



Comparison of phenolic, flavonoid and antioxidant activity of some endemic Apiaceae genera in Iran

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Apiaceae



● 420 genera

● 3100 species

● 90 genres

Kameli et al (2012)

Iran is one of the major centers of endemic plant species in the world.

- Iran with about 1.65 million square kilometer surface area is a large country and after Turkey is the richest country of plant diversity in the Middle East
- The country of Iran is one of the major centers of endemic plants in the world.
- This country is rich in plant diversity, topographic factors have created a very diverse microclimate and edaphic conditions that caused the plant growth pattern and their compounds.

Endemic species of Apiaceae in Iran.

- Apiaceae family possesses many endemic species in Iran.
- The fruits of many endemic Apiaceae plant in Iran have many applications in pharmacology and food science.
- Among the Iranian endemic species of Apiaceae *Ducrosia anethifolia*, *Heracleum lasiopetalum* Boiss, *Kelussia odoratissima* Mozaff. *Ferula gummosa* and *Dorema aucherii* have distribution in many geographical regions of Iran (*Kanani, et al., 2011, Rechinger, 1963*).

Five endemic Apiaceae genera used in this research



- *Ducrosia anethifolia*



- *Kelussia odoratissima*



- *Heracleum lasiopetalum*



- *Ferula gummosa*



- *Dorema aucherii*



Ducrosia anethifolia

Ducrosia anethifolia

- ❑ *D. anethifolia* is commonly known in Iran as Moshgak.
- ❑ It is one of the three species of Iranian *Ducrosia* species growing wild in several areas of the Iran.
- ❑ In Iran this plant is used to improve the smell of foods and drinks.

Medicinal function:

- ❑ The whole herb – especially its aerial parts – has been used in Iranian folk medicine as a pain reliever for headache, backache, colic, and colds. In some regions of Iran, it is claimed to be especially effective against anxiety and insomnia. (Hajhashemi et al., 2010).



Heracleum lasiopetalum

Heracleum lasiopetalum

- ❑ *Heracleum* L., commonly named Golpar in Persian language.
- ❑ Often grows along rivers and humid mountains.

Medicinal function:

- ❑ Its fruits and essential oil (seeds) are used as spice and flavor of pickles in Iran.
- ❑ Also used as a carminative, digestion aid, tonic and reduce swelling in folk and traditional medicine (*Ghahreman, 1999; Mojab and Nickavar, 2003*).



Kelussia odoratissima

Kelussia odoratissima

- ❑ *Kelussia odoratissima* Mozaff. is one of the latest species of the Umbelliferae family that is only found in Iran.
- ❑ *K. odoratissima* is a monotypic and self-growing medicinal plant which is endemic of the restricted western parts of Iran and locally called “Karafs-e-koohi.”

Medicinal function:

- ❑ popular as garnish and also as a folk medicine to treat hypertension and inflammation. (*Rabbani, et al 2012*).
- ❑ the recent publications on the sedative effect.



*Dorema
aucherii*



Dorema aucherii

- ❑ In Persian it is called Bilhar.
- ❑ It is distributed in western parts of Iran and normally cooked with steam and served with butter as meal.

Medicinal function:

- ❑ Roots and leaves are known as medicinal parts in traditional medicine
- ❑ as stimulant, antispasmodic, expectorant, kidney stone repellent and analgesic.
- ❑ As vegetable by some people in western parts of Iran

Ferula
gummosa



Ferula gummosa

- ❑ *Ferula gummosa* Boiss 'Barijeh' is native to central Asia.
- ❑ This plant has traditionally been used in the treatment of many diseases.
- ❑ The antihypoxic and antioxidant activities of *Ferula gummosa* roots were also investigated (Ebrahimzadeh et al., 2011)
- ❑ **Medicinal function:**
- ❑ traditionally use its **resin** for the treatment of diarrhea.

Aims of present study

- ❑ The aims of the present study were to evaluate these plant species in respect to their total phenolic, flavonoid content and antioxidant activity of seed extracts.
- ❑ Evaluation of correlation of metabolites and soil characteristics of these species in their natural habitats.

Materials and methods

- ❑ The seeds of each species collected at full maturation stage in different geographical regions of Iran.
- ❑ The total phenolics were determined colorimetrically using Folin-Ciocalteu reagent.
- ❑ Total flavonoid content was determined spectrophotometrically.
- ❑ The antioxidant activity of seed extracts was assessed on the basis of the radical scavenging effect on 1, 1-diphenyl-2-picrylhydrazyl (DPPH) free radical, Reducing power (FTC and beta-carotene – linoleic model systems).

Results and discussion

Evaluation of soil characteristics of natural habitats

Collection site, and soil characteristics of different populaions.

Collection sites	Altitude	clay	loam	sand	organic mater	acidity
Fereydun Shahr, Isfahan, Iran	2490	26	36.3	37.5	2.7	7.6
Shikh Alikhan, Charmahal & Bakhtiari, Iran	2360	34	45	21	2.1	7.4
Chogyurt, Isfahan, Iran	2350	14	49	37	1.3	7.5
Padena, Isfahan, Iran	2400	19	56	25	3.76	7.5

phenolic , flavonoid content and Antioxidant activity in different Apiaceae populations

Population	phenolic content (mg tannic acid/g dry material)	Radical scavenging activity (%)	β -carotene-linoleic acid	Flavonoids
<i>Ducrosia anethifolia</i>	10.08	70.82	37.2	6.6
<i>Heracleum lasiopetalum</i>	77.48	65.54	17.44	6.2
<i>Kelussia odoratissima</i>	36.2	89.3	26.74	3.75
<i>Ferula gummosa</i>	20.46	87.0	83	7.8
<i>Dorema aucherii</i>	24.81	82.17	81.39	7.7

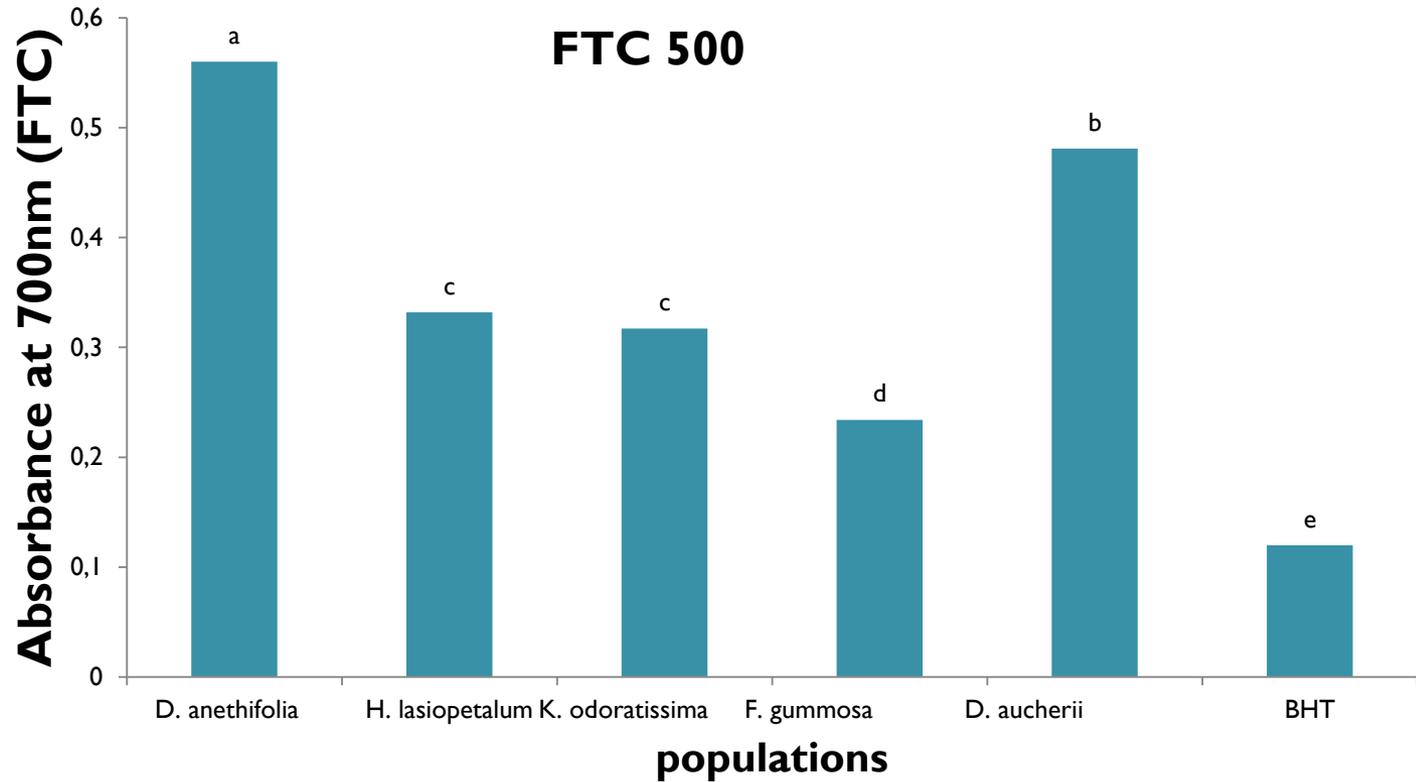


Fig. 1. Reducing power (FTC) of different populations extracts in comparison with BHT; different lowercase letters represent significant difference at $p < 0.05$.

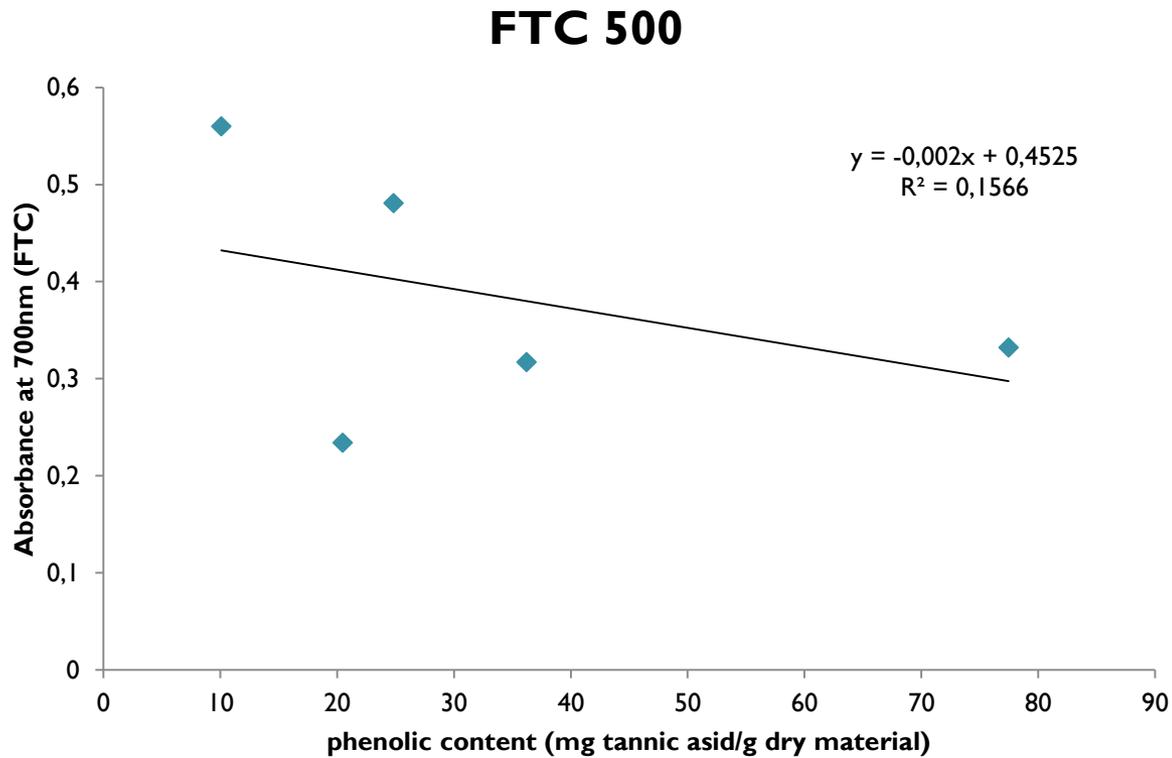


Fig 2. Correlation between total phenolic content and antioxidant activity (Reducing power model system).

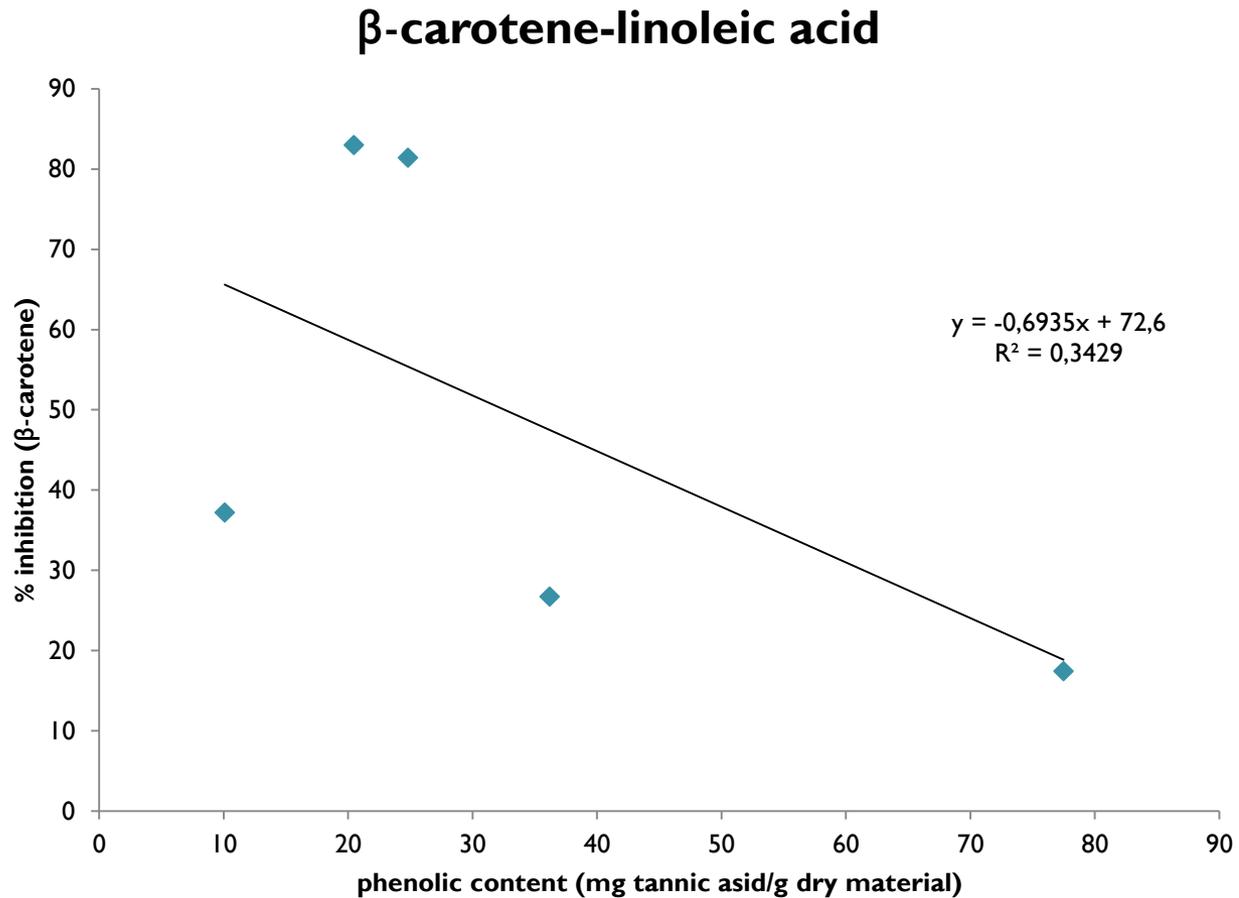


Fig 3. Correlation between total phenolic content and antioxidant activity (β-carotene-linoleic acid model system).

DPPH scavenging activity

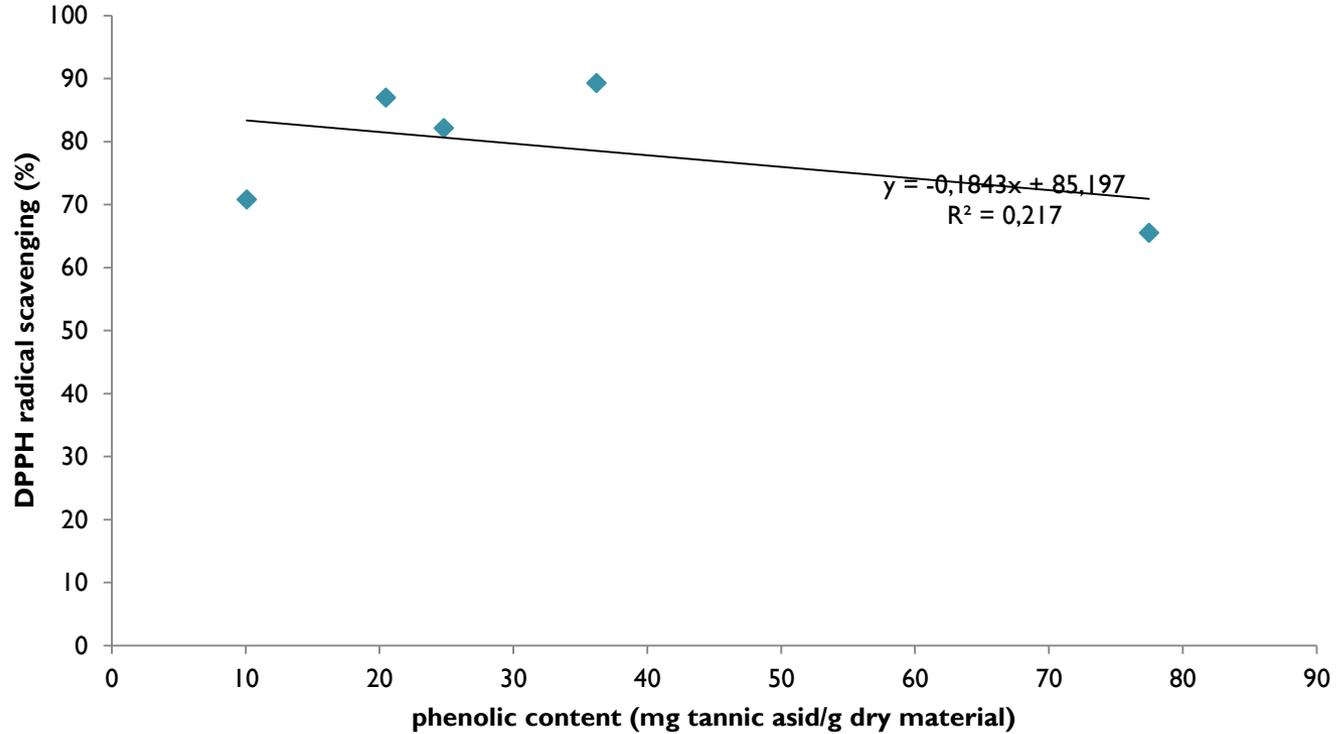


Fig 4. Correlation between total phenolic content and antioxidant activity (Radical scavenging activity model system).

Table 3. Correlations of antioxidant activity of populations and some environmental factors.

Components											
Phenolic content	1										
%Radical scavengin activity	0.536	1									
β -carotene	.765*	.520	1								
FTC	.810*	-.424	-.055	1							
Flavonoids	.857*	-.161	.752	.160	1						
Altitude	-.420	.117	-.415	.534	-.532	1					
Clay	.717*	.716*	.937**	.177	-.547	.229	1				
Silt	.038	.138	.752*	-.107	.742*	-.744*	-.504	1			
Sand	-.721*	.537	.105	-.061	-.255	.557	-.425	-.568	1		
Organic matter%	-.180	.005	.052	.721*	-.076	.449	.091	.183	-.284	1	
Acidity	-.743*	.451	-.026	.362	-.412	.883**	-.227	-.597	.839*	.261	1

* and **. Correlation is significant at the 0.05 and 0.01 level respectively.

Results

- ❑ High variation was observed among and within studied species.
- ❑ Total phenolic content (TPC) of fruit extracts of varied from 20.5 mg tannic acid per 1g dry weight in *F. gummosa* to 77.48 mgTAEg⁻¹DW in *H. lasiopetalum*.
- ❑ The flavonoid of seeds extract varied from 3.75 mg quercetin per 1g dry weight in *K. odoratissima* to 7.8 mgQUEg⁻¹ in *F. gummosa*.
- ❑ Seeds extract showed excellent radical scavenging activity as compared to BHT, ranging from 65.5% in *H. lasiopetalum* to 89.3% in *K. odoratissima*.
- ❑ Analyses showed positive correlation between total phenolic and antioxidant activity that highlights the role of phenolic compound in radical scavenging.

Discussion

- ❑ In conclusion, the seed extracts of populations showed a stronger antioxidant activity, DPPH radical, and beta-carotene/linoleic acid activities compared BHT standard.
- ❑ Among the studied populations, *Heracleum lasiopetalum* populations showed the highest total phenolic and antioxidant activity compared with other species. It can be concluded that the higher phenolic compounds may contribute directly to higher antioxidant in this species.
- ❑ The populations grows in clay soils had higher phenolic content and antioxidant activity, while the results showed negative correlation with sandy soil and soil acidity. So, It may be recommended to cultivate these plant species in clay soils to gain higher phenolic, flavonoid and antioxidant activity.

Thanks for your attention

