Review Article

Ethnobotanical knowledge of Apiaceae family in Iran: A review

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Abstract

Objective: Apiaceae (Umbelliferae) family is one of the biggest plant families on the earth. Iran has a huge diversity of Apiaceae members. This family possesses a range of compounds that have many biological activities. The members of this family are well known as vegetables, culinary and medicinal plants. Here, we present a review of ethnobotanical uses of Apiaceae plants by the Iranian people in order to provide a comprehensive documentation for future investigations.

Materials and Methods: We checked scientific studies published in books and journals in various electronic databases (Medline, PubMed, Science Direct, Scopus and Google Scholar websites) from 1937 to 2015 and reviewed a total of 52 publications that provided information about different applications of these plant species in human and livestock.

Results: As a result of this review, several ethnobotanical usages of 70 taxa, 17 of which were endemic, have been determined. These plants were used for medicinal and non-medicinal purposes. The most commonly used parts were fruits, leaves, aerial parts and gums. The most common methods of preparation were decoction, infusion and poultice.

Conclusion: To our knowledge, this paper represents a comprehensive literature search of ethnobotanical uses of Apiaceae reported from Iran. This study highlights the rich traditional knowledge of this family that has remained in Iran. However, most of this knowledge survive only as memories from the past in the minds of the elderly, and will probably vanish in a few decades. Thus, we compiled these scattered data together in a single document for the next scientific works with ethnobotanical interests.

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Introduction

The Apiaceae (previously known as the Umbel Family: Umbelliferae) is one of the largest plant families in the world. This family comprises approximately 450 genera and 3700 species worldwide (Pimenov and Leonov, 1993). The members of this family are well known as...
vegetables, culinary and medicinal plants such as *Anethum graveolens* (dill), *Anthriscus cerefolium* (chervil), *Angelica spp.* (angelica), *Apium graveolence* (celery), *Carum carvi* (caraway), *Coriandrum sativum* (coriander), *Cuminum cyminum* (cumin), *Foeniculum vulgare* (fennel), *Ferula gummosa* (galbanum) and *Pimpinella anisum* (anise), etc. Plants of this family usually possess a characteristic pungent or aromatic smell which is owing to the presence of essential oil or oleoresin (Singh and Jain, 2007). Members of Apiaceae possess various compounds with many biological activities. Some of the main properties are ability to induce apoptosis, antibacterial, hepatoprotective, vaso-relaxant, cyclooxygenase inhibitory and antitumor activities (Pae et al., 2002). For the family Apiaceae, Iran is a major center of diversification. In Iran, the Apiaceae family is represented by 121 genera and 360 species. Iran with unique climatic conditions has a large variety of plants, especially some unique endemic plants. From the endemism points of view, Apiaceae is an important family in the flora of Iran with 122 endemic taxa (Mozaffarian, 2007; Emami and Aghazari, 2011). Iran has a very honorable history in folk medicine, which dates back to the time of Babylonian-Assyrian civilization. One of the most significant ancient heritages is knowledge of people who tried over the millennia to discover useful plants for health improvement and each generation added their own experience to this tradition (Naghibi et al., 2005). Iran has a long history of medical practice and knowledge of plant remedies. The documentation of traditions of plant use in Iran was begun many years ago (Hopper and Field, 1937). Recently, several local ethnobotanical studies focusing on different parts of Iran have been published (Amin, 1992; Zargari, 1996; Ghorbani, 2005; Ahvazi et al., 2012; Amiri et al., 2012; Emami et al., 2012; Mosaddegh et al., 2012; Rajaei et al., 2012; Amiri and Joharchi, 2013; Safa et al., 2013; Dolatkhahi and Nabipour, 2014; Sadeghi et al., 2014; Sharififar et al., 2014; Tahvilian et al., 2014; khodayari et al., 2015). However, there are no distinct references on the ethnobotanical applications of this family in Iran and most of the publications and documents are scattered. Thus, we compiled these scattered data together in a single document for the next scientific works with ethnobotanical interests. In addition, we reported information on conservation and endemism status of some of these taxa in Iran.

**Methods**

We checked scientific studies in various electronic databases (Medline, Pubmed, Science Direct, Scopus, and Google Scholar websites) from 1937 to 2015. After a comprehensive search on the ethnobotanical aspects of Apiaceae family in Iran, we reviewed a total of 52 publications that provided information about different applications of these plant species in human and livestock. In this article, scientific and author names of plant species were checked for latest changes according to “The plant list” (http://www.theplantlist.org).

**Results**

In this review, ethnobotanical usages of 70 species, 17 of which were endemic, have been determined. Table 1 illustrates the results of this study. The plants used for various purposes in different parts of Iran were arranged in alphabetical order of their botanical names, with the relevant data. The information includes vernacular names, the part(s) used, the method of preparation, and medicinal and non-medicinal aspects along with literature sources. The species marked with an asterisk (*) were endemic species belonging to this family in Iran. The mostly used parts of the plants were fruits.
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(21 species) followed by leaves (17 species), aerial parts (17 species), gum (13 species), root (12 species), stem (7 species), flowers (4 species), whole plant (4 species), seed (3 species) and rhizome (1 species) (Figure 1). The most common methods of preparation were decoction (20 species), followed by infusion (13 species), poultice (6 species), smoke (3 species), vapor (3 species), pill (2 species) and powder (2 species) (Figure 2).

Ethnobotanical investigations generally result in the documentation of a rather limited set of well-documented beneficial plants, mostly medicinal, but also those known to be poisonous or used in nourishment (Ghorbani et al., 2006). In this paper, the members of Apiaceae family were used for various purposes, however we categorized their uses into three main groups including: 1) medicinal plants used in human; 2) medicinal plants used in livestock and 3) non-medicinal aspects.

**Medicinal plants used for humans**

From a total of 70 species belonging to this family, 66 species were reported to be used for medicinal purposes in human. Among them, the most frequently quoted species in this category were: *Bunium persicum* (Boiss.) B.Fedtsch., *Cuminum cyminum* L., *Dorema aucheri* Boiss., *Dorema ammoniacum* D.Don, *Ducrosia anethifolia* (DC.) Boiss., *Ferula asafoetida* L., *Ferula gummosa* Boiss., *Ferulago angulata* (Schltdl.) Boiss., *Oliveria decumbens* Vent., *Prangos ferulacea* (L.) Lindl. and *Smyrnium cordifolium* Boiss. Most reported medicinal uses were for treatment of gastro-intestinal, respiratory system, urinary system, metabolic system, gynaecological and skin disorders, and also they were used as antiseptic, anthelmintic, calmative, antipyretic, galactogogue and appetizer agents.

**Medicinal plants used for livestock**

Ten species have been recorded to have medicinal uses in veterinary. Among them, the most commonly used plants were: *Carum carvi* L. fruits, which were consumed for ectoparasites, digestive troubles, skin diseases, fever and mouth infection in livestock. The fruits of *Cuminum cyminum* L. were used to increase libido in female camels and as an anti-bloat agent in cattle and sheep. Gum and root of *Dorema ammoniacum* D.Don were used to treat infectious wound
infection and abscess in sheep and goat. Gum and root of *Dorema aucheri* Boiss. were used for treatment of infectious wounds and infection in sheep. Aerial parts of *Oliveria decumbens* Vent. were used for treatment of diarrhea. Aerial parts and root of *Smyrnium cordifolium* Boiss. were used for treatment of urinary retention.

**Plants with non-medicinal uses**

From the 70 taxa recorded in this article, 30 species had both medicinal and non-medicinal applications. Apart from these, four species including *Astrodaucus orientalis* (L.) Drude, *Chaerophyllum macropodum* Boiss., *Freripeia subpinnata* (Ledeb.) Baill. and *Physospermum cornubiense* (L.) DC. had no medicinal effect and were only used for other purposes. In totally, thirty-four species have been reported for miscellaneous uses including edible, making pickles, as natural dyes and as flavors in salad, soup, etc. As stated in Table 1, the most cited species for edible uses were *Anethum graveolens* L., *Coriandrum sativum* L., *Cuminum cyminum* L., *Ferula angulata* (Schltdl.) Boiss., *Foeniculum vulgare* Mill., *Heracleum persicum* Desf. ex Fisch., *Petroselinum crispum* (Mill.) Fuss, *Pimpinella anisum* L., *Prangos ferulacea* (L.) Lindl. and *Smyrnium cordifolium* Boiss. Many of these taxa were used all over the country. However, some other species, such as *Dorema aucheri* Boiss., *Kelussia odoratissima* Mozaff. and *Oliveria decumbens* Vent. were only used in a small area. Most of these taxa were used as wild vegetables. These species with much narrower distribution were exclusively used in Iran, and therefore could be considered as ‘typical Iranian wild edibles’. It is sometimes hard to know whether a particular sample was wild or cultivated. For example, some species, such as *Kelussia odoratissima* Mozaff. were only native to certain parts of Iran, although they were cultivated in some other regions of the country. Kelus or karafs-e-Bakhhtyari (*Kelussia odoratissima* Mozaff.) was widely used as a wild vegetable and flavoring. It could be found in local markets and beside the roads by local people. Some species such as *Echinophora platyloba* DC., *Kelussia odoratissima* Mozaff. and *Levisticum officinale* W. D. Koch were used as a flavor in yoghurt. *Chaerophyllum macropodum* Boiss. was cooked and eaten with rice. *Ferula angulata* Schltdl. was added as a flavor to animal oil. The young leaves and branches of *Dorema aucheri* Boiss. were used for making a locally famous pickle called “Bilhar Pickle” and used as vegetable in a local soup. Non-edible uses have also been recorded. For instance, aerial parts of *Prangos ferulacea* (L.) Lindl. were used as a dye (yellow color).

**Comments on some most cited species**

Our results indicated that medicinal species such as *Bunium persicum* (Boiss.) B.Fedtsch., *Dorema ammoniacum* D.Don, *Ducrosia anethifolia* (DC.) Boiss., *Ferula assa-foetida* L., *Ferula gummosa* Boiss., *Oliveria decumbens* Vent., *Prangos ferulacea* (L.) Lindl. and *Smyrnium cordifolium* Boiss. were mentioned by many studies. Among Iranian people, the use of Zireh (Persian name) is very popular. According to Table 1, five kinds of Zireh including Zireh-e-Siah (*Bunium persicum* (Boiss.) B.Fedtsch.), Zireh-e-Shami (*Carum carvi* L.), Zireh-e-Sabz (*Cuminum cyminum* L.), Zireh-e-Sefid (*Cuminum setifolium* (Boiss.) Kos.-Pol.) and Zireh-e-vahshi (*Lagoecia cuminoides* L.) were used in Iran. The most remarkable one that has the highest number of reports was *Bunium persicum* (Boiss.) B.Fedtsch., which is also known as Zireh-e-koohi in Iran. In Iranian folk medicine, this species was applied as a galactagogue, carminative, calmative, appetizer, decongestant agent and to treat indigestion, children earache, newly delivered ladies...
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recovery, cold-natured conditions and weaknesses. In addition, it was used as a flavor. The genus *Ferula* comprises about 170 species distributed from central Asia to northern Africa. It represented by 30 taxa, 20 of which are endemic to Iran. The popular Persian name for most of these species is “Koma” (Pimenov and Leonov, 1993; Emami and Aghazari, 2011; Mozaffarian, 2007). Most species of this genus have been used in traditional medicine. The most striking of them, with the highest number of citations were *Ferula assa-foetida* L. and *Ferula gummosa* Boiss. The most popular Persian names for *Ferula assa-foetida* L. were Anghuzeh, Heltit and Gane-bu. It was claimed to be highly effective on stomachache, cough, epilepsy, tremor and epilepsy and is used as an anthelmintic and antihemorrhoid agent and also in the treatment of gastritis. *Ferula gummosa* Boiss., commonly known as Barijeh or Ghasni, was used for liver cysts and dyspepsia, and as an anthelmintic, anticitarrhal, antiallergic, appetizer and emmenagogue agent. The genus *Dorema* is represented by 7 species in Iran, 2 of which are endemic. The most famous of them, with the highest number of citations were *Dorema ammoniacum* D.Don and *Dorema aucheri* Boiss. The most popular persian names for *Dorema ammoniacum* D.Don were Kandal, Vasha and Ushegh. It was traditionally used for the treatment of different diseases, such as cystitis, digestive, colic, furuncles, and asthma and as an anthelmintic, emmenagogue and anticoagulant agent. In Iranian traditional medicine, *Dorema aucheri* Boiss. was used against asthma, bronchitis, parasites of digestive system, constipation and burns. The genus *Oliveria* is represented only by a single species, namely *Oliveria decumbens* Vent., in Iran. It was traditionally used for the treatment of different diseases such as indigestion, diarrhea, abdominal pain, feverish

conditions, stomach pain and cold and to relieve thirst in children.

Credibility of plant species used in ethnobotany

Due to the interdisciplinary nature of ethnobotany, few individuals can be expected to be experts in all components of the cross-disciplinary research that ethnobotany represents in botany, pharmacology, medicine, chemistry, anthropology and linguistics. Therefore, it needs a close collaboration of multidisciplinary teams of researchers who are experts in botany, pharmacology, medicine and anthropology (Alexiades and Sheldon, 1996). Unfortunately, in Iran, botanists are not really involved in this field of inquiry, even though botany is one of the basic fields involved in interdisciplinary field of ethnobotany. Most of the studies in Iran have been done by pharmacognosists and ethnobotanists. Improvement of ethnobotany and ethnomedicinal in Iran needs more involvement of botanist in these fields (Ghorbani et al., 2006). Sometimes, the studies of ethnobotany, can comprise a few incorrect identifications. Botanists attempt to record a much lower number of erroneous ethnobotanical taxa. Reports on plants which do not exist in Iran may be a result of plant misidentification. For example, in the literature review of this family in Iran, we found that *Eryngium campestre* L. has been recorded for ethnobotanical uses (Mirdeilami et al., 2011). However, according to Flora Iranica, this species does not exist in Iran (Mozaffarian, 2007). Therefore, we have removed this plant from the list (Table 1). In some cases, identical names are given to different species, or various names to the same species. This is particularly important for taxa that are marketed. Owing to some morphological similarities of the plant parts and their improper identification by the consumers and herbal plant sellers and lack of a standard identification system, the crude medicinal
plants and their parts are often adulterated or substituted in commerce which may result in the loss of their efficacy. For instance, *Zosima absinthifolia* Link adulterated or substituted instead of *Levisticum officinale* W.D.J.Koch in some commercial samples. Identification and recognition of medicinal plants are very important because the adulterants, although belonging to the same genus, do not possess the medicinal properties of the drug. For example, *Bunium cylindricum* is being mixed with real Zireh-e-siah (*Bunium persicum*) and is sold in the market but with less quality and efficacy. Correct identification of plant species is the foundation of safe use of herbal medicines and products. Therefore, in order to ensure safety, therapeutic potency and efficacy of lucrative and medicinal plants, correct identification, authentication, and elimination of adulteration are essential and the taxa should only be authenticated by a panel of experts including taxonomists (Joharchi and Amiri, 2012).

**Comments on conservation status of some notable species**

Some of species have a narrow distribution and collection from wild populations will threaten these taxa. Furthermore, various parts of plants should only be collected in such a manner that ensures their continued presence, both in specific collection locations and across the landscape (Meeker et al., 1993). Harvesting from wild populations and destructive collecting methods, such as removal of subterranean and aerial parts which are essential to the survival of the plants, could be serious threats and often lead to vanish this species. Various species of Apiaceae family are monocarpic, so that only once produce flowers during the life cycle and only reproduce through seeds such as *Ferula spp*. Excessive harvest of roots and flowers of these species are dangerous, and must be avoided, especially in the case of endemic and endangered species. Of the 70 plant species included in this review, 17 taxa were listed as endemic. Some of these species such as *Dorema aucheri* Boiss., *Echinophora cinerea* (Boiss.) Hedge &Lamond, *Ferula hezarlalehzarica* Ajani and *Kelussia odoratissima* Mozaff. are narrow-range endemics and occur only in a few specialized niches. *Heracleum gorganicum* Rech.f. is an endemic species of Iran which is widely and heavily harvested from the wild and this could be a big threat for these species (Ghorbani, 2005). *Dorema aucheri* Boiss. is considered as an endemic species which is heavily collected. Excessive collection of these plants has caused a notable decrease in populations of the plant in the area. Many individuals of young plants are harvested to be sold (Mosaddegh et al., 2012). *Kelussia odoratissima* Mozaff. is another endemic species with a narrow distribution range in Iran which is subjected to heavy use by inhabitants of the region. The local people are using the whole plant for different purposes. Excessive collection of it has led to the decrease of the plant in the area. Some rare species such as *Levisticum officinale* and *Dorema ammoniacum* have been threatened as herbalists and traders hire the local people for collecting these species due to the economic purposes. In addition, local people sometimes sell these medicinal plants in the local market for making money (Rajaei et al., 2012). Many of these plants are potentially endangered and vulnerable taxa. Collecting of plants from the wild led to the impoverishment of various plant communities in many areas, especially for plants that their roots or flowers are used, and that harvesting should be controlled. So, sustainable harvesting and domestication of these plants is a need for conservation which would guarantee these renewable resources for the future. Special consideration should be given to promising plants in the area and protect them from extinction by excessive utilization.
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#### Table 1. Importance of ethnobotanical applications of Apiaceae family in Iran

| NO | Scientific name | Vernacular name | Part used | Preparation | Medicinal uses (Human) | Medicinal uses (Livestock) | Non-medicinal uses | Reference cited |
|----|-----------------|-----------------|-----------|-------------|------------------------|---------------------------|---------------------|------------------|
| 1  | Ammi majus L.    | Khelale-dandan   | Fruit     | -           | Flatulency, Diuretic, Tonic, digestant, dyspepsia | -                        | -                   | Safa et al., 2013; Dolatkhahi et al., 2012; khodayari et al., 2015. |
| 2  | Ammi visnaga (L.) Lam. | Khelale-dandan   | Aerial parts | -          | Tonic, treatment of gingivitis, Digestive disorders, Carminative, appetizer | -                        | -                   |                  |
| 3  | Anethum graveolens L. | Shevid, Toragh | Fruit-Shoot Infusion | Abortion, Anti-Dysmenorrhea, Galactogogue, Antihyperlipidemia, Carminative, Treatment of Diabetes, Digestive disorders, Infertility treatmentmen | -                        | Culinary               | Amir and Joharchi, 2013; Ghorbani, 2005; Sharififar et al., 2010; Dolatkhahi et al., 2012; Sadeghi and Mahmood, 2014; Azizi and Keshavarzi, 2015; Dolatkhahi and Nahipour, 2014; khodayari et al., 2015. |
| 4  | Anthriscus sylvestris (L.) Hoffm. | Jenjil | Leaf; root | - | Treatment of stomachache, Antihyperlipidemia, Stomach tonic | -                        | -                   | khodayari et al., 2015. |
| 5  | Apium graveolens L. | Karafs | Fruit, Leaf; Stem Decoction | Carminative, Tonic, Emmenagogue, Diuretic, Liver disorders, asthma, Loss of appetite, Rheumatic, Lumbago | -                        | Culinary               | Hopper and Field, 1937; Amin, 1992; Amir and Joharchi, 2013; Ghorbani, 2005; Mardaninejad et al., 2013; Nazemiyeh et al., 2009. |
| 6  | Astraeaouras orientalis (L.) Drude | Havij-e-kohi | Whole plant | - | - | - | used as a salad, vegetable and a food additive | Amir and Joharchi, 2013; Safa et al., 2013; khodayari et al., 2015; Sharififar et al., 2010; Amir et al., 2012. |
| 7  | Bupleurum falcatum (Boiss.) B.Fedtsch. | Zireh-e-Siah | Fruit Decoction, powder | Obesity, Galactogogue, Flavoring, Carminative, Calmative, Appetizer, Indigestion, decongestant, children earache, newly delivered ladies recovery, cold-natured treatment, strengthening weaknesses | -                        | Flavouring             | Amir and Joharchi, 2013; Safa et al., 2013; khodayari et al., 2015; Sharififar et al., 2010; Amir et al., 2012. |
| 8  | Bupleurum falcatum L. | - | Leaf; seed Decoction, poultice | Fever, dermal wound, Joint pain and inflammations | -                        | -                        | Rajaei et al., 2012. |
| 9  | Carum carvi L.    | Zireh-e-Shami   | Fruit Infusion | Obesity, Facilitate digestion, Sour stomach, Blood pressure, Diarrhea | -                        | Flavouring             | Mardaninejad et al., 2013; Sadeghi and Mahmood, 2014; Ghorbani et al., 2014. |
| 10 | Chaerophyllum macrourum Boiss. | Garkava, Chelghaba | Young stem | - | - | Eaten with rice | Mosaddegh et al., 2012. |
| No. | Species | Part | Preparation | Uses/Effects |
|-----|---------|------|-------------|--------------|
| 11  | *Coriandrum sativum* L. | Fruit | Decoction | Relieve headache, relieve toothache, jaundice, Acne, Treat of Flatulence, Appetizer, Aphrodisiac, Antiseptic, Galactagogue, Obesity, Digestive, Painkiller. |
|     |         |       |             | Gasteralgia, sore throat, Aromatic, Painkiller. Diabetes control. Gout control. |
| 12  | *Conium maculatum* L. | Root | - | Cholagogue, Depilator. Treat of Dermal Allergic. |
| 13  | *Cuminum cyminum* L. | Fruit | Infusion | Relieve pain after child-birth, Carminative, Cure of Colic. Galactagogue, Obesity, Digestive, Favoring, Antiseptic. |
|     |         |       |             | Increase libido in female. Analgesic in cattle and sheep. |
| 14  | *Cuminum setifolium* (Boiss.) Kos.-Pol. | Fruit, root | - | Carminative. |
| 15  | *Daucus carota* L. | Fruit | - | Diuretic, Emmenagogue, Disposal of worms, Constipation. |
|     |         |       |             | Appetizer and Diuretic. |
| 16  | *Dorema ammoniacum* D.Don | Gum | Infusion | Infectious wound healing and infection. |
|     |         | root | poultice | Abscess in the sheep and goat. |
|     |         |       |             | Edible, culinary. |
| 17  | *Dorema aucheri* Boiss. | Gum, young aerial part, root | Fresh paste | Abortion, aphrodisiac, Scorch. |
|     |         |       |             | Edible, use as vegetable, young stems are pickled. |
| 18  | *Dorema aureum* Stocks | Gum | Decoction, cataplasm | Carminative, Irregularities of Menstruation, lactiferous. |
|     |         |       |             | Dissolves renal calculi, Anti aphthous (Mouth wash). |
| 19  | *Dorema glabrum* Fisch. & C.A.Mey. | - | Leaves, gum-resin | Carminative, Irregularities of Menstruation, lactiferous. |
|     |         | aerial parts, leaf, seed | Decoction | Dissolves renal calculi, Anti aphthous (Mouth wash). |
|     |         |       |             | Foreign vegetable. |
| 20  | *Ducrosia anethifolia* (DC.) Boiss. | Aerial parts | - | Stimulant and an invigorator of the stomach, diuretic, anti-cancer. |
|     |         |       |             | Spices. |
| 21  | *Echinophora cinerea* (Boiss.) Hedge & Lamond | Aerial parts | - | Stimulant and an invigorator of the stomach, diuretic, anti-cancer. |
|     |         |       |             | Spices. |
| 22  | *Echinophora platyloba* DC. | Aerial parts | Decoction | Dissolves renal calculi, Anti aphthous (Mouth wash). |
|     |         |       |             | Spices, flavoring with yogurt. |

**References:**
- Hopper and Field, 1937; Amin, 1992; Amiri et al., 2014; Ghorbani, 2005; Tahvilian et al., 2010; Mardaninejad et al., 2013; Azizi and Keshavarzi, 2015.
- Amiri and Joharchi, 2013.
- Sharififar et al., 2010; Koohpayeh et al., 2011; Safarinejad et al., 2011.
- Hopper and Field, 1937; Amin, 1992; Amiri and Joharchi, 2013; Sharififar et al., 2010; Koohpayeh et al., 2011; Safarinejad et al., 2011.
- Amiri and Joharchi, 2013; Sharififar et al., 2010; khodayari et al., 2015; Ghorbani, 2005; Tahvilian et al., 2014; Mardaninejad et al., 2013; Azizi and Keshavarzi, 2015.
- Rajaei et al., 2012; khodayari et al., 2015; Sadeghi and Mahmood, 2014; Koohpayeh et al., 2011.
- Amiri and Joharchi, 2013; Sharififar et al., 2010; khodayari et al., 2015; Ghorbani, 2005; Tahvilian et al., 2014; Mardaninejad et al., 2013; Azizi and Keshavarzi, 2015.
- Amiri and Joharchi, 2013; Sharififar et al., 2010; khodayari et al., 2015; Ghorbani, 2005; Tahvilian et al., 2014; Mardaninejad et al., 2013; Azizi and Keshavarzi, 2015.
- Rajaei et al., 2012; Mosaddegh et al., 2012; Tahvilian et al., 2014; Koohpayeh et al., 2011; Mozaffarian, 2013.
- Amiri and Joharchi, 2013; Sharififar et al., 2010; khodayari et al., 2015; Ghorbani, 2005; Tahvilian et al., 2014; Mardaninejad et al., 2013; Azizi and Keshavarzi, 2015.
- Rajaei et al., 2012; Mosaddegh et al., 2012; Tahvilian et al., 2014; Koohpayeh et al., 2011; Mozaffarian, 2013.
- Amiri and Joharchi, 2013; Sharififar et al., 2010; khodayari et al., 2015; Ghorbani, 2005; Tahvilian et al., 2014; Mardaninejad et al., 2013; Azizi and Keshavarzi, 2015.
- Rajaei et al., 2012; Mosaddegh et al., 2012; Tahvilian et al., 2014; Koohpayeh et al., 2011; Mozaffarian, 2013.
- Amiri and Joharchi, 2013; Sharififar et al., 2010; khodayari et al., 2015; Ghorbani, 2005; Tahvilian et al., 2014; Mardaninejad et al., 2013; Azizi and Keshavarzi, 2015.
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| No. | Species | Parts Used | Application | Reference |
|-----|---------|------------|-------------|-----------|
| 23  | _Eryngium billardieri_ Delile | Aerial parts, root | Decoction | Constipation, palliative, antifungal, arthritis pain reliever | Mosaddegh et al., 2012; Abbasi et al., 2012; Sharififar et al., 2014. |
| 24  | _Eryngium bungei_ Boiss. | Aerial parts, fruit | Decoction | Painkiller | Sharififar et al., 2014. |
| 25  | _Falcaria vulgaris_ Bernh. | Aerial parts, fruit | Decoction | Treat of Vitiiligo, Cht, Wound, Carminative, Febrifuge, Hemostatic | Amir and Joharchi, 2013; Tahvili, 2014. |
| 26  | *Feresa assa-foetida L._ | Gum | Decoction | Stomachache, Anthemorrhoid, Cough, Tremor, epilepsy, treatment of gastritis | Culinary |
| 27  | *Feresa badrakema_ Koso-Pol. | Resin | - | Anticonvulsant, tonic, anti-hysteria, decongestant, treatment of neurological disorders, stomach ache | |
| 28  | *Feresa behboudiana_ (Rech.f. & Esfand.) D.F.Chamb. | Stem, leaves, inflorescence | Smoking, Sodden | Anti-septic | Appetizer | Bahmani et al., 2012; Pirbalouti et al., 2013. |
| 29  | _Feresa diversivitata_ Regel & Schmalh. | Root | - | Anticonvulsant, tonic, anti-hysteria, decongestant, treatment of neurological disorders, stomach ache | |
| 30  | _Feresa foetida_ (Bunge) Regel | Gum | - | Appetizer, treatment of wounds, liver cysts, Anthemintic, Anticatarrhal, Antiallergic, Dyspepsia, Emmenagague | Powdered fruits, stem as pickle |
| 31  | _Feresa gummosa_ Boiss. | Fruit, gum, root | Decoction, poultice | - | |
| 32  | _Feresa haussknchii_ H.Wolf ex Rech.f. | Stem, leaves, inflorescence | smoking | Anti-septic | |
| 33  | _Feresa hezarlalehzarica_ Ajani | Stem, rhizome | Hydrodistillation | Stomachache, Carminative | |
| 34  | _Feresa latisecta_ Rech.f. & Aellen | Leaves | - | Indigestion and anthemintic | |
| 35  | _Feresa macrocolea_ Boiss. | Leaves, stem | - | Anti-naussea, anti-stomach acid | |
| 36  | _Feresa oopoda_ (Boiss. & Buhse) Boiss. | Seed, gum | Demulcent, vapor, pill | Cough, asthma, respiratory disorders, migraine, expectorant | |
| 37  | _Feresa ovina_ (Boiss.) Boiss. | Shoot, fruit | Decoction | Anticonvulsants, Tonic, constipation, Back pain treatment | |

References:
- Mosaddegh et al., 2012; Abbasi et al., 2012; Sharififar et al., 2014.
- Sharififar et al., 2014.
- Amir and Joharchi, 2013; Tahvili, 2014.
- Emami et al., 2012; Safa et al., 2013; Mosaddegh et al., 2012; khodayari et al., 2015; Sharififar et al., 2010; Sadeghi and Mahmood, 2014; Sajjadi et al., 2011.
- Zargari, 1996.
- Bahmani et al., 2012; Pirbalouti et al., 2013.
- Zargari, 1996.
- Amir and Joharchi, 2013.
- Hopper and Field, 1937; Amir and Joharchi, 2013; Ghorbani, 2005; Mosaddegh et al., 2012; khodayari et al., 2015; Amir et al., 2012.
- Pirbalouti et al., 2013.
- Rajaei et al., 2012.
- Amir et al., 2012.
- Khodayari et al., 2015.
- Ghorbani, 2005; Sharififar et al., 2014.
- Abbasi et al., 2012; Ahmadi et al., 2009; Sajjadi et al., 2011.
| No. | Species | Part(s) | Uses | Pharmacological Effects |
|-----|---------|---------|------|-------------------------|
| 38  | *Ferula persica* Wild. | Stems, roots, leaves, gum | Poultice, vapor | Lumbago, rheumatism, gout, sinusitis, pododynia, backache, Treat epilepsy, laxative, antitussive |
| 39  | *Ferula szovitziana* DC. | Gum | Demulcent, vapor, pill | As a local vegetable, as a spice, flavoring in soups and foods |
| 40  | *Ferula angulata* (Schlt.dl.) Boiss. | Leaves | Anti-septic, renal pain | Relieve flatulence |
| 41  | *Ferula carduchorum* Boiss. & Hausskn. ex Boiss. | Gum | Poultice | Dermal wounds |
| 42  | *Foeniculum vulgare* Mill. | Aerial parts, Fruit | Decoction | Tonic, carminative and relief stomachache |
| 43  | *Froetiepis sulpinuata* (Lede.) Baill. | Aerial parts | - | - |
| 44  | *Grammoctiscium platycarpum* Boiss. & Hausskn. | Leaves | Infusion | As a local vegetable, as a local spice, flavoring |
| 45  | *Haassksnebtia elymatica* Boiss. | Aerial parts | - | Diabetes, hypertension |
| 46  | *Heracleum gorganicum* Rech.f. | Seed | - | Digestive disorders |
| 47  | *Heracleum persicum* Desf. ex Fisch.,C.A.Mey. & Avé-Lall. | Fruit, flowers | Infusion, decoction | Treat of Hiccup, Appetizer, Flavoring, Carminative, Antihelmintic, Stomach Tonic, Tremor, migraine, headache caused by sinusitis |
| 48  | *Johrenia aromatic* Rech.f. | Leaf, root | Decoction | Dissolves renal calculi, cornicde |
| 49  | *Kelussia odoratissima* Mozaff. | Whole plant | - | Indigestion, rheumatism, Gastric ulcer, anti-diabetes, pain, cough, Irritation, Sedative |
| 50  | *Lagoezia cuminoides* L. | Aerial parts | Infusion | Bile stone repellent, Diarrhea |

*Note: Uses and Pharmacological Effects are based on various references listed in the text.*
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| No. | Species & Common Name | Parts Used | Preparation | Uses | Notes |
|-----|-----------------------|------------|-------------|------|-------|
| 51  | Levisticum officinale W.D.J.Koch | Angedane-roomi, Karafe-kushi | Fruit, leaf, root | Infusion | Nerve Diseases, Heart Tonic, Indigestion, Blood sugar, Asthma, diuretic |
|     |                       |            |             |      | Flavored with yogurt, use as vegetable |
|     |                       |            |             |      | Amiri and Joharchi, 2013; Rajaei et al., 2012. |
| 52  | *Oliveria decumbens Vent. | Moshkurak, Tighnak, Den | Aerial parts | Decoction | Relieve thirst in children, indigestion, diarrhea, abdominal pain and feverish conditions, Stomach pain, cold therapy |
|     |                       |            |             |      | Diarrhea |
|     |                       |            |             |      | Mosaddegh et al., 2012; khodayari et al., 2015; Dolatkhahi et al., 2012; Bahmani et al., 2012; Dolatkhahi and Nabipour, 2014. Pirbalouti et al., 2013. |
| 53  | Opopanax hispidus (Friv.) Griseb. | Alafshir | Stem, leaves, inflorescence | Smoking | Anti-septic |
|     |                       |            |             |      | - |
| 54  | Petroselinum crispum (Mill.) Fuss | Jafari | Fruit | Infusion | Emmenagogue, Diuretic, Carminative, Kidney Disorders, Bladder disease, Gout, Blood pressure, Blood sugar, Varicocele |
|     |                       |            |             |      | Edible as vegetable, flavoring |
|     |                       |            |             |      | Amiri and Joharchi, 2013; Mardaninejad et al., 2013 |
| 55  | Peucedanum officinale L. | Bokhurol ekrad | Gum | - | Diuretic, Cough, Meningitis, Paralytic, Renal stone, Respiratory ulcers |
|     |                       |            |             |      | Treatment of cold |
|     |                       |            |             |      | - |
| 56  | Peucedanum rathenicum M.Bieb. | Razianekoochi | Fruit | - | Treat of Flatulence, Anthelmintic, Treat of Colic, Antacid, Stomachache, Antidiarrhea |
|     |                       |            |             |      | Culinary use |
| 57  | Physospermum cornubiense (L.) DC. | Ghaziaghi | Stem | - | Treatment of flatulence |
|     |                       |            |             |      | - |
| 58  | Pimpinella anisum L. | Vavelshing, Anson (Badianroomi) | Fruit | Infusion | Treat of Flatulence, Anthelmintic, Treat of Colic, Antacid, Stomachache, Antidiarrhea |
|     |                       |            |             |      | - |
| 59  | *Prangos cheilanthefolia Boiss. | Sakhinj | Aerial parts | - | Treatment of flatulence |
|     |                       |            |             |      | - |
| 60  | Prangos ferulaecea (L.) Lindl. | Balhur, Ginoo, Marzah | Aerial parts | Decoction | Laxative, Anti-parasitic, Anti-cancer, Carminative |
|     |                       |            |             |      | Treatment of thick and louse (Ruminants) As a natural dye |
|     |                       |            |             |      | Pirbalouti et al., 2013; khodayari et al., 2015; Azizi and Keshavarzi, 2015; Barani and Rahimpour, 2014; Ghorbani et al., 2014. |
| 61  | Prangos uloptera DC. | Jashir-e-sakhehroooy | Fruit, flower | - | Tonic, Carminative |
|     |                       |            |             |      | - |
| 62  | *Psammogonet canescens Vatke | Shen jar | Aerial parts | - | Disinfectants |
|     |                       |            |             |      | Flavored |
|     |                       |            |             |      | Sajjadi et al., 2011. |
| 63  | Pycnocyclus aucherana Decne. ex Boiss. | Sagdandan | Leaves, stem | - | Back, leg and other part muscles pain |
|     |                       |            |             |      | - |
| 64  | Scandix pecten-veneris L. | Suzanak | Aerial parts | Decoction | Palpitation, blood coagulation, body pains |
|     |                       |            |             |      | - |
| 65  | Scandix stellata Banks & Sol. | Badian-e-koohi | Whole plant | - | Stomach tonic, Has a hot temper |
|     |                       |            |             |      | - |

Notes:
- = Used for specific purposes indicated.
| No. | Species | Part | Preparation | Uses                                                                 | Authors |
|-----|---------|------|-------------|-----------------------------------------------------------------------|---------|
| 66  | Seseli tortuosum L. | Whole parts | Infusion, Sodden | Treat epilepsy | - | - | Sahranavard et al., 2014; |
| 67  | Smyrnium cordifolium Boiss. | Aerial parts, seeds, root | Infusion | Urinary ducts and prostate problems, gynaecological disease, Indigestion and stomachache, Bitter aromatic, hot effects, tonic, anti-helminthic, Antipyretic, anti-worm tooth | - | Urinary retention | Roots and stems as a food to be consumed raw or cooked | Mosaddegh et al., 2012; Ahvazi et al., 2012; Tahvilian et al., 2014; Pirbalouti et al., 2013; Bahmani et al., 2012; Ahmadi et al., 2009. |
| 68  | Tetraenaenium lasiopetalum (Boiss.) Manden. | Fruit | Sodden | Anti-septic | - | - | Spice and condiment | Pirbalouti et al., 2010. |
| 69  | Trachyspermum ammi (L.) Sprague | Fruit | Infusion | Carminative, Anthelmintic, Antidiarrhea, Treat of Colic, Antacid, Galactogogue | - | - | Flavoring | Amiri and Joharchi, 2013; Sharififar et al., 2010. |
| 70  | Turgenia latifolia (L.) Hoffm. | Aerial parts | Infusion | Urinary duct problems | - | - | - | Mosaddegh et al., 2012. |

The species marked with an asterisk (*) are endemic species belonging to Apiaceae family in Iran.
Conclusion
This paper clearly represents a deep-rooted ethnobotanical heritage of Apiaceae family in Iran. Traditional knowledge of Iranian peoples is based on oral tradition passed through several generations and most of this information survives only in the memory of the elderly people and is now in danger of vanishing. This review illustrates the necessity of ethnobotanical works in various regions of Iran to record all the folkloric knowledge practiced among indigenous people and attempts to compile these scattered data in order to help maintaining cultural traditions. The best and quickest way to species selection for pharmacological and phytochemical works is by reviewing the ethnobotanical literature. This highlights the significance of such investigations. Based on the data of this paper some taxa should be given priority for further phytochemical and pharmacological studies, including: *Dorema glabrum* Fisch. & C.A.Mey., *Echinophora cinerea* (Boiss.) Hedge & Lamond, *Johrenia aromatic* Rech.f., *Opopanax hispidus* (Friv.) Griseb. and *Pycnocycla aucherana* Decne. ex Boiss. Some species are good candidates for future research, specially in the case of endemic species. The flora of Iran is rich in endemic species of Apiaceae (122 taxa), many of which have been poorly investigated. These taxa are unique and potentially interesting as a basis for future research works. To our knowledge, there is no literature on some notable species that have been traditionally used in Iran such as *Azilia eryngioides* (Pau) Hedge & Lamond, *Ferula macrocolea* Boiss., *Haussknechtia elymaitica* Boiss., *Heracleum gorganicum* Rech.f., *Kalakia marginata* (Boiss.) Alava, etc. Identification of plants in each area provides a better understanding of restorable natural resources and their applications. Ethnobotanical efforts should continue, particularly in regions that have received less attention. It is strongly believed that detailed data as introduced in this paper on the ethnobotany of Apiaceae, provides detailed evidence for the use of these plants for different purposes. Regarding the rich background of traditional knowledge of these species, it seems there are still a large number of unaccomplished researches, which provides baseline data for subsequent pharmacological and phytochemical investigations.

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Conflict of interest
There is no conflict of interest in this study.

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