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Original research article

Botanicals from Eastern Anatolia Region of Turkey: Antioxidant capacity and phenolic constituents of endemic herbal medicines

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ABSTRACT

Antioxidant capacity and polyphenolic composition of four endemic medicinal plants from the Eastern Anatolia Region of Turkey; *Verbascum cheiranthifolium* Boiss. var. *cheiranthifolium* Boiss., *Dactylorhiza chuhensis* Renz & Taub., *Eryngium bornmuelleri* Nábelek and *Centaurea karduchorum* Boiss. were evaluated for the first time. Aqueous plant extracts, representing decoctions traditionally used for medical purposes by the local population, exhibited high total reducing capacities (ferric reducing antioxidant power assay) and oxygen radical scavenging abilities (oxygen radical absorbance capacity assay) comparable to or higher than numerous Chinese and Ayurvedic medicinal plants and commonly used medicinal herbs. Flavonoids and hydroxycinnamic acids were two major phenolic groups present in the extracts. Extracts of leaves and flowers which are predominantly used for medical purposes exhibited the highest antioxidant capacities and polyphenolic content. Beside their application as traditional medicine, leaves and flowers might be utilized as sources of natural antioxidants.

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1. Introduction

Floristic studies have shown that Turkey has a vast diversity of species and is one of the richest countries in the world in terms of endemic plants (Davis, 1965–1985; Davis et al., 1988; Güner et al., 2000). According to Avcı (2005), the flora of Turkey is represented by approximately 12,000 species of which 30% are endemic. Four endemic medicinal plants from the Eastern Anatolia Region of Turkey: *Verbascum cheiranthifolium* Boiss. var. *cheiranthifolium* Boiss., *Dactylorhiza chuhensis*

Renz & Taub., *Eryngium bornmuelleri* Nábelek and *Centaurea karduchorum* Boiss. are used by the local population to treat a number of health conditions such as cancer, oedema, haemorrhoids, among others (Table 1). *E. bornmuelleri* Nábelek and *C. karduchorum* Boiss. grow in a restricted area of Konalga village located far from cities and until today are extensively used as herbal medicine.

E. bornmuelleri Nábelek of the Apiaceae family is a perennial distinct endemic herb. Stems are 1–1.5 m tall, with many branches. This plant is growing in a restricted area of Cilo Mountain (Hakkari) and village of Konalga (Van), Turkey, and is

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Table 1 – Traditional medicinal uses of endemic plants from Eastern Anatolia Region of Turkey.

Plant part	Therapeutic effect/ ailments treated	Preparation	References
<i>Verbascum cheiranthifolium</i>			
Aerial parts	Rheumatism	Bath with decoction	Tuzlacı and Erol (1999), Tatlı and Akdemir (2006)
	Eczema, earache and menstrual pains	Directly placed on skin	Tatlı and Akdemir (2006)
	Haemorrhoids	Directly placed on skin	Tatlı and Akdemir (2006), local inhabitants of Konalga village, Çatak/Van (Personal communication, 2010)
Flower	Oedema	Pounded parts used as a plaster	Local inhabitants of Konalga village, Çatak/Van (Personal communication, 2010)
	Earache Haemorrhoids	Decoction dropped into ears Decoction (Ext. ^a); placed directly on skin	Tuzlacı and Erol (1999) Gürhan and Ezer (2004), Tuzlacı and Erol (1999)
Leaf	Menstrual pains	Decoction (+flour) (Ext.)	Tuzlacı and Erol (1999)
Flowering branches	Haemorrhoids	Decoction (Ext.)	Gürhan and Ezer (2004)
	Arthralgia	Crushed (+ wheat flour) and eaten	Tuzlacı and Dogan (2010)
<i>Eryngium bornmuelleri</i>			
Latex (root–stem)	Analgesic for toothache	Latex of root-stem used directly on tooth	Local inhabitants of Konalga village, Çatak/Van (Personal communication, 2010)
Aerial parts	Cancer	Herbal tea	Local inhabitants of Konalga village, Çatak/Van (Personal communication, 2010)
<i>Centaurea karduchorum</i>			
Whole plant	Wound healing	Dried powder placed on injury	Local inhabitants of Konalga village, Çatak/Van (Personal communication, 2010)
<i>Dactylorhiza chuhensis</i>			
Tuber	Common colds, bronchitis and diarrhoea	Dried powder used for preparing sahlep, a medicinal drink	Local inhabitants of Chuh path, Başkale/Van (Personal communication, 2010)

Local names of medicinal plants: *Verbascum cheiranthifolium*: Masicerk, Girch, Sığırkuyruğu; *Eryngium bornmuelleri*: Tusi.; *Centaurea karduchorum*: Giya brinok.; *Dactylorhiza chuhensis*: Şepirze, Kulilkaqamişa.

^a External.

in frequent use by the local population to treat cancer and as an analgesic. In addition, it is an edible plant utilised in local dishes. The plant is also used for the production of honey and as fuel for heating.

C. karduchorum Boiss. of the Asteraceae family is a perennial endemic species belonging to a genus *Centaurea*, which is represented in Turkey by 172 species grown in Eastern Anatolia Region. The herb is a branched woody rootstock and has numerous decumbent stems. It has grey tomentose leaves and rose-purple scarcely radiant flowers. This herb grows in a restricted area of the Eastern Anatolia Region and is used to treat injuries.

D. chuhensis Renz & Taub. of the Orchidaceae family is an endemic plant grown in a restricted area of Van City: Chuh path, between Hoşap town and Başkale County of the Eastern Anatolia Region of Turkey. The herb is robust, leaves are oblong, lanceolate, and flowers are rose-purple. It produces a tuber, which is collected in spring, air dried and ground to obtain a fine powder. This powder is later used to prepare a medicinal drink (sahlep), used by the local population to cure common colds, bronchitis and diarrhoea (Table 1) and is utilized in food, especially ice-cream, during summer.

V. cheiranthifolium Boiss. var. *cheiranthifolium* Boiss. of the Scrophulariaceae family is a biennial endemic herb of genus *Verbascum* (mullein), which is represented in Turkey's flora by 228 species. The slender stem is yellowish, 30–120 cm tall and usually many-branched. Basal leaves are linear-lanceolate to oblong, 7–30 cm × 1.5–8 cm, blunt to acutish and acuminate, entire or rarely crenate; the petiole is 2–6 cm; upper cauline lanceolate broadly ovate and suborbicular, rounded or subcordate at base. Inflorescence has many slender, erect-spreading branches, forming oblong to ovate panicles, with loose clusters of 2–7 flowers. The aerial parts (stem, leaf and flower) are extensively used to cure haemorrhoids (Table 1). It is also used as fuel for heating. Ground seeds are used for fishing.

The common method of the application of these plants as a medicine is preparation of a decoction in boiled water that is applied internally or externally and it is clear that water soluble phytochemicals are the active compounds. Therefore, the objective of our study was to understand the antioxidant capacity of hydrophilic plant extracts obtained from various parts of these medicinal plants, and their composition in regard to phenolic compounds as potentially the active ingredients of traditionally used decoctions.

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