

ABSTRACT

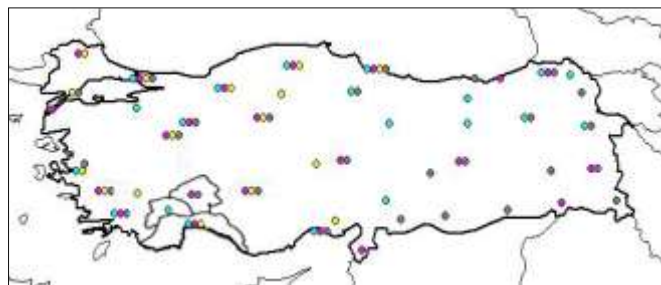
Most members of Lamiaceae family have ostentatious leaves and flowers and angular stems. They are also rich in essential oils content. Thus, they are used in wide area such as landscape, medicinal, pharmaceutical, food, cosmetics and perfumery. However, many species of this family, represented almost 574 species in Turkey, are not well known. In this study, 4 taxa of Lamiaceae family that is noticed and studied in detail around the world but have not wide using area in Turkey, has been selected as study material. These species are *Ajuga orientalis*, *Ajuga chamaepitys* subsp. *chia* var. *chia*, *Teucrium chamaedrys* subsp. *chamaedrys* and *Teucrium polium*. The aim of the study is that these species of aesthetic and functional properties has been taken into consideration in landscape architecture. To determine aesthetic and functional properties of these species, length of plant, the number of leaves, the number of flowers, flower size and the diameter of stem was be measured as visual characteristics thus percentage of living have been calculated. To determine phenological properties, beginning of vegetation, end of vegetation flowering time, the color of flowers have been observed. The study showed that these species are suitable for use in landscape design in terms of both aesthetic and visual characteristics.

KEYWORDS: *Lamiaceae*, *Ajuga sp.*, *Teucrium sp.*, planting desing, visual characteristic

I. INTRODUCTION

Today, the basic material of all design work is the nature itself. In designing and developing of the design, it is indispensable to use various structural and herbal materials inspired from the nature. Choosing species that are naturally distributed in the area and area that will be designed in the selection of plant materials is an important factor for both sustainable design and lowering costs such as irrigation and maintenance [1], [2], [3]. On the other hand, in the world, alternatives to large grass surfaces are sought in recent years, particularly in urban areas where global warming is more pronounced and water-scarce urban areas are encountered. So that designs that are more sensitive to nature, consume less water and require less maintenance are at the forefront. One of the first conceptual approaches developed in the direction of this basic idea is "Urban Landscape Arrangement" [4]. Xeriscape designs that needs less irrigation and repulution have gained importance in landscape studies in recent years. These designs are based on using ground-covering plants and other materials that are thought to be naturally grown and alternative to germination. In this direction the realization of xeriscape landscape designs and conservation of natural species belonging to the region, where the species are grow up, are important designs, especially, for conservation of natural species. [5], [6], [7], [8].

In this study, 4 taxa of Lamiaceae family family having not wide using area in Turkey but noticed and studied in detail around the world, where selected as study material.. These species are *Ajuga orientalis*, *Ajuga chamaepitys* subsp. *chia* var. *chia*, *Teucrium chamaedrys* subsp. *chamaedrys* and *Teucrium polium* and the natural distribution areas of these plants in Turkey are shown in Figure 1.







 <i>Ajuga orientalis</i>
 <i>Ajuga chamaepitys subsp. chia var. chia</i>
 <i>Teucrium chamaedrys subsp. chamaedrys</i>
 <i>Teucrium polium</i>

Table.1 Natural distribution areas of studied plant species in Turkey (TUBIVES, 2013)

Ajuga chamaepitys subsp. chia var. chia has spreads in Greece, Aegean, Crimea, Palestine, Western Iran and Northern Iraq. In Turkey, it have been detected in almost all regions [10]. It is a perennial plant, floor covering and a creeping structure [11], [12]. The length of the shoots is 5-30 cm. The whole plant is covered with white feathers and flowers are yellow [13]. This species usually blooms in June-September. Most of the studies have been focused on essential oil composition of the plant [14], [13].

Ajuga orientalis spreads from Crimea to Sicily, West Syria, Cyprus, Caucasus, North West Iran. It is known that it spreads widely in the Mediterranean and Black Sea regions and Eastern in Turkey. It is a perennial plant species that can grow 10-40 cm [15]. The color of the flowers is purple-blue and it usually blooms in April-July. It is seen on the literature that antibacterial, antimicrobial effects and the essential oil composition of the *Ajuga orientalis* have been studied. [16], [17].

Teucrium chamaedrys spreads in the Europe-Siberia region in the world is grown in almost all regions except the eastern and southeastern Anatolia region in Turkey. It is a perennial woody plant that can grow 50-60 cm. The color of the flowers is pink and it usually blooms in June-September [10]. It is seen on the literature that analgesic and anti-inflammatory activities and the essential oil composition of the *Teucrium chamaedrys* have been studied. [18], [19].

Teucrium polium spreads widely in the Mediterranean countries and the Middle East in the world. It grows naturally in all regions of Turkey [10]. It is a perennial plant species that can grow 10-35 cm [20]. This species of flowers are white-gray in color and usually bloom in June-September [10]. It is seen on the literature that assess analgesic and anti-inflammatory activities and the essential oil composition of the *Teucrium polium* have been studied [21], [22].

The aim of the study is that of aesthetic and functional properties these species has been taken into consideration in landscape architecture. To determine aesthetic and functional properties of these species, length of plant, the number of leaves, the number of flowers, flower size and the diameter of stem was be measured as visual characteristics thus percentage of living have been calculated. To determine phenological properties, beginning of vegetation, end of vegetation flowering time, the color of flowers have been observed.

II. MATERIALS AND METHODS

The visual characteristics of these plants were determined by measurements and observations.

Phenological Observations: The some measurements were made within the scope of the study.

Beginning of vegetation: Date vegetation in which the first leaves are sprouted in the plant has been determined as the beginning.

Flowering time: It is time between beginning and ending flowering.

Flower color: The colors of the flowers in the trial parcels are determined using color scales.

Vegetation ending: The beginning date of the first yellowing of the leaves in the plant is determined as the vegetation ending.

Visual characteristics: Within the scope of the study, the visual characteristics of the species have been measured during the vegetation period.

Plant length: Length (distance between the terminal bud in the limb rising vertically to the root nearest to the plant body in flowering period in plants) is measured by ruler.

Plant diameter: The diameter (circumferential width of the plants) is measured by a ruler.

Leaf width and leaf length: The length is measured with electronic calipers for the reason that the leaves of the plant are small during the vegetation period.

Number of ear flowers: Species are in the form of flowering ear (stem flowers emerging from the bract's arm over the extended main axis). Therefore, the aim of exposing the visual characteristics of the plant has been expanded with respect to the size of the flower. In this context, the number of flower ear in each plant was calculated

Flower length: The length of the terminal bud from the point where the head is joined to the body in plants is measured by a ruler.

Number of spike flower: During the vegetation period, the number of florets in the head is counted and the number of florals in one ear is determined.

Number of leaves on spike: The brachy leaves were counted and the average number of leaves in one ear was determined.

Spreading length: *Teucrium chamaedrys* subsp. *The chamaedrys* species have a rhizome root structure, unlike other species. This is why there is a spreading feature. In addition to the other measurements for this species in the study, the longest distance propagated from the plant body diameter was determined as the propagation length.

III. RESULTS AND DISCUSSION

The study, species have lateral flower structure in ear shape. This causes flowering and coexistence of vegetative growth. Phenological observations were made in the natural growing area of species given in Table 1.

Table.1 This study is data of the phenological observations of species in the field environment

Phenological observations	<i>Ajuga chamaepitys</i> subsp. <i>chia</i> var. <i>chia</i>	<i>Ajuga orientalis</i>	<i>Teucrium chamaedrys</i> subsp. <i>chamaedrys</i>	<i>Teucrium polium</i>
Beginning of vegetation	15.03.2016	01.03.2016	20.04.2016	15.03.2016
Vegetation ending	25.07.2016	02.05.2016	15.09.2016	31.08.2016
Vegetation time	4,5 month	2 month	5,5 month	5,5 month
Beginning of flowering	29.03.2016	18.03.2016	31.05.2016	08.04.2016
Flowering ending	25.07.2016	15.04.2016	29.07.2016	19.07.2016
Flowering time	3,5 month	1 month	2 month	3,5 month

In the study, the visual characteristics of the species have been measured Where the plant grows naturally. The measurements of visual characteristics of *Ajuga chamaepitys* subsp. *chia* var. *chia* and *Ajuga orientalis* species were given in Table 2. and Table.3.

Table.2 In the study, data of the visual characteristics of *Ajuga chamaepitys* subsp. *chia* var. *chia* and *Ajuga orientalis* species in the field environment

Visual characteristics	<i>Ajuga chamaepitys</i> subsp. <i>chia</i> var. <i>chia</i>			<i>Ajuga orientalis</i>		
	Min. value	Max. value	Average	Min. value	Max. value	Average
Plant length (cm)	4,00	13,40	7,40	18,10	30,80	22,10
Plant diameter (cm)	7,60	12,20	9,50	8,20	14,50	10,30
Leaf width (cm)	0,10	0,40	0,24	1,50	3,00	2,10
Leaf length (cm)	0,70	1,90	1,26	1,50	3,50	2,20
Flower length (cm)	5,20	14,50	8,80	18,30	30,70	22,10
Number of spike flower	5,00	12,00	8,10	2,00	8,00	5,00
Number of floret on spike	12,00	24,00	17,00	24,00	42,00	30,80
Number of leaf on spike	16,00	24,00	20,00	20,00	40,00	29,80

Ajuga chamaepitys subsp. chia var. chia has 7-15 cm diameter, 4-15 cm height and has a creeping structure (Figure.2). Leaves are 0,4x1,9 cm wedge shaped. Flowers were 0,7x1,2 cm yellow color and were separated from their tip parts. Virgo flowers were 5-15 cm long. It was seen that the vegetation period is 5 months (March-July) and the flowering period is 4 months (April-July).



Figure.2 *Ajuga chamaepitys subsp. chia var. chia*

Ajuga orientalis is a plant with 18-30 cm length, 8-15 cm diameter. The leaves are 3x3.5 cm and are arranged crosswise on the body. Flowerpots are 0,4x1,1 cm violet-blue and cream colored (Figure.3). Virgo flowers were 18-30 cm long. The vegetation period is 2 months (March-April) and the flowering period is 1 month (15 March-15 April).



Figure.3 *Ajuga orientalis*

The measurements of visual characteristics of *Teucrium chamaedrys subsp. chamaedrys* and *Teucrium polium* species were given in Table 3.

Table.3 In the study, data of the visual characteristics of *Teucrium chamaedrys subsp. chamaedrys* and *Teucrium polium* species in the field environment

Visual characteristics	<i>Teucrium chamaedrys subsp. chamaedrys</i>			<i>Teucrium polium</i>		
	Min. value	Max. value	Average	Min. value	Max. value	Average
Plant length (cm)	10,10	17,50	13,22	6,40	10,80	7,90
Plant diameter (cm)	19,00	38,20	27,56	20,20	32,00	26,40
Leaf width (cm)	0,80	1,40	1,11	3,00	6,00	4,60
Leaf length (cm)	1,20	1,80	1,52	0,10	0,20	0,14
Flower length (cm)	12,10	18,50	14,78	48,00	102,00	80,80
Number of spike flower	20,00	30,00	24,00	0,50	1,00	0,75
Number of floret on spike	16,00	28,00	22,44	5,50	10,30	8,00
Number of leaf on spike	18,00	30,00	24,67	34,00	48,00	41,20

Teucrium chamaedrys L. subsp. chamaedrys L. is a perennial woody plant which is 20-30 cm diameter and 15-30 cm length and cm. Leaves were 1.4x1.8 cm rectangles, flowerbeds were 0.5x1,2 cm and they were pink color (Figure.4), Virgo flowers were 12-20 cm long. The vegetation period is 6 months (March-September) and the flowering period is 2 months (June-July).



Figure.4 *Teucrium chamaedrys L. subsp. chamaedrys L.*

Teucrium polium L. has 8-15 cm length and 10-40 cm diameter. Moreover, it was lying on the soil or standing, white or gray color and hairy structure. The leaves are 0,15x0,75 cm and rectangular, the flowers are 0,4x0,7 cm and whitish (Figure.5) Virgo flowers are 5-12 cm long. The structure of leaves and body are more effective in the visual characteristic of the plant comparing to its flower. The vegetation duration is 6 months (March-August) and the flowering period is 4 months (April-July).



Figure.5 *Teucrium polium L.*

IV. CONCLUSION

Some phonological observations and visual characteristics of *Ajuga orientalis*, *Ajuga chamaepitys* subsp. *chia* var. *chia*, *Teucrium chamaedrys* subsp. *chamaedrys* and *Teucrium polium* were studied. Plant materials for landscape design should be chosen from naturally growing species. Because natural species are an important factor for both sustainable design and reducing costs such as irrigation and maintenance. Since the species in the study are natural species, they will show the best growth with less water and less care when used in xeric landscape designs. The study indicated that these species are suitable for use in landscape design in terms of both aesthetic and visual characteristics.

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