



## Biodiversity and Urban Gardens: Medicinal and Aromatic Plants That Can Used in Erzurum (Turkey) Urban Gardens

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### Abstract

Turkey is a rich country in biodiversity due to its characteristics like topographic and geomorphological structures it shelters, being an extended peninsula and climatic features. Europe and Middle East countries with the richest biodiversity distribution showing the number of plant species in Turkey is close to the number of plant species in the whole of the European continent.

According to data of TUBIVES 2017 (official plant database), Turkey owns more than 12000 plant taxa 3000 of which are endemic. Erzurum province shelters 264 of endemic plants growing in East Anatolia, some of which have medicinal and aromatic effects East Anatolia Region of Turkey is the second richest region in the country following the Mediterranean for the number of endemic plant species.

The method of research consists of survey, data collection, analysis and synthesis. As a result of this study; among the medicinal and aromatic plants grown naturally in and around Erzurum city, fruit, flowers, calligraphic features, seasonal colour change, plants which can be used as ornamental plants were determined and their usage areas in landscape architecture were determined.

**Keywords:** Biodiversity, medicinal and aromatic plants, landscape architecture, Erzurum, Turkey.

## Biyoçeşitlilik ve Kentsel Bahçeler: Erzurum (Türkiye) Kentsel Bahçelerinde Kullanılan Tıbbi ve Aromatik Bitkiler

### Öz

Türkiye, sahip olduğu topoğrafik, jeomorfolojik yapı, üç tarafının denizlerle çevrili olması, iklim özellikleri gibi faktörlerden dolayı biyoçeşitlilik yönünden oldukça zengin bir ülkedir. Avrupa ve Orta Doğunun en zengin biyolojik çeşitliliğe sahip ülkesi olan Türkiye’de yayılış gösteren bitki türlerinin sayısı Avrupa kıtasının tümündeki bitki türlerinin sayısına yakındır. Yani, bu haliyle Türkiye Florası bir kıta florası niteliğine sahiptir.

TUBIVES 2017 verilerine göre; Türkiye, 3000 ‘i aşkın endemik olmak üzere, 12000’e yakın bitki taksonuna sahiptir. Doğu Anadolu Bölgesi’nin sahip olduğu endemik bitkilerin 264 ‘ü Erzurum kentine aittir. Bu bitkilerin bir kısmı tıbbi ve aromatik etkiye sahiptir. Doğu Anadolu Bölgesi, endemik bitki sayısı yönünden Akdeniz Bölgesi’nden sonra ikinci sırada yer alır.

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*Araştırmanın yöntemini etüt, veri toplama, analiz ve sentez oluşturmaktadır. Bu çalışmanın sonucunda; Erzurum kenti ve çevresinde doğal olarak yetişen, tıbbi, aromatik yönden kullanılan bitkiler arasından meyve, çiçek, kaligrafik özellik, mevsimsel renk değişimi bakımından etkili olan aynı zamanda süs bitkisi olarak kullanılabilir bitkiler belirlenip peyzaj mimarlığındaki kullanım alanları tespit edilmiştir.*

**Anahtar Kelimeler:** *Biyçeşitlilik, tıbbi ve aromatik bitkiler, peyzaj mimarlığı, Erzurum, Türkiye.*

## 1. Introduction

Ecological and biological diversity of Turkey surpasses that of countries located on 400 N longitude due to the combination of the characteristics of three older continents (Europe, Africa and Asia). As the indicator of extended climatic and topographical diversity range, the country inhabits the features of three plant geography regions i.e. Mediterranean, Euro- Siberian and Iran-Turan. Each of these regions shelters their own endemic species and natural ecosystems (Tan, 2010; Anonymous, 2012).

More than 12000 taxa belonging to more than 9000 flowering plant species can be seen in Turkey's flora. Such a figure is 2000 less than that was recorded in whole Europe (excluding Russia). It may be stated in order to better understand that in its existent situation, Turkey's flora seems to have continent flora characteristics, 30% of which is composed of endemic plant species. One – third of this flora includes aromatic plants and nearly 1000 plant species have long been used in traditional folk medicine (TFM) (Başer, 2002; Başer, 2014).

Turkey inhabits a considerable number of medicinal and aromatic plant species in its rich flora. Folk medicines have reached to date after a long experimental process in Anatolia where folk medicinal practices are seen frequently (KUDAKA, 2013).

Medicinal plant is accepted to be that is grown or picked up from nature to produce drug convenient with pharmacopoeia while aromatic plant is the that bearing odorant substances in its body and grown or collected from nature to obtain drug or other products with quality standards convenient with pharmacopoeia or other standards (Sezik, 2001).

Erzurum is included in the most extended of three plant gene zones in Turkey, Iran-Turan, which is very rich in grassy and woody plant species. In addition, TRA1 NUTSII Region (Erzurum-Erzincan-Bayburt) covers a number of naturally growing medicinal and aromatic plant species (KUDAKA, 2013).

Medicinal and Aromatic Plants (MAP) may have important effects on global climate change. Even though the number and importance of fields in which such plant species are used increase, they are collected largely from natural flora in the country and need to be grown under cultural conditions in suitable ecologies. Such as the gardens constituted in urban areas.

*Thymus L., Rosmarinus officinalis L. and Astragalus spp.* are the species to be evaluated to produce alternative products in case of global warming and climate change (Yaldız and Şekeroğlu, 2012). These species can grow in the flora of Erzurum province.

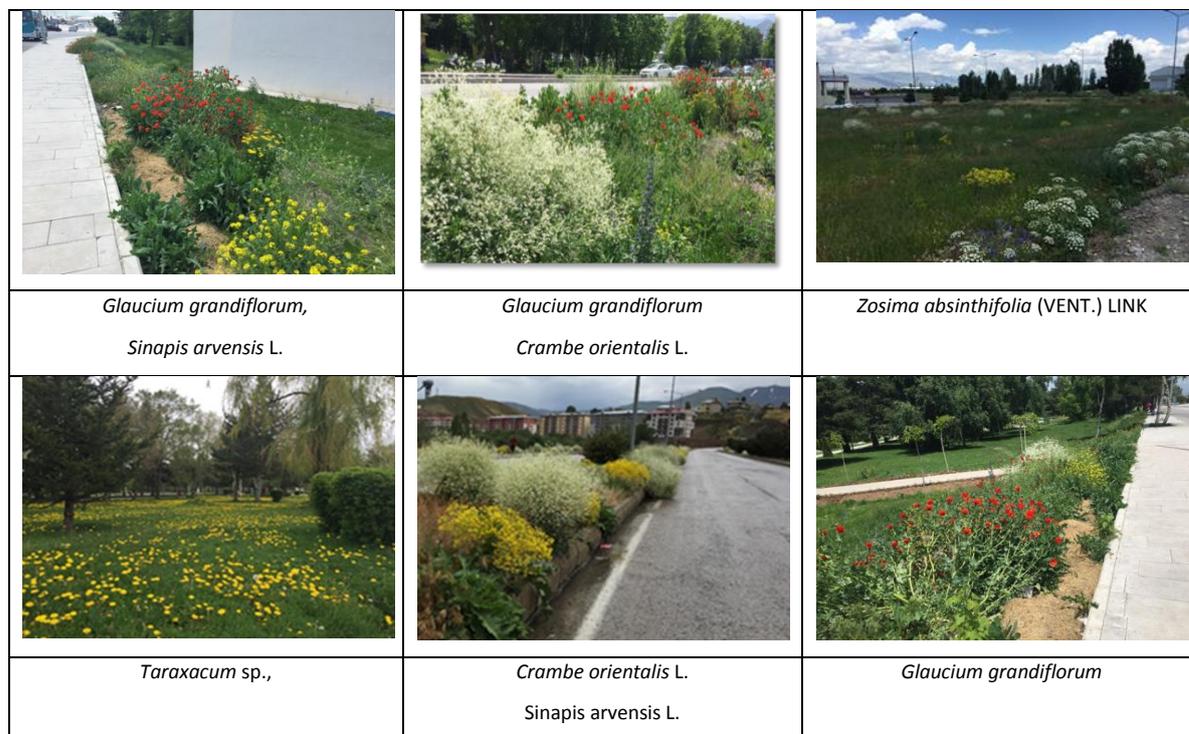
The aim of present study is to offer the plant species naturally growing in Erzurum city and its surrounding and used for their medicinal and aromatic characteristics to be used in urban garden practices in the city by considering their fruits, flowers, calligraphic characteristics, seasonal colour changes and usability as ornamental aims and landscape design techniques.

## 2. Material and Methods

Material of the present study is Erzurum urban gardens (parks, squares, refuges, house gardens etc.) and Turkish Plant Data Service (TUBİVES) 2017. In the study, survey, data gathering, analysis, synthesis were determined to be the method. In the survey study, plants with medicinal and aromatic characteristics growing naturally in the gardens in the city centre of Erzurum were determined. Literature view was performed in data collection. The most important literature was data from TUBİVES 2017. Field and literature data were analysed and synthesized.

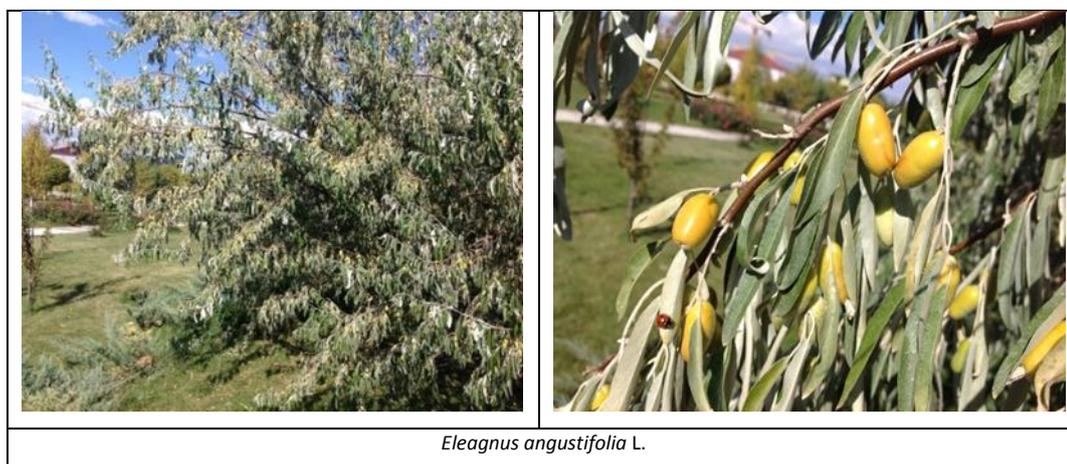
## 3. Results

Use of some plant species growing in the vegetation of Erzurum city and its close surrounding in landscape and medicinal and aromatic fields; Figure 1 gives some ground covering plant species growing around pedestrian side-walks, vehicular ways, bicycle lanes, in parks and gardens, refuges, open spaces in the city and having medicinal and aromatic and landscape effects such as flower, form and colour.



**Figure 1.** Medicinal and aromatic plant species naturally growing in Erzurum and having landscape value

Figure 2 gives some tree and shrub species growing around pedestrian side – walks, vehicular ways, bicycle lanes, in parks and gardens, refuges, open spaces in the city and having medicinal and aromatic and landscape effects such as flower, form and colour.



**Figure 2.** Medicinal and aromatic plant species with landscape value in Erzurum city centre

Some examples of trees and shrubs with both medicinal and aromatic effects and landscape value in Erzurum city are given in Table 1.

**Table 1.** Examples of trees and shrubs with both medicinal and aromatic effects and landscape value in Erzurum city

	Use in Landscape Architecture	Medicinal and Aromatic Effects	
<i>Eleagnus angustifolia</i> L.	It can be used in parks and gardens solitarily or as groups. It may exhibit charming views in fall and winter months with its fruits. It can also be used as fence and improvement of salty soils (Yücel, 2012).	Infusion of its flowers and leaves has diuretic and anti-pyretic effects (Baytop, 1999).	
<i>Hippophae rhamnoides</i> L.	It can be used in parks and gardens solitarily or in groups as well as roadsides, planting coastal sandy areas, as live fence and wind screen, and improvement of poor soils (Yücel, 2012)	Its fruits have protecting effects on intestinal obstruction, strengthening and antiseptic effects. Since it contains vitamin C, it is good for removing cold and influenza (Baytop, 1999).	
<i>Rosa canina</i> L.	It can be used as solitary or groups in flower plots, side lines, fencing, fruit gardens, pots, balcony, terraces, roof gardens, road sides, middle refuges and controlling erosion (Yücel, 2012).	It has protecting effects on intestinal obstruction and strengthening effects. It is also used among people as a cure for diabetes. Its fruits can also be used for the treatment of defects in kidneys and urinary system diseases, expelling kidney stones, oedema, rheumatoid and gut treatment, flue, cold and fever (Baytop, 1999; PDR for Herbal Medicines, 2000; Tanker et al., 2007).	
<i>Salix alba</i> L.	It can be used as solitary in parks and gardens and the sides of lakes, rivers, and wetlands (Yücel, 2012). It is resistant to wind. It is a frontier plant. It can also resist floods for 1 – 2 months (Güngör et al., 2002)	Its crust has relaxing, strengthening, anti-pyretic, protecting effects on intestinal obstruction, removing and relieving effects on rheumatoid pains (Baytop, 1999).	

When look through the historical background it can readily be seen to what an extent plants can occupy in human life. From the old days to date, humans have used plants primarily as food sources, for protection, heating and defending tools as well as healing materials when they are sick (Tanker et al. 1997).

The medicinal use of plants among people in traditional ways is also prevalent today. In addition, plants are also used in medicine industry. Turkey is rich in medicinal and aromatic plant species and several of them are exported to abroad. Again Erzurum and its surrounding exhibit huge diversity for plant flora.

Table 2 gives the plant species which can grow in and around Erzurum and be used in both landscape works (Irmak, 2008; Yüce, 2002; Yılmaz and Karahan, 1999) and exhibit medicinal and aromatic effects (Grossgein, 1952; Tanker et al., 1997; Baytop, 1999; PDR for Herbal Medicines, 2000; Comission E Monographs, 1998; Okhunov, 2012; Korkmaz, 2016).

**Table 2.** Use of some MAPs naturally growing in Erzurum in landscape architecture

	Uses in Landscape Architecture	Medicinal and Aromatic Effects	Landscape View
<i>Achillea biebersteinii</i> AFAN.	It can be used in rock gardens, borderlines or extended areas as ground covering plants and in pots on terraces. It is resistant to cutting and pressing (Yücel, 2002).	Water in which leaves are boiled is used among people for relieving stomach and abdominal pains. In addition, topsoil part of the plant is used as wound healing (Sezik et al., 2001).	
<i>Achillea millefolium</i> L.		Topsoil part is used as biligenic, spasm and oedema remover and anti-inflammatory (PDR for Herbal Medicines 2000 Comission E Monogrphs, 1998).	
<i>Crambe orientalis</i> L.	It is used in rock gardens solitarily or in groups, flower beds/lines, covering extended areas. After fruits mature, trunk is cut from top soil and dried and it is evaluated as dried flower (Yücel, 2002).	In Caucasian region, its petals are used for the protection of gingival bleeding (Grossgeim, 1952; Okhunov, 2012;).	
<i>Galium verum</i> L.	It is used in rock gardens, flower beds/lines and covering extended areas in groups (Yücel, 2002).	It is used by being applied directly on swollen ankles and for curing kidney irritation among people. It is also applied on not – healing wounds (PDR for Herbal Medicines, 2000).	
<i>Glaucium corniculatum</i> (L.) RUD.	It can be used solitarily and in pure groups in flower beds or to fill large spaces, in border lines, planting sandy areas as ground covering (Yücel, 2002).	It has relieving, antitussive and anaesthetic effects. Its use is dangerous among kids. Extracts prepared from its leaves have slowing down effect on heart. People define it to be poisonous. However it does not cause severe poisoning cases (Baytop, 1999).	
<i>Hyocyamus niger</i> L.	It can be used in turfs solitarily or in groups, roadsides and rock gardens (Yücel, 2002).	It is used among people to relieve some pain syndromes especially tooth, face, stomach- aches, stomach cramps, and pains in pelvic cavity, painful ulcers and tumours while its oils are used for tissue treatment by being applied directly on the defective zones. In the old day, people used this plant was used as fumigant for asthma and toothaches (PDR for Herbal Medicines, 2000; Tanker et al., 2007).	

<i>Hypericum scabrum</i> L.	It can be used in flower beds as groups or solitarily, rock gardens and extended areas as ground covering (Yücel, 2002).	<i>Hypericum</i> species are known as centaury (kantaron in Turkish). Flowered branches are stored in olive oil and centaury oil is obtained. It is used for healing wounds and burnt zones. In addition, a flavonoid, hypericin is used for depression treatment (Tanker et al., 1997).	
<i>Taraxacum crepidiforme</i> DC.	This species can be used in rock gardens, turfs, flower beds as groups. It can give large amount of seeds and spread very quickly to the environment (Yücel, 2002).	It is appetising and used for protecting hepatic lipidosis (Korkmaz, 2016).	
<i>Trifolium pratense</i> L.	It can be used around highways (Yilmaz and Karahan, 1999).	It is used internally to remove cough and respiratory disorders in especially pertussis and externally for chronic dermatologic diseases like psoriasis and eczema (PDR for Herbal Medicines, 2000).	
<i>Salvia multicaulis</i>	It is used in rock gardens, flower beds, balcony and terraces, road side slopes, erosion control projects as ground covering plants (Yücel, 2002).	<i>Salvia</i> species are known as sage among people. It is rich in volatile oils. It is a good respiratory antiseptic. It is also used as wound healing (Tanker et al., 1997). <i>Salvia multicaulis</i> and <i>Salvia verticillata</i> can be seen in and around Erzurum (Irmak, 2008).	
<i>Salvia verticillata</i>	It is used in rock gardens, flower beds, balcony and terraces, road side slopes, erosion control projects as ground covering plants (Yücel, 2002).	<i>Salvia</i> species are known as sage among people. It is rich in volatile oils. It is a good respiratory antiseptic. It is also used as wound healing (Tanker et al., 1997). <i>Salvia multicaulis</i> and <i>Salvia verticillata</i> can be seen in and around Erzurum (Irmak, 2008).	

#### 4. Discussion and Conclusion

Medicinal and aromatic plant species may have indirect effects on the mitigation of climate change when used in gardens and green spaces in urban areas as ornamental and functional plants by growing easily and tolerantly since they naturally grow.

In today's modern cities, increase of ecological and identity problems obliged designers to find a new understanding in cities to form natural surroundings. Formation and increase of biodiversity in a city using natural plant species have gained importance for ecologic and cultural identities of the same city. Natural /native plant species are used in several city parks, gardens and landscape areas in Europe. Some of natural plant species are also medicinal and aromatic ones at the same time.

Selection of plant materials in landscape architecture works is very important. The use of natural plant materials increases the success rate of application, is an economic approach and makes a combination between the city and its close proximity (Ekici, 2010; Sezen and Aytatlı, 2016). MAPs take place among natural plant species. It is a requirement to propagate naturally growing MAPs in and around city centres in similar living environment with their natural habitats, use them in suitable areas, protect and conserve those growing naturally in urban areas.

MAPs growing in stony and rocky lands in their habitats, should be used in landscape architecture practices such as rock garden designs; those with strong root structure should be used in landscape restoration works such as erosion control, those which can grow water banks and turf lands should be used in the design of artificial pools, plant pools and those exhibiting effective flowers should be used as cut flowers if suitable.

Plant species effective and charming with their characteristics of flower, fruit and leaves and tissue and form can be used in the areas like city parks, neighbourhood parks, squares and refuges etc. and in this way natural life can be carried to city centres a combination can be achieved between cities and their close proximities.

As the result of the study, some proposals were given for MAPs growing in Erzurum city to be used in landscape architecture works based on their characteristics in the fields such as cut flower growing, in roadside slopes, wetlands, rural areas, roof gardens, city parks, neighbourhood parks, squares, park slots, refuges, streets, rock gardens.

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