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Phytoconstituents of *Filipendula vulgaris* Moench and Their Biological uses: A Review

M. Sharaf[1]*, E.R. Kotb[2]

[1]*Phytochemistry and Plant Systematics, National Research Centre, Dokki, Cairo, Egypt*

[2] *Photochemistry Departments, National Research Centre, Dokki, Cairo, Egypt*

Abstract

Filipendula vulgaris Moench is an important source of different secondary metabolites of beneficial activities on human health. Phytochemical studies showed the presence of many bioactive compounds such as rutin, quercetin, kaempferol, apigenin and phenolic acids. The biological studies of the plant showed antimicrobial, antioxidant and anti-inflammatory. Also, the entire plant oreven its parts (aerial parts, flowers, leaves, roots) were used to treat breathlessness, sore throats, congestion, diarrhea, and rheumatism. The present review summarizes information concerning the biological activities of some compounds isolated from F. vulgaris in addition to their chemical structures.

Keywords: Filipendula vulgaris, Rosaceae, medicinal plant, isolated compounds, biological activities.

1. Introduction

Medicinal plants have a long history as a source of potential therapeutic agents. The *Filipendula* species have been used in folk medicine [1]. The use of the species was reported from Europe in countries such as Poland, Romania, Russia and Serbia [2-5]. *Filipendula vulgaris* Moench, commonly known as dropwort or fern-leaf dropwort, is a perennial herb of the family Rosaceae. It is found in dry pastures across much of Europe and central and northern Asia mostly on lime. It is a medicinal plant and reported to have antibacterial, anti-inflammatory, antipyretic, antihyperalgesic, and antioxidant properties, as well as nootropic activity. Also, antirheumatic and anti-ulcer properties were reported.

Diuretic, anti-inflammatory, and astringent properties are ascribed to the whole plant [6]. While the flowers of *F. vulgaris* has been traditionally used to treat rheumatism, gout and fever [7]. The pharmacological properties of the different parts of the plant are tabulated in Table 1.

Table 1: Pharmacological properties of *F. vulgaris*

Part of the plant	Pharmacological activities	Ref.
Whole plant	Antioxidant, nootropic.	(8, 9)
Flowers	Gastroprotective, antihyperalgesic, colds, rheumatism, diuretic, Anti-inflammatory, antipyretic, diaphoretic.	(10,11, 12)
Aerial part	Anti-inflammatory	(2)
Roots	Antioxidant, sore throats, anti-inflammatory, kidney diseases, diarrhea	(2, 12)
Leaf	Antimicrobial, antioxidant, eye-inflammation	(13, 14)

Biological activity:

As there is insignificant scientific evidence regarding acute, subacute, and chronic toxicity owing to the usage of *F. vulgaris*, it is considered a very imperative and safe herbal medicine. Also, it is used as a potential source of inhibitory bioactive compounds used in the traditional medicine such as antifungal, anti-inflammatory, antidiabetic, and anticarcinogenic. The different parts of the plant include a wide variety of active secondary metabolites endowed with several documented

*Corresponding author e-mail: sharafali1589@gmail.com.; (Mahmed sharaf).
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biological activities used in traditional medicine (Table 1). Many chemical constituents were isolated from *F. vulgaris*, some of them showed a wide variety of biological activities. The biologically active compounds present are mainly phenolics; flavonoids, phenolic acids, salicylates, tannins, and traces of coumarins. Flavonids were characterized as rutoside, hyperoside, luteolin, spireoside, astragalin, kaempferol, quercetin, quercitrin, avicularin, myricetin. Some catechin derivatives; namely: (+)-catechin, (−)-epigallocatechin, as well as phenolic acids; gallic, ellagic, syringic, salicylic, chlorogenic, caffeic acids have been identified in dropwort leaves and flowers. The essential oils from the plant were also reported [4, 8, 15-17]. Searching the available sources, and to the best of our knowledge, a summary of the compounds naturally isolated from *F. vulgaris* and their biological activities are presented in Table 2.

Table 2: Biological activities of the chemical constituents isolated from *F. vulgaris* Moench

No	Compds.	Plant part	Biological activity	Ref.
	Flavonoids			
1	Kaempferol	L,F	Expectorant, anticancer, antispasmodic, antiviral, antihepatotoxic, antioxidant, antiallergic, antibacterial, antihistaminic, antiaggregant	(18, 19, 20)
2	Quercetin	L, F, R	Antioxidant, antiviral, antibacterial, antiflu antiinflammatory, antiallergic anticancer, antihistaminic, antipharyngitic, anticapillary-fragility, antiaggregant, antithrombic, antiatherosclerotic, antispasmodic	(21-24)
3	Apigenin	L	Anti-inflammatory, antioxidant, antiviral, anti-HIV, anticancer, diuretic antibacterial, sedative, antiestrogenic, antispasmodic, antidermatitic, antimetastatic, antileukemic, antimutagenic	(25, 26)
4	Luteolin	L	Antioxidant, anti-inflammatory, antimicrobial, anticancer, antidiabetic	(27)
5	Hyperoside (quecetin 3-*O*-galactoside)	L, F, R	Antioxidant, anti-inflammatory, antidiapetic, antithrombotic, hepatoprotective	(28)
6	Astragalin (kaempferol 3-*O*-glucoside)	F	Anti-inflammatory, antioxidant, antiulcer, neuroprotective, cardioprotective, antiobesity, antiosteoporotic, anticancer, antiulcer, antidiabetic	(26, 29)
7	Spiraeoside (quercetin 4'-*O*-glucoside	F, L, R	Antitumor, antimicrobial, anti-inflammatory, antioxidant	(26, 30, 31)
8	Luteolin 7-*O*-glucoside	L, R	Antimicrobial, anti-inflammatory	(32, 33)
9	Quercetrin (quercetin 3-*O*-rhamnoside)	F, L, R	Antimicrobial, antioxidant, anticancer	(34,35)
10	Myricetin	F, L	Anticancer, antiviral, antioxidant, antiseptic, anti-inflammatory, antidiapetic, diuretic	(26, 36, 37)
11	Taxifolin (dihydroquercetin)	L, F	Antioxidant, anti-inflammatory	(38,39)
12	Isoquercetrin (quercetin 3-*O*-glucoside)	L, F	Anti-allergic, antioxidant, anticancer, cardiovascular disorders, antidiapetic	(40)
13	Rutin (quercetin 3-*O*-rutinoside)	L	Antiviral, antiinflammatory, anticapillary-fragility, antiflu, antiherpetic, antiradicular, antihepatotoxicm, antispasmodic	24, 26, 41
14	Astragalin 2″-*O*-gallate	F	Anti-inflammatory	42
15	Avicularin (quercetin 3-*O*-arabioside)	F, L	Diuretic, antiseptic, anti-inflammatory, anti-rheumatoid, arthritis	26, 43
16	Miquelianin (quercetin 3-*O*-glucuronide)	L	Antidiabetic, antioxidant, anti-HIV	44, 45
17	(+)-Catechin	F, L	Antioxidant, antiaggregant, anticancer,antiulcer anti-HIV, anti-inflammatory, antimutagenic	(26, 46)
18	(-)-Epicatechin	F, L	Antibacterial, antiviral, antidiabetic, anti-inflammatory, antioxidant, anticancer	(26, 47)

	Tannins			
19	Rugosin D	F, L	Antiviral, antimicrobial, antitumor	(26, 48, 49)
20	Tellimagrandin I	F, L	Antiviral, antifungal	(26, 50)
	Phenolic acids			
21	Gentisic acid	F, L	Analgesic, anti-inflammatory, analgesic, antigenotoxic , antirheumatic, antibacterial, antioxidant, antiviral	(26, 51)
22	Vanillic acid	F, L	Antibacterial, antioxidant, anti-inflammaotry, cytotoxic, antiproliferative, antiradicular. anticancer, neuroprotective	(26, 52)
23	Gallic acid	F, L, R	Antiviral, antioxidant, analgesic, antibacterial, antiflu antiseptic, anti-HIV, anticarcinomic	(26, 53)
24	p-Coumaric acid	L, F	Antihepatotoxic, antioxidant, fungicide, antibacterial, antispasmodic, anticancer	(26, 54)
25	Caffeic acid	L. F	Antioxidant, anti-inflammatory, analgesic, anticarcinogenic, antibacterial, antiflu, antiviral, antiseptic, antiedemic	(26, 55, 56)
26	Ellagic acid	L, F, R	Antibacterial, antioxidant, antiviral, antiseptic	(26, 57)
27	Ferulic acid	L, F, R	Anti-inflammatory, anticariogenic	(26, 58)
28	Salicylic acid	L, F	Antioxidant, analgesic, antibacterial, antitumor, anti-inflammatory, anticancer, antipyretic	(26)
	Triterpene acids			
29	Ursolic acid	L	Analgesic, anti-inflammatory, antihistaminic, antioxidant, antiviral, antihistaminic, antiedemic	(26, 59)
30	Oleanolic acid	L	Anti-HIV, anticancer, antioxidant, antiviral, antitumor, antiseptic, anti-inflammatory, antibacterial	(26, 60)
	Coumarins			
31	Umbelliferone	L	Anti-inflammatory, antiprostaglandin, antibacterial, antispasmodic, anticancer, antimetastatic, antihistaminic	(26, 61)
32	Esculetin	L	Anti-inflammatory, antibacterial, antipyretic, anticancer	(26, 62)
33	Fraxetin	L	Antioxidant, antibacterial	(63, 64)
	Essential oils			
34	Hexanol	L	Antiseptic	(26)
35	Benzaldehyde	L	Sedative, antibacterial, antiseptic, anticancer, antispasmodic, antitumor	(26)
36	Linalool	L	Antiviral, antiseptic, fungicide, antimicrobial, antispasmodic, anticancer, antiallergic	(26, 65)
37	Methyl salicylate	L	Anticancer, anti-inflammatory, analgesic, antipyretic, antiseptic	(26, 66)
38	Neroal	L	Antibacterial, antiseptic	(26)
39	B-Ionone	L	Antibacterial, fungicide anti-inflammatory, anticancer, antileishmanial	(26, 67)
40	α-Asarone	L	Antipyritic, antispasmodic, anticonvulsanta antielleptic, anticancer	(26, 68)

L=leaves; F=flowers; R= roots

CONCLUSIONS

The different health promotion activities of *F. vulgaris* makes it a good candidate for discovering a new series of naturally originated drugs. *F. vulgaris* has a wide range of applications in traditional medicine. Recently, the pharmacology and chemistry of this plant have been extensively studied. Chemical studies of the different parts of *F. vulgaris* have shown the presence of many beneficial compounds. Biological studies have revealed significant antidiabetic, antimicrobial, antioxidative, anti-inflammatory, immunomodulatory, and antiviral activities, providing support to traditional medicinal uses. Nevertheless, despite its importance and variable pharmacological studies available, future experimental and clinical trials are necessary to confirm the use of this species in medical practice.

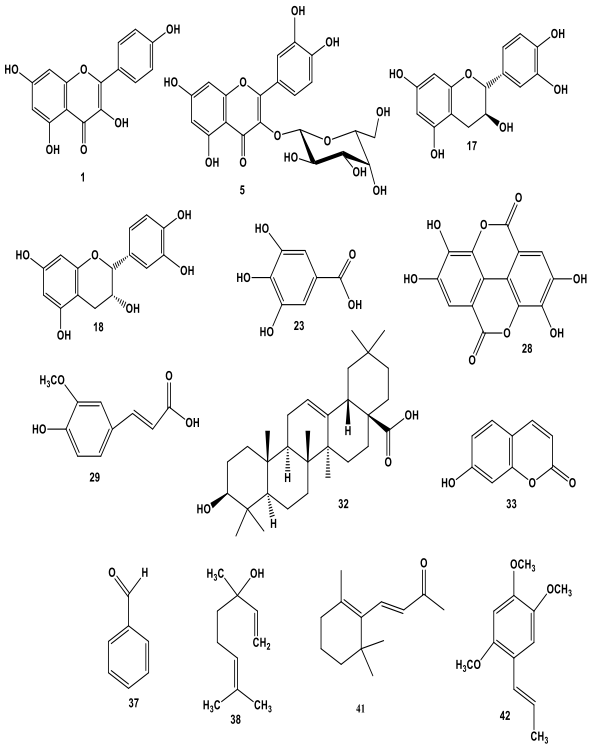

Fig.1: Structures of some isolated compounds from F. vulgaris

Conflict of interest:

The authors declare that there is no conflict of interest.

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