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**Sweta Srivastava**  
Research Scholar  
Department of Pharmacognosy  
School of Pharmacy, DAVV  
Indore, India  
Email: [sweta.koka@gmail.com](mailto:sweta.koka@gmail.com)  
Tel: 9893106061

**G.P Choudhary**  
Reader  
Department of Pharmacognosy  
School of Pharmacy, DAVV  
Indore, India  
Email: [choudhary.gp@gmail.com](mailto:choudhary.gp@gmail.com)  
Tel: 09406622383

**Correspondence:**  
**Sweta Srivastava**  
Research Scholar,  
Department of Pharmacognosy,  
School of Pharmacy, DAVV, Indore,  
India  
Email: [sweta.koka@gmail.com](mailto:sweta.koka@gmail.com)  
Tel: 9893106061

## Pharmacognostic and pharmacological study of *Fumaria vaillantii* Loisel: a review.

Sweta Srivastava, G.P Choudhary

### ABSTRACT

*Fumaria vaillantii* L. syn *Fumaria indica* belongs to the family of Fumariaceae (fumitory). Its local name is 'Parpata' or 'Pitpapa' or 'Parpatakam'. It is found in India, Pakistan, Afghanistan, Central Asia, North Dakota and Colorado. *Fumaria* plants have been traditionally used against various diseases. In the present study, a review has been done on *Fumaria vaillantii* Loisel. extensively for treating a variety of ailments in various system of indigenous medicine.

**Keywords:** *Fumaria vaillantii* Loisel, Botanical Characteristic and Pharmacological activity.

### 1. Introduction

Use of medicinal plant to cure specific ailments has been invoked from ancient times. This Medico lore is passed over from generation to generation traditionally all over the world. Nature has bestowed mankind with several plants which contains natural substances which cure diseases & promote health. Such medicinal plants are also rich sources to develop secondary metabolites which are also potential in curing different ailments. In the past decades, there is increased attention and interest in use of herbal medicines globally [1].

Plants have also been used as medicines for thousands of years all over the world. WHO estimates indicate that 80% of the population, mostly in developing countries still relies on plant-based medicines for primary care WHO 1978. The different systems of medicinal usage practiced in India, Ayurveda, Siddha, Unani, Amchi and local health traditions, utilize a large number of plants for treatment of human and animal diseases. Those plants used were called as medicinal plants. India is a country with a vast reserve of natural resources and a rich history of traditional medicine. Medicinal plants contain numerous biologically active compounds which are helpful in improving the life and treatment of disease. Compounds such as carbohydrates, proteins, enzymes, fats, oils, terpenoids, flavonoids, sterols simple phenolic compounds etc. [2,3] In the last few decades, the field of herbal medicine has gotten popularized in both developed and developing countries [4]. This is because the herbal a medicines are cheap, and have natural origin with higher safety margins and lesser or no side effects [5].

### 1.1 Taxonomy

Kingdom	:	Plantae
Subkingdom	:	Tracheobionta
Superdivision	:	Spermatophyta
Division	:	Magnoliophyta
Class	:	Magnoliopsida
Subclass	:	Mangoliidae
Order	:	Paperverales
Family	:	Fumariaceae
Genus	:	<i>Fumaria</i>
Species	:	<i>F. vaillantii</i>

## 1.2 Vernacular Name

Language	Vernacular name	Language	Vernacular name
Sanskrit	Parpata/Suksmapatra	Hindi	Pitpapra
English	Fumitory	Assamese	Shahtraj
Nepalese	Kairuwa	Kashmi	Shahterah
Sinhalese	Patha padagam	Bengali	Shotara/pipapapra/bandhania
German	Erdrauch	Gujrati	Pittapapdo
Chinese	Tuysha tu chian	Marathi	Pittapapra
Unani	Shahotarah	Kannada	Parpataka/Kallu sabbasige
Arabian	Shahtraj	Tamil	Thara/Tura/Thusha
Turkish	Sahtere	Telugu	Parpatakamu

## 2. Geographical distribution

The *Fumaria* is a genus of herbs distributed in Asia, Europe and Africa. The *F. indica* plants are distributed over the greater part of India upto 2438 m in the Himalayas, Baluchistan, Afghanistan, Persia, and Mongolia [5]. According to wealth of India, Indian plant bearing the name “Shahtrah” or “Pitpapra” has been wrongly referred as *Fumaria officinalis* Linn. or *Fumaria paviflora* Lam. by many authors, which are common fumitory in Europe but not found in India [6]. The identification of *Fumaria* species is difficult due to the occurrence of inter-specific hybridization [7].

## 3. Pharmacognostic study

### 3.1 Morphological character

The seed is spherical to ellipsoid and has an apical pore and rib. The fruit is spherical to elliptic and is pointed in all studied *Fumaria* species. The seed shape in *Fumaria* species is determined by the ratio of a seed's vertical diameter to seed's horizontal diameter. Therefore, the seed shape was spherical *F. vaillantii*. Seed color is a green with red stripes. The seed surface in *F. indica* is smooth or plicate. *F. vaillantii* has a scabrate and a wrinkled fruit surface [8]. Roots of *F. vaillantii* is of cream-buff colour about 3mm thick, slender taproot with numerous rootlet and root hairs, tortuous: fracture, easy to break; taste, bitter; odour, non-characteristic [9].

### 3.2 Microscopic character

Microscopically, the lamina of the leaf has single layer epidermis on either side, consisting of thin walled, rectangular, oval shaped, parenchymatous cells; mesophyll is composed of thin walled, oval to polygonal, parenchymatous cells; vascular bundles are scattered throughout the mesophyll; anomocytic stomata are present on both the surfaces. Microscopically, the stem of *F. indica* is quadrangular to pentagonal in shape. The outer most single layered epidermis is covered with cuticle. The cortex is divided into two regions and endodermis is absent. Closed and bicollateral vascular bundles are either single or in group of two and arranged at the ridges. Each vascular bundle is capped with sclerenchyma. In root, epidermis are obliterated or crushed and cortex consists of thin walled, irregular shaped, parenchymatous cells; endodermis is not distinct; secondary phloem is well developed and consist of sieve tube, companion cell and phloem parenchyma [11].

## 4. Chemical Composition.

The major chemical constituents of *F. vaillantii* are alkaloid such as protopine, narceimine, tetrahydrocoptisine, narulimidine, methyl fumarate, naralimidine, bicuculline and fumariline [10]. The isoquinoline alkaloids adlumiceine, adlumidicine, coptisine, cryptopine, fumaricine, fumariline, fumaritine, fumarophycine, O-methylfumarophycine, parfumine, sinactine, N-methylstylophine are also present [11].

## 5. Pharmacological activity

### 5.1 Antioxidant activity

Antioxidant activity of the various extract such as chloroformic extract, ethyl acetate extract, n-butanol extract of *F. vaillantii* was determined using DPPH (1,1 diphenyl, 2 picrylhydrazyl) method. They showed the antioxidant activity probably due to the presence of phenolics and flavonoids. The ethyl acetate extract showed the highest antioxidant activity as compared to rest of the two extract it showed 83.41% of inhibition of DPPH radical at 250  $\mu$ l [12].

Another study was designed to investigate the antioxidant potential of crude methanolic extracts of some medicinally important aromatic plants in Refined bleached and deodorized (RBD) sunflower oil (SFO) at frying temperature. *Althea rosea* L (Malvaceae), *Chenopodium album* L (Chenopodiaceae), *Cichorium intybus* L (Asteraceae) and *Fumaria indica* L (Fumariaceae) were selected due to intensive use in folk medicines. Oxidative stability of SFO was determined by measuring Peroxide value (PV), Iodine value (IV), Conjugated diene (CD), Conjugated triene (CT) and P-anisidine value at frying temperature, and plant extract of *Fumaria indica* L was found to be a potent source of natural antioxidant among all plant extracts due to higher concentration of flavonoids and phenolics. The overall order of antioxidant potential of all plant extracts was *Fumaria indica* L > *Cichorium intybus* L > *Chenopodium album* L > *Althea rosea* L. [13]

### 5.2 Hepatoprotective Activity

For hepatoprotective activity 50% ethanolic water extract, and its three major fractions viz. hexane, chloroform and butanol and one major alkaloid protopine of *F. indica* were studied on D-GaIN induced liver hepatitis. And the study results indicated that *F. indica* extracts, its fraction and protopine could inhibit D-GaIN induced hepatitis by regulating various biochemical parameters such as SGPT, SGOT, ALP, BL and liver metabolites [14].

In another study methanolic extract of, *Fumaria vaillantii* was investigated against carbon tetrachloride (CCl<sub>4</sub>) induced hepatocellular injury in rat, and the result revealed that CCl<sub>4</sub> administration caused severe acute liver damage in rats, demonstrated by significant elevation of serum AST, ALT levels and classic histopathological changes. It seems that post-treatment of methanol extract of it significantly reduces the ALT, AST and ALP levels in comparison with CCl<sub>4</sub> group. Histopathological studies also provided supportive evidence for the biochemical analysis [15].

On further investigation chemoprotective efficiency of *Fumaria indica* on antioxidant status on N-Nitrosodimethylamine (NDEA) AND CCl<sub>4</sub> induced hepatocarcinogenesis in wistar rat was determined and it was found that *F. indica* exert chemoprotective

effect by reversing the oxidant –antioxidant imbalance due to hepatocarcinogenesis [16].

Mono methyl fumarate (MMF) is the active component of methanolic extract *Fumaria* sp. The effect of MMF and *F. vaillantii* on acetaminophen induced acute liver disease is that they exhibit significant hepatoprotective effect as compared to standard drug silybum marianum and silymarin [17].

### 5.3 Anti hypochlorhydric and Anti lipidperoxidative

Hypochlorhydria (pH  $\geq$ 4.0) refers to suppression of hydrochloric acid secretion by the stomach. It affects the digestion and absorption of nutrients. *Helicobacter pylori* infection is associated with hypochlorhydria and it is a common agent for the destruction of parietal cells. Thus, in the present study protective effect of pre-administration followed by co-administration of aqueous extract of whole plant of *Fumaria vaillantii* L. (AEFV) and ripe fruit of *Benincasa hispida* (AEBH)T. In ranitidine induced hypochlorhydric male albino rat and the data revealed that Pre-administration as well as co-administration of AEFV or AEBH or composite extract causes a significant decrease in gastric pH in compared to hypochlorhydric rat. The most effective response was noted in pre-administration followed by co-administration of AEBH, in comparison to composite extract. This may be due to the prevention of the gastric parietal cell degeneration or by stimulating the secretion of HCl [18].

### 5.4 Analgesic activity

The extract of *Fumaria vaillantii* was found to be better than the standard drug, as at higher doses the extract has a rapid onset of action and longer duration of action are the two factors which determine the efficacy of a drug. The extract of *Fumaria vaillantii* shows its effect in a dose dependent manner [19].

### 5.5 Antiulcer

Aqueous extract of *Fumaria vaillantii* significantly protects gastric mucosa against the depletion of gastric wall mucus. The mucus gel adhering to the gastric mucosal surface protects the underlying epithelium against acid, pepsin and necrotizing agents such as ethanol and indomethacin. Cytoprotection caused by Aq- *Fumaria vaillantii* might be due to interaction with the adhering gastric mucus layer. Thus aqueous extract of *F. vaillantii* L causes, reduction in gastric acid secretion, acidity and ulcer formation [20].

The anti-*Helicobacter pylori* and protective effect of aqueous extract of *Fumaria vaillantii* was investigated in pylorus ligation, indomethacin and toxic induced ulcer lesion. The result showed that the plant has significant inhibition of gastric damage at dose of 100, 200 and 300 mg/kg body weight in different models of ulcer induction [21].

### 5.6 Anti-inflammatory and anti-nociceptive activity

The anti-inflammatory activity of the 50% ethanolic extract of *F. indica* in different models of inflammation-acute exudative and proliferative phases of inflammation was studied. A dose of 400 mg / kg shows anti-inflammatory and anti-nociceptive effect to standard drugs. Caffeic acid is one of the phenolics present in *F. indica*, which was reported to possess anti-inflammatory activity *F. indica* has potential anti-inflammatory activity against both exudative (carrageenan and histamine induced inflammation) and proliferative (cotton pellet induced granuloma) phases of inflammation; the extract also showed anti-nociceptive activity, mediated both centrally and peripherally. *F. indica* extract

significantly raised the pain threshold [22].

### 5.7 Anticholinesterase

Whole Plant  $\text{CHCl}_3$  and Methanolic Extract of *F. vaillantii* is used treatment of Alzheimer's disease, senile dementia, ataxia, myasthenia Gravis and Parkinson's disease center around the reduction of cholinergic deficit by the use of AChE and BChE inhibitors [23].

### 5.8 Antifungal activity

Antifungal activity of the essential oil of *F. vaillantii* was assayed using the agar disc diffusion method using Mueller Hinton Agar and the measure of inhibition zones at different oil dilutions against *A. flavus* (PTCC=5004) and gentamycin was used as standard. And antifungal impacts of the *F. vaillantii* essential oil shows that the oil of this plant has an inhibitory effect in 1, 1/2, 1/4, 1/8 and 1/16 dilution with average diameter growth of 28, 22, 15, 12 and 8 mm respectively. The results of standard antibiotic gentamicin (8mg/ml) with a diameter of 19 mm had inhibitory effect. The results show that the essential oil from *Fumaria* plant at 1 and 1/2 oil dilutions exhibited strong antifungal activity than gentamycin antibiotic on *A. flavus* and thymol exhibited good inhibition at 10% dilution [24].

### 5.9 Cognitive disorder

50% ethanolic extract of *F. indica* L. *F. indica* was evaluated for putative cognitive function modulating effects. *F. indica* showed dose- dependent decrease in brain AChE activity and increase in muscarinic receptor density, and such was also the case for its observed beneficial effects on the brain antioxidative status. *F. indica* also inhibited the scopolamine- induced overexpression of the three tested cytokines observed in a rat's brain. *F. indica* possesses nootropic- like beneficial effects on cognitive functions [25].

### 5.10 Antidiabetic Activity.

An herbal mixture comprising 50 gm each of *Tylophora hirsuta* leaves *Trigonella foenum graecum* seeds and aerial parts of *Fumaria indica*. This mixture has significantly reduced blood glucose level of diabetics [26].

### 5.11 Cytotoxic

Four extract of *Fumaria indica* viz aqueous, ethanol, chloroform and n-hexane were analyzed and found that carbohydrates, starch, flavonoids, tannins, alkaloids, anthraquinones and saponin were present in all the extracts .For cytotoxic effect the result was all the extracts with a sequence of n-hexane> chloroform> ethanol [27].

### 5.12 Anticolic

Anticolic study was conducted on infants investigation states that's treatment with *Fumaria* extract, the frequency, length of crying and the occurrence of waking up due to colic pain were decreased in the study group, while they either remained unchanged or increased in the control group and there was a statistically significant difference between them [28].

### 5.13 Jaundice

Infusion of aerial parts of *Fumaria vaillantii* is used in the treatment of jaundice [29].

## 6. Conclusion

The use of herbal medicines is widespread among the patients in treating varieties of diseases. The review on

*Fumaria vaillantii* Loisel highlights the importance of its different pharmacological activities.

## 7. References

- Sawant R, Sandeep V, Binorkar, Bhojar M, Gangasagre NS. Phyto-constituents Bio-efficacy and Phytopharmacological activities of Terminalia chebula- A Review. *Int J Ayu Alt Med* 2013; 1(1):1-11.
- Harish KH, Pandith A, Shruthi. A review on; *Murraya koenigii*: multipotential medicinal plant. *Asian J Pharm Clin Res* 2012; 5(supple4):5-14.
- Nayak S. Influence of Ethanol Extract of *Vinca rosea* on Wound Healing in Diabetic Rats. *Online Journal of Biological Sciences* 2006; 6(2):51-55.
- Naik GH, Priyadarsini KI, Naik DB, Gangabhairathi R, Mohan H. Studies on the aqueous extract of *Terminalia chebula* as a potent antioxidant and a probable radioprotector. *Phytomedicine* 2004; 11:530-538.
- Ayyanara M, Ignacimuthu S. Ethnobotanical survey of medicinal plants commonly used by Kani tribals in Tirunelveli hills of Western Ghats in India. *J Ethnopharmacol* 2011; 134:851-64.
- Kirtikar KR, Basu BD. *Indian Medicinal Plants*. 3rd vol. In: Lalit Mohan Basu, Allahabad 1985; 138.
- Anonymous. *The Wealth of India: Raw Materials*. Vol 4, New Delhi: Publication and Information Directorate, Council of Scientific and Industrial Research, 1956, 68.
- Fatemeh EA, Maryam K, Masoud S. Parinaz ghadam Fruit and seed morphology of the *Fumaria L.* species (Papaveraceae) of Iran. *Turk J Bot* 2011; 35:167-173.
- Keshavarzi I M, Habibi FT, Ebrahimzadeh I, Masoud S. Comparative anatomy of the *Fumaria* (Papaveraceae) species in Iran. *Phytologia Balcanica* 2011; 17(1):79-87.
- Anagha AR, Anuradha S, Upadhaye. Botanical and phytochemical standardization of *Fumaria vaillantii* Loisel. *Indian J natural products and resources* 2011; 2(3):369-374.
- Gupta PC, Sharma N, Rao CV. A review on ethnobotany, phytochemistry and pharmacology of *Fumaria indica* (Fumitory). *Asian Pac J Trop Biomed* 2012; 2(8):665-669.
- Ivan GI, Radka ZV, Andrey SM, Nadezhda TP, Ina YA, Panteley PD *et al.* Antioxidant activities and phenolic compounds in Bulgarian *Fumaria* species. *Int J Curr Microbiol App Sci* 2014; 3(2):296-306.
- Raza SA, Rashid A, William J, Razaq A. Evaluation of oxidative stability of sunflower oil at frying temperature in presence of butylated hydroxytoluene and methanolic extracts of medicinally important plants of Pakistan. *International Food Research Journal* 2014; 21(1):331-334.
- Rathi A, Srivastava A, Shirwaikar A, Rawat A. Hepatoprotective potential of *Fumaria indica* Pugsley whole plant extracts, fractions and an isolated alkaloid protopine *Phytomedicine*. *International Journal of Phytotherapy & Phytopharmacology*, 2008.
- Sayed RM, Nassiri-Asl M, Farahani-Nick Z, Savad S, Seyed KF. Protective effects of *Fumaria vaillantii* extract on carbon tetrachloride induced Hepatotoxicity in rats; *Pharmacologyonline* 2007; 3:385-393.
- Hussain T, Hefazat HS, Sheeba F, Sweety K, Vijayakumar M, Rao CV. Chemopreventive effect of *Fumaria indica* that modulates the oxidant antioxidant imbalance during N-nitrosodiethylamine and CCl<sub>4</sub>- induced hepatocarcinogenesis in Wistar rats; *Asian Pacific Journal of Tropical Biomedicine* 2012; S995-S1001.
- Ezzat M, Kian A, Bagher M, Seyedeh ZOS. Protective activity of *Fumaria vaillantii* Loisel and mono methyl fumarate on acetoaminophen induced hepatotoxicity in mice. *Int J Pharmacology* 2012; 8(3):177-184.
- Mandal U, Nandi D, Chatterjee K, Biswas A, Ghosh. Remedial effect of aqueous extract of whole plant of *Fumaria vaillantii* Loisel and ripe fruit of *Benincasa hispida* Thunb in ranitidine induced-hypochlorhydric male rat. *International Journal of Applied Research in Natural Products* 2010; 3(1):37-47.
- Ahmad SR. Screening of some Turkish medicinal plants for their analgesic activity. *Pakistan Journal of Pharmaceutical Sciences* 1993; 6(2):29-36.
- Rifat-uz-Zaman, Attiq-ur-Rehman. Anti-helicobacter pylori and protective effects of aqueous *Fumaria vaillantii* L extract in pylorus-ligated, indomethacin- and toxic-induced ulcers in rats. *African Journal of Pharmacy and Pharmacology* 2010; 4(5):256-262.
- Agrawal KK, Singh K, Verma A, Singh K. A review on ulcer healing plants *Novel Science International Journal of Pharmaceutical Science* 2012; 1(8):515-528.
- Chandana VR, Arti RV, Gupta PK, Vijayakumar M. Anti-inflammatory and anti-nociceptive activities of *Fumaria indica* whole plant extract in experimental animals *Acta Pharm* 2007; 57:491-498.
- Adewusi EA, Moodley N, Steenkamp V. Medicinal plants with cholinesterase inhibitory activity: A Review. *African Journal of Biotechnology* 2010; 9(49):8257-8276.
- Moghtader M. *In vitro* antifungal effects of *Fumaria vaillantii* Loisel. essential oil on *Aspergillus flavus*. *Journal of Yeast and Fungal Research* 2013; 4(2):21-25.
- Singh GK, Rai G, Chatterjee SS, Kumar V. Effects of ethanolic extract of *Fumaria indica* L. on rat cognitive dysfunctions, *AYU*, 34(4):421-430.
- Ahmad M, Khan MA, Arshad M, Zafar M. Ethnophytotherapeutic approaches for the treatment of diabetes by the local inhabitants of district attock (Pakistan).
- Shambaleed H, Muhammad I, Barkatullah, Imtiaz A. Comparison of three extracts of *Fumaria indica* for the evaluation of cytotoxic and phytotoxic activities. *International Journal of Biosciences* 2012; 2(12):112-119.
- Sedigheh M, Shahnaz P, Hashem M. Effects of *Fumaria* Extract on Colic Pain in 3-16 Weeks Infants, *Iranian Journal of Neonatology* 2013; 4:10-1.
- Mashhad, Mohammad SA, Mohammad RJ, Mohammad E, Taghavizadeh Y. Ethno-Medicinal Plants Used to Cure Jaundice by Traditional Healers of Iranian *Journal of Pharmaceutical Research* 2014; 13(1):157-162.