

Investigations on Turkish *Crataegus* Species

Türkiye’de Yetişen *Crataegus* Türleri Üzerinde Araştırmalar

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Abstract

As a result of our investigations on *Crataegus* species growing in Turkey, (*C.tanacetifolia*, *C.orientalis*, *C.stevenii* and *C.microphylla*) it has been found that hyperoside is the main flavonoid of the leaves and flowers of all these species. Especially the leaf and flower extract of *C.microphylla* and the flower extract of *C.stevenii* have high flavonoid contents. The presence of hesperetin, 5-hydroxyauranetin, santin and scutellarein 4',7-dimethylether have been shown for the first time in *Crataegus* species. The leaf and flower extracts of *C.tanacetifolia* have been shown to decrease the heart rate and blood pressure in rats and have hypotensive effect.

Key words: Turkish *Crataegus* species, flavonoids, activity.

Introduction

Crataegus species known as “Hawthorn” are especially used for mild heart diseases because of their flavonoids and procyanidines. Generally, the leaves and flowers (*Crataegi folium cum floribus*) and sometimes the fruits (*Crataegi fructus*) of the plant are used. The most important feature of *Crataegus* extracts is their positive inotropic effect. They increase the activation of the heart muscle cells, provide them a well feeding, have coronary dilators and regulate the blood flow (Ammon, 1994; Kaul, 1998). In phytotherapy, *Crataegus* species are very important for geriatric treatment.

The herbal tea and extracts prepared from the drugs are especially seen in European pharmacies. *Crataegus* species take the first place in widely used drugs according to the statistics (Weiss and Fintelmann, 1997; Çubukçu *et al.*, 2002; Baytop *et al.*, 1982). Investigations on *Crataegus* species are especially on *C.monogyna*, *C.pentagyna* and *C.oxyacantha* (Syn.*C.laevigata*) which grow in Europe (Nikolov *et al.*, 1982; Kartnig *et al.*, 1987).

Crataegus monogyna, which is accepted as the medicinal species, grows in Turkey together with 16 other *Crataegus* species (Browicz, 1972). In Turkey these species are known as alıç, yemişen, alış, alaş, aluç, elaç, geyik dikenini, halıç, haluç, kızlar yemişi, kuş yemişi, yemişen, yemişken, yemşen and they are used by people (Baytop, 1997).

Because of the popularity of *Crataegus* species we intended to study their active compounds. Till now *Crataegus tanacetifolia* (Meriçli and Ergezen, 1994), *C.stevenii*

(Melikoğlu, Meriçli and Meriçli, 1999), *C.orientalis* (Melikoğlu and Meriçli, 2000) and *C.microphylla* (Melikoğlu and Meriçli) have been investigated chemically for their flavonoids. Activity studies have been also conducted on *C.tanacetifolia* (Birman *et al.*, 2001; Tamer, 2001; Tamer *et al.*, 1999).

Materials and Methods

Plant materials: The leaves and flowers of *Crataegus tanacetifolia* (Lam.) Pers. were collected from Bolu-Seben, Turkey in May 1989, the plant material was identified by Prof.Dr.Kerim Alpınar, voucher specimens have been deposited in the Herbarium of the Faculty of Pharmacy of Istanbul Universty with Nr. ISTE 61150. *Crataegus orientalis* Pallas ex Bieb. var.*orientalis* was collected near Afyon, Turkey in June 1996, the plant material was identified by Prof.Dr.Kerim Alpınar, voucher specimens have been deposited in the Herbarium of the Faculty of Pharmacy of Istanbul University with Nr. ISTE 62471; *Crataegus stevenii* Pojark was collected near Afyon in Turkey in June 1996, the plant material was identified by Prof.Dr.Kerim Alpınar, voucher specimens have been deposited in the Herbarium of the Faculty of Pharmacy of Istanbul University with Nr. ISTE 62472; *Crataegus microphylla* C.Koch was collected near Bolu, Turkey in June 1999, the plant material was identified by Dr. Emine Akalın, voucher specimens have been deposited in the Herbarium of the Faculty of Pharmacy of Istanbul University with Nr. ISTE 76223.

Results and Discussion

In the first step the leaves, flowers and unripe fruits of *Crataegus* species were investigated especially for their flavonoids but after testing the first two species it was determined that the fruits contained less flavonoids and showed less activity, so the investigation on the fruits was discontinued.

The flavonoid content of all investigated parts of *Crataegus* species was determined according to DAB 10 with comparison of Turkish *Crataegus monogyna*. The results are shown in Table 1.

The isolated flavonoids from Turkish *Crataegus* species are shown in Table 2.

Table 1: Flavonoid content of Turkish *Crataegus* species

	Leaves (%)	Flowers (%)
<i>Crataegus monogyna</i>	1.26	0.83
<i>C.tanacetifolia</i>	0.68	0.58
<i>C.orientalis</i>	0.98	0.63
<i>C.stevenii</i>	0.89	1.39
<i>C.microphylla</i>	2.04	1.28

Our studies on the activities of *Crataegus* extracts were achieved only on *Crataegus tanacetifolia* till now and it was shown that the leaf and flower extracts of this species decreased the heart rate and blood pressure; had hypotensive effects on rats and could

modify rheological parameters and thus can be used in clinics for the treatment of hypertension and other diseases associated with abnormal rheological parameters.

According to DAB 10 the *Crataegus* leaves and flowers should have at least 0.7 % flavonoid content, so the amounts in the leaves and flowers of *C.microphylla* and in the flowers of *C.stevenii* are relatively high for *Crataegus* species. Both of these species contain more flavonoids than the medicinal species *C.monogyna*.

Table 2: Flavonoids of Turkish *Crataegus* species

Flavonoids		<i>C.tanacetifolia</i>		<i>C.orientalis</i>		<i>C.stevenii</i>		<i>C.microphylla</i>	
		Leaves	Flowers	Leaves	Flowers	Leaves	Flowers	Leaves	Flowers
A g l y c o n e s	Apigenin	+	-	+	+	+	+	+	-
	Eriodictyol	-	-	-	-	-	-	-	+
	Hesperetin	-	-	-	-	-	-	-	+
	5-Hydroxyauranetin	-	+	-	-	-	-	-	-
	Kaempferol	+	+	-	-	-	-	-	-
	Luteolin	-	-	-	-	-	-	+	-
	Quercetin	+	+	-	+	+	+	+	+
	Santin	+	+	-	-	-	-	-	-
	Scutellarein 4',7-dimethylether	-	-	-	-	-	+	-	-
G l y c o s i d e s	Apigenin 7-glucoside	+	-	+	-	+	-	-	-
	Hyperoside	+	+	+	+	+	+	+	+
	Kaempferol 3-galactoside	+	+	-	-	-	-	-	-
	Luteolin 7-glucoside	-	-	-	-	-	-	+	+
	Rutin	-	-	-	+	-	-	-	-
	Vitexin	+	+	+	-	-	-	+	-
	Vitexin 4'-rhamnoside	+	-	+	+	+	+	+	-
	Vitexin 2''-rhamnoside	-	+	-	-	+	+	-	-

The flavonoids found in Turkish *Crataegus* species are similar to the flavonoids of the *Crataegus* species investigated before. Hyperoside (quercetin 3-galactoside) is always the major flavonoid in all species and the other characteristic flavonoid vitexin and its derivatives can be isolated from the Turkish *Crataegus* species also; but the presence of hesperetin, 5-hydroxyauranetin, santin and scutellarein 4',7-dimethylether in *Crataegus* species have been shown for the first time in these studies. (-)Epicatechin and procyanidin B-2 were also isolated from *C.tanacetifolia*.

Özet

Türkiye’de yetişen *Crataegus* türlerinden *C.tanacetifolia*, *C.orientalis*, *C.stevenii* ve *C.microphylla* üzerinde yapılmış araştırmalar sonunda, incelenen türlerin hepsinin yaprak ve çiçeklerinin ana flavon bileşiğinin hiperozit olduğu saptanmıştır. Özellikle *C.microphylla* yaprak ve çiçek ekstreleri ile *C.stevenii* çiçek ekstreleri yüksek oranda flavon bileşikleri taşımaktadır. *Crataegus* türlerinde hesperetin, 5-hidroksiauranetin, santin ve skutellarein 4',7-dimetileter varlığı ilk defa bu çalışmalar ile gösterilmiştir. *C.tanacetifolia* yaprak ve çiçek ekstrelerinin ayrıca sıçanlarda kalp frekansı ve kan basıncını düşürdüğü ve tansiyon düşürücü etkilerinin olduğu saptanmıştır.

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