



## The ethnopharmacological review of medicinal plants in uses hypertension treatment in Iranian complementary medicine

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### ABSTRACT

**Background & Aim:** One of the most common diseases in the world, especially among Iranian people, is high blood pressure which can cause many cardiovascular disorders such as heart attack. The disease is often associated with other diseases such as diabetes and hyperlipidemia. Methyldopa and captopril are the most common drugs among several medications used to control blood pressure in Iran. Nowadays, herbal medicines are very prevalent because medicinal plants have least of the side effects. Various herbals are used in the Iranian traditional medicine to improve hypertension, but among them, barberry, olive leaf, garlic, celery, sumac and hibiscus are the most prevalent.

**Experimental:** In this paper, the most herbs in uses in treatment of hypertension were studied and these effects of natural products on these plants were clarified.

**Results & Discussion:** The results indicate that these plants and their phenolic compounds can be used as an alternative or supplement to chemical medicines used to control blood pressure.

**Industrial and practical recommendations:** There is suggestion for pharmaceuticals and food industrials to use of these herbs for improve new methodology in herbal drugs production.

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### 1. Introduction

Arterial hypertension is most important diseases in developing countries. This common and asymptomatic disease is curable and can be easily diagnosed, but it may have fatal consequences if left untreated (Leng *et al.*, 1996). Hypertension in adults refers to an increase in systolic blood pressure equal to or more than 140 mm/hg as well as diastolic blood pressure equal to or more than 90mm/Hg separately or together (Lloyd-Jones *et al.*, 2005). Some studies show that a great

number of factors contribute to the raised blood pressure in hypertensive patients, and their relative roles may differ between individuals. Among the factors that have been intensively studied are salt intake, obesity and insulin resistance, the renin-angiotensin system, and the sympathetic nervous system (Beevers *et al.*, 2001). Studies have shown that if hypertension disorder is left untreated, it can cause problems such as heart failure, coronary artery disease, angina, myocardial infarction, development of thrombosis, and cerebral hemorrhage (MacMahon *et al.*, 1990). Hypertension management consists of two

main approaches: lifestyle modifications and pharmacological treatment. Lower intake of salt and fat, regular exercise and limited alcohol intake are the most important lifestyle factors (Appel *et al.*, 2003). There are some mechanisms for lowering blood pressure: decreasing blood volume and Na, decreasing peripheral resistance, restrain heart activity, peripheral vasodilation by interfering NO and angiotensin suppression. There are several groups of antihypertensive drugs, including diuretics, anti-adrenergic receptor, a vascular dilator and angiotensin-converting enzyme inhibitors (ACEI) (Collaboration, 2000). Nowadays, the need for multiple drug therapy especially for whom with resistant hypertension and rising number of patients suffering from adverse effects and side effects of synthetic drugs have led to the popularity of herbal medicines. Growing use of medicinal plants highlights the need for more research on medicinal plants and their effects on clinical trials. Many medicinal plants in traditional medicine in Iran are used to control blood pressure for their relatively high effectiveness, slight side effects, being natural, and lower prices compared to expensive drugs. In this review, several plants are used to treat hypertension which is studied clinically and in laboratory conditions focused on Iranian complementary medicine. In many reference books such as Canon written by Ibn Sina many of these plants are mentioned (Tekol, 2007).

#### ***Berberis Vulgaris***

A shrub 1 to 5 meters in length with small red fruits that, fruit of this plant contains alkaloids such as Berberine, Jatrorrhizine, Chloramine, Palmatine, Oxycodone, this is fluorine Eyes and Magnoflorine which have antibiotic effects and help lower blood pressure (Imanshahidi and Hosseinzadeh, 2008). There is plenty of evidence that barberry fruit improve blood pressure and this characteristic is attributed to alkaloid berberine (Fatehi-Hassanabad *et al.*, 2005). In experimental intravenous administration of aqueous extract of barberry to rats suffering from high blood pressure it was shown that the reduced blood pressure was significant at the probability level of  $P < 0.01$ . In this experiment blood pressure was caused by sodium chloride in the drinking water of rats, then, blood pressure was significantly reduced by injecting the aqueous extract of barberry (Hong *et al.*, 2002). In another experiment, aqueous extract of barberry in the

form of 200 mg capsules was administered to 60 patients three times a day and for two weeks. At the end, the average systolic blood pressure was reduced from 169.05 to 145.08 and diastolic blood pressure was reduced from 99.8 to 83.75 and the reduction was significant at  $P < 0.01$  (Cicero and Ertek, 2009).

#### ***Alium sativum***

Garlic is an herbaceous perennial plant consisting of 10 to 50 cubes. The uses of garlic to treat various diseases back to thousands years ago. However, there is little scientific support for medicinal properties of garlic (Koch and Lawson, 1996). But in the past decade, the protective properties of garlic against cancer was proved by epidemiological studies and animal experiments (Thomson and Ali, 2003; Wargovich, 1987). Garlic contains the various compounds such as organosulfur compounds, amino acids, vitamins and minerals. It is possible that some sulfur compounds, including allicin, ojeone, allyl cystein, diallyl thiosulfinate are responsible for the health benefits of garlic (Kimbaris *et al.*, 2006). Animal studies showed that garlic extract reduces plasma lipids and cholesterol (Ali *et al.*, 2000; Eidi *et al.*, 2006). In an experiment the effect of garlic pill on the patients with high blood pressure was examined and the results indicated that the garlic pill significantly reduced blood sugar, blood lipid and systolic blood pressure (Reinhart *et al.*, 2008).

#### ***Apium graveolens***

Celery is a plant of Apiaceous family, which has different chemical compounds including glycosides, sugars, pectin and ether essence (Momin and Nair, 2001). Apigenin as the importance flavonoid in celery is a potent antiplatelet agent and this vascular relaxant effect in animals has been demonstrated (Zhang *et al.*, 2011). In another study, the effects of the celery seed tea bag were examined clinically in 37 patients with hypertension (Moghadam *et al.*, 2013). Before the experiment, the mean systolic and diastolic blood pressure was 171.35 and 94.3, respectively and after the treatment, they were measured 154.3 and 89.6, respectively. This difference was significant at the probability level of 0.05. This effect is probably produced by opening vascular effects of diuresis (Fazal and Singla, 2012). In the other study it was shown that aqueous celery extract significantly reduced fat in the blood serum of mice (Mansi *et al.*, 2009).

### *Olea europae*

Olive is a plant which belongs to the Oleaceae family and the scientific name of the fruit is *Olea europae*. Its leaf and fruit are used in traditional medicine. Olive leaf has a bitter taste with diuretic and astringent properties, that it also improving blood pressure. Olive leaf reduces blood pressure by opening ducts of surface vessels without affecting heart (Perrinjaquet-Mocchetti *et al.*, 2008). Olive leaf contains a substance called oleuropein whose relaxant effects on the isolated arteries walls of animals were demonstrated (Huang and Sumpio, 2008). Another study conducted by Fehri *et al* (1993) demonstrated that aqueous olive leaf extract reduces blood pressure, blood sugar and uric acid levels in the rodent (Fehri *et al.*, 1993). In another study conducted on mice, aqueous extract of olive leaf significantly reduced systolic blood pressure compared to placebo (Susalit *et al.*, 2011).

### *Hibiscus Sabdariffa*

An annual plant with 2 to 3 m high bush which has 3-5 faceted yellowish green leaves and red flowers with green sepals which go red the fruit ripens. This plant has a very sour taste because of containing high citric acid level. Its effectiveness on reducing blood pressure has been demonstrated in several article which in most cases consider anthocyanin as the main factor for hypertension improving (Faraji and Tarkhani, 1999; Mozaffari-Khosravi *et al.*, 2009). In several countries the aqueous extract of sour tea has been used to treat digestive disorders, hypercholesterolemia, and diuretic, diaphoretic [causing sweating] and anti- hypertensive for many years. The experimental values of 500 mg / kg and 1000 mg / kg body weight calyx of hibiscus tea infusion in hypertensive and normotensive wistar-kyoto rats, significantly reduced the systolic and diastolic (Onyenekwe *et al.*, 1999). In an experiment conducted by Whabi *et al.* (2010), the blood pressure-lowering property of this plant in diabetic patients has been demonstrated (Wahabi *et al.*, 2010). In another experiment to compare the effects of anti- hypertensive and tolerability of a standardized extract from hibiscus tea with captopril, a randomized controlled clinical trial, patients 30 to 80 years of age were diagnosed with hypertension and were not treated for at least one month prior to study. One group of subjects drank the

infusion made from 10 g sepal of hibiscus tea dried flower in half a liter of water [containing 9.6 g anthocyanin] before breakfast and the other group used 25 mg captopril twice a day. The results showed that the hibiscus tea reduced the systolic blood pressure from 139.05 to 123.73 mmHg and diastolic blood pressure from 90.81 to 79.52 mmHg. At the end of the study, no significant difference was observed in blood pressure measured in two treatment groups (Herrera-Arellano *et al.*, 2004). In the other study, the tolerance for both treatment groups was 100%. A natriuretic effect was observed in hibiscus tea. The obtained data showed that in terms of hypotensive, and anti-hypertensive effectiveness as well as tolerance there was no significant difference between Hibiscus tea extract standardized on 6.9 mg of anthocyanin's and 50 mg of captopril (Ajiboye *et al.*, 2011).

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