D.Subha et al, International Journal of Pharmaceutical Sciences and Business Management,
Vol.2 Issue. 12, December- 2014, pg. 21-28

ISSN: 2310-6913

Pharmacognostic Investigation of *Tanacetum parthenium* L. grown in India

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Abstract

Various traditional systems of medicine enlightened the importance of the leaves of to *Tanacetum parthenium* L. (Feverfew) belongs to Asteraceae family have a great medicinal value. This plant was collected from Herbal garden, Mother Teresa Women's University, Kodaikanal, Dindigul district, Tamil Nadu, India. The pharmacognostic investigation of *Tanacetum parthenium* L. leaf powder was carried out in terms of extractive value, organoleptic, fluorescence analysis, elemental analysis and physicochemical parameters. The dried leaves were subjected to successive Soxhlet extraction using Petroleum ether, Hexane, Chloroform, Acetone and Methanol. Highest extractive value was found in methanol (30.23) while lowest extractive value was found in Petroleum ether extract (4.16). The analysis of leaves (100 g) showed wide range of micronutrients like Ca (492.08mg), Na (189.18 mg), Zn (31.39mg), Fe (20.96 mg), and K (70.64mg). Elemental analysis by AAS reveal presence in order of Ca>Na >K>Zn >Fe>Cu. The present study provides pharmacognostical details of *Tanacetum parthenium* leaf which is useful in laying down standardization and pharmacopoeia parameters.

***Keywords*:** Pharmacognostic, Extractive value, *Tanacetum parthenium*, Element

1. Introduction

Drug evaluation is a verification of its identity and determination of its quality and purity and detection of nature of adulteration. Many people were provoked to consider the importance of many herbs for treating several diseases. The plant drugs also constitute a potential for developing some novel semisynthetic therapeutic agents. It is

ISSN: 2310-6913

recognized that 80% of the world's population has depend on traditional medicine, mainly plant drug for their primary health care (Dubey *et al*., 2004). But in recent years, the number of patients experiencing negative health consequences caused by the use of herbal medicine and its mainy due to poor quality of herbal drug and raw medicinal plant materials (Richardo, 2006). Authentication and standardization are prerequisite steps especially for herbal drugs and their formulations in traditional systems of medicine (Nagani *et al*., 2011). Pharmacognostic study is the preliminary step in the standardization of crude drugs which gives valuable information regarding the morphology and physical characteristics of the crude drugs. Physical constants like ash and extractive values help in establishing the pharmacopoeial standards of drug. Fluorescence analysis help to identify the drug in powder form. *Tanacetum parthenium* L. (Feverfew)) is one of the important perennial medicinal herb and its belongs to Asteraceae family which is commonly used to prevent migraine headaches, and is also occasionally grown for ornament. It's also known as "featherfew," because of its feathery leaves (Duke and Boca Raton,1985; Jackson and McDonald, 1986) The plant has been used to treat arthritis, asthma, constipation, dermatitis, earache, fever, headache, inflammatory conditions, insect bites, labor, menstrual disorders, potential miscarriage, psoriasis, spasms, stomach ache, swelling, tinnitus, toothache, vertigo, and worms. Feverfew also has been used as an abortifacient, as an insecticide, and for treating coughs and colds. Traditionally, the herb has been used as an antipyretic (Jain and Kulkarni, 1999; Heptinstall *et al*., 1992; Setty and Sigal, 2005; Pittler and Ernst, 2004; Sumner *et al*., 1992). In the present investigation, we reported a pharmacognostic evaluation and Fluorescence analysis of *Tanacetum parthenium* leaf material.

2. Materials and Methods

2.1. Collection, identification and processing of plant samples

Plant leaf sample (*T. parthenium)* was collected from Herbal garden, Mother Teresa Women's University, Kodaikanal, Dindigul district, Tamil Nadu, India. The taxonomic identity of the plant was confirmed by Botanical Survey of India, Southern circle, Coimbatore, Tamil Nadu. The plant materials were rinsed under running tap water to eradicate the surface pollutants and the leaves were air dried under shade. The dried sample was powdered and used for further studies.

2.2. Pharmacognostic evaluation

Organoleptic evaluation

In organoleptic evaluation, various sensory parameters of the plant material, such as size, shape, color, odor, and taste of the leaves were recorded.

2. 3. Physical evaluation

In physical evaluation, crude fiber, moisture content, ash values (total ash, acid insoluble ash and water soluble ash) and extractive values (alcohol soluble extractive value, water soluble extractive and ether soluble extractive values

ISSN: 2310-6913

were determined. 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.

2.3.1. Estimation of crude fiber (Acid detergent fiber, ADF)

Crude of leaves consists of cellulose, lignified nitrogen, and alkali-soluble lignin. In a 500 ml beaker, 2 g of leaf material was distilled by refluxing with 50 ml ADS (20gm cetyl trimethyl ammonium bromide (cetrimide) in 1 litre of previously standardized N sulphuric acid) by boiling vigorously at first and then more gently. After 1 hr of reflux distillation, the contents were transferred to a tared crucible and the contents were allowed to percolate through the sintered glass plates. The residue was repeatedly washed with boiling water until diaappearence of foam in the filtered solution. The residue was sucked dry and washed with 3 × 20 ml of acetone and finally sucked dry. The crucibles were kept overnight in a hot air oven at 100 °C, cooled in a desiccator and weighed. The residue which remained insoluble in the hot ADS was the amount of ADF in given sample. The ADF content of leaf powder was calculated.

2.3.2. Determination of Moisture content (loss on drying)

Two grams of accurately weighed fresh leaves of *T. parthenium* was dried at 105 °C for 5hrs and weighed. Drying and weighing was continued at one hour interval until difference between two successive weighings corresponded to not more than 0.25%. After drying, the sample was cooled in a desiccator for 30 min and recorded the moisture content.

2.3.3 Determination of total ash

Two grams of air dried leaf powder of *T. parthenium* was taken in a silica crucible and incinerated at a temperature not exceeding 450 °C until the sample turn into white color. After cooled down in a desiccator for 30 min, total ash content was recorded.

2.3.4. Determination of Acid-insoluble ash

The total ash obtained from 2g of leaf powder was gently boiled for 5 minutes with 25 ml of dilute hydrochloric acid and the insoluble matter was collected on a Whatman filter paper. It was washed with hot water until the filtrate become neutral and then ignited at 450 °C. Then the residue was allowed to cool in a desiccator for 30 min. The percentage of acid insoluble ash was calculated.

2.3.5. Determination of Water soluble ash

The total ash obtained from 2g of leaf powder was boiled for 5 minutes with 25 ml of water and the insoluble matter was collected on a Whatman filter paper. It was washed with hot water and ignited for 15 min at 450 °C. Then the residue was allowed to cool in a desiccator for 30 min. The percentage of water soluble ash was calculated.

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2.4. Micronutrient estimation

The samples for micronutrient estimation were prepared according to the procedures described by Singh et al. (2012) using muffle furnace and Ca, Fe, Cu, K, Na, and Zn were analysed through Atomic Absorption Spectrophotometer (AAS; Shimandzu AA 6200, Scientific Instruments Inc. Columbia, USA).

2.5. Determination of extractive value

Accurately weighed powder (5g) of leaves was taken and a thimble pack was prepared. The crude drug in the pack was extracted with 100 ml of solvent (petroleum ether, hexane, chloroform, acetone and methanol) in a continuous extraction by Soxhlet apparatus for 24 h. The extract was filtered and the filtrate was evaporated and dried at 105°C for 6 hours, cool in a desiccator for 30 minutes and weigh it immediately. Calculate the content of extractable matter in % of air-dried material.

2.6. Fluorescence analysis

The fluorescence analysis of various extracts of leaves of *T. pathenium* was studied under UV light and daylight. Powder was extracted with various reagents.. These were observed under short UV (254 nm), long UV (365 nm) and visible light.

3. Results and Discussion

In organoleptic evaluation, appropriate parameters like taste, odor, size, shape and color of the leaves and leaf powder were studied. Fresh leaves are simple, pinnate or bipinnate and green in colour and aromatic in odour with a slightly bitter taste. The leaf powder was also green in colour with characteristic odour and bitter taste.

The leaf powder of *T. parthenium* was extracted with Petroleum ether, Hexane, Chloroform, Acetone and Methanol and the yield of the extracts were observed. All the solvents produced dark green coloured extracts from the leaf powder except petroleum ether extract produced pale yellow colour extract. Among the solvents employed methanol produced highest yield (30.23%) with lowest yield extracted out by petroleum ether (4.16%) as shown in Table 1. Extractive values are useful for determination of crude drugs and it gives an idea about the nature of the chemical constituents present. The extractive values are useful to evaluate the chemical constituents present in the crude drug and also in estimation of specific constituents soluble in a particular solvent (Thomas *et al*., 2008).

Physico-chemical parameters such as moisture content, total ash content, water soluble ash content, acid insoluble ash content and extractable matter content play an important role in quality control and standardization by means of stability, purity and phytochemical composition of an herbal drug (Gami and Parabia, 2010). Ash values are used to determine quality and purity of crude drug. It indicates the presence of various impurities such as carbonate, oxalate and silicate. Determination of physicochemical parameters are very important in order to maintain the purity of herbal medicines (Gami and Parabia, 2010; Kunle *et al*., 2012). The water soluble ash contains mainly silica,

ISSN: 2310-6913

particularly in sand and it indicates contamination with earthy material. The percentage moisture content in the *T. parthenium* leaf powder was found to be 9.93%w/w. Determination of the moisture content helps prevent degradation of drug.

Table 1. Extractive value of successive extracts of powdered leaves of *T. parthenium L.*

S. No	Solvents	Extractive values (% w/w)	Colour of extracts
1.	Petroleum Ether extract	4.16	Pale yellow
2.	Hexane extract	7.30	Green
3.	Chloroform extract	25.78	Dark green
4.	Acetone extract	14.92	Dark green
5.	Methanol extract	30.23	Dark green

Table 2. Physicochemical parameters of powdered leaves of *T. parthenium L.*

S. No	Parameter value	% (w/w)
1.	Acid detergent fiber	13.66
2.	Moisture content	9.93
3.	Total ash	11.13
4.	Acid insoluble ash	4.9
5.	Water soluble ash	3.6

The results of micronutrient analysis of *T. parthenium* collected from Western Ghats of India are presented in Table 3. The study showed that the Ca, Fe, K, Na and Zn content was found to be 492.08 mg/100 g, 20.96 mg/100 g, 70.64 mg/100 g, 189.18 mg/100 g and 31.39 mg/100 g respectively. Sodium was essential element for proper functioning of body but excess intake affect the physiology of organs like kidney and heart and it ranges from 23.6 mg/100 g to 697.8 mg/100 g. Calcium, which is essential element for several life processes, was found to be highest in *T. parthenium* leaf material. The mineral content are essential part of plant biomass like iron, copper and sulphur were detected in different crops (Hofstein, 1974; Redshaw et al., 1984;Vora and Venkateswar, 1988). Zinc is cofactor in many of the physiological enzyme of body system and also acts as cofactor in free radical scavenging capacity of various enzymes. Several (*Nelumbo nucifera*, *Embelia ribes*, and *Eugenia Jambolana*) plant seeds contain elements like potassium, manganese, iron and copper with some medicinal activity (Indrayan, 2005).

Fluorescence is the phenomenon exhibited by various chemical constituents present in the plant material. In visible light some constituents show fluorescence. The ultra violet light also produces fluorescence in many natural products, which do not visibly fluoresce in daylight. If the substances themselves are not fluorescent, they may often be converted into fluorescent derivatives or decomposition products by applying different reagents.

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Table 3. Micronutrient estimation of *T. parthenium* leaf sample

S. No	Elements	% (mg/100g)
1.	Calcium (Ca)	492.08
2.	Copper (Cu)	Not detectable
3.	Iron (Fe)	20.96
4.	Potassium (K)	70.64
5.	Sodium (Na)	189.18
6.	Zinc (Zu)	31.39

Table 4. Fluorescence analysis of *T. parthenium* leaf sample

Powdered drug	Visible/Day light	UV 254 nm (short)	UV 365 nm (long)
Powder drug as such	Green	Green	Light green
Powder + Methanol	Dark Green	Light green	Light green
Powder + 1% glacial acetic acid	Light Green	Green Fluorescence	Green
Powder +10% NaOH	Green	Yellowish	Yellowish
Powder + dil. NH3	Brown	Light green	Green
Powder + Conc. HNO3	Brown	Blackish brown	Dark brown
Powder +1M H2SO4	Brown	Dark brown	Yellowish
Powder +1M HCl	yellowish	Brown	Orange
Powder + 10% FeCl3	Light green	Light brown	Brownish yellow
Powder +Acetone + Methanol	Dark green	Light green	Green
Powder +10% Iodine	Yellowish brown	Green	Green

The fluorescence analysis is useful in the characterization of crude drugs (Apraj et al., 2011) and further reveals the presence of active agents in the leaf and stem by their various colour reactions to diverse chemicals and colour change under the UV at 254 and 366 nm. Fluorescence analysis of *T. parthenium* leaves are presented in Table 4. Hence, fluorescence studies on the biological and chemical activities of *T. parthenium* will further help in identifying the purity, correct identification of the crude drug.

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4. Conclusion

Pharmacognostic values for leaves of *T. parthenium* for parameters such as extractive value, determination of ash, crude fibre and fluorescence analysis of extract and elemental analysis with significant results can be employed as evaluating parameter. Information generated through the present study could be effectively used for the quality control and standardization process of leaves of this plant in order to validate/upgrade the Indian pharmacopeia.

5. Acknowledgement

The first and corresponding author would like to thank UGC, New Delhi for providing the BSR fellowship.

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