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PHARMACOGNOSTICAL AND PHYTOCHEMICAL INVESTIGATION OF *FUMARIA PARVIFLORA* LAM.

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ABSTRACT: The present paper deals with the pharmacognostical and phytochemical investigation of *Fumaria parviflora* Lam. whole plant. The qualitative and quantitative phytochemical analysis was carried out for the important bioactive constituents present in *Fumaria parviflora* Lam. (whole plant) in its Hydroalcoholic extract. The preliminary phytochemical analysis showed the presence of alkaloids, phenols, flavonoids, carbohydrates, protein, steroids, and sulphate. The total phenolic content (TPC) and the total flavonoid content (TFC) were also determined from the extrapolation of calibration curves which were prepared by using Tannic acid and Quercetin respectively as standard solutions. The results indicated the presence of phenols and flavonoids in considerable amounts. Thus, the study revealed the presence of various bioactive constituents in *F. parviflora* which could be exploited for their potential applications for medicinal purposes.

INTRODUCTION: Plants are essential natural resources for the existence of various life forms on the earth and well-recognized for their medicinal values throughout the world. The use of medicinal herbs in the treatment of infection is an age-old practice, and several natural products are used as phytotherapeutic for the treatment of many diseases [1]. Traditional medicine involves the use of extracts of various plants, which are found to have various medicinal properties [2]. The curative potential of the plants lies in the chemical compounds comprised by them, which generate some kind of physio-logical actions in the human body.

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By isolating and identifying the bioactive constituents, new drugs can be formulated to treat various diseases and disorders [3]. The necessity for the formulation of safe and cost-effective novel drugs has drawn the attention of researchers all around the world towards compounds of plant origin.

Fumaria parviflora Lam. (Family: *Fumariaceae*), commonly known as fine-leaved fumitory (in English), Shahatra, Pittapapara or Pittapapada and Dhamgajra (in Hindi). The name of the genus is derived from the Latin fumus terrae, which means "smoke of the earth [4]. The genus *Fumaria* (*Fumariaceae*) consists of 46 species in the world, and Fumaria species are known as fumitory, earth smoke, beggary, fumus, vapor fumittery, or wax dolls in English [4, 5]. The plant is a native of Europe commonly found over the greater parts of India as a winter season weed, mostly in wheat fields [6]. Farmland and sunny situation are favourable for its

cultivation [6]. It can be grown successfully on a wide range of soils. It shows much variation in height; *i.e*. 15-60 cm^{-6}. *Fumaria parviflora* (*Fumariaceae*) is a pale green, diffuse, much branched annual herb widely used in Ayurvedic medicine as well as in the Traditional, Yunani system of medicine in throughout of India [7]. Some species of *Fumaria* have been paid great attention for their traditional use as herbal medicine. The plant has been widely used in the Ayurvedic medicine system is bitter; cooling, expectorant, constipating, increases vata removes biliousness, fever, burning of the body, tired feeling, wandering of the mind, intoxication, urinary discharge, vomiting, thirst, enriches the blood, good in leprosy [8]. In folk medicine of Turkey, it was used against hepatobiliary dysfunction, while, in the Unani traditional system, it was prescribed to treat gut and respiratory disorders, abdominal cramps, indigestion, and asthma [9].

MATERIALS AND METHODOLOGY:

Collection Identification and Authentication of Plants: The plant material was collected in the month of July 2020 and identified taxonomically by Dr. Suman Mishra, Consultant taxonomist, X cell venture Institute of Fundamental Research Pvt. Ltd., Bhopal (MP). She is also a Botany scientist in MFP-PARC, Barkheda pathani, Bhopal. The plant was identified as *Fumaria parviflora* Lam. belonging to the family *Fumariaceae* by its macroscopic, microscopic, and powder microscopic examination.

Reagents Used: All the chemicals and solvents used for testing were analytical grade reagents Merck Ltd. India.

Extraction: The plant material was washed and then kept for shade drying for 7 days. The dried plant sample was powdered by a mechanical grinder into fine powder. The powder was stored in an air-tight container at room temperature before extraction. The air-dried powdered material of the whole plant of *Fumaria parviflora* (100 gm) was extracted with Hydroalcoholic solvent [methanol and water solvent (1:1) using the Soxhletion process with the help of Soxhlet-apparatus. Excess solvent was then evaporated in a water bath at 50-100 ºC to obtain the crude for phytochemical evaluation and further studies.

FIG. 1: SOXHLET EXTRACTION OF *FUMARIA PARVIFLORA*

Preliminary Phytochemical Analysis of Plant Extracts: Preliminary phytochemical analysis is the first step and a very important procedure to estimate the presence of chemical compounds in any plant or its particular part. The phytochemical analysis (tests) for the estimation of the presence of phenols, flavonoids, saponins, carbohydrates, alkaloids, *etc*. were performed by using the standard procedures [10, 11].

Estimation of Total Phenolic and Flavonoid Content:

Total Phenolic Content (TPC): The total phenolic content of hydroalcoholic extract of *Fumaria parviflora* (whole plant) was determined using the method described by Jia *et al.* [12] with some modifications. 1.0 ml of sample was mixed with 1.0 ml of Folin and Ciocalteu's phenol reagent. After 3 min, 1.0 ml of saturated Na_2CO_3 (~35%) was added to the mixture and made up to 10 ml by adding distilled water.

The reaction was kept in the dark for 90 min observed under UV-Vis spectrophotometer at 760 nm absorbance. A calibration curve was constructed with different concentrations of Tannic acid (20-100 µg/ml) as standard. The results were expressed as mg of Tannic acid equivalents (TAE)/g of dry extract. The estimation of the phenolic compound was carried out in triplicate.

Total Flavonoid Content (TFC): The total Flavonoid content of hydroalcoholic extract of *Fumaria parviflora* (whole plant) was determined

using the method described by Jia *et al.* [12] with slight modifications. Quercetin was used to plot the standard calibration curve. Take a clean test tube and add 0.5 ml of the sample (Extract) containing 1.25 ml of distilled water. Then added 0.075 ml of 5% sodium nitrite solution and allowed to stand for 5 min. Added 0.15 ml of 10% aluminum chloride, after 6 min 0.5 ml of 1.0 M sodium hydroxide were added, and the mixture was diluted with another 0.275 ml of distilled water. The absorbance of the mixture at 510 nm was measured immediately. The flavonoid content was expressed as mg quercetin equivalents (QE)/g of dry extract. The estimation of flavonoid compounds was carried out in triplicate.

RESULTS:

Identification Tests:

Organoleptic Evaluation: Colour - dusty grey; odour - pleasant; taste - bitter and slightly acrid condition - dried.

Macroscopic Examination: Root - Buff or cream coloured, branched, about 3 mm thick, cylindrical. Stem - Light green, smooth, diffused, hollow, about 2 to 4 m thick. Leaf- Compound, pinnatifid, 5 - 7 cm long, divided into narrow segments (about 5 mm long and 1 mm broad), linear or oblong, more or less glaucous, acute or subacute; petiole, very thin, 2.5 to 4.0 cm long.

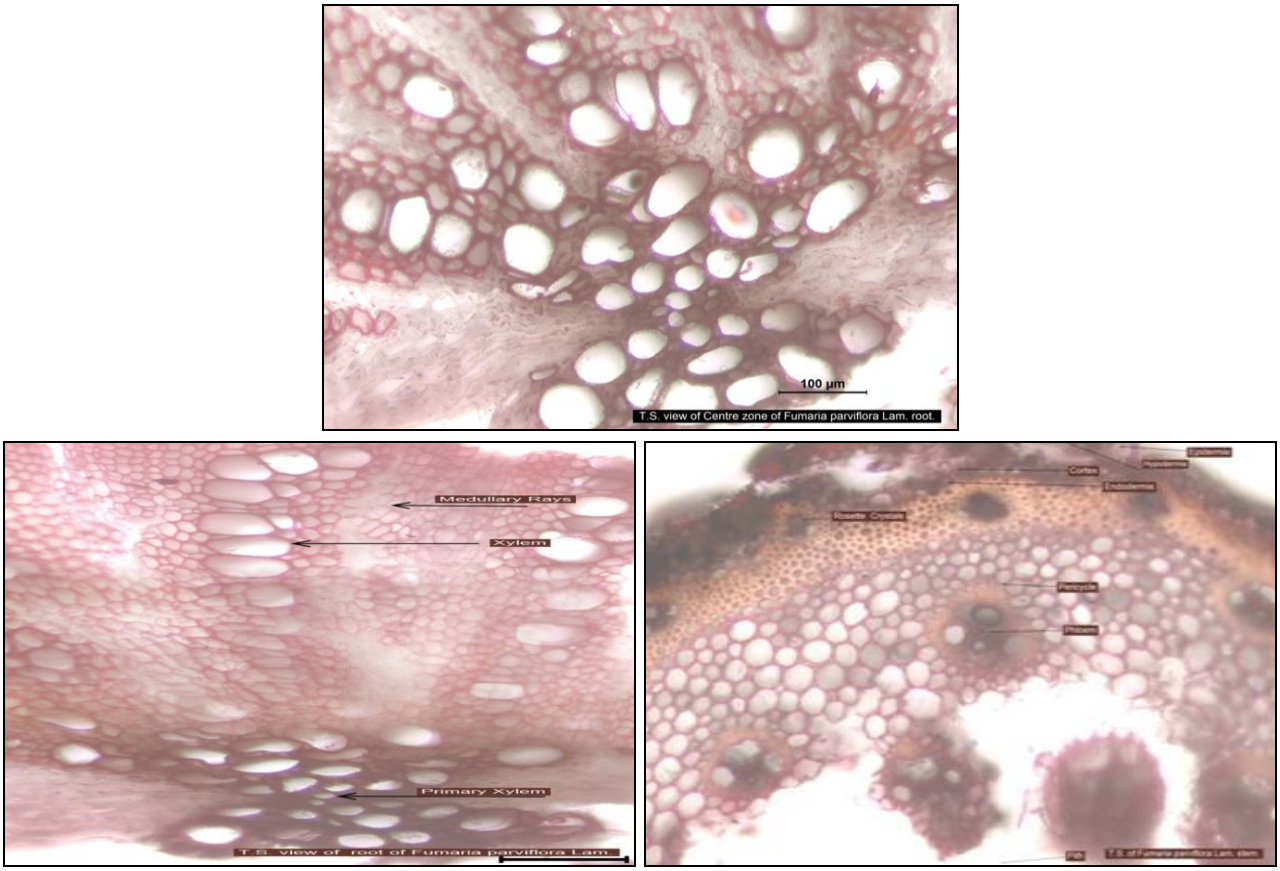

FIG. 2: T.S. VIEW OF *F. PARVIFLORA*: (A) CENTRE ZONE OF ROOT; (B) ROOT; (C) STEM

Microscopic Examination: Root - Root shows single-layered epidermis, followed by 5 or 6 layers of cortex consisting of thin-walled, rectangular, parenchymatous cells, outer 1 or 2 layers irregular and brown in colour; endodermis not distinct; secondary phloem very narrow and consisting of 2 or 3 rows with usual elements; central core shows a wide zone of xylem and consists of usual elements; vessels mostly solitary having reticulate and spiral thickening, medullary ray less developed and mostly uniseriate; fibres moderately long, thick-walled, having narrow lumen and blunt tips. Stem - Stem has a pentagonal outline, with prominent angles comprising collenchymatous cells; epidermis is single-layered & thin-walled, oblong, rectangular cells, covered with thin cuticle; cortex narrow, composed of 2 to 4 layers of chlorenchymatous cells; endodermis not distinct; vascular bundles collateral, 5 or 6 arranged in a ring; each vascular bundle capped by a group of sclerenchymatous cells; phloem consists of usual elements; xylem consists of vessels, tracheids, fibres, and xylem

parenchyma; vessels much elongated having reticulate, annular or spiral thickening or simple pits; xylem fibres narrow elongated with pointed ends having a few simple pits; center either hollow or occupied by narrow pith consisting of thin-walled parenchymatous cells.

Powder Microscopic Examination: Light greenish-brown: shows tracheids, fibres, and vessels having simple pits and spiral thickenings; starch grains, acicular fibres, a fragment of bordered pitted xylem vessel.

TABLE 1: PHYTOCHEMICAL SCREENING OF *FUMARIA PARVIFLORA* WHOLE PLANT EXTRACT

S. no.	Plant Constituents	Tests/Reagents	Results
1	Test for carbohydrate	Molish- test	+
	Test for non-reducing polysaccharides	Cobalt chloride test	-
	starch	Iodine test	-
2	Test for protein	Biurettest	-
		Millions test	+
		Xanthoprotein test	+
3	Test for Amino acid: cysteine		-
4	Test for steroid	Salkowski reaction	+
5	Test for glycosides: deoxysugar	Keller - Killiani test	-
6	Test for Coumarin Glycosides		-
7	Test for Saponin	Foam test	-
8	Test for Flavonoids	Lead acetate solution test	-
		Alkaline reagent test	+
		Shinoda test	+
9	Test for alkaloids	Mayer's test	+
		Wagner's test	+
10	Test for Tannins and	5% $Fecl_3$ sol	+
	compound	Lead acetate sol.	+
		Gelatin sol.	-
		Acetic acid sol.	-
		Dilute iodine sol.	+
		Dil. potassium permagnate sol.	-

TABLE 2: PREPARATION OF CALIBRATION CURVE OF TANNIC ACID

S. no.	Concentration µg/ml	Absorbance (760 nm)
S-1	20	0.84
S-2	40	0.915
S-3	60	1.144
S-4	80	1.267
S-5	100	1.348

Preliminary Phytochemical Screening of Plant Extract:

Estimation of Total Phenolic and Flavonoid Content:

Total Phenolic Content (TPC) Assay: The content of total phenolic compounds (TPC) was expressed as mg of Tannic Acid Equivalent/g of dry extract using the equation obtained from the calibration curve: $Y = 0.006 \times + 0.692$, $R_2 = 0.97$, where X is the Tannic Acid Equivalent (TAE) and Y is the absorbance.

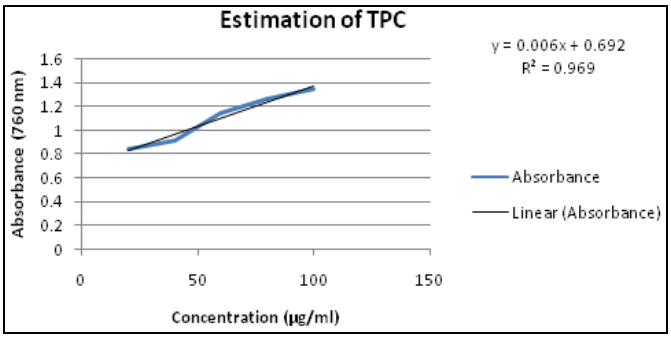

FIG. 3: GRAPH OF ESTIMATION OF TOTAL PHENOLIC CONTENT

Total Flavonoid Content (TFC) Assay: Total flavonoids content was calculated as mg of Quercetin Equivalent/g of dry extract using the equation based on the calibration curve: Y = 0.012 × + 0.697, R^2 =0.99, where × is the quercetin equivalent (QE) and Y is the absorbance

TABLE 3: PREPARATION OF CALIBRATION CURVE OF QUERCETIN

S. no.	Concentration µg/ml	Absorbance (510 nm)
S-1	20	0.9
S-2	40	1.207
S-3	60	1.477
S-4	80	1.682
S-5	100	1.883

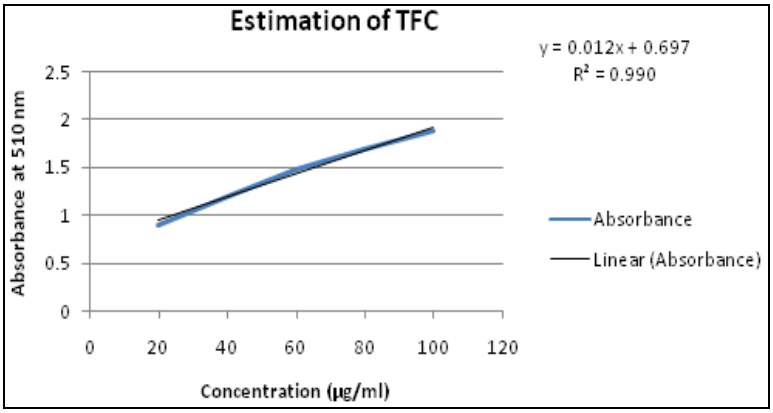

FIG. 4: GRAPH OF ESTIMATION OF TOTAL FLAVONOID CONTENT

TABLE 4: TOTAL PHENOLS & FLAVONOIDS CONTENT IN *FUMARIA PARVIFLORA* (WHOLE PLANT)

S. no.	Quantitative Analysis	*Fumaria parviflora*
1	Total Phenols	98.847 ± 28.67 (mg of TAE/g of dry extract)
2	Total Flavonoids	73.488 ± 09.60 (mg of QE /g of dry extract)

Results are expressed as Mean (of three replications) ± SE.

DISCUSSION: The pharmacognostic examination made it easy to identify the study plant by studying its morphological and microscopical characters. Preliminary phytochemical analysis of *Fumaria parviflora* revealed the presence of compounds such as alkaloids, phenols, flavonoids, carbohydrates, protein, steroids and sulphate **Table 1**. The total phenolic content and the total flavonoid content were calculated as 98.847 ± 28.67 (mg of TAE/g of dry extract) and 73.488 ± 09.60 (mg of QE/g of dry extract) respectively in the hydro-alcoholic extract of *Fumaria parviflora* **Table 4**. Several studies have been performed on various species of genus *Fumaria,* which supports the outcomes of the present study. Similar studies conducted on the phytochemical analysis of *Fumaria parviflora* revealed the presence of flavonoids, glycosides, tannins, saponins, steroids, triterpenoids, phenols, alkaloids and anthra-quinones [9, 13, 14]. *Fumaria parviflora* contained [%w/w] phenolics: 6.15 ± 0.28 and flavanoids: 3.64 ± 0.35 [15].

The preliminary qualitative phytochemical screening of different extract showed a maximum number of phytoconstituents along with alkaloids, terpenoids, steroids, flavonoids, phenols [16]. Phenols and flavonoids seemed to have the potential to act as a source of useful drugs and also to improve the health status of the consumers as a result of the presence of various compounds that are vital for good health [2, 17]. Thus, the results of the present study may be beneficial in adding much value to the medicinal efficacy of *Fumaria parviflora*.

CONCLUSION: The results of the present study indicates that the plant bears some important bioactive constituents that could serve as a source of new drug formulation and thus justifies the usage of its various parts in the traditional medicinal system as an effective home remedy. The data estimated from this study could be useful in standardizing extracts of *F. parviflora* and will be helpful in studying the pharmacological properties of the plant in the future. However, further studies

are required for screening, isolation, and purification of pharmacologically important compounds present in various parts of this plant.

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