

Phytochemical Evaluation of Various Solvent Extracts of the Leaves, Fruits and Shoots of *Ferula Jaeschkeana* Vatke

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Abstract

The genus *Ferula* possess strong aromatic smell due to the presence of essential oil or oleoresin and is well-known in folk medicine for the treatment of various disorders. The present study aimed to investigate the presence of phytochemicals in various solvent extracts of leaves, fruits and shoots of *Ferula jaeschkeana* Vatke. This study investigates the effects of ethanol, methanol, chloroform, petroleum ether and aqueous extracts of leaves, fruits and shoots. Phytochemical screening revealed the presence of various phytochemical constituents in the extracts of leaves, fruits and shoots. Phytochemical analysis of extracts of leaves confirmed the presence of flavonoids, alkaloids, terpenoids, saponins, phenolic compounds, proteins, anthraquinone glycosides, phytosterols, tannins, steroids, coumarins, quinones, carbohydrates, resins, triterpenoids and xanthoproteins, while it gave the negative results for cardiac glycosides, amino acids, phlobotannins and oxalates. Phytochemical analysis of extracts of fruits revealed the presence of all phytochemicals except anthraquinone glycosides, phlobotannins and xanthoproteins. Phytochemical analysis of extracts of shoots confirmed the presence of all phytochemicals except phlobotannins and oxalates. The presence of a several phytochemicals in *Ferula jaeschkeana* Vatke may serve as a possible source for the development of plant based novel drugs.

Keywords: *Ferula jaeschkeana*; Fruits; Leaves; Phytochemical evaluation; Shoots

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Introduction

Plant kingdom is a treasure house of potential drugs most of which are easily available, cheap, safe, efficient and have less side effects. According to World Health Organization medicinal plants are the finest source to obtain variety of drugs [1]. In last five decades, plants have been extensively studied by advanced scientific techniques and various medicinal properties viz., anticancer, antibacterial, antioxidant, antifungal, antidiabetic, hepatoprotective, haemolytic, larvicidal and anti-inflammatory activities [2,3] have been reported. There is a diverse array of phytochemicals present in the plants but the most important are alkaloids, flavonoid, tannin and phenolic compounds [4]. Knowledge of the chemical constituents of plants is useful not only for the discovery of therapeutic agents, but also because such information would be of value in disclosing new resources of such chemical substances [5].

Ferula jaeschkeana Vatke (Apiaceae) is found in Iran [6], Afghanistan, Western Pakistan [7], Western Himalaya in India [8-10] and Central Asia [11]. *Ferula jaeschkeana* Vatke is mostly found in the sloppy regions of Kashmir Himalaya and is used in folk medicine for curing various ailments like chest pain, gastric problems, treatment of tumors, chronic wounds and ulcers [12-14]. So far no systematic research on comparative studies has been reported on the presence of phytochemicals in *Ferula jaeschkeana*. In this study, we describe the presence of phytochemicals in various solvent extracts of leaves, fruits and shoots of *Ferula jaeschkeana* Vatke.

Materials and Methods

For phytochemical evaluation of leaves, fruits and shoots, the plant material was collected from Betab Valley, Pahalgam (Altitude=2400 masl), during the month of June-2013. The plants were identified at the Department of Botany, University

of Kashmir, Srinagar. The plant material of the selected species was washed with water to remove any associated debris, shade dried and chopped into small pieces. The dried plant material was taken and ground using an electric blender to obtain a fine powder. The powder was further passed through a sieve to obtain finer particles. For extraction of phytochemicals, 50 g of powdered material was kept in closed conical flask with 150 mL of various solvents like methanol, ethanol, chloroform, petroleum ether and distilled water at room temperature for 48 hours. After incubation, the extracts were filtered using Whatman No. 1 filter paper. The extracts were collected and stored in airtight bottles in the refrigerator at 4°C. The extracts were then subjected to phytochemical evaluation as per the methods given by Harborne, Kokate [15,16].

Results

The presence of various phytochemical constituents in various solvent extracts of the leaves, fruits and shoots of *Ferula jaeschkeana* Vatke is reported in Tables 1-3 respectively. A total of 5 different types of extracts were prepared to test the availability of 20 biochemical compounds (5 × 20=100). In case of leaves, 32 gave positive results and the remaining 68 gave negative results while as in case of fruits 50 gave positive results and the remaining 50 gave negative results. In case of shoots, 53 gave positive results and the remaining 47 gave negative results. Phytochemical evaluation of the present study revealed the presence of flavonoids, alkaloids, terpenoids, saponins, phenolic compounds, proteins, anthraquinone glycosides, phytosterols, tannins, steroids, coumarins, quinones, carbohydrates, resins, triterpenoids and xanthoproteins, while it gave the negative results for cardiac glycosides, amino acids, phlobotannins and

oxalates in the leaves of this species. Similarly, in case of fruits, phytochemical evaluation revealed the presence of flavonoids, alkaloids, terpenoids, saponins, cardiac glycosides, phenolic compounds, proteins, amino acids, phytosterols, tannins, steroids, coumarins, quinones, carbohydrates, resins and triterpenoids, while it gave the negative results for anthraquinone glycosides, phlobotannins and xanthoproteins. Phytochemical analysis of extracts of shoots confirmed the presence of all phytochemicals except phlobotannins and oxalates.

In case of leaves, chloroform extract shows the presence of 12 compounds followed by ethanolic (9), aqueous (6), methanolic (3) and petroleum ether (2) while as in case of fruits, ethanolic extract shows the presence of 12 compounds followed by methanolic and chloroform (11 each), aqueous (10) and petroleum ether (6). In case of shoots, ethanolic extract shows the presence of 15 compounds followed by aqueous and chloroform (11 each), methanolic (9) and petroleum ether (7). In the present study, the presence of saponins is evident in all the extracts of leaves and also the terpenoids in the fruits.

Discussion

Our study shows the presence of several phytochemicals in the leaves, fruits and shoots of this medicinal plant species. Plants contain lot of phytochemicals like alkaloids, tannins, flavonoids, amino acids, saponins, terpenes, fatty acids, glycosides and sterols that have disease preventive properties [17,18]. It is already reported that steroids, triterpenoids and saponins have the analgesic properties and central nervous system activities [19,20]. Reports show that saponins possess hypocholesterolemic, anti-inflammatory, antidiabetic properties, hemolytic and foaming activity, antifungal, fungistatic and molluscidal activity [21]. The

Table 1 Phytochemical evaluation of the leaves of *Ferula jaeschkeana*.

| Phytoconstituents | Aqueous | Methanolic | Ethanolic | Chloroform | Petroleum ether |
|---|---------|------------|-----------|------------|-----------------|
| Flavonoids | + | - | + | + | - |
| Alkaloids | - | - | - | + | - |
| Terpenoids | - | - | - | + | - |
| Cardiac Glycosides | - | - | - | - | - |
| Saponins | + | + | + | + | + |
| Phenolics | + | + | + | - | - |
| Proteins | - | - | - | + | - |
| Amino acids | - | - | - | - | - |
| Anthraquinone glycosides | - | - | - | + | - |
| Phytosterols | - | - | + | + | - |
| Tannins | + | + | + | - | + |
| Steroids | - | - | + | + | - |
| Phlobotannins | - | - | - | - | - |
| Coumarin | + | - | + | + | - |
| Quinone | - | - | - | + | - |
| Carbohydrates | - | - | + | - | - |
| Resins | - | - | - | + | - |
| Triterpenoids | - | - | + | + | - |
| Xanthoproteins | + | - | - | - | - |
| Oxalates | - | - | - | - | - |
| Number of chemical compound in each extract | 6 | 3 | 9 | 12 | 2 |

Key: (+): Present (-): Absent.

Table 2 Phytochemical evaluation of the fruits of *Ferula jaeschkeana*.

| Phytoconstituents | Aqueous | Methanolic | Ethanolic | Chloroform | Petroleum ether |
|---|---------|------------|-----------|------------|-----------------|
| Flavonoids | + | + | + | + | - |
| Alkaloids | - | + | + | + | + |
| Terpenoids | + | + | + | + | + |
| Cardiac Glycosides | - | + | + | + | + |
| Saponins | + | - | + | + | + |
| Phenolics | + | + | + | - | - |
| Proteins | + | - | + | - | - |
| Amino acids | + | + | - | - | - |
| Anthraquinone glycosides | - | - | - | - | - |
| Phytosterols | + | - | + | + | - |
| Tannins | + | + | + | - | - |
| Steroids | - | + | - | + | - |
| Phlobotannins | - | - | - | - | - |
| Coumarin | + | + | + | - | - |
| Quinone | + | + | - | - | - |
| Carbohydrates | - | - | + | + | - |
| Resins | - | - | - | + | + |
| Triterpenoids | - | + | + | + | + |
| Xanthoproteins | - | - | - | - | - |
| Oxalates | - | - | - | + | - |
| Number of chemical compound in each extract | 10 | 11 | 12 | 11 | 6 |

Key: (+): Present (-): Absent.

Table 3 Phytochemical evaluation of the shoots of *Ferula jaeschkeana*.

| Phytoconstituents | Aqueous | Methanolic | Ethanolic | Chloroform | Petroleum ether |
|---|---------|------------|-----------|------------|-----------------|
| Flavonoids | + | + | + | - | - |
| Alkaloids | - | + | + | + | + |
| Terpenoids | + | - | + | + | + |
| Cardiac Glycosides | - | + | + | + | + |
| Saponins | + | - | + | + | - |
| Phenolics | + | + | + | - | - |
| Proteins | + | - | + | - | - |
| Amino acids | + | + | - | - | - |
| Anthraquinone glycosides | - | - | - | + | - |
| Phytosterols | + | - | + | + | + |
| Tannins | + | + | + | + | - |
| Steroids | + | - | + | + | + |
| Phlobotannins | - | - | - | - | - |
| Coumarin | - | + | + | - | - |
| Quinone | - | + | + | + | - |
| Carbohydrates | - | - | - | - | + |
| Resins | - | - | + | + | - |
| Triterpenoids | + | - | + | + | + |
| Xanthoproteins | + | + | + | - | - |
| Oxalates | - | - | - | - | - |
| Number of chemical compound in each extract | 11 | 9 | 15 | 11 | 7 |

Key: (+): Present (-): Absent.

latex of this medicinal plant is used to cure gastric problems and relieve toothache. The powder prepared from the dried parts is used to cure chest pain. Terpenoids also are reported to have antibacterial properties [22]. The resin of this medicinal plant is used in folk medicine for the treatment of wounds and gastric

ulcers. It is well known that tannins are used in healing wounds and inflamed mucous membranes [23]. Terpenoids also play an active role in wound healing, strengthen the skin, increase the concentration of antioxidants in wounds and restore inflamed tissues by increasing blood supply [24].

The resin of this medicinal plant is also used in folk medicine for the treatment of tumors. It is also reported that coumarins also have effective antitumor, anti-fungicidal, and anti-hemorrhagic activities [25]. Flavonoids and phenols in plants are likely to be accountable for pharmacological and biochemical actions including anti-carcinogenic, anti-inflammatory, hepatoprotective, antioxidant, anti-viral, free radical scavenging abilities etc. [26]. The alkaloids are used as anesthetic agents Kumbhar and Godghate [27].

Conclusions

This study of the phytochemical analysis revealed that these phytochemicals are mainly present in the chloroform and ethanolic extract as compared to others as shown in Tables 1-3. The medicinal properties of these extracts may be due to the

presence of these phytochemicals. The investigation carried out by us conveys the medicinal properties of this plant species. It shows that the plant is likely to act as an antimicrobial agent. The quantitative analysis of these phytochemicals will be an interesting area for further study. Our work can prove beneficial and serve as scientific background for the development of variety of drugs.

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Conflict of Interest

We declare that we have no conflict of interest.

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