Short Communication

Investigating the most effective compounds in medicinal plant of *Sambucus nigra* in Azarbayjan region

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Abstract

For many years now, identification of native medicinal plants which are effective in improving human health has been the focus of attention by the United Nations World Health Organization. *Sambucus nigra* is a valuable medicinal plant used for a long time in traditional medicine for prevention and treatment of common diseases such as cold, joint swell, and rheumatic pains. In this research, root, stem and leaf samples of *Sambucus nigra* were collected at altitude of 850 m from Souly valley in Azerbaijan region in northwestern Iran and the plant extracts were obtained from dry samples powder. Various compounds were identified by gas chromatography apparatus. The most important compounds included quercetin (11.3%), sambunigrin (7.6%), astragalin (5.7%), isoquerctin (4.8%), delphinidin, 3-rutinoside(6.1%), cyaniding -3, and 5 diglucoside (4.1%). The study also revealed that the amount of these compounds in leaves was generally more than in the other parts of the plant.

Keywords: extract; *Sambucus nigra*; effective compounds; gas chromatography

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Introduction

Elderberries (Caprifoliaceae family) are large deciduous small trees native mostly to the northern hemisphere, although they have become naturalized throughout much of the temperate and subtropical regions where humans live. The large compound leaves are typically dark green. Ornamental selections, which are popular for landscaping, have been identified that are variegated and dark purple. The fruits are individually small (0.3- 0.6 cm) but collectively hundreds of fruits produce very large clusters. Fruits of the cultivated elderberry are very dark purple, nearly black, but the various species range from bright red to blue and dark purple. The mild – flavored fruits ripen in mid to late summer.

Elderberry bark, root, stems, flowers, and fruit have been used by Native American cultures as medicine, food and to produce toys and tools (Lee & Finn, 2007). In traditional medicine, roots and leafs of this plant are used for treatment of the joints pains such as arthritis rheumatic,

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infected wounds, eczema and urticaria (Bergner, 2005). Investigations showed that extract of this plant contains different compounds such as flavonoids (routin, coercetin, isocoercetin, astragalin), phenolic acids, vitamin A and C (in fruit), anthocyanin and volatile materials (Mumcuoglu et al., 2007). Vitamin C, phenolic compounds and flavonoids act as antioxidants and antivirus agents used for treatment of cold and reducing the fever (Bergner, 2005).

High concentrations of anthocyanin, which is a complex blend of flavonoids used for treatment of influenza and arthritis rheumatic, are reported for *Sambucus nigra* species (Wightman, 2004). In respect to the influence of this plant on different kinds of bacteria and treatment of the cold and due to its importance in treatment of chronic human diseases, this study aimed at identifying and comparing the most important compounds in extracts obtained from different parts of *Sambucus nigra* plant.

Materials and Methods

Plant gathering

The different parts of *Sambucus nigra* plant including root, stem and leaf were collected from Souly valley in Azerbaijan region, northwestern Iran. The prepared samples were validated in the herbarium of Islamic Azad University, Saveh Branch. After gathering, the plants were immediately dried in shadow and far from the direct sun light as direct sun light can remove about 30 percent of volatile compounds. The complete dried samples were then powdered for extracting their compounds.

Extract derivation

100 grams of each sample powder (root, stem and leaf) was poured into a separate volumetric flask and $\frac{2}{3}$ of the volume of the flask were filed with distilled water. Then, the Clevenger was connected to each flask, fastened by a clip and a stand. After 6 hours, the extract that remained on the water was separated from water surface with sodium sulfate. After dehydration, extracts were kept in dark and seamless bottles. 2.8 ml extract was obtained per 100 g dry weight of plant.

Table 1
Analytical report for essential oil compounds in root , stem and leaf of *Sambucus nigra* L.

compounds	number	Retention time(min)	Leaf (%)	Stem (%)	Root (%)
Cyanidin-3,5-diglucoside	1	5.0	4.1	2.4	1.3
Unknown	2	6.1	4.6	3.2	1.9
Cyanidin-3-sambubioside	3	8.2	3.7	5.1	2.4
Cyanidin-3-glucoside	4	9.3	2.5	-	0.8
3-caffeoylquinic acide	5	9.8	4.6	1.5	1.6
α-campholenal	6	17.8	2.5	4.2	2.3
Delphinidin,3-rutinoside	7	18.3	6.1	2.3	1.8
Chlorogenic acid	8	18.7	2.9	-	-
Unknown	9	19.6	6.5	4.0	-
Isoquercetin	10	20.5	4.8	3.3	1.1
Unknown	11	21.3	1.8	2.7	4.6
Astragalin	12	22.7	3.9	5.1	1.8
sambunigerine	13	23.4	7.6	2.5	1.8
Unknown	14	25.5	3.5	1.1	2.0
quercetin	15	31.7	11.3	6.8	2.5
Quercetin-3-rutinoside	16	33.2	6.9	2.9	-
Unknown	17	36.5	4.3	1.8	-
Petunidin-3- rutinoside	18	48.5	5.2	1.9	2.6

Identifying extract compounds

The most important components of extract was identified by gas chromatography apparatus and Varian C-P-3800 pattern and apparatus column of Spsil8CB with 60 meters length and 0.32 mm diameter and thickness of layer in static phase was 0.25µm and nitrogen was used as conveying gas and the gas pressure of top column VPSI was adjusted. The temperature range was between 50 to 230 °C with 3 °C incremental steps per minute. The temperature of injection case was 117 °C linearly increasing to 250 °C. 1 ml of extract obtained from root, stem and leaf samples of *Sambucus nigra* plant was analyzed in three separate injections. The obtained spectrums were identified by standard materials and the inhibition of time comparison (Table 1).

Results

Gas chromatography of the root, stem and leaf samples revealled 13 compounds including quercetin (11.3%), sambunigrin (7.6%), astragalin (5.7%), isoquercetin (4.8%), delphinidin, 3-rutinoside (6.1%), cyaniding-3, 5-diglucoside (4.1%). Moreover, the qualitative analysis of samples revealed that compounds in leaf were more than other parts of the plant (Table 1)

Discussion

The results of survey of secondary compounds in plants showed that the *Sambucus nigra* plant has many different compounds. The compounds which had the most amount in the plant includes: Quercetin which is 11/3 percent and Quercetin-3-rutinoside which is 6/9 percent. Both of two compounds are attributed to *Sambucus nigra* leaf organ. The stem and the root of this plant had these compounds less than leaf organ respectively.

In initial analyses, the results of HPLC-UV and GC-MS for extracts obtained from fruit and flower of *Sambucus nigra* plant revealed a wide spectrum of bioflavonoids and showed that flavons, flavonols and dihydroflavons were respectively presented as the most abundant aromatic compounds in these extracts (Hearst et al., 2010).

Material obtained from black elderberry flowers confirmed the presence of flavonols that the most abundant of those are Quersetin and anthocyanin. Also, some phenolic components such as Cinnamic acid and Gallic acid as other derivatives are present with changes in chemical structures (Borchard, 2008).

Non-aromatic antimicrobials were identified in fruit and elderberry flower that are included of Lectins, oligosakarids and peptides which are potent inhibitors of bacterial cell metabolism (Karpova, 2007).

The presence of some compounds such as flavonoids and tannins are effective in the anti-microbial properties of extracts of these plants. Anthocyanins Cyaniding-3-sambubioside and Cyaniding-3-glucoside in *S.nigra* has been found that the anticancer effect of elderberry fruit were introduced due to anthocyanin pigments (Bergner, 2005).

In this survey, the results obtained from the most important of secondary materials of black elderberry showed that this plant has important compounds that can be used in the pharmaceutical industry and health.

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