Table S1 Bioactive compounds found in members of Apiaceae subtribe Ferulinae in Iran. Those components with high percentage have shown in bold.

Taxon	Plant part	Bioactive compounds (content %)	Major components	biological activity
***Leutea* Pimenov**				
L. avicennae Mozaff.	Aerial parts	quercetin, astragalin, caffeic acid, p-coumaric acid, salicylic acid, from Hamadan [1]	Phenolic compounds [1] flavonoid	antioxidant, anti- acetylcholinesterase inhibitory [1]
L. cupularis (Boiss.) Pimenov	Flower	**DL-limonene** (25.04%), d-2-carene (15.81%), sabinene (7.96%), β-phellandrene (6.89%), α-terpinolene (5.61%), δ-3-carene (5.21%), γ-terpinene (2.19%), from Yasuj [2]	**Monoterpene hydrocarbons** (81%), oxygenated monoterpenes (17%), sesquiterpene hydrocarbons (0.31 %) [2]	antibacterial [2]
	Leaf	**β-pinene** (13.87%), β-ocimene (9.05%), bornyl angelate (6.55%), allo-ocimene (6.06%), *trans*-isolimonene (5.78%), dihydro-linalool acetate (5.02%), β-phellandrene (4.18%), *p*-mentha-1,5,8-triene (4.05%), α-terpinyl isobutyrate (3.7%), terpin-4-ol (3.45%), *cis*-dihydro-α-terpinyl acetate (3.11%), δ-2-carene (2.9%), camphene (2.69%), neo-allo-ocimene (2.68%), citronellyl *n*-butyrate (2.63%), decane (2.37%), α-phellandrene (2.36%), from Yasuj [2]	Monoterpene hydrocarbons (55%), oxygenated monoterpenes (29%), oxygenated sesquiterpene (0.68 %), sesquiterpene hydrocarbons (4%), non-terpenoid components (4.8%) [2]	antibacterial [2]
	Stem	**α-terpinyl isobutyrate** (8.69%), δ-3-carene (8.38%), bornyl angelate (7.45%), *trans*-sabinol (6.87%), sothol (5.96%), *p*-cymen-9-ol (5.53%), terpinyl acetate (5.19%), linalool isobutyrate (3.41%), camphor (3.03%), β-bourbonene (2.7%), *p*-menth-1-en-9-ol acetate (2.65%), citronellyl butyrate (2.57%), myrcenone (2.39%), *trans*-sabinyl acetate (2.19%), and iso-verbanol acetate (2.18%), from Yasuj [2]	Monoterpene hydrocarbons (8.38%), **oxygenated monoterpenes** (63.7%), oxygenated sesquiterpene (3%), sesquiterpene hydrocarbons (18.7 %) [2]	antibacterial [2]
L. elbursensis Mozaff.	Aerial parts	α-pinene (37%), β-pinene (36%), limonene (4.8%), from Karaj, Tehran [3]	Monoterpene hydrocarbons (86%), sesquiterpenes (0.2%) [3]	—
		α-pinene (33.18–43.22%) and β-pinene (32.4–	—	

	Fruit	40.9%), myrtenol (5.6%), trans-verbenol (5.6%), isobornyl acetat (4.95%), from Tehran [5]		—
L. glaucopruinosa (Rech.f.) Akhani & Salimian`	Aerial parts	α-pinene (31.5%), sabinene (9.7%), β-pinene (9.2%), exo-fenchyl acetate (4.5%), - (-) bornyl acetate (3.6%), limonene (2.6 %), epi-ligulyloxide (2.6 %), (Z)-verbenol (2.5%), myrtenal (2.3%), from Golestan [4]	Monoterpene hydrocarbons (55.7%), oxygenated monoterpenes (18.7%), sesquiterpene hydrocarbons (7%), oxygenated sesquiterpenes (5%) [4]	—
L. kurdistanica Mozaff.	Aerial parts	α-asarone (50-62.5%), elemicin (16-22.5%), α-phellandrene (1-6 %), α-pinene (1.6-5 %), from Kurdistan [6]	Phenylpropanoids (68-86%), monoterpene hydrocarbons (10-28.5%), oxygenated sesquiterpenes (1-2.7%) [6]	—
	Aerial parts	limonene (25%), γ–terpinene (18%), elemicin (15%), Δ-3-carene (8%), α-pinene (7%), myristicin (4.8%), from Kurdistan [7]	Monoterpene hydrocarbons (68%) [7]	antioxidant, antibacterial, antifungal [7]
L. petiolaris (DC.) Pimenov	Aerial parts	sabinene (58%), δ-3-carene (36%), (E)-β-ocimene (1.8%), from Karaj, Tehran [8]	—	—
	Fruit	__, from Tehran [5]; terpinolene (8%), (E)-β-ocimene (24.6%), endo-fenchyl acetate (7.4%), p-cymene (11.5%), γ-terpinene (9.7%), (Z)-β-ocimene (8%), from **Shahroud** [9]; α-pinene (47.3%), sabinene (45.9%), from Touchal, Tehran [10]	— **Monoterpene hydrocarbons** (70.8%), oxygenated monoterpenes (11%), sesquiterpene hydrocarbons (7%), oxygenated sesquiterpenes (7.7%) [9]; Monoterpenes [10]	—
	Leaf	terpinolene (14%), (E)-β-ocimene (10%), endo-fenchyl acetate (15%), limonene (9%), (Z)-β-ocimene (7.8%), from Shahroud [9]; α-pinene (42.6%), sabinene (42.3%), from Touchal, Tehran [10]	Monoterpene hydrocarbons (50.7%), oxygenated monoterpenes (21%), sesquiterpene hydrocarbons (10.3%), oxygenated sesquiterpenes (6.7%) [9]	—
	Stem	terpinolene (10%), (E)-β-ocimene (10.5%), endo-fenchyl acetate (7.6%), p-cymene (15%), hexadecanoic acid (9%), γ-terpinene (5%), from Shahroud [9]	Monoterpene hydrocarbons (51.6%), oxygenated monoterpenes (21.8%), sesquiterpene hydrocarbons (2%), oxygenated sesquiterpenes (6%) [9]	
	Rhizome	β-bisabolene (31.3%), (*E*)-sesquilavandulol	Sesquiterpenes (51%) [10]	—

		(20.5%), geranyl acetate (5.7%), α-pinene (5.9%), citronellyl acetate (5.2%), sabinene (5.2%), from Touchal, Tehran [10]		
***Ferula* L.**				
F. alliacea Boiss.	Fruit	iso-pimpinellin, ferrulin, from India [11]	Furanocoumarins [11, 13]	—
	Root	epi-γ-eudesmol (22.3%), valerianol (12.5%), hinesol (8.3%), guaiol (7.3%), *Z*-propenyl-*sec*-butyl trisulphide (6.5%), from Bezgh, Khorasan-Razavi [12]	**Oxygenated sesquiterpenes** (74.7%), sulphur-containing compounds (16.6%), sesquiterpene hydrocarbons (3.7%), oxygenated monoterpenes (2.6%) [12]	—
F. ammoniacum (D.Don) Spalik & al. (≡ ***Dorema ammoniacum*** D.Don)	Aerial parts	β-himachalene (9.3%), β-chamigrene (8.7%), from Kashan [14]	Sesquiterpene hydrocarbons (35%), oxygenated non-terpenes (28.7%), monoterpene hydrocarbons (1.5%), oxygenated monoterpenes (5.2%), oxygenated sesquiterpenes (10.4%), hydrocarbon diterpenes (4.6%), oxygenated diterpenes (3.5%) [14]	antibacterial, antioxidant [14]
	Root	β-bisabolene (15.1%), hexadecanal (13.2%), (E)-nerolidol (11.3%), tetradecanal (10.5%), 1,15-hexadecadiene (7.1%) from Kashan [14]	**Oxygenated non-terpenes** (54%), sesquiterpene hydrocarbons (16.9%), oxygenated sesquiterpenes (11.3%), monoterpenes hydrocarbon (0.9%), oxygenated monoterpenes (2.6%), hydrocarbon non-terpenes (8.1%) [14]	**antibacterial**, antioxidant [14]
	Stem	α-muurolol (14%), hexadecanoic acid (7%), (E)-nerolidol (5%) from **Shahroud** [9]	Monoterpene hydrocarbons (0.62%), oxygenated monoterpenes (7%), sesquiterpene hydrocarbons (14%), **oxygenated sesquiterpenes** (38%), non terpenoid compounds (29%) [9]	—
	Leaf	(E)-β-ocimene (30.9%), γ-terpinene (11%), p-cymene (10%), (Z)-β-ocimene (7%), terpinolene (6%) and endo-fenchyl acetate (5.25%), from Shahroud [9]	**Monoterpene hydrocarbons** (69.5%), oxygenated monoterpenes (10%), sesquiterpene hydrocarbons (10.3%), oxygenated sesquiterpenes (8%), non terpenoid compounds (1.9%) [9]	—
F. assa-foetida L.	Gum	(E)-1-propenyl sec-butyl **disulfide** (58.9%), (Z)-β-ocimene (11.9%), (E)-β-ocimene (9%), β-	Monoterpene hydrocarbons, organosulphur compounds (disulfides)	—

		pinene (5%) and (Z)-1-propenyl sec-butyl disulfide (3.9%), from Kerman [15]; (E)-1-propenyl sec-butyl disulfide (40%), germacrene B (7.8%), from Kerman [16]	[15]; sesquiterpenoids [16]	
	Leaf	eremophilene (31.28%), δ-cadinene (22%), longiborneol (12.1%), dehydro aromadendrene (3.99%), isoledene (3.98%), τ- gurjunene (3.93%), J-guaiene (3.53%), from Lorestan [17];	—	antibacterial, antifungal, antiviral, antioxidant [17-22]
		umbelliprenin, tadshiferin, asacoumarin A, assafoetidin, franesiferol A, B, & C, galbanic acid, conferol, gummosin, assafoetidinol A, & B, ferocaulicin, epi-samarcandin, epi-samarcandin acetate, kamolonol, foetisulfide A & C [18]	Sesquiterpene coumarins, coumarins, polysulfides, diterpenes, sesquiterpenes [18] Sulfur containing compounds	
	Fruit	epi-α-cadinol (23%), germacrene B (10.98%), α-gurjunene (6.18%), (Z)-1-propenyl sec-butyl disulfide (5.89%), 5-epi-7-epi-α-eudesmol (4.89%), δ-cadinene (4.78%), γ-cadinene (3.36%), germacrene D (3.09%), from Kermanshah [23]	Sesquiterpene hydrocarbons (43.48%), oxygenated sesquiterpens (37.77%), monoterpene hydrocarbons (6.14%), oxygenated hydrocarbon (0.35%), sulphides (11.18%) [23]	—
	Oleo-gum-resin	(E)-1-propenyl *sec*-butyl disulfide (36.15%), (Z)-1-propyl *sec*-butyl disulfide (27.93%), Guaiol (5.50%), carotol (5.14%), from Tabas, Yazd [150]	Sesquiterpene	**antibacterial** [150]
	seed	α-D-xylofuranoside, methyl 2,5-di-o-methyl- (30.2%), (E)-1-propenyl *sec*-butyl disulfide (13.13%), (Z)-1-propyl *sec*-butyl disulfide (11.34%), trifluoromethyl t-butyl disulfide (6.33%), disulfide (5.47%), from Tabas, Yazd [150]		antibacterial [150]
	Aerial parts	1-methylpropyl-(1E)-disulfide (32.8%), 1-methylpropyl-(1Z)-disulfide (9.1%), α-pinene (11.3%), β-pinene (6.1%), from Kerman [149]	Monoterpene hydrocarbons (23.9%), sesquiterpene hydrocarbons (12%), organosulfur compounds (45.3%) [149]	—
F. aucheri (Boiss.) Piwczyński & al. (≡ ***Dorema aucheri***	Leaf	galic acid, chlorogenic acid, *p*-coumaric acid, from Yasuj [24]	**Flavonoids**, Carotenoids, anthocyanin, phenolic acids [24]	anti-oxidative, antibacterial [24]

Boiss.)				
	Stem	galic acid, **chlorogenic** acid, caffeic acid [24]	Phenolic acids, anthocyanin [24]	anti-oxidative [24]
	Flower	galic acid, chlorogenic acid, caffeic acid, *p*-coumaric acid [24]	Phenolic acids, flavonoid, anthocyanin [24]	**anti-oxidative**, **antibacterial** [24]
	Aerial parts	salvigenin, nepetin, cirsiliol, **eupatorin,** from Yasuj [25]	Flavonoids, terpenoids [25]	__
	Root	__, from Shiraz [26]	Phenols [26]	antioxidant, antibacterial [26]
F. badrakema Koso-Pol.	Root	badrakemin, badrakemin acetate, isosamarcandin, umbelliferone, conferol acetate, from Turkmenia (Kyzyl Dzhar) [27]	Hydroxycoumarins [27]; terpenoid coumarins [27, 28]	__
	Fruit	β-pinene (46%), α-pinene (11%), *cis*-isolongifolanone (4%), β-phellandrene (2.7%), myrcene (2.4%), carvacrol methyl ether (2.4%), from Khorasan Razavi [29, 30]	Monoterpene hydrocarbons (69%), oxygenated monoterpenes (6%), sesquiterpene hydrocarbons (9%), oxygenated sesquiterpens (11.8%), phenylpropanoids (1.8%) [30]	antibacterial, antifungal [30]
F. badghysi Koso-Pol. (≡***F. oopoda*** (Boiss. & Buhse) Boiss.)	Leaf	β-phellandrene (21.7%), thymol-methyl ether (13.8%), myrcene (13.5%), **α-ylangene** (11.3%), from Zarand, Kerman [91]	Monoterpene hydrocarbons (56.8%), oxygenated monoterpenes (16.6%), sesquiterpene hydrocarbons (22.4 %) [91]	__
	Seed	myrcene (32.8%), β-phellandrene (24%), germacrene D (6.8%), from Zarand, Kerman [91]	Monoterpene hydrocarbons (72.9%), oxygenated monoterpenes (4.6%), sesquiterpene hydrocarbons (17%), nonterpenoid hydrocarbon (0.2 %) [91]	
F. behboudiana (Rech.f. & Esfand.) D.F.Chamb.	Aerial parts	disulphane (59.4%), glubolol (12.5%), α-pinene (8.8%), α-bisabolol (6%), β-pinene (3.9%), from Ilam [32];	Disulfides [31], sulphur derivatives (60%), oxygenated sesquiterpene (19%), monoterpene hydrocarbons (13.4%), sesquiterpene hydrocarbons (3.6) [32];	__
		sabinene (75.3%), (E)-caryophyllene (16.1%), from Lorestan [149]	Monoterpene hydrocarbons (82.6%), sesquiterpene hydrocarbons (16.1) [149]	
F. diversivittata Regel &	Aerial parts	α-pinene (25.8%), limonene (15.4%), bornyl acetate (11.6%), camphene (11.4%), myrcene	Monoterpene hydrocarbons (68.8%), oxygenated monoterpenes (27%),	__

Schmalh.		(7.9%), β-pinene (6.3%), from Khorasan-Razavi [33]; verbenone (69.4%), ar-curcumene (6.2%), from Kashmar, Khorasan [149]	sesquiterpene hydrocarbons (2.1%) [33]; Oxygenated monoterpenes (74%), sesquiterpene hydrocarbons (12.5%)[149]	
	Root	diversolides A-G, guaianolides from Khorasan-Razavi [34]; diversivittatin [35]; diversin [36]	Sesquiterpene lactone derivatives, stigmasterol [34]; Phenylpropanoids [35]; coumarins [36, 37]	antibacterial, antifungal [34] __
	Root	__, from Tashkent [38]	Terpenoid coumarins [38]	
	Aerial parts & root	__, from Neishabour [39]	__	antioxidant [39]
F. flabelliloba Rech.f. & Aellen	Aerial parts & root	__, from Neishabour [39]	__	antioxidant [39]
	Fruit	10-epi-Y-eudesmol (14.1 %), ß-dihydroagrofuran (13.3 %), α-bisabolol (9.9 %), guaiol acetate (4.3 %), hinesol (3.6 %), germacrene D (3.2 %), fenchyl acetate (3.0 %) and ß-acorenol (3.0 %), from Khorasan-Razavi [40]	Monoterpene hydrocarbons (5.9%), oxygenated monoterpenes (3.4%), sesquiterpene hydrocarbons (19%), oxygenated **sesquiterpenes** (59%) [40]	__
	Aerial parts	α-pinene (10%), from Khorasan-Razavi [40]; epi-α-cadinol (17.8%), α-pinene (5.4%), β-phellandrene (5.6%), 2,5-diethylthiophene (5.4%), from Khorasan [149]	**Monoterpenes** [40]; Monoterpene hydrocarbons (20.3%), oxygenated monoterpenes (4.3%), sesquiterpene hydrocarbons (49.1%), oxygenated sesquiterpenes (5.1%), organosulfur compounds (5.4%) [149]	__
	Root	farnesiferone B, flabellilobin A, flabellilobin B; ligupersin A, 7-epi-gamma-eudesmol, persicasulfide A, conferdione, umbelliprenin, conferone, feselol, lehmferin, farensiferol B, from Khoeasan-Razavi [41]	Sesquiterpene coumarins [41]	__
F. foetida (Bunge) Regel	Root	foetisulfide A, & B, & C, & D, foetithiophene A, & B, from Uzbekistan [42]	Organosulphur compounds – disulfide [42-44]; tiophene derivative [42, 43]; phenylpropanoid [42]	__
	Aerial parts	2,3,4,5-tetramethylthiophene (6%), 2-ethylthiopyridine (10.4%), eucalyptol, from Bukhar Oblast, Uzbekistan [43]	Oxygenated monoterpene, sesquiterpene coumarins, coumarin compounds [43]	__

	Resin	*epi*-conferdione, colladonin, karatavicinol, 8-acetoxy-5-hydroxyumbelliprenin, asacoumarin, from Chinese medicine store in Taiwan [45]	Sulfur containing compounds Terpenoid coumarins, sesquiterpene coumarins [45]	__
	Epigeal part	cynaroside (0.98%), from Kazakhstan [46]	Flavonoid [46]	
	Aerial parts	__, from Central Elburz [47]; 2,3,4-trimethylthiophene (49%), 2,5-diethylthiophene (27.5%), elemicine (8.1%), 3,6-dimethoxy-2-ethyl-benzaldehyde (3.7%), α-pinene (3.4%), from Sabzevar, Khorasan [149]	Phenolic compounds, flavonoids [47]; Monoterpene hydrocarbons (6.1%), organosulfur compounds (76.6%), phenylpropanoids (13.9%) [149]	antioxidant, antihemolytic [47]
F. glabrifolia M.Panahi & al. (≡ *Dorema glabrum* Fisch. & C.A.Mey.)	Root	Myristicin (14%), elemicin (11.7%), from E-Azerbaijan [50]	Oxygenated non-terpenes (38%)= phenylpropanoids derivatives, monoterpene hydrocarbons (17%), sesquiterpene hydrocarbons (19.6%), oxygenated monoterpenes (8%), phenylpropanoids, phloroacetophenone glycosides (acetophenone derivatives), hydroxyl coumarin, phenolic acids, cardenolide (=Steroid)[50]	__
	Root	δ-cadinene (13%), β-bisabolene (7.5%), copaene (5.7%), cubenol (5%), callamenene (5%) and α-fenchyl acetate (6%), from Jolfa [48]	Non-oxygenated sesquiterpenes (42.6%), oxygenated sesquiterpene (14%), oxygenated monoterpenes (12.6%) [48]	__
	Leaf Root Flower	β-caryophyllene (35%), from Jolfa [49] δ-cadinene (18.9%), myristicin (9.7%) [49] carvone (26%), germacrene B (13%), α-limonene (10.7%) [49]	Monoterpenes, sesquiterpenes, diterpens [49] " "	antioxidant [49] antioxidant [49] **antioxidant** [49]
	Aerial parts	elemicin (38.6%), myristicin (14%), from E-Azerbaijan [51]	Oxygenated non-terpenes (56%), sesquiterpene hydrocarbones (22%), daucosterol, phenolic acid derivatives, flavonoids [51]	antioxidant [51]
F. gummosa Boiss. (≡ ***F. galbaniflua*** Boiss. & Buhse.)	Oleo-gum-resin	sabinene (40%), α-pinene (14%), β-pinene (14%), *p*-cymene (8.5%), α-thujene (8%), from market Isfahan [52]	Monoterpene hydrocarbons (88%) [52]	antimicrobial, antibacterial [52]
F. gummosa Boiss.	Seed	__, from Lar, Tehran [53]	__	antimicrobial [53]

		β-pinene (58.8%), δ-3-carene (12%), α-pinene (5.7%) and β-myrcene (4.6%), from Kashan [54]	Monoterpenes [54]	
	Oleo-gum-resin & Latex	β-pinene (43.8%), α-pinene (27.3%) myrcene (3.37%), from Daran, Isfahan [55]	Monoterpene hydrocarbons (77%), oxygen-containing monoterpenes (5%), sesquiterpene hydrocarbons (7%), oxygen-containing sesquiterpenes (6.7%) [55]	antibacterial, antifungal [55]
	Fruit	β-pinene (82%), α-pinene (5.4%), myrcene (3.4%), from Tehran [56];	—	—
	Root	α-pinene (1.3-4.6%), β-pinene (41-69.7%), guaiol (4.6-15.7%), guaioyl acetate (5-22.8%), from 7 locations of Semnan [56]; α-pinene (4.2, 8%), β-pinene (62.6, 71%), Δ-3-carene (3, 11.4%), guaiol (3, 8.2%), guaioyl acetate (3.6, 7.9%), from Firouzkouh [56]; α-pinene (15.6, 17.9%), β-pinene (55, 78.1%), Δ-3-carene (2.4, 7.4%), limonene (2, 5.9%), from Zanjan [56]; α-pinene (3.5, 5.6, 7.1%), β-pinene (77.2, 73, 67.5%), p-cymene (0.6, 9, 1%), limonene (8.9, 7, 3.8%), guaiol (1, 3.4, 3.1%), from Kashan [56]; α-pinene (4.2%), β-pinene (79.9%), limonene (8.4%), from Delijan [56]; α-pinene (4, 5.2%), β-pinene (56.4, 66.4%), Δ-3-carene (11.7, 9.1%), limonene (11.2, 0.8%), guaiol (3.7, 5.2%), guaioyl acetate (3.9, 5.3%), from Margh, Kashan [56]; α-pinene (13.8, 11.5%), β-pinene (68.4, 65.5%), from Beigan, N Khorasan [56]; α-thujene (4.6%), α-pinene (12.6%), β-pinene (45.8%), Δ-3-carene (10.9%), limonene (5.8%), germacrene D (9.7%), from Ploor [56]		
		ß-Pinene (28.44 - 40.99%), **α-Pinene** (1.42 - 33.9%), **δ-3-Carene** (1.36 - 11.8%), **limonene** (5.1 - 9.15 %); from Kashan, **Ilam** and **Semnan** [57]	—	antifungal [57]
F. gummosa Boiss.	Oleo-gum-resin	**β-amyrin, (+) norinone, limonene**, from Firuzkooh [58]	**Triterpenes/triterpenoids** (55%) monoterpenes/monoterpenoids (15%),	—

		sesquiterpenes/sesquiterpenoids (30%), [58]	
Oleo-gum-resin	β-pinene (26.85-69.15%), α-pinene (1.4-33.9%), δ-3-carene (0.59-11.80%), limonene (1.06-9.15%), from 16 locations of Iran [59]	—	—
Root	β-pinene (58.8%), from Firouzkouh (as ***F. galbaniflua***) [60]	Monoterpene hydrocarbons (>55%), sesquiterpene (15.7-12.1%) [60]	—
Stem	β-pinene (46.4%), cis-chrysanthenyl acetate (6.1%), (E)-nerolidol (5.2%); from Firouzkouh, Tehran [60]		
Oleo-gum-resin	α-pinene (13%), limonene (14%), terpinolene (10%), linalool (9%), β-myrcene (10%), δ-3-carene (9%), from Isfahan [61]	—	antispasmodic [61]
Fruit	β-pinene (50%), α-pinene (18.3%), δ-3-carene (6.7%), α-thujene (3.3%), sabinene (3%), from Ploor, Tehran [62]	—	antiepileptic [62]
Oleo-gum-resin	bulnesol (7.2%), α-eudesmol (4.4%), α-bisabolol (3.7%), [64]; __, from Firouzkouh [63, 64]	Oxygenated monoterpenes (13.32%), monoterpene hydrocarbons (1.7%) [63]; Sesquiterpenes (30.55%), oxygen-containing sesquiterpenes (45.25%) [64]	—
Root	gummosin, gumosides A & B, cauferoside, feselol, conferoside, ferilin, ferocaulidin, ligupersin A, conferol, daucosterol, from Khorasan-Razavi [65]	Terpenoid coumarins, sterol, phenylpropanoid, phenolic acid derivative [65]	Cytotoxic [65]; antibacterial [68]
Flower	__, from Sari, Iran [66]	**Phenolic** & **flavonoid** compounds [66]	antioxidant, antihemolytic, [66]
Leaf	"	" (higher antioxidant activity) [66]	
Stem	"	" (higher antihemolytic activity) [66]	
Seed & gum	__, [67]	—	cytotoxic [67]
Root & fruit	__, from Polour, Tehran [69]	Terpenoids, alkaloids, cardenolids [69]	antinociceptive [69]; antiepileptic [70, 71]
Root	quercetin, from Ghaemshahr [72]	Phenolic & flavonoid compounds [72]	antioxidant, antihemolytic [72]

	Aerial parts	α-pinene (16.2%), β-pinene (40.7%), β-phellandrene (22.7%), δ-cadinene (7.2%), from Esfarayen, Khorasan [149]; α-pinene (36.6%), β-pinene (59%), from Isfahan [149] (as ***F. galbaniflua***); α-pinene (20.3%), β-pinene (66.3%), Δ-carene (8.6%), from Ploor, Tehran [149] (as ***F. galbaniflua***)	Monoterpene hydrocarbons (81.8%), sesquiterpene hydrocarbons (10.8%) [149]; Monoterpene hydrocarbons (96.6%), oxygenated monoterpenes (2.8%) [149]; Monoterpene hydrocarbons (97.5%), sesquiterpene hydrocarbons (0.6%) [149]	—
F. haussknechtii H.Wolff ex Rech.f.	Root	apiene, from Eastern Anatolia [73]	Sesquiterpene asters [73]	—
F. hezarlalehzarica Ajani	Aerial parts	myrcene (35.3%), (Z)-β-ocimene (41.7%), thymyl methyl ether (3.5%), from Kerman [149]	Monoterpene hydrocarbons (78%), oxygenated monoterpenes (3.5%), sesquiterpene hydrocarbons (3.8%) [149]	cytotoxic [74]
F. hirtella Boiss.	Aerial parts	α-pinene (15.4%), thymol (15%), spathulenol (6.5%), citronellol (6.4%), β-pinene (5.9%), from Moteh, Isfahan [75]; germacrene B (15.5%), bicyclogermacrene (12.9%), α-pinene (9.9%), β-elemene (6.3%), γ-elemene (8.5%), germacrene D (8.5%), citronellyl propanoate (5.2%), β-pinene (4.6%), from Yazd [149]	Monoterpene hydrocarbons (38.4%), oxygenated monoterpenes (27.3%), sesquiterpenes (19%) [75]; Monoterpene hydrocarbons (23%), oxygenated monoterpenes (8.3%), sesquiterpene hydrocarbons (55.7%) [149]	—
F. hyrcana (Koso-Pol.) Puchałka & al. (≡ ***Dorema hyrcanum*** Koso-Pol.)	Root	—, from Golestan [76]	Sesquiterpenoid derivatives, acetophenone derivatives, terpenoid coumarins [76]	antiplasmodial [76]
	Root	—, from Turkmen [77]	Phenolic glycosides [77]	—
F. karakalensis Korovin	Root	chimganidin, ferolin, federin, karaferin, karaferinin [78]	Sesquiterpene ester [78]	—
F. karelinii Bunge [≡ ***Schumannia karelinii*** (Bunge) Korovin]	Leaf	Luteolin [79]	Flavonoids [79]	—
F. kashanica Rech.f.	Aerial parts	α-pinene (33%), limonene (20.3%), camphene (16.8%), myrcene (8.6%), bornyl acetate (6.2%), from Isfahan [33]	Monoterpene hydrocarbons (83.5%), oxygenated monoterpenes (11.3%), sesquiterpene hydrocarbons (0.2%),	—

			oxygenated sesquiterpene (1.17%) [33]	
F. latisecta Rech.f. & Aellen	Aerial parts	(Z)-ocimenone (32.4%), (E)-ocimenone (20.3%), cis-pinocarveol (11.4%), from Khorasan [80]; methylpropyl (1Z)-disulfide (88.9%), methylpropyl (1E)-disulfide (5%), from Khorasan [149]	Oxygenated monoterpenes (75.3%), monoterpene hydrocarbons (8.3%), sesquiterpenes (4.1%) [80]; Monoterpene hydrocarbons (0.2%), sesquiterpene hydrocarbons (0.4%), Oxygenated sesquiterpenes (0.4%), **organosulfur compounds** (97.8%) [149]	antibacterial [80, 81]
	Fruit	*sec*-butyl-(Z)-propenyl disulfide (65%), *sec*-butyl-(E)-propenyl disulfide (6.8%), from Khorasan-Razavi [81]	Polysulphides (75.5%) [81]	antifungal [29, 81]
F. macrocolea Boiss.	Aerial parts	β-pinene (15.9%), α-pinene (10.4%), β-caryophyllene (8.6%), from Tehran [82]; α-pinene (21.9%), β-pinene (17.8%), (Z)-caryophyllene (6.2%), myrtenol (4.7%), limonene (4.3%), caryophyllene oxide (4.6%), from Lorestan [149]	Monoterpenes (44.9%), sesquiterpenes (40.4%), aliphatic compounds (1%) [82]; Monoterpene hydrocarbons (47.6%), oxygenated monoterpenes (9%), sesquiterpene hydrocarbons (28.1%), oxygenated sesquiterpenes (4.6%) [149]	__
F. michaelii M.Panahi & al. (≡ ***Dorema aitchisonii*** Korovin ex Pimenov)	Root	phenolic glycoside, from Bdkhyz, Turkmenia [83]	Acetophenone derivatives [83]	
	Aerial parts	gallic acid, rutin, quercetin, cumarin [84]	Phenolic compounds, flavonoids [84]	antihemolytic [84]
F. microcolea (Boiss.) Boiss.	Aerial parts	α-pinene (19%), nonane (13%), β-pinene (13%), from Chalous [75]	Monoterpene hydrocarbons (53%), oxygenated monoterpenes (6.5%), sesquiterpenes (16.3%), aliphatic hydrocarbon (13.2%) [75]	__
	Aerial parts	α-pinene (27.3%), β-pinene (16.4%), nonanal (8.7%), β-caryophyllene (8.5%), thymol (6.7%), from Lorestan [85];	Monoterpenes (70.8%), sesquiterpenoids (14.2%), alkyl aldehyde (8.7%) [85];	antioxidant [85]
		nonane (16%), α-pinene (41.2%), β-pinene (13.8%), myrcene (4.7%), limonene (4.4%), δ-cadinene (4.6%), sabinene (4.3%), from Kohkilouye [149]	Monoterpene hydrocarbons (71.4%), oxygenated monoterpenes (1.6%), sesquiterpene hydrocarbons (8.1%), oxygenated sesquiterpenes (2.3%), aliphatic hydrocarbons (16%) [149]	
F. microloba Boiss.	Root	auraptene [86]; __, from Turkmen [87]; microlobin from Turkmen [89]; microlobidene [90]	Terpenoid coumarins [86, 87, 88]; Sesquiterpene cumarin [89]; Terpenoid coumarin [90]	__

F. oopoda (Boiss. & Buhse) Boiss.	Leaf	β-phellandrene (22.4%), thymol-methyl ether (15.3%), myrcene (8.7%), from Zarand, Kerman [91]	Monoterpene hydrocarbons (54.5%), oxygenated monoterpenes (21%), sesquiterpene hydrocarbons (21.7%) [91]	—
	Seed	myrcene (36.1%), β-phellandrene (28.2%), germacrene D (5.5%), from Zarand, Kerman [91]	Monoterpene hydrocarbons (80.3%), oxygenated monoterpenes (3%), sesquiterpene hydrocarbons (14.5%), nonterpenoid hydrocarbon (0.3%) [91]	
	Root	feruhodin A, & B, scoparone, from Khorasan-Razavi [92]; badkhysinin [93, 102, 103]; guaianolide [94]; feropodin [96]; oopodin [97, 101, 105]; isobadkhysin [99]; ferulin [100]; ferulidin [104]; opoferzin [108]; opoferdin [109]	Sesquiterpene lactones, coumarins [92, 93, 96-109]; Sesquiterpene [94]	cytotoxic [92]
	Seed	semopodin, from Nakhichevan, Azerbaidzhan [95, 106]	Sesquiterpene lactone [95]; aromatic ester [110]	—
	Aerial parts	α-terpinyl acetate (73.3%), sabinene (19.7%), from Shahroud, Semnan [149]	Monoterpene hydrocarbons (25.7%), oxygenated monoterpenes (73.3%) [149]	
F. orientalis L.	Aerial parts	β-phellandrene (23.6%), (*E*)-β-ocimene (13.8%), α-phellandrene (11.5%), α-pinene (12.5%), (*Z*)-β-ocimene (3.5%), dehydro-sesquicineole (10%), from Turkey [111]	Monoterpene hydrocarbons, oxygenated sesquiterpene [111]	antioxidant [111]
	Aerial parts	α-pinene (28.4%), **sabinene** (15.4%), β-phellandrene (5.6%), **naphthalene** (15.3%), from Bingol, Turkey [112]; α-pinene (35.5%), **sabinene** (22%), camphene (6.5%), β-phellandrene (6.4%), from Elazig, Turkey [112]; α-pinene (27.7%), **β-pinene** (20%), **naphthalene** (13.5%), from Malatya, Turkey [112];	—	—
F. orientalis L.		nonane (45.6%), α-pinene (32.1%), 2-methyloctane (19.4%), from Urmia, Azarbaijan [149]	Monoterpene hydrocarbons (33.8%), aliphatic hydrocarbons (65.2%) [149]	
	Leaf	α-cadinol (10.4%), δ-cadinene (8%), germacrene D-4-ol (6.8%), epi-α-muurolol (5.9%), α-pinene (5.7%), from Erzurum, Turkey [113]	Monoterpene hydrocarbons (7.6%), oxygen-containing monoterpenes (6.4%), **sesquiterpene hydrocarbons** (31%), **oxygen-containing sesquiterpenes**	antigenotoxic [113]

			(36.8%) [113]	
	Flower	α-cadinol (11.7%), δ-cadinene (9.3%), germacrene D-4-ol (11.9%), epi-α-muurolol (6.1%), α-pinene (7.2%), from Erzurum, Turkey [113]	Monoterpene hydrocarbons (9.3%), oxygen-containing monoterpenes (3.1%), **sesquiterpene hydrocarbons** (33.9%), **oxygen-containing sesquiterpenes** (37.3%) [113]	—
	Root	daucane, germacrane aster, from EAnatolia, Turkey [114]	non-volatile sesquiterpenes [114]	
F. ovina (Boiss.) Boiss.	Fruit	**α-pinene** (37.4%), β-phellandrene (10.8%), isobornyl acetate (9.2%), α-fenchene (8.9%), myrcene (5.8%), γ-elemene (4.6%), β-pinene (4.1%), from Khorasan-Razavi [115]	Monoterpene hydrocarbons (68.8%), oxygenated monoterpenes (14.7%), sesquiterpene hydrocarbons (13%), oxygenated sesquiterpenes (2.5%) [115]	—
	Aerial parts	α-pinene (50%), limonene (11.5%), β-pinene (9.7%), α-fenchyl acetate (7.4%), bornyl acetate (6%), from E Tehran [116]	Monoterpenes (87.5%) , sesquiterpenes (2.3%) [116]	
	Aerial parts (fresh)	**Limonene** (16.9%), α-pinene (15.2%), ß-myrcene (7.7%), *cis*-ß-ocimene (6.1%), iso-sylvestrene (5.1%), ß-pinene (4.4%), γ-elemene (4.3%), from Taleghan, Tehran [117]	Monoterpene hydrocarbons (63.8%), oxygenated monoterpenes (3.4%), sesquiterpene hydrocarbons (18.2%), oxygenated sesquiterpenes (0.8%), alkenes (2.5%), phenylpropanoids (3.9%), sesquiterpene alcohols (2.4%) [117]	—
	Aerial parts (dry)	**α-pinene** (20.2%), spathulenol (9.6%), germacrene D (6.3%), ß-caryophyllene (5%), α-terpineol (5%), caryophyllene oxide (4.4%), Limonene (4.3%), ß-pinene (3.3%), from Taleghan, Tehran [117]	Monoterpene hydrocarbons (38.5%), oxygenated monoterpenes (5%), sesquiterpene hydrocarbons (22.5%), oxygenated sesquiterpenes (15.3%), alkenes (-), phenylpropanoids (-), sesquiterpene alcohols (7.1%) [117]	—
F. ovina (Boiss.) Boiss.	Aerial parts	carvacrol (9%), α-pinene (8.2%), geranyl isovalerate (7.2%), geranyl propionate (7%), limonene (6.7%), carotol (6.5%), from Isfahan [118];	Monoterpene hydrocarbons (24%), oxygenated monoterpenes (52.2%), sesquiterpene hydrocarbons (2.1%), oxygenated sesquiterpenes (7%), phenypropanoids (trace) [118];	
		α-pinene (61%), myrcene (6.3%), limonene (6.3%), camphene (5.6%), from Ghazvin [149];	Monoterpene hydrocarbons (86.7%), oxygenated monoterpenes (2.3%),	

		α-pinene (63.8%), limonene (4.9%), camphene (6.5%), from Bojnourd, Khorasan [149];	sesquiterpene hydrocarbons (2.5%) [149]; Monoterpene hydrocarbons (81.6%), oxygenated monoterpenes (1%), sesquiterpene hydrocarbons (0.6%) [149];	
		α-pinene (68.7%), camphene (4.2%), β-pinene (4.25), myrcene (4.7%), limonene (4.1%), from Lar, Tehran [149];	Monoterpene hydrocarbons (87.2%), oxygenated monoterpenes (1.4%), sesquiterpene hydrocarbons (1.5%) [149];	
		α-pinene (65.4%), β-pinene (5.1%), spathulenol (4.2%), from Fars [149]	Monoterpene hydrocarbons (79.8%), sesquiterpene hydrocarbons (7.6%), oxygenated sesquiterpenes (4.2%) [149]	
	Root	ferutinin, from Binalood, Iran [119], ferutin & ferutinin, from Kyzyl-Arvat, Uzbek [120]	Sesquiterpene (ester) [119, 120]	cytotoxic (antitumor)[119]
F. persica Willd.	Aerial part	__	__	cytotoxic [74]
var. ***latisecta***	Root	__, from Tehran [121]	Organosulphur compounds [121]	
	Aerial parts	α-pinene (55%), camphene (20.5%), limonene (4.8%), spathulenol (6%), sabinene (4.1%), from Daran, Isfahan [149]	Monoterpene hydrocarbons (87.7%), oxygenated monoterpenes (3.7%), sesquiterpene hydrocarbons (1.3%), oxygenated sesquiterpenes (6%) [149]	—
var. ***persica***	Root	dimethyl trisulphide (18.2%), myristicin (8.9%), dimethyl tetrasulphide (7.6%), α-terpinyl *n*-pentanoate (5.8%), from Tehran [122]	Sulfur compounds (28.6%), oxygenated monoterpenes (23.2%), sesquiterpene hydrocarbons (11.1%) [122]	
	"	persicasulfide A, & B, from Tehran [123]	Organosulphur compounds [123]	antifungal [123]
	"	umbelliprenin, persicasulphide B, badrakemone, farnesiferol A, gummosin, persicasulphide A, from Tehran [124]	Organosulphur compounds [124]	
F. persica var. ***persica***	Aerial parts	dill-apiole (57.3%), elemicine (5.6%), from Alborz Mont. Tehran [125];	Phenylpropanoids (64.7%), oxygenated monoterpenes (13%), monoterpene hydrocarbons (6.7%), sesquiterpene hydrocarbons (3.6%) [125];	—
		α-pinene (33.5%), camphene (11.7%), spathulenol (8.2%), citronellyl acetate (5.3%), β-elemene (5.1%), from Ghazvin [149]	Monoterpene hydrocarbons (54.8%), oxygenated monoterpenes (8%), sesquiterpene hydrocarbons (21.5%),	

			oxygenated sesquiterpenes (11.6%) [149]	
	Aerial parts & root	__, from Tehran [126]; Umbelliprenin, from Tehran [126, 128]; farnesiferol A & B, badrakemone, gummosin, farnesiferone A [129]	non-volatile sesquiterpenes [126]; terpenoid coumarins [126-129]	antibacterial [128]
	Root	Persicaosides A-D, phytosterol glycosides, from Alborz Mont. Tehran [127]; __, from Azerbaidzhan [130]	Sterols, sesquiterpene coumarin [127]; Monoterpene esters [130]	
F. pseudalliacea Rech.f.	Root	Kamolonol, szowitsiacoumarin A, farnesiferon B, farnesiferol C, flabellilobin A, from Sanandaj [131]; kamolonol acetate, fekrynol acetate, ethyl galbanate, methyl galbanate, farnesiferol B, aristolone, from Sanandaj [132]	Terpenoid coumarins [131, 132]; sesquiterpenes [132]	antibacterial, cytotoxic [131]; antiplasmodial [132]
F. rigidula Fisch. ex DC.	Root	Humulane esters, from Nakhichivan, Azerbaidzhan [133, 135]; Daucane esters [134]	non-volatile sesquiterpenes [133, 134]; phenyl propanoids [135]; Phenyl propanoid ester [134]	__
F. schtschurowskiana Regel & Schmalh. ex Regel	Root	conferone, from Uzbekistan [136]	Terpenoid coumarins [136]	
F. sharifii Rech.f. & Esfand.	Seed	β-pinene (21.7%), α-pinene (16%), sabinene (5.7%), naphthalene (8%), isolongifol (6.7%), *trans*-pinocarveol (5%), myrtenol (4.8%), azulene (3.8%), from Charmahal Bakhtiari [137]	Monoterpene hydrocarbons (43.9%) [137]	antibacterial [137]
F. stenocarpa Boiss. & Hausskn. ex Boiss.	Aerial parts	α-pinene (48.8%), β-pinene (30%) [138]; α-pinene (37.3%), β-pinene (36.2%), from Kerman [149]	Monoterpene hydrocarbons [138]; Monoterpene hydrocarbons (91.5%), oxygenated monoterpenes (3.1%), sesquiterpene hydrocarbons (2.1%), phenylpropanoids (0.6%) [149]	__
F. szowitsiana DC.	Aerial parts	α-pinene (12.6%), germacrene D (12.5%), β-pinene (10%), epi-α-cadinol (8.9%), myrcene (7%), bicyclogermacrene (5.6%), β-phellandrene (5.6%), from Semnan [139]; α-pinene (51.6%), β-pinene (13.7%), limonene (10%), sabinene (5.5%), from Shahroud, Semnan	Monoterpene hydrocarbons (37.1%), sesquiterpene hydrocarbons (14.2%), oxygenated sesquiterpenes (21.7%) [139]; Monoterpene hydrocarbons (86.2%), oxygenated monoterpenes (0.5%),	__

		[149]	sesquiterpene hydrocarbons (7.6%), oxygenated sesquiterpenes (2.4%) [149]	
	Leaf	α-pinene (8.6%), β-pinene (4.6%); β-caryophyllene (5.6%); β-eudesmol (32%), α-eudesmol (18.2%), guaiol (5%), caryophyllene oxide (4%), from Turkey [140]	Monoterpene hydrocarbons (16.2%), sesquiterpene hydrocarbons (8.6%), oxygenated sesquiterpenes (68.7%) [140]	antimicrobial [140]
	Stem	α-pinene (6.4%), β-pinene (4.3%); β-caryophyllene (4.5%); β-eudesmol (29.5%), α-eudesmol (16.6%), guaiol (5.3%), caryophyllene oxide (3.5%), from Turkey [140]	Monoterpene hydrocarbons (13.3%), sesquiterpene hydrocarbons (8%), oxygenated sesquiterpenes (65.6%) [140]	__
	Root	szowitsiacoumarin A & B, auraptene, umbelliprenin, galbanic acid, methyl galbanate, farnesiferol B & C, persicasulfide A, β-sitosterol, stigmasterol, from Golestan [141, 142];	Organosulphur compounds, phenyl propanoids, sterols [141]; terpenoid coumarins [141-144]	antileishmanial [141]; cytotoxic [142];
		__, from Khoy, Iran [143]	__	antimicrobial synergistic [143]
	Root	farnesiferol C, from Nakhichevan [144]; umbelliferone, galbanic acid, from E Azarbaijan [145]	Coumarins [144, 145]; furanocomarin derivatives, phenylethanoid derivative [145]	antioxidant [145]
	Aerial parts & root	__, from Khoy, Iran [146]	Phenolic compounds, monoterpene coumarins, sesquiterpene coumarins [29, 146, 147]; steroidal compounds [147]	antibacterial, antioxidant [29, 146, 147]
F. tabasensis Rech.f.		__	volatile sesquiterpenes [148]	

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