture content. The phytochemical parameter taken for analysis are- alkaloids, flavonoids, carbohydrates, amino acids, terpenoids, phenol, tannins, saponin, glycoside, etc. The physicochemical properties of various leaves-extracted samples were determined based on the total ash, water-insoluble ash, acid insoluble ash, and loss on drying parameter estimation as per the standard process.

MATERIALS AND METHODS

Plants sample selected: - The following seven plants species was selected for the present research work for the analysis of their phytochemical properties –*Embica officnatis, Bacopa monnieri, Lawsennia iermis, Hemibi smus, Embelia Ribes, Careya arborea,* and *Murraya koenigil*.

Chemicals required: -Ammonia solution, Fehling solution A and Fehling solution B, distill water, aqueous HCl, chloroform,

concentrated sulphuric acid, ethanol, picric acid, methanol, Hexane, molisch reagent

Collection and identification of plant materials: -The plants were gathered from the local nursery of Indore, Madhya Pradesh region. Then the plan sample was identified from the botanically in the department of botany. The selected medicinal plant was used to analysis their phytochemical properties. The fresh leaves parts of these plant species were washed off under running tap water, then all the leaves material was shade dried at room temperature and crushed to convert it into powdered form.

The medicinal plant species used for the research analysis of phytochemical properties are given below in the table: -

S. No.	Scientific plant	local name	Family	Part of the used
1	*Embica officinalis*	Amla	Euphorbiaceac	Leaves
2	*Bacopa monnieri*	Bhrahmi	Scrophulariaceae	Leaves
3	*Lawsennia iermis*	Henna/mehndi	Lythraceae	leaves
4	*Hemibi smus*	Anantamool	Asclepiadaceae	leaves
5.	*Embelia Ribes*	Vaividanka	Myrsinaccea	leaves
6	*Careya arborea*	kumbhi	Myrtaceae	leaves
7.	*Murraya koenigil*	mithinim	Rutaceae	leaves

Ethno botanical description of the herbal medicinal plant taken for the phytochemical analysis: -

Plant extraction preparation: -

The leaves of all the desired herbal plants were collected and washed properly under the running tap water. Further all the leave sample were air dried for 4-5 days. The completely dried leaves were crushed with the help of mortar and pestle and converted in to fine powdered and store in the airtight container or foil. The sample of all the leaves was taken one at a time in separate test tube. After adding distilled water and ethanol, the solution was mixed properly by shaking it well. In next step the solution of various leaves extract was filtered for the phytochemical analysis.

Preliminary analysis of physiochemical properties

- **Total Ash Value** -The 2gm plant material that was air dried was ignited at 4500 C. The ash was later cooled in a desiccator and weighed. The weight of white ash corresponded to the ash or mineral matter.
- ***Water-soluble Ash*** -Ash obtained is subjected to 30 ml of water which is later filtered for about 5 minutes. The insoluble ash was deposited on ash less filter paper and washed with hot water and burned at 1050°C and weighed. The

percentage of water-soluble ash with the relation to total ash was calculated.

- ***Acid insoluble Ash***–Absolute ash obtained was boiled for 5 minutes with 25% dilute HCl. The insoluble ash was accumulated in an ash-less filter paper, washed with hot water and ignited in an oven at a constant temperature of 105°C. The percentage of insoluble ash from acid was calculated with the total ash reference.
- ***Loss on Drying: -*** Approximately 25 g of plant was placed in an evaporating apparatus and exposed to a temperature of 1050 C in an oven until a fixed weight is obtained.

  Based on the following formula the loss on drying was determined:-

  Loss of Drying (%) =Loss in weight x 100/W where, W=Weight of plant material in gm

Preliminary qualitative phytochemical analysis

Preliminary qualitative phytochemical analysis of the various plant extract collected: -

- **Test for reducing sugar**: -Take 1 g of plant sample and put in it 10 ml of distilled water to it. Now add little ethanol to the solution and mix well with the sample. In the mixture add 2 ml of Fehling solution A and 2 ml of Fehling solution B in a test tube. Now heat the solution till boiling and add it to the aqueous ethanol extract. Coloration indicates a positive result. The same procedure is repeated with all the plant extracts **[22]**.
- **Test for Carbohydrates**: To analyze the presence of carbohydrates in the plant extracts. Take 1ml of extract and add in it 0.5 ml of Molisch's reagent and few drops of concentrated sulphuric acid. If purple or reddish color precipitate formed in the test tube. The sample contains carbohydrate in it.
- **Test for Tannins**: Take 2 ml of plant extracting test tube add 3 ml of 5% $FeCl_3$. Dark blue or greenish-black precipitation confirms the presence of tannin **[22]**.
  - **Test for Saponin: -** The presence of saponin is identified by taking 3 ml of plant extract in it add 3 ml of distilled water. The mixture is shaken in a graduated cylinder for 20 min vertically. The formation of a foamy layer of about 1cm confirms the presence of saponins **[22]**.
- **Test for Alkaloids:** 0.5 g of the plant samples was taken out in various test tubes after that 2 ml of hexane was mixed in it, shaken well, and filtered. Further mix 6 ml of 2% HCl in the test tube containing the mixture of a sample. Heat the mixture and filter it and add 4-5 drops of picric acid to a solution. The appearance of a yellow color precipitate indicates the presence of alkaloids.

- **Test for Flavonoids:** To analyze the presence of flavonoids in various plant samples, take 1 g of the plant extract in a test tube and mix 15 ml of distilled water in it. Add 4 ml of dilute NH3 solution to a portion of the aqueous filtrate of each plant extract. Add 1.5 ml concentrated H2 S04to it. The presence of yellow color validates the presence of flavonoid **[22]**.
- **Test for Terpenoids: -** In 1ml plant extract, 2ml of chloroform and concentrated H_2SO_4 was added. The mixture is shaken well at a regular interval of time. The emergence of red-brown color at the junction of the 2 solutions substantiate the presence of terpenoids **[23]**.
- **Test for Glycosides**: In the 2 ml of plant extract, added 3ml of $CHCl_3$ and 10% NH_3 solution with constant stirring. The emergence of pink coloration indicates the presence of glycosides.
- **Test for Phenols:** To confirm the presence of phenol in the take 1ml plant extracts dissolve it in 2 ml of distilled water in a beaker and add 4-5 drops of 10% ferric chloride ($FeCl_3$). Blue or green coloration symbolizes the presence of phenols **[24]**.
- **Test for amino acid: -**Ninhydrin Test: Take few drops of various plant extracts in a sample tube, add a few drops of 0.2% ninhydrin reagent and then heat the solution for few minutes. The appearance of blue color confirms the presence of amino acids.

RESULTS

Table 1: Result of preliminary analysis of physiochemical properties

S. No	Medicinal plant	Total ash %	Water soluble ash%	Acid insoluble ash%	Loss on drying%
1	*Embica officinalis*	9.43	3.44	1.23	2.43
2	*Bacopa monnieri*	6.54	2.35	1.67	1.90
3	*Lawsennia iermis*	3.78	1.50	0.50	1.98
4	*Hemibi smus*	3.90	2.14	1.01	1.2
5	*Embelia Ribes*	6.22	2.02	1.23	2.46
6	*Careya arborea*	4.12	1.54	0.97	2.01
7	*Murraya Koenigil*	2.76	1.4	0.50	1.30

Table 2: Analysis of phytochemical properties of various plant extract sample

S. No	Scientific plant	Reducing sugar	Carbo-hydrate	Tannin	Saponin	Alkaloid	Flavonoid	Glycosides	terpenoids	Amino acid	phenols
1	*Embica officnatis*	+	-	-	+	+	+	_	-	+	-
2	*Bacopa monnieri*	+	+	-	-	+	+	+	+	+	+
3	*Lawsennia iermis*	+	_	-	-	+	+	+	-	+	+
4	*Hemibi smus*	+	+	+	+	+	-	+	-	+	-
5	*Embelia Ribes*	+	+	-	+	-	+	+	+	+	+
6.	*Careya arborea*	+	_	-	-	+	+	+	-	+	+
7	*Mucuna Truriens*	+	+	-	+	+	+	-	+	+	_
8	*Murraya Koenigil*	+	+	+	+	+	+	+	+	+	--

+ = shows presence of phytochemical constituents; - = shows absence of phytochemical constituents

The examination of the seven plants has confirmed the presence of phytochemicals in them. These phytochemicals are vital medicinal chemical constituents. Various essential medicinal phytochemicals for instance- tannins, reducing sugar, flavonoids, alkaloids, etc., were present in the samples. The outcome of the phytochemical analysis and qualitative estimation confirms that the seven plants had ample alkaloids, flavonoids, tannins, reducing sugars, and saponins. Plant *Murraya koenigil* has most of these phytochemicals. Tannins are present in *Hemibi smus* and *Murraya koenigil*. Tannins are medicinally vital due to their astringent attributes. They aid rapid healing and the development of new tissues on wounds and inflamed mucosa. Tannins are utilized in the cure of diseases like- varicose ulcers, hemorrhoids, minor burns, frostbite, inflammation of gums, etc. Reducing sugars are present in all the plants. Saponin are present in *Embica officnatis, Hemibi smus, Embelia Ribes, Mucuna Truriens and Murraya koenigil*. Saponins help check cholesterol levels, stimulate the immune system, manage diabetes, and restrain tumor growth. They also enhance lipid metabolism and helps check and treat obesity. Flavonoids are found in *Embica officnatis, Embelia ribes, Mucuna Truriens, Murraya koenigil, Bacopa monnieri, Careya arborea, and Lawsennia iermis*. Studies suggest that coronary heart disease is restrained by dietary flavonoids. Alkaloids are present in *Embica officnatis*, *Mucuna truriens, Murraya koenigil, Bacopa monnieri, Careya arborea, Lawsennia iermis, and Hemibi smus*. Plants that encompass alkaloids can be used in medicines to bring down headaches and fever. These are accredited to antibacterial and analgesic properties. Alkaloids are exceptionally acclaimed anesthetics, cardioprotective, and anti-inflammatory agents. Some of the clinically used alkaloids include morphine, strychnine, quinine, ephedrine, and nicotine. Glycosides are present in *Bacopa monnieri, Careya arborea, Lawsennia iermis, Hemibi smus, and Murraya koenigil*. It protects against predators through their unpalatability possesses laxative and purgative effects, dilates coronary arteries, blocks calcium channels, antispasmodics, and antibiotics.

DISCUSSION

The examination was conducted on the seven selected medicinal plants. In the trials, it was observed that alkaloids, amino acids, glycosides, flavonoids, and reducing sugar were present in most of the samples. Alkaloids, reducing sugars, carbohydrates, tannins, saponins, glycosides, terpenoids,

amino acids, and flavonoids are present in *Murraya koenigil*, phenols were absent. Reducing sugars, flavonoids, saponins, amino acids, and alkaloids were present in the leaves of *Embica officnatis* while the remaining phytochemical constituents were absent. Bacopa monnieri contains reducing sugars, carbohydrates, alkaloids, flavonoids, glycosides, terpenoids, amino acids, and phenols. *Lawsenniai ermis* possess reducing sugars, alkaloids, flavonoids, glycosides, amino acids, and phenols. *Hemibi smus* encompasses reducing sugars, carbohydrates, tannin, saponins, alkaloids, glycosides, and amino acids. It is the only plant studied which does not possess flavonoids. *Embelia ribes* includes reducing sugars, carbohydrates, saponins, flavonoids, glycosides, terpenoids, amino acids, and phenols. It is the only medicinal plant from the test sample which do not possess alkaloids. *Careya arborea* encompasses reducing sugars, alkaloids, flavonoids, glycosides, amino acids, and phenols. *Mucuna truriens* includes reducing sugars, carbohydrates, saponins, alkaloids, flavonoids, terpenoids, and amino acids.

The total ash is the debris remaining after incineration. The total-ash test proffers an estimation of the purity and authenticity of the sample. Acid-insoluble ash value refers to siliceous impurities. It consists primarily of silica and silicates. On the contrary, water-soluble ash value gives an estimation of inorganic contents. Loss on drying is an extensively used test approach to ascertain the moisture content of a sample, although it may also point to the loss of any volatile matter **[7]**.

The total ash percentage, water-soluble ash percentage, and acid-insoluble ash percentage of *Embica officnatis* are 9.43, 3.44, and 1.23. Among all other test samples, it has the highest total ash percentage. The total ash percentage, water-soluble ash percentage, and acid-insoluble ash percentage of Bacopa monnieri are 6.54, 2.35, and 1.67., and of *Embelia ribes* are 6.22, 2.02, and 1.23. *Embica officnatis, Bacopa monnieri*, and *Embelia ribes* have high values for all three tests that indicate the high purity and organic contents along with high siliceous impurities. The total ash percentage, water-soluble ash percentage, and acid-insoluble ash percentage of *Murraya koenigil* are 2.76, 1.4, and 0.50., and of *Lawsennia iermis* are 3.78, 1.50, and 0.50. *Lawsennia iermis* and *Murraya koenigil* have the lowest acid-insoluble ash percentage that refers to their low siliceous impurities. *Embelia ribes* has the highest moisture content among all the samples while *Hemibi*

smus has the lowest loss on drying percentage that refers to the low moisture content.

CONCLUSION

Seven medicinal plants were examined as the provinance of the secondary metabolites - alkaloids, flavonoids, saponin, tannin, and reducing sugars. Remedial plants play an essential part in the prevention of numerous melady/diseases. The antidiuretic, anti-inflammatory, anti-analgesic, anticancer, anti-viral, anti-malarial, anti-bacterial, and anti-fungal activities of the medicinal plants are due to the presence of the above-mentioned secondary metabolites.[25] Medicinal plants utilized for locating and screening phytochemical constituents are pivotal for the abrication of new drugs. The phytochemical analysis of medicinal plants is essential for the production of new drugs for the medicaments of numerous diseases. Thus, the vital phytochemical properties pin downed by this research are assumed to be helpful to get through different types of ailment.

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