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Ethnobotanical studies of some Apiaceae plants in Kahramanmaras and a review of their phytochemical studies

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Abstract: Kahramanmaras is located in the South-East Anatolia Region of Turkey. It has a very rich flora, ca 2500 taxa 20% of which are endemic. This study is a master thesis which aims to identify the various folk usage of the plants in the Andırın (Kahramanmaraş) district. As a result of this study, several ethnobotanical usages of 147 taxa, 10 of which are endemic, have been determined. Among them, 8 taxa (*Apium nodiflorum* (L.) Lag., *Bunium paucifolium* DC. var. *junceum* (Boiss.) Hedge & Lamond, *Eryngium campestre* L. var. *virens* Link., *Ferula longipedunculata* Peşmen, *Ferulago cassia* Boiss., *Laser trilobum* (L.) Borkh., *Lecokia cretica* (Lam.) DC., *Smyrnium connatum* Boiss & Kotschy) belong to Apiaceae (Umbelliferae) family and are being used for medicinal purpose and food. Many phytochemical and biological activity studies of some of these species are exist. In the review part of this study the results of these studies were summarized.

Key words: Andırın, Kahramanmaraş, ethnobotany, phytochemical, Apiaceae

Introduction

This study is a master thesis which aims to identify the various folk usage of the plants in the Andırın (Kahramanmaraş) district (Demirci, 2010). As a result of this study, several ethnobotanical usages of 147 taxa, 10 of which are endemic, have been determined. This survey aims to identify the various folk usage of the Apiaceae plants recorded in this master thesis. 8 taxa (*Apium nodiflorum* (L.) Lag., *Bunium paucifolium* DC. var. *junceum* (Boiss.) Hedge & Lamond, *Eryngium campestre* L. *var. virens* Link., *Ferula longipedunculata* Peşmen, *Ferulago cassia* Boiss., *Laser trilobum*

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(L.) Borkh., *Lecokia cretica* (Lam.) DC., *Smyrnium connatum* Boiss & Kotschy) belong to Apiaceae (Umbelliferae) family and are being used for medicinal purpose and food in Andırın (Figure 2-3).

Phytochemical and biological activity studies of these species have been surveyed and the following studies were performed: chemical compositions of the essential oil obtained from *Apium nodiflorum*, *Eryngium campestre* and *Laser trilobum* were analyzed, the antimicrobial activities of *Apium nodiflorum, Eryngium campestre, Laser trilobum* and *Smyrnium connatum* were determined, the antioxidant activities of *Laser trilobum* and *Smyrnium connatum* were investigated, *in vivo* anti-inflammatory and antinociceptive activities of *Eryngium campastre* were evaluated, antihaemolytic activity of *Laser trilobum* was determined, many of sesquiterpene lactone were isolated and identified from the fruits of *Smyrnium connatum*. Literature survey showed that there are no any phytochemical and biological activity studies about *Bunium paucifolium, Ferula longipedunculata*, *Ferulago cassia* and *Lecokia cretica*.

The genus *Bunium,* with approximately 50 species is distributed in Asia, Europe and North Africa (Giancarlo et al., 2006). In Turkey, 18 taxa are exist where 6 of which are endemic (Davis, 1972; Özhatay & Kültür, 2006; Özhatay et al., 2009, 2011; Güner et al., 2012). *Bunium persicum* is commonly known Black Cumin. The seed of *Bunium persicum* has economic value as it is used as a spice in many countries. It has several therapeutic effects including the treatment of digestive disorders, urinary tract disorders and diuretic, gynaecologic, anticonvulsion, antiemetic and also antiasthma and dyspnoea utilities in traditional medicine (Giancarlo et al., 2006; Shahsavari et al., 2008; Cakilcioglu et al., 2011).

The genus *Ferula* comprises about 170 species distributed from central Asia to northern Africa (Sahebkar & Iranshahi, 2011). It represented by 23 taxa, 13 of which are endemic, in Turkey (Davis, 1972; Özhatay & Kültür, 2006; Özhatay et al., 2009, 2011; Güner et al., 2012). Some species of *Ferula* have been used in traditional medicine as antirheumatic, analgesic and antispasmodic. More than 70 species of *Ferula* have already been investigated chemically in the world. The genus are phytochemically characterized mainly by coumarins and sesquiterpenes. Antiepileptic, carminative, digestive, laxative, sedative, analgesic, antihelmintic,

aphrodisiac, anti-inflammatory, antipyretic, antibacterial, antioxidant and anticarcinogenic activities of some *Ferula* species were reported (Miski & Jakupovic, 1990; Özek et al., 2008; Iranshahy & Iranshahi, 2011; Mahendra & Bisht, 2012).

The genus *Ferulago* is represented by 40 species in the world. In Turkey, 34 taxa are exist, 19 of which are endemic (Davis, 1972; Özhatay & Kültür, 2006; Özhatay et al., 2009, 2011; Güner et al., 2012). Anatolia is gene centre for this genus. *Ferulago* species have been used as spice and flavoring. Furthermore they have been used as sedative, tonic, digestive and as well as in the treatment of intestinal worms in traditional medicine. Roots of *Ferulago* species are also used in Turkey as aphrodisiac (Demirci et al., 2000). The chemical compositions of some *Ferulago* species have previously been reported. They contains coumarins, flavonoids, *β*-sitosterol, aromatic, monoterpenes, phenylpropanoid and sesquiterpene aryl esters (Khalighi-Sigaroodi et al., 2005).

The genus *Lecokia* is represented by only a single species, namely *Lecokia cretica*, in Turkey. Literature research showed that there are no any phytochemical and biological activity studies about *Lecokia cretica*.

The aim of this study is to identify the various folk usages of the plants belonging to Apiaceae family in the Andırın (Kahramanmaraş) district and to reviewed phytochemical and biological activity studies of some of these species.

Material and methods

Research area named (Andırın) is a township of Kahramanmaras province. It is located in the South-East Anatolia Region of Turkey (Figure 1). The landscape of the province is mountainous and plain. The main mountainous parts of the province are the overhangs of the Southern Taurus Mountains in east-west direction. Binboga, Nurhak, Ahır and Engizek are the most important mountains situated in the North. The hilly parts of the province begin from the West and reach to the Göksun-Andırın district. Kahramanmaras has a very rich flora, ca 2500 taxa and many endemic species (20%). The main reason of this richness is that the province is located in the transition zone of Irano-Turan and Mediterranean plant geography regions, taking place in the South of Anatolian Diagonal.

The region is one of the remarkable floristic features of Turkey for its geomorphologic features, microclimate and habitat diversities. The surveyed region distributed in 52 villages located on the mountains of an altitude of up to 2250 m. The population of the region is about 40915. The field work was carried out about 9 months. During the research all of the 52 villages were visited, about 500 plant specimens used by local people were collected and to 265 local people were interviewed.

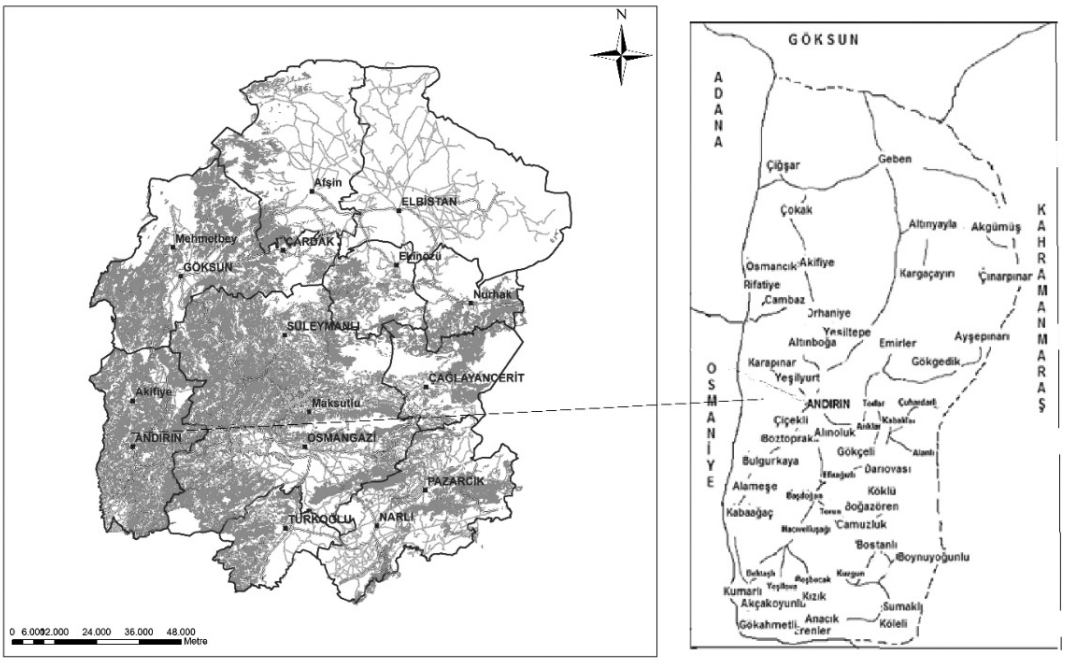

Figure 1. Maps of research area (Andırın, Kahramanmaraş)

Results and discussion

Ethnobotanical usages of 8 taxa belong to the Apiaceae (Umbelliferae) family distributed in Andırın have been determined (*Apium nodiflorum* (L.) Lag., *Bunium paucifolium* DC. var. *junceum* (Boiss.) Hedge & Lamond, *Eryngium campestre* L. *var. virens* Link., *Ferula longipedunculata* Peşmen, *Ferulago cassia* Boiss., *Laser trilobum* (L.) Borkh., *Lecokia cretica* (Lam.) DC., *Smyrnium connatum* Boiss & Kotschy). They are

being used for medicinal purpose and food presented in Table 1. Many phytochemical and biological activity studies of some of these species are exist. Table 2 shows phytochemical and biological activity studies of these species, namely, *Apium nodiflorum*, *Eryngium campestre*, *Laser trilobum* and *Smyrnium connatum*. The following studies were performed: chemical compositions of the essential oil obtained from *Apium nodiflorum*, *Eryngium campestre* and *Laser trilobum* were analyzed, the antimicrobial activities of *Apium nodiflorum, Eryngium campestre Laser trilobum* and *Smyrnium connatum* were determined, the antioxidant activities of *Laser trilobum* and *Smyrnium connatum* were investigated, *in vivo* anti-inflammatory and antinociceptive activities of *Eryngium campastre* were evaluated, antihaemolytic activity of *Laser trilobum* was determined, many of sesquiterpene lactone were isolated and identified from the fruits of *Smyrnium connatum*. Yet, there are no any phytochemical and biological activity studies about *Bunium paucifolium, Ferula longipedunculata*, *Ferulago cassia* and *Lecokia cretica* and they might be promising pecies to investigate in phytochemically and biological activity.

Table 1. Ethnobotanical uses of the species

Species	Ethnobotanical Uses	References
Apium nodiflorum (L.) Lag.	Herba has been used as an antihypertensive and leaves have been used as a food.	Demirci, 2010; Demirci & Özhatay, 2011, 2012
Bunium paucifolium DC. var. *junceum* (Boiss.) Hedge & Lamond	Tubers have been used as a food.	
Eryngium campestre L. var. *virens* Link.	Fresh stem has been used as a food.	
Ferula longipedunculata Peşmen	Rhizome has been used as an aphrodisiac.	
Ferulago cassia Boiss.	Seeds have been used to treatment eye disease and to increase milk.	
Laser trilobum (L.) Borkh.	Seeds have been used as a spice.	
Lecokia cretica (Lam.) DC.	Seeds have been used to treatment hypertension.	
Smyrnium connatum Boiss. & Kotschy	Fresh stem has been used to treatment asthma.	

Table 2. Phytochemical and biological activity studies of the species

Species	Phytochemical Studies	References
Apium nodiflorum (L.) Lag.	· The chemical composition of the essential oil obtained from *Apium nodiflorum* was analyzed by gas chromatography/ mass spectrometry, and 14 components were identified. Limonene (27.72 %), p-cymene (23.06 %), myristicine (18.51 %), and β-pinene (6.62%) were the main components. The antimicrobial activity of the essential oil was assayed in vitro against *Helicobacter pylori* (strain DSMZ 4867), resulting in a minimum inhibitory concentration value of 12.5 µg/mL. · The essential oil exhibited higher antifungal activity. These results support the potential of *A. nodiflorum* oil in the treatment of dermatophytosis and candidosis.	Menghini et al., 2010; Maxia et al., 2012
Eryngium campestre L. var. *virens* Link.	· Seven new triterpene saponins were isolated from the roots of *Eryngium campestre*. · *Eryngium campestre* was evaluated for in vivo anti-inflammatory and antinociceptive activities. The result showed apparent anti-inflammatory and antinociceptive activity. · The chemical composition of the essential oil of *Eryngium campestre* was determined by direct thermal desorption (DTD)-GC/MS analyses. A total of 13 components were identified in the oils, a-pinene and decanal being the major compounds. The essential oil was also tested for inhibitory activity of methicillin-resistant Staphylococcus aureus (MRSA) strains by the agar disc diffusion method. The anti-MRSA activity of *Eryngium campestre* oil was comparable with those of the reference antibiotic vancomycin and oregano oil.	Kartal et al., 2005, 2006; Küpeli et al., 2006; Çelik et al., 2011
Laser trilobum (L.) Borkh.	· The essential oil of *Laser trilobum* was determined by GC and GC/MS analyses. The main constituents were identified as beinglimonene (26.7–91.0%) and perillaldehyde (4.4–62.0%). · The fruit extract of *Laser trilobum* had a significant antimicrobial effect on pathogen bacteria such as *Staphylococcus aureus*, *Proteus vulgaris* (FMC 1), *Proteus mirabilis, Bacillus cereus* (FMC 19), *Aeromonas hydrophila* (ATCC 7965), *Enterococcus faecalis* (ATCC 15753), *Klebsiella pneumoniae* (FMC 5), *Salmonella typhimurium, Enterobacter aerogenes* (CCM 2531) and *Escherichia coli* (ATCC 8739), whereas no significant antimicrobial effect of the essential oils was observed (Parlatan et al., 2009). · The antioxidant and antihaemolytic activities of the hydroalcohol extract of *Laser trilobum* L. leaf were investigated. The results showed that *Laser trilobum* exhibited good but varying levels of antioxidant and antihaemolytic activities in nearly all the models studied, when compared with controls. · One of the study about *Laser trilobum* was investigated the immune activity of the SLs laserolide, isolaserolide, eudeslaserolide, archangelolide and 2-deangeloyl-archangelolide isolated from *Laser trilobum*. The result showed that the highest potential to inhibit cytokine and NO production is possessed by laserolide, which is effective at an IC_{50} of approximately 5µM. Laserolide also inhibits VEGF, a factor known to be associated with tumour growth.	Baser et al., 1993; Ebrahimzadeh et al., 2009; Zidek et al., 2009
Smyrnium connatum Boiss. & Kotschy.	· Many of sesquiterpene lactone were isolated and identified from the fruits of *Smyrnium connatum*. · The antimicrobial and antioxidant activities of *Smyrnium connatum* were determined. Antioxidant properties of methanol extract was studied by 1,1-diphenyl-2-picrylhydrazyl (DPPH) free radicalscavenging method. *Smyrnium connatum* showed the most potent radical scavenging activities. Antimicrobial activities of the extract was studied using agar well diffusion method and *Smyrnium connatum* showed broad-spectrum antibacterial activity against *Escherichia coli, Enterobacter cloacae, Sarcina lutea, Salmonella typhimurium*.	Ates & Ulubelen, 1978; Minareci et al., 2012

A. nodiflorum

E. campestre

L. trilobum

S. connatum

Figure 2. Leaves of *A. nodiflorum* (1); general habit of *E. campestre* (2); fruits of *L. trilobum* (3), inflorescens of *S. connatum* (4) in the study area.

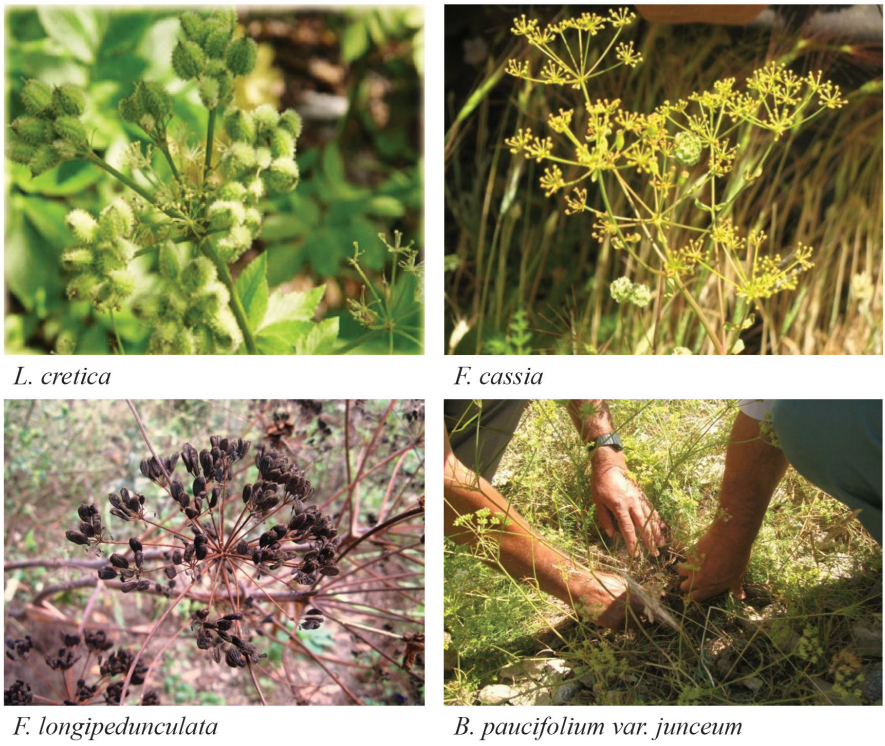

Figure 3. Fruit of *L. cretica* (1); general habit of *F. cassia* (2); fruits of *F. longipedunculata* (3), habitat of *B. paucifolium var. junceum* (4) in the study area.

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