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Phytochemical and Pharmacognostic Investigation of Tanacetum Parthenium, Hypericum Perforatum, and Evodia Rutaecarpa Plants

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ABSTRACT

Medicinal plants still play important roles in the daily lives of people living in developing countries of Asia and Africa, including Ethiopia. Medicinal plants not only serve as complements or substitutes for modern medical treatments, which are often inadequately available but also enhance the health and security of local people. Thus, these plants play indispensable roles in daily life and are deeply connected to diverse social, cultural, and economic events associated with life, aging, illness, and death. Medicinal plants are used to treat and diagnose diseases and infections. From ancient times, plants have been rich sources of effective and safe medicines. The world health organization defined traditional medicine as the total combination of knowledge and practices that can be formally explained or used in the prevention and elimination of physical, mental, or social imbalance and relying exclusively on practical experience and observation handed down from generation to generation, whether verbally or in writing. About 75–90% of the rural population in the world (excluding western countries) relies on traditional medicines as their only health care system. This is not only because of poverty where people cannot afford to buy expensive modern drugs, but traditional systems are also more culturally acceptable and meet the psychological needs in a way modern medicine does not. Ethnomedicinal practices are believed to be one of the potential bases for the development of safe and effective treatments. Ethiopia has a long history of a traditional health care system, but studies on traditional medicinal plants have been limited in comparison to the country's multiethnic, cultural, and flora diversity Also, the use of medicinal plants to treat infections is an old practice in large parts of Ethiopia to solve health problems for livestock and humans.

1. INTRODUCTION

Medicinal plants have natural active components that can treat illness or soothe pain. It is often known that traditional medicines and medicinal plants are used as therapeutic agents to maintain good health in the majority of developing nations. According to estimates from the World Health Organization, 80% of people in poor nations receive their primary medical care from traditional practitioners using primarily herbal plant medications. The plant's anti-oxidant, antibacterial, and antipyretic properties may stem from the phytochemicals it contains. Herbs are thought to be non-toxic, and traditional medicine practitioners worldwide have long utilized them to treat a wide range of ailments. Despite several documented cases of toxicity resulting from the use of herbs, neither the general public nor professional associations in traditional medicine have acknowledged the possible toxicity of herbs. The practice of using medicinal plants as raw materials to make drugs is becoming more and more common.

India, known as the Botanical Garden of the World, is reportedly the world's biggest producer of medicinal plants. In one form or another, medicinal herbs have been used for thousands of years by traditional medical systems including Ayurveda, Sidha, and Unani. Approximately 3.6 lakh kinds of medicinal plants exist on Earth, with 1.4 lakh of them species being found in India. Approximately 70,000 plants are utilized in traditional medical systems, according to a recent survey.

Herbal medicine has only recently entered the market and expanded upon age-old techniques. Many were dissatisfied with conventional medication or surgery and resorted to herbal medicine as a result. Because they are natural, herbal medicines are still considered harmless, which is one of the main reasons they are still somewhat popular today. Pharmacologists separate, separate, extract, and synthesize particular components of plants instead of utilizing the entire plant in order to obtain the active principles. Plants contain not only active chemicals but also minerals, vitamins, volatile oils, glycosides, alkaloids, bioflavonoids, and other compounds that contribute to the therapeutic qualities of certain herbs.

2. METHODOLOGY

2.1 Selection and Collection of plant material

The plants were chosen based on their availability and traditional uses. *Tanacetum parthenium, Hypericum perforatum,* and *Evodia rutaecarpa* plants all have bark, leaves, flowers, roots, fruits, and seeds that contain active secondary metabolites. Fresh, healthy, and disease-free plant leaves were collected in August 2024 from the rural Raisen (M.P.) location. Dr. Madhusmita Naik from Mahamaya Degree College in Nuapada, Jharkhand, where she works in the Botany Department.

2.2 Drying & Storage of plant material

Any undesired contaminants or dust particles that are sticking to the plant sample leaves, sort them and give them a wash in sterile distilled water. Parts of fresh plants were shaded yet sun-dried. *Tanacetum parthenium, Hypericum perforatum* and *Evodia rutaecarpa* dry leaves were properly wrapped in plastic bags and ground into powder in compliance with the guidelines.

2.3 Investigation of physio-chemical parameters

Using known techniques, physicochemical data were determined, such as the percentage of total ash, water soluble ash, acid insoluble ash, and loss on drying.

a. Determination of moisture contentLoss on drying

Tanacetum parthenium, Hypericum perforatum, and Evodia rutaecarpa leaves were ground into a one-gram powder and then put in a petridish. After being heated to 105^0C for an hour in a hot air oven, the loaded plate was cooled in desiccators. We measured the moisture content using weight loss. Each sample's matching moisture content % was computed. The fresh sample and dried powder weights were weighed and the percentage loss due to drying and water loss was calculated. The percentage loss was calculated by using following formula**:**

$$\%\ \textbf{Loss of drying} = \frac{Loss\ in\ weight\ of\ the\ sample}{Weight\ of\ the\ sample} x\ 100$$

b. Determination of ash values:

Burned, cooled, and weighed leaves of Tanacetum parthenium, Hypericum perforatum, and Evodia rutaecarpa at a temperature not to exceed 450°C in a tarred platinum or silica dish until the leaves were carbon-free. Two grams of carefully measured dry powdered leaves were obtained as a result. If this did not result in a carbon-free ash, the dust was next spread out over the filter paper that had less ash, burnt at a temperature not higher than 450oC, and evaporated until it was completely dry. After that, boiling water was used to empty the burned material. The ash was collected, cooled, weighed, and the air-dried product was used to determine the amount of ash.

$$\textbf{Ash Value} = \frac{\text{Initial Weight} - \text{Final Weight}}{\text{Initial Weight}} \text{x } 100$$

c. Determination of extractive values and percentage yield

The extractive values of leaf powder from Tanacetum parthenium, Hypericum perforatum, and Evodia rutaecarpa were ascertained using the following process. The mass of plant extracts recovered following solvent extraction as compared to the initial sample quantity is known as the extraction yield, and it serves as a gauge of the solvent's effectiveness in removing bioactive components from the chosen natural plant samples. Next, a calculation was performed to convert the

yield of the extracted plant extracts from grams to percentages. The following formula was applied in order to calculate the specified plant components' percentage yield.

The formula below was used to compute each extract's % yield.:

$$\textbf{Percentage Yield} = \frac{\text{Weight of Extract}}{\text{Weight of Powder drug taken}} \text{x } 100$$

2.4 Phytochemical screening

The phytochemical screening test of the powdered leaves were studied. The phytochemical analysis of extracts showed the presence of alkaloids, flavonoids, cardiac glycosides, terpenoids, carbohydrates, tannins, and steroids. The pharmacognostical, physicochemical, and phytochemical data have been reported which provides referential information for the right identification and standardization of this unexplored species. The qualitative phytochemical analysis, some of which are the most important phytochemicals such as phenolic, tannins, alkaloids, saponins, glycosides, steroids, terpenoids, flavonoids are studied by the researcher. Medicinal plants are a historic source of medical supplies, and many modern pharmaceutical products are indirectly derived from plants. Phytochemical components are made up of two main bioactive components (such as proteins, sugar, amino acids, chlorophyll, etc.) and secondary bioactive components (such alkaloids, terpenoids, flavonoids, etc.). As per standard protocols, each extract underwent phytochemical analysis.

3. RESULT AND DISCUSSION

Herbal remedies derived from nature are carefully considered to be safe and effective natural treatments for a range of illnesses. In this work, we aimed to demonstrate the antioxidant activity, head pain, and migraine potential of Tanacetum parthenium, Hypericum perforatum, and Evodia rutaecarpa extracts. After thoroughly washing the dried Leaves material under running water, an electric grinder was used to grind it. Through the maceration process, the powder was extracted one step at a time using ethanol and water, two solvents with increasing polarity.Three separate standardized criteria were used to assess *Tanacetum parthenium, Hypericum perforatum,* and *Evodia rutaecarpa*: organoleptic measurement, percentage loss, % yield, and phytochemical screening.

3.1 Plant material and their part used

Table 3.1: Showing plant material and their part used

Plant Species	Family	Part used
Tanacetum parthenium	Asteraceae	Leaves
Hypericum perforatum	Hypericaceae	Leaves
Evodia rutaecarpa	Rutaceae	Leaves

3.2 Pharmacognostic and Organoleptic evaluation of powder of plant material

Table 3.2: Organoleptic evaluation of powder of plant materials

S.N.	Plant	Color	Odour
1	*Tanacetum parthenium*	Green	Characteristic
2	*Hypericum perforatum*	Green	Characteristic

3	*Evodia rutaecarpa*	Green	Characteristic

3.3 Result of Percentage loss

Table 3.3: Showing the percentage loss of *Tanacetum parthenium*

S. No.	Plant name	percentage loss
1.	*Tanacetum parthenium*	45%
2	*Hypericum perforatum*	58%
3.	*Evodia rutaecarpa*	56%

3.4 Physio-chemical parameters of plants powder

Table 3.4: Percentage ash value of leaves of *Tanacetum parthenium, Hypericum perforatum, and Evodia rutaecarpa*

S. No.	Parameters	*Tanacetum parthenium*	*Hypericum perforatum*	*Evodia rutaecarpa*
1.	Total ash value	3.7%	2.5%	1.5%

3.5 Result of Percentage yield

Table 3.5: Results of percentage yield of leaf extracts of *Tanacetum parthenium, Hypericum perforatum and Evodia rutaecarpa*

Plant Name	Percentage yield (%)	
	Ethanol	Water
Tanacetum parthenium	7.83	8.49
Hypericum perforatum	6.14	5.47
Evodia rutaecarpa	5.17	4.15

3.6 Phytochemical screening of extracts

The bioactive components of plant extracts are often identified and categorized with the aid of preliminary phytochemical

investigation. For all sample extracts, a subset of the dried plant leaf extracts was subjected to phytochemical screening utilizing Kokate's (1994) procedures for the independent chemical testing of proteins and amino acids, diterpenes, tannins, alkaloids, glycosides, flavonoids, saponins, and phenolics.

Table 3.6: Result of Phytochemical Screening of extracts of *Tanacetum parthenium*

S. No.	Constituents	Ethanol extract	Aqueous extract
1.	Alkaloids A) Mayers Test: B) Hager's Test:	 -Ve -Ve	 -Ve -Ve
2.	Glycosides A) Legal's Test:	 +Ve	 -Ve
3.	Flavonoids A) Lead acetate Test: B) Alkaline Reagent Test:	 +Ve +Ve	 +Ve +Ve
4.	Saponins A) Foam Test:	 -Ve	 -Ve
5.	Phenolics A) Ferric Chloride Test:	 +Ve	 +Ve
6.	Proteins and Amino Acids A) Xanthoproteic Test:	 +Ve	 +Ve
7.	Carbohydrate A) Fehling's Test:	 +Ve	 +Ve
8.	Diterpenes A) Copper acetate Test:	 +Ve	 +Ve
9.	Tannin A) Gelatin test:	 +Ve	 +Ve

Phenols and flavonoids were present in the *Tanacetum parthenium* leaves that were extracted using ethanol. When compared to aqueous solvent, the ethanolic extracts include almost all of the phytochemicals that were examined. Table 3.6 showed that the *Tanacetum parthenium* ethanol extract included flavonoids, carbohydrates, diterpenes, tannins, alkaloids, and phenolics. Alkaloids and saponins were the only phytochemicals found negatively in leaves screening results. *Tanacetum parthenium* leaves extract in water demonstrated the presence of tannins, alkaloids, phenolics, flavonoids, and carbohydrates. When glycosides, alkaloids, and saponins were screened for phytochemicals using an aqueous leaf extract from *Tanacetum parthenium* the results were negative.

Table 3.7: Result of Phytochemical Screening of extracts of *Hypericum perforatum*

S. No.	Constituents	Ethanol extract	Aqueous extract
1.	Alkaloids A) Wagner's Test: B) Hager's Test:	 +Ve +Ve	 -Ve -Ve
2.	Glycosides A) Legal's Test:	 +Ve	 +Ve
3.	Flavonoids A) Lead acetate Test: B) Alkaline Reagent Test:	 +Ve +Ve	 +Ve +Ve
4.	Saponins A) Froth Test:	 +Ve	 +Ve
5.	Phenolics A) Ferric Chloride Test:	 +Ve	 +Ve
6.	Proteins and Amino Acids A) Xanthoproteic Test:	 -Ve	 -Ve
7.	Carbohydrate A) Fehling's Test:	 +Ve	 +Ve
8.	Diterpenes A) Copper acetate Test:	 +Ve	 -Ve
9.	Tannin A) Gelatin test:	 +Ve	 +Ve

Table No.3.7 shows the outcomes of the phytochemical screening of the *Hypericum perforatum* leaves extract. The findings of the phytochemical screening also revealed that the phytochemical makeup of the aqueous and ethanol solvents was mostly identical. Chemical tests were used to perform phytochemical screening on *Hypericum perforatum* leaves extract in ethanol and water solvents. The findings are show in Table. The phytochemical analyses identified a number of bioactive secondary metabolites that may be in charge of their therapeutic properties. The ethanolic extract of *Hypericum perforatum* leaves has shown the absence of proteins and amino acids as well as the presence of alkaloids, glycosides, flavonoids, carbohydrates, tannin, diterpenes, and saponins. The findings of the aqueous extract's phytochemical screening indicated that there were no alkaloids, proteins, diterpenes, or amino acids present.

Table 3.8 : Result of Phytochemical Screening of extracts of *Evodia rutaecarpa*

S. No.	Constituents	Ethanol extract	Aqueous extract
1.	Alkaloids A) Wagner's Test:	 +Ve	 +Ve

	B) Hager's Test:	+Ve	+Ve
2.	Glycosides A) Legal's Test:	-Ve	-Ve
3.	Flavonoids A) Lead acetate Test: B) Alkaline Reagent Test:	+Ve +Ve	+Ve +Ve
4.	Saponins A) Froth Test:	+Ve	+Ve
5.	Phenolics A) Ferric Chloride Test:	+Ve	-Ve
6.	Proteins and Amino Acids A) Xanthoproteic Test:	-Ve	-Ve
7.	Carbohydrate A) Fehling's Test:	+Ve	+Ve
8.	Diterpenes A) Copper acetate Test:	-Ve	-Ve
9.	Tannin A) Gelatin test:	+Ve	-Ve

Evodia rutaecarpa ethanolic extract tested positive for tannin, alkaloids, flavonoids, saponins, and phenolics. Glycosides, diterpenes, proteins, and amino acids are among the phytoconstituents missing from the ethanolic extract of Evodia rutaecarpa. The only compounds in the Evodia rutaecarpa aqueous extract that tested positive were alkaloids, flavonoids, saponins, and phenolics.

CONCLUSION

The phytochemical values and pharmacognostic characteristics presented in this article may be utilized as a diagnostic tool to standardize this therapeutic plant. This characteristic makes it simple to identify adulterants, if any exist. This characteristic might aid in establishing the drug's authenticity in accordance with WHO requirements. The findings support and call for more research on the traditional medicinal uses of *Tanacetum parthenium, Hypericum perforatum,* and *Evodia rutaecarpa*. Rats were used to test the analgesic effects of an ethanolic extract of *Tanacetum parthenium, Hypericum perforatum,* and *Evodia rutaecarpa. Tanacetum parthenium*, *Hypericum perforatum,* and *Evodia rutaecarpa* extracts all showed dose-dependent responses to their analgesic effects, which were equivalent to those of the reference medication indomethacin.

During the course of the 180-minute therapy, the extracts were most effective at a dosage level of 400 mg/kg body weight. Therefore, an alternate bioresource for producing analgesic drugs may be the extracts of *Tanacetum parthenium, Hypericum perforatum,* and *Evodia rutaecarpa.* To understand the mechanism underlying this action and their active substances, more research is needed. Thus, the current study provides scientific validation and support for the traditional use of *Evodia rutaecarpa, Hypericum perforatum* and *Tanacetum parthenium* in the treatment of pain.

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