

Types of Paeonia and Their Use in Phytotherapy

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Abstract

Treatment with medicinal herbs dates back to the times before Christ and has been widely used all over the world for years. Today, its importance is increasing day by day and it is widely preferred because it is found more reliable. According to the World Health Organization, 20 thousand plant species are known in modern and traditional medicine. The number of plants used by the cosmetic and botanical industry is not included to the number. It takes many years to recognize a plant and use it in treatment and it is very difficult to protect it. Therefore, it is of great importance to recognize and develop the plants used in phytotherapy in the past. *Paeonia* L. (*Paeoniaceae*), known as "peony", is a perennial (geofit) plant with showy and attractive flowers and tubers under the ground. *Paeoniaceae* family is located in the rich flora of our country and has been used for their many medicinal effects. In this review article, peony species and their use in phytotherapy in Turkey and World were discussed with the studies on the subject.

Keywords: Paeonia, Peony, Phytotherapy, Geophyte

Paeonia Türleri ve Fitoterapide Kullanımı

Öz

Şifalı bitkilerle tedavi, milattan önceki zamanlara kadar uzanır ve yıllardır tüm dünyada yaygın olarak kullanılmaktadır. Günümüzde önemi gün geçtikçe artmakta ve daha güvenilir bulunduğu için yaygın olarak tercih edilmektedir. Dünya Sağlık Örgütü'ne göre modern ve geleneksel tıpta 20 bin bitki türü biliniyor. Kozmetik ve botanik endüstrisinin kullandığı bitki sayısı rakamlara dahil edilmemiştir. Bir bitkiyi tanımak ve tedavide kullanmak uzun yıllar alır ve onu korumak çok zordur. Bu nedenle geçmişte fitoterapide kullanılan bitkilerin tanınması ve geliştirilmesi büyük önem taşımaktadır. "Şakayık" olarak bilinen *Paeonia* L. (*Paeoniaceae*), yer altında gösterişli ve çekici çiçekleri ve yumruları olan çok yıllık (geofit) bir bitkidir. *Paeoniaceae* familyası, ülkemizin zengin florasında yer almakta ve birçok tıbbi etkisinden dolayı kullanılmaktadır. Bu derleme yazısında şakayık türleri ve Türkiye ve Dünya'daki fitoterapide kullanımları konu ile ilgili çalışmalarla tartışılmıştır.

Anahtar Kelimeler: Paeonia, Şakayık, Fitoterapi, Geofit

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1. Introduction

Turkey is extremely rich in terms of plant diversity of a country. On the basis of this diversity, the presence of Turkey's on the three Phytogeographic regions, topographic diversity, diversity of climate and geological structure play role (Davis, 1965). While it was said that there were 3000-5000 species that grow naturally in Turkey until 1960, according to the studies and researches of the last 40 years, it has been revealed that this number is over 9000 today. Floristic studies in Turkey, especially in the 1700s began with Tournefort. Later, the rich flora of our country was proved with the works of E. Boissier's "Flora of Turkey and East Aegean Islands", and these studies were tried to be completed with many floristic researches made after them. According to the result of this research in terms of species compared with the flora of Central and Western European countries, Turkey is much richer (Donner, 2007).

2. Paeonia, Important Types

Turkey; geographical regions with differences in climate and soil characteristics, the intersection of Asian and European continents, being located at the intersection of two important Vavilov gene centers (Mediterranean and Near East), being surrounded on three sides by seas, three important phytogeographic regions (Europe-Siberia, Iran-Turan and Mediterranean). It has an important place in the world in terms of plant diversity. With the last diagnosis, there are over 12000 plant taxa in our country (Avcı, 2005; Karagöz et al., 2010). The rate of endemism of plant diversity as in Turkey (34%) in order to conserve has an important place in the world. Compared with Europe, which is 15 times larger than Turkey, that our wealth is better understood. As a matter of fact, while Greece has the most endemic species with 800 in Europe, this number is more than 3000 in Turkey (Uyanık, 2013). Twelve thousand endemic plant species grow in the world and most of these endemic plants grow in Anatolian lands. About a third, that is, four thousand. Considering that there are two thousand 400 endemic plant species throughout Europe, the value of our existence is better understood (Anonymous, 2020a). Due to the fact that Turkey has such a rich flora, geophytes show a great variety in the country. Turkey is known as more than 900 of geofits (bulbs, tubers, rhizomes) plant species (more than 1000 taxa) are (Kaya, 2016). *Paeonia* L. (*Paeoniaceae*) are perennial (geophyte) plants known as "peony", with showy flowers and underground tubers (Ünlü, 2010). *Paeonia* species are also known as 'Ayıgülü, Eşek Gülü, Bocur, Şakayık, Yer Şakayığı, Dağ Zambağı, Savul, Ayı Kulağı, Kavak Gülü, Kozluk Çiçeği, Orak Gülü Tombak' in Turkey (Baytop 1994, 1999; Tuzlacı, 2006; Tanker et al., 2007). The only herbaceous form of peony in our country; it is a perennial

plant with tubers, blooms in different colors and can grow up to 1 m. Herbaceous peony accepted as the major gene present in central Turkey Flora 11 taxa including 54 populations have been identified (Kaya, 2010) Researchers have shown that there are six species in our flora, but they are rare in nature, although tubers are exported (Baytop, 1994; Özhatay et al., 1998). Since the cultivation techniques are not known, the tubers exported are collected from nature especially the endemic-rare species are becoming extinct. Due to the insufficiency of studies on peonies; although we have the main gene center of peony, it could not be evaluated effectively because exactly how many species exist, in which regions, which species are in danger, breeding techniques and usage possibilities are not known; there was no contribution to the national economy. Up to now, all regions of Turkey have been scanned, and 54 populations have been identified and cultured from generally 500-2500m high altitude and rocky places. Only Turkey fluorescent belonging *P. turcica*, unknown subspecies of *P. xkayae* species and other species are introduced at international level. Especially the distribution of *P. peregrina* species in many regions and population differences between these locations have been highlighted (Kaya, 2010).

3. The Place and Importance of Phytotherapy in History

The term “phytotherapy; phytos= plant, therapy= treatment”, which can be explained as the approach of treating patients by using herbs traditionally in China and India, was first used by the French physician Henri Lenclerc who lived between 1870-1953. It is named in the magazine called Presence Medical (Sarışen et al., 2005; Sert et al, 2015). In the inscriptions dating back to 3000 years B.C., it has been proved that in some civilizations there were treatments with herbal and animal drugs. Approximately B.C. in 2500 Rig Veda, one of the important representatives of Indian medicine, has been in a parallel development with the medicine in the Far East and mentioned about a thousand medicinal plants in his reports. However, in the writings of Hippocrates, who is an important name of Greek medicine and accepted as the father of modern medicine, he mentioned about 400 herbal products. During the period of Islamic civilization, Ebu Reyhan, the author of the book “Kitâbü’s Saydana Fî’t Tıb”, a copy of which mentions about 20 medicinal plants, is in the Orhan Gazi Library, and mentioned 800 animal and herbal treatments that were accepted as reference books until the 1650s. Ibn-i Sina and Al Gafini, who wrote the book “Medicinel Law”, have important works on herbal medicine. In addition, in 1978, a commission formed by Germany prepared a report evaluating the clinical effects of 300 herbs (Nathan et al., 1999; Izzo et al., 2005).

Nowadays, the use of natural products and medicinal plants is increasingly widespread for individuals to prevent and treat disease. Because these herbal products are easily accessible and cheap, and at the same time, the amount of use has increased among the people, considering that they

are harmful to nature. Since it is natural and has no harmful effects, the consumption of many animal and herbal products, vitamins, minerals and similar substances has been increasing in recent years (Friedman, 2000; Izzo et al., 2005). According to the data of the World Health Organization, it is known that around 20 thousand plant species are used in modern and traditional types. Plant species used by the cosmetic and botanical industry are not included in this number. It was noted that in 2000 the medical and aromatic plants market share of approximately 60 billion dollars. This figure accounts for approximately 20 percent of the annual pharmaceutical market in the world. According to international reports, the global market for medicinal herbal products and medicines reached 93 billion dollars in 2015 and 107 billion dollars in 2017. The herbal products and medicines market has grown significantly over the past decade despite the economic recession worldwide. Despite the fact that Turkey is one of the most important countries, world exports of medicinal and aromatic plants in terms of medicinal and aromatic plants are not yet at the desired level. According to data of 2017 in Turkey, about 140 million dollars in the vicinities medicinal and aromatic plants performing export market has found a total of 2.5 billion dollars. Turkey exports of medicinal plants which ranks 18th of 110 countries (Anonymous, 2018).

4. Its Use in Phytotherapy and Its Chemical Content

Paeonia flowers (Flores *paeoniae*) contain anthocyanin pigments (paeonin), flavonoids (chempferol derivatives), tannins (gallottanene, which has been proven in leaves and roots). It has been used in folk medicine in the past to treat epilepsy, rheumatism, intestinal disorders (especially seeds and roots) and cough. It has been used in homeopathy against cracks, hemorrhoids and varicose veins. It is no longer used today. However, it is sometimes added to tea blends to improve the appearance of herbal teas. The use of flowers, seeds and roots in high doses causes gastroenteritis, colic and diarrhea. *Paeonia* roots (*Radix paeoniae*) are used as emetics and emmenagogue (Bisset, 1994).

According to Baytop (1994), its roots are used as a sedative. As a result of experiments on mice, no anti-inflammatory effect was found.

The roots of *P. officinalis* species *Radix paeoniae* contain a heteroside called peonol and has astringent and antispasmodic effects. It is used an infusion sedative in epilepsy and pertussis (Tanker et al., 2007).

In Eastern countries, especially in Egypt, *Paeonia* root is used against epilepsy by being passed on the patient's chest in the form of a cross. For this reason, this drug is called "Cross of the Cross" in Egypt. In old publications, it is recorded that it is beneficial to make incense with the fruits of this plant against the palace or to hang its root around the neck of the patient (Baytop, 1999).

On the anti-inflammatory activity of *P. peregrina* and *P. daurica* species, although the methanol extract of *P. daurica* roots showed high anti-inflammatory activity compared to the standard aspirin, no significant activity was detected in *P. peregrina* roots. A study on the anti-inflammatory property of the roots of *P. daurica* species in Turkey has shown that folk medicine use of this plant is actually ready to replace drugs (Yeşilada et al., 1989; 1992).

Şener (1994) reported that the roots of *P. daurica* species had anti-inflammatory activity and concluded that it could be used instead of Moutan roots used in traditional Chinese medicine.

Orhan and Şener (2005), in their work on drug candidates of some plants in Turkey stated that anti-inflammatory activity was observed in the roots of *P. daurica* species.

Ethanol extract of *Paeonia lactiflora* roots at doses of 250 and 500 mg/ kg opposed reserpine-induced ptosis and low body temperature (hypothermia), while at a dose of 125 mg/ kg it only opposed hypothermia, and as a result, *P. lactiflora* species was clearly antidepressant (Mao et al. 2008).

6860 patients and 37046 Chinese herbal medicine samples were used in a 4-year study on drugs used in Chinese herbal medicine for insomnia. There were *Carthamus tinctorius* which was most prescribed and another blend containing *Paeonia lactiflora* in its Formula. Among the most commonly prescribed examples of Chinese herbs, *P. suffruticosa* (Mu Tan Pi) and *P. lactiflora* (Shuoh- Yaw) species are also found in the most widely used herbal mixtures. Herbal mixture known as Jia-Wey--Shiau-Yau-San, consisted of *Angelica sinensis*, *Atractylodes macrocephala*, *Paeonia lactiflora*, and *Bupleurum chinense*, *Poria Cocos*, is the most used in the regulation of menopausal symptoms. This mixture has been sought to relieve critical symptoms in women who often refuse hormone intake or develop contraindications after menopause (Chen et al., 2009).

Mao et al. (2009) exposed mice to chronic uncertain stress and investigated the effect of *Paeonia* glycosides on this stress. At the end of the study, it was stated that *Paeonia* glycosides alleviated this induced depression and this antidepressant-like effect occurs through inhibition of monoaminooxidases and reduction of oxidative stress in the mouse brain. Thus, it has been proven that the relationship between *Paeonia* and the healer Paeon has a medical.

Modern researchers have found a compound in *Paeonia* roots that was formerly thought to be alkaloid but acts as a glycoside, yielding oil known as paeonol and paeonine. This oil now has limited use even in Asian medicine. Western neuropathic and homeopathic practitioners mostly use flowers and seeds (Stearn et al., 1984; Halda et al., 2004).

In the book titled "Treatment with Plants in Turkey" it has been stated that peony roots has soothing properties, and used as a sedative against epileptic seizures and cough. It has also been stated that it contains tannin, essential oil, alkaloid and paeonol in its composition and that the infusion is used as drinking 2-3 glasses a day (Baytop, 1999).

On the ethnobotanical research and evaluation of medicinal plants conducted in the Izmir region, it was noted that the roots of 14 *P. mascula* (L.) species were used as mouthwash against sore throats in the form of antihemorrhagic, antispasmodic, epilepsy, sedative, cough, whooping cough and tuberculosis (Ugulu et al., 2009).

In a study conducted in Adana and Mersin, the flowers and roots of *P. mascula* (L.) Miller (Şakayık, ayıgülü, dede gülü) species contain tannin and essential oils and purgative, stomachic, collagog, hepatoprotective. They stated that it is used in urinary system diseases, in the treatment of jaundice and as a hemagogue in the form of douching or direct application. The *P. mascula* species is known as the local 'ayıgülü' in Kahramanmaraş and its roots are used as sedative, epilepsy and cough treatment and as a respiratory regulator (Karaman et al., 2001; Everest and Öztürk, 2005).

In a study conducted in Ovacık town of Tunceli Province, Turkey, Doğan (2008) stated that the infusion prepared from the young above-ground parts of *P. mascula subsp. arietina* drunk on an empty stomach to reduce blood sugar and its young above ground parts could be used in the treatment of diabetes.

The type of *P. mascula subsp* is known as 'ayıgülü' in Turkey and its roots are used as an infusion in sedatives, antitussives and epilepsy (Fakir et al., 2009).

Ding et al. (2000) examined the effects of chemical compounds isolated from the roots of Chinese *Paeonia suffruticosa*. They reported that they play an important inhibitory role against platelet aggregation with hemorrhage and inflammation caused by bacterial infection.

In a study conducted in Turkey, *Paeonia daurica* obtained from Mesudiye town of Ordu province showed antimicrobial activity against Gram (-) bacteria, Gram (+) bacteria, mycobacterium and fungi (Tosun et al., 2011).

Picerno et al. (2011), investigating the free radical scavenging and antifungal effects of dried roots of *Paeonia rockii*, reported that methanol extract of the roots free radical scavenging and antifungal effects.

In a study on plants used in the treatment, it has been reported that *Paeonia mascula* L. Miller subsp. *Arietina* (Anders) type is used in the treatment of asthma (Melikoğlu et al., 2015).

Paeonia mascula L. Miller subsp. *Arietina* (Anders) in the form of decoction was also reported to be used in the treatment of diabetes in Eastern Anotolia (Arituluk and Ezer, 2012).

The anti-amnesic activity of the ethanolic extract of the *P. lactiflora* (*Paeoniaceae*) subtype, which is reported to be used against amnesia in traditional Chinese medicine was measured in vitro, it was concluded that this traditional treatment was confirmed by the study conducted by Sevim et al. (2011).

Some previous studies reported that hydroxyl and olefinic groups from resveratrol and other stilbene derivatives obtained from the leaves of *P. lactiflora* play significant antioxidant activity (Kim et al., 2002; Orhan et al., 2010).

In an in vitro study investigating the endothelium-dependent vasodilatation effect of extracts obtained from *Paeonia lactiflora* roots in isolated rat aortas, it was found that the main active components Paeoniflorin and Paeonol did not show vasodilatory effect, while some components showed endothelium-dependent vasodilator activity (Goto, 1996). In another study, it was observed that the components of both *P. lactiflora* and *P. suffruticosa* increased blood flow by inhibiting blood coagulation and platelet aggregation (Koo, 2010).

Paeonia lactiflora Pall has been used for over 1200 years in traditional Korean, Japanese and Chinese medicine. It is used in the treatment of fever, muscle cramps and spasms, rheumatoid arthritis, systemic lupus, dysmenorrhea, hepatitis. Pain relief has also been demonstrated in various animal models. In animal models of acute and subacute inflammation, its direct anti-inflammatory effect has been demonstrated by suppressing the increase in intracellular calcium ion concentration and inhibiting the production of nitric oxide, leukotriene B4 and prostaglandin (He et al., 2011). In another study, it was observed that *P. lactiflora* prevented itching and exhibited antiallergic effect in mice (Bomi et al., 2008).

Lee et al., (2006) evaluated the antiviral effect of the solvent prepared from the roots of the species of *P. lactiflora* Pall. in tissue culture system. The ethylacetate fraction showed strong anti-hepatitis b activity. However, other fractions showed no inhibition at the HBV DNA level.

In addition, Himalayan *Peony* (*Paeonia emodi* Royle) has been reported to be effective against epilepsy in traditional medicine for a long time (Miyazawa et al., 1984; Kirby and Schmidt, 1997; Verma et al., 2015).

5. Conclusion

With the increasing interest in phytotherapy in Turkey and in the world, the economic market value is also growing. It is thought that by determining the species present in the rich flora and investigating the possibilities of use in phytotherapy, we can bring beneficial returns to our country in terms of health and economy. With this review, it is aimed to draw attention to the peony plant, which has an important commercial ornamental potential and various species are used in phytotherapy. The plant is likely to be one of the important plants of the future.

Authors' Contributions

All authors contributed equally to the study.

Statement of Conflicts of Interest

There is no conflict of interest between the authors.

Statement of Research and Publication Ethics

The author declares that this study complies with Research and Publication Ethics.

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