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Clerodendrum bungei an Ornamental Plant with Several New Records Outside of Parks and Gardens in Türkiye

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ABSTRACT

Clerodendrum bungei (Lamiaceae) is a deciduous shrub that occurs both within its native Asian range and beyond to temperate and tropical regions around the world as a result of both unintentional and intentional introductions for ornamental uses. Although it was listed as an ornamental plant in parks and gardens of Türkiye, this paper presents a list of 55 records including 47 new records of *C. bungei* outside parks and gardens of Black Sea Region. The new list includes 11 records from Artvin, 10 from Rize, 8 from Trabzon, 14 from Giresun, 3 from Ordu, and 1 from Samsun. The rapid increase in the number of new localities outside gardens and parks of Türkiye in the last 10 years shows that the species will become an invasive alien species in this region shortly. So, it will outcompete native plant species and impact habitat values, thus it is important to closely monitor the populations outside parks and gardens in this region and should take the necessary precautions for local farmers and administrations.

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Clerodendrum bungei: Türkiye'de Park ve Bahçeler Dışında Çok Sayıda Yeni Kaydı Tespit Edilen Bir Süs Bitkisi

ÖZET

Clerodendrum bungei (Lamiaceae) süs amaçlı kullanımlar için hem kasıtlı hem de kasıtsız olarak, doğal yayılış alanı olan Asya'da ve dünyanın ılıman ve tropikal bölgelerinde yayılış gösteren, yaprak döken bir çalıdır. Türkiye'deki park ve bahçelerde süs bitkisi olarak bildirilmesine rağmen, bu makalede *C. bungei*'nin Karadeniz Bölgesi'nde park ve bahçeler dışında 47 adeti yeni olmak üzere, toplam 55 kaydının bir listesi sunulmaktadır. Sunulan listede, Artvin'den 11, Rize'den 10, Trabzon'dan 8, Giresun'dan 14, Ordu'dan 3 ve Samsun'dan 1 yeni kayıt yer almaktadır. Türkiye'de bahçe ve parklar dışında yeni popülasyonların son 10 yılda hızla artması, türün yakın gelecekte bu bölgede istilacı yabancı bir tür haline geleceğini göstermektedir. Dolayısıyla doğal bitki türlerine üstünlük sağlayacağı ve habitat yapısını etkileyeceğinden, bu bölgedeki park ve bahçe dışındaki popülâsyonların yerel yönetici ve çiftçiler tarafından yakından takip edilmesi ve gerekli önlemlerin alınması önemlidir.

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Anahtar
Doğallaşmış tür
Karadeniz Bölgesi
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Yabancı tür
Yeni kayıt

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INTRODUCTION

The genus *Clerodendrum* L. (Lamiaceae) is comprised of shrubs, woody vines and perennial herbs (Rueda, 1993). This genus was formerly called Verbenaceae, but it is treated under the Lamiaceae following a series of molecular-based studies (Olmstead et al., 1993; Wagstaff et al., 1998). It is one of the largest genera within the Lamiaceae (Labiatae) and native to tropical, subtropical regions of both hemispheres and well known for its showy and attractive ornamental and frequently cultivated species (Wearn & Mabberley, 2011).

Clerodendrum is represented by *C. bungei* Steud. (Kismetağacı) and *C. trichotomum* Thunb. (Hoş kismetağacı) as indoor and outdoor ornamental plants in parks and gardens in Türkiye (Aslan, 2014; Güner et al., 2012). Both species were first planted in parks and gardens of Türkiye as ornamental plants, however, *C. bungei* has become naturalized on the edges of roads at altitudes of 0–500 m a.s.l. in the Black Sea Region of Türkiye (Aslan, 2014) and present observation revealed that it has gained an invasive feature in the cited region. It is well known that such plant species mostly introduced by humans deliberately or else through human activity or unintentionally from one area to another have negative effects on native flora in various ways (Wilson & Hoch 2009; Gupta et al., 2021). In the last few decades, it has been reported that many alien species became invasive due to several human activities in several ecosystems of Türkiye. In the previous decades, several alien species have been reported from Türkiye such as *Sicyos angulatus* L. (Duman & Güner, 1996; Terzioğlu ve Anşin, 1999), *Rhus chinensis* Mill. (Terzioğlu & Coşkunçelebi, 2017), *Impatiens glandulifera* Royle (Coşkunçelebi & Terzioğlu, 2022), *Reynoutria japonica* Houtt. (Karaer et al., 2020) and *Spiraea japonica* (L.) Desv. (Terzioğlu & Coşkunçelebi, 2022). One of these alien species, *Sicyos angulatus*, has been reported to have rapidly increased its population in the east of the Black Sea Region in the last twenty years, causing damage to both ecological and agricultural areas (Terzioğlu et al., 2014). Therefore, the populations of such new naturalized alien species must be monitored, and necessary precautions must be taken to prevent them from spreading further outside parks and gardens and becoming invasive (Emiroğlu et al., 2022).

In this paper, the new distribution records outside of parks and gardens of *C. bungei* with high invasion potential in the agricultural areas of the middle and east of the Black Sea Region of Türkiye are presented and discussed.

MATERIAL and METHODS

Clerodendrum bungei was identified using morphological characters provided by Aslan et al. (2009). Field surveys were conducted in the Black Sea Region during field studies on invasive alien species of terrestrial areas and inland waters in Türkiye (TERIAS, 2020). The list of new distribution records of the species is ordered alphabetically by the names of the cities including the name of the administrative area, the name of localities with GPS coordinates, altitudes and the date of collection/observation. However, only two selected voucher specimens were deposited in both herbaria at Karadeniz Technical University, Faculty of Forestry (KATO: 19256!) and Faculty of Science (KTUB: Coşkunçelebi 1443!). The physiographic division of Türkiye followed by Davis et al., (1965) and Güner et al. (2012).

RESULTS and DISCUSSION

Invasive alien species (introduced species) pose one of the greatest threats to biodiversity and alter land use natural disturbance patterns, and ecosystem processes such as nutrient cycling (CBD, 2010). After habitat destruction, they are also considered the second most significant threat to biodiversity (Wilcove et al., 1998). Thanks to their wide ecological adaptability, they occupy the places of natural species in the new habitats they enter, causing damage and changes in the ecosystem that are very difficult to restore. Humans spend billions of dollars yearly to reduce the losses caused by invasive alien species (McGeoch et al., 2010). The number of invasive plant species in Türkiye has increased significantly in recent decades (Coskuncelebi & Terzioğlu, 2022). Detecting the new records of invasive species in agricultural and natural areas is one of the most important steps to eliminate them. *C. bungei* is reported as an ornamental plant species in parks and gardens of the Middle and East Black Sea (Aslan, 2012). The fruits of this species are eaten by birds, which also disperse the seeds (Moldenke, 1985). This deciduous shrub grows rapidly up to 1.8 m in height escapes from gardens and rapidly forms a spreading colony in NE Anatolia (Figure 1).

According to Aslan et al. (2009) *C. bungei* is reported from Trabzon (Yomra, Yesilyurt village, 500 m a.s.l., roadside), Samsun (Çarşamba, Değirmenbası, 10-15 m a.s.l.; Salıpazarı, Karaman Village, 300 m a.s.l.) and Artvin (Hopa, road to Artvin, roadside). However, during the field study, an ongoing project on another invasive alien species bur cucumber (*Sicyos angulatus*), new localities for the species were recorded or/and observed in 2020 by the present authors. The list contains 46 new records of *C. bungei*, including 11 records from Artvin, 10 from Rize, 8 records from Trabzon, 14 records from Giresun, 3 from Ordu and 1 from Samsun (Table 1, Figure 2 These new localities show that *C. bungei* continues to increase its distribution ranges and population density rapidly in the east of the Black Sea Region. The fact that this species has escaped from gardens to natural environments in the last 10 years poses a danger to both the natural ecosystem and the agricultural activities in the area. For this reason, the species should be monitored by local governments and farmers in the region and the necessary measures should be implemented in the future.

Figure 1. a: Blooming flowers; b: Coordinate; c: Habit; d-k: Habitats (d-g: Along the road, h: Edge of tea plantation, i: Garden, j: Cemetery, k: Woodland).

Şekil 1. a: Açmış çiçekler; b: Koordinat; c: Habitus; d-k: Habitatlar (d-g: Yol boyu, h: Çay bahçesi kenarı, i: Bahçe, j: Mezarlık, k: Orman).

Table 1. Records of *Clerodendrum bungei* in Türkiye (NR: New records. Altitudes are given relative to sea level).

Çizelge 1. Clerodendrum bungei'nin Türkiye'deki kayıtları (NR: Yeni kayıtlar. Rakımlar deniz seviyesine göre verilmiştir).

-No	Square (Davis, 1974) and locality information	Remarks
1	A8 Artvin, Arhavi, Aşağı Hacılar, Çamlı, 04.08.2020, 19 m, 41.377071N, 41.361482E	NR
2	A8 Artvin, Hopa, Sarp merkez, 04.08.2020, 29 m, 41.518456N, 41.548668E	NR
3	A8 Artvin, Hopa, Kazimiye, 04.08.2020,182 m, 41.511163N, 41.563959E	NR
4	A8 Artvin, Hopa, Kazimiye, 04.08.2020, 236 m, 41.507885N, 41.563913E	NR
5	A8 Artvin, Hopa, Kazimiye, 04.08.2020,195 m, 41.511909N, 41.564036E	NR
6	A8 Artvin, Hopa, Üçkardeş, 04.08.2020, 72 m, 41.493333N, 41.556667E	NR
7	A8 Artvin, Hopa, Çamurlu, 04.08.2020, 58 m, 41.491944N, 41.566564E	NR
8	A8 Artvin, Borçka, Çifteköprü, 07.08.2020, 585 m, 41.387642N, 41.550941E	NR
9	A8 Artvin, Borçka, Muratlı, 05.08.2020, 82 m, 41.484032N, 41.711317E	NR
10	A8 Artvin, Hopa, Çavuşlu, 07.08.2020, 111 m, 41.388382N, 41.488793E	NR
11	A8 Artvin, Hopa-Artvin Çamburnu Tabiatı Koruma Alanı yolu güzergahı, yol kenarları, çalılık içinde, 275 m, 21.06.2013, Ş.IŞIK 184	Işık & Eminağaoğlu (2023)
12	A8 Artvin, Borçka, Demirciler, 05.08.2020, 180 m, 41.368886N, 41.636204E	NR
13	A8 Artvin, Borçka, Güreşen Köyü Köprüsü mevkii, yol kenarı, 115 m, 08.04.2013, Ş.IŞIK 183	Işık & Eminağaoğlu (2023)
14	A8 Artvin, Hopa, Hopa yolu, 01.10.2007, 10 m, 41.387786N, 41.413308E	Aslan et al. (2009)
15	A8 Rize, Çamlıhemşin, Kavak, Dikkaya Köyü, 18.08.2020, 342 m, 41.083614N, 41.026563E	NR
16	A8 Rize, Kalkandere, Ünalan, 19.08.2020, 526 m, 40.927206N, 40.498368E	NR
17	A8 Rize, Ardeşen, Işıklı, 07.08.2020, 119 m, 41.200396N, 41.043162E	NR
18	A8 Rize, Ardeşen, Işıklı, 07.08.2020, 20 m, 41.208415N, 41.051140E	NR

19	A8 Rize, Ardeşen, Seslikaya, 07.08.2020, 183 m, 41.153110N, 41.026307E	NR
20	A8 Rize, Ardeşen, Akdere, 07.08.2020, 310 m, 41.137009N, 41.037821E	NR
21	A8 Rize, Çayeli, Beyazsu Köyü, 07.08.2020, 52 m, 41.053699N, 40.726394E	NR
22	A8 Rize, Çamlıhemşin, Behice, 18.08.2020, 274 m, 41.086474N, 41.037044E	NR
23	A8 Rize, Çamlıhemşin, Merkez, 18.08.2020, 305 m, 41.044534N, 41.006375E	NR
24	A8 Rize, İyidere,Hazar, 08.08.2020, 120 m, 40.993662N, 40.345320E	NR
25	A7 Trabzon, Maçka, Coşandere, 25.08.2020, 534 m, 40.766201N, 39.602265E	NR
26	A8 Trabzon, Of, Çaltılı, Hayrat Yolu, 08.08.2020, 57 m, 40.957489N, 40.307500E	NR
27	A8 Trabzon, Of, Eskipazar, 08.08.2020, 16 m, 40.970471N, 40.310585E	NR
28	A7 Trabzon, Maçka, Yazlık Köyü, 25.08.2020, 736 m, 40.776783N, 39.620006E	NR
29	A7 Trabzon, Ortahisar, Yeşilbük, 25.08.2020, 283 m, 40.921682N, 39.733588E	NR
30	A7 Trabzon, Ortahisar, Yeşilbük Köyü Yolu, 25.08.2020, 211 m, 40.923625N, 39.747968E	NR
31	A7 Trabzon, Ortahisar, Yeşilbük Köyü, 25.08.2020, 320 m, 40.918359N, 39.754393E	NR
32	A8 Trabzon, Of, Yemişalan, 25.08.2020, 191 m, 40.908552N, 40.296835E	NR
33	A8 Trabzon, Yomra, Yeşilyurt Köyü, 08.08.2006, 500 m, 40.922216N, 39.775177E, ibid., 25.06.2008, S. Aslan 2620	Aslan et al. (2009)
34	A7 Giresun, Eynesil, Ören, 11.08.2020, 211 m, 41.039997N, 39.149878E	NR
35	A7 Giresun, Eynesil, Ören Köyü Yolu, 11.08.2020, 272 m, 41.035324N, 39.148428E	NR
36	A7 Giresun, Eynesil, Ören, 11.08.2020, 365 m, 41.019205N, 39.144336E	NR
37	A7 Giresun, Eynesil, İshaklı,11.08.2020, 295 m, 41.036096N, 39.128312E	NR
38	A7 Giresun, Eynesil, Köseli, 11.08.2020, 33 m, 41.053853N, 39.126895E	NR
39	A7 Giresun, Eynesil, Köseli, 11.08.2020, 10 m, 41.055150N, 39.126790E	NR
40	A7 Giresun, Görele, Çavuşlu, 11.08.2020, 5 m, 41.042009N, 39.072011E	NR
41	A7 Giresun, Eynesil, Derebaşı, 11.08.2020, 135 m, 41.057042N, 39.155998E	NR
42	A7 Giresun, Görele, Sayfiye, Manastır Yolu, Dayılı, 11.08.2020, 115 m, 41.019493N, 39.003657E	NR
43	A7 Giresun, Keşap, Çamlıca, 12.08.2020, 600 m, 40.776102N, 38.540724E	NR
44	A7 Giresun, Yağlıdere, Ümütbükü, 12.08.2020, 301 m, 40.774490N, 38.670160E	NR
45	A7 Giresun, Tirebolu, Düzköy, 12.08.2020, 16 m, 40.964065N, 38.741698E	NR
46	A7 Giresun, Tirebolu, Adabük, Arageriş, 12.08.2020, 110 m, 40.952470N, 38.761989E	NR
47	A7 Giresun, Tirebolu, Demirci, Halkoval, 12.08.2020, 10 m, 41.009678N, 38.866160E	NR
48	A6 Ordu, Perşembe, Ordu, Efirli, 02.09.2020, 10 m, 41.023752N, 37.810678E	NR
49	A6 Ordu, Perşembe, Ramazan, 02.09.2020, 258 m, 41.105410N, 37.733179E	NR
50	A6 Ordu, Fatsa, Ayazlı, 02.09.2020, 9 m, 41.022501N, 37.479051E	NR
51	A6 Samsun, Terme, Gündoğdu, 23.08.2020, 15 m, 41.214771N, 36.935575E	NR
52	A6 Samsun, Çarşamba, Değirmenbaşı Mahallesi, 14.07.2005, 15 m, 41.189449N, 36.719500E	Aslan et al. (2009)
53	A6 Samsun, Salıpazarı, Karaman Köyü, 01.06.2007, 300 m, 41.052755N, 36.802066E	Aslan et al. (2009)
54	A6 Samsun, Salıpazarı, Merkez, 01.09.2008, 70 m, 41.079716N, 36.826125E	Aslan et al. (2009)
55	A3 Düzce, Aydınpınar Şelalesi, şelalenin batısı, 154 m, 19.06.2014, 40º 44' 33.3" K, 31º 05' 56.3" D, MSZK 1096	Seydioğlu & Kaya (2016)

Clerodendrum bungei distributes 0-500 m a.s.l. in Türkiye (Aslan et al., 2009) however, we described its highest distribution at 736 m a.s.l. in A7 Trabzon: Maçka-Yazlık Köyü. It is an early successional colonizer via root runners of gardens, cemeteries, and degraded lands along the roads. This is because it can easily become invasive and displace native vegetation if not properly controlled in the newly arrived areas of the Black Sea Region. Additionally, *C. bungei* has the potential to hybridize with *C. trichotomum* and share the same habitats somewhere in Türkiye, which can lead to the formation of invasive hybrids. The invasive effects of *C. bungei* can have a negative impact on native ecosystems, including reduced biodiversity and alterations in ecosystem processes. Thus, it is important to monitor and control the spread of this species in regions where it is considered invasive in Türkiye.

C. bungei is one of the species of this genus that in traditional medicine, in China, leaves and stems are used for detoxification (Wu & Raven, 1994; Kasmaei et al., 2022) and its rhizome has been reported to be used in the treatment of livestock diseases (Shen et al. 2010). Furthermore, work suggests that the essential oil of *C. bungei* has promising potential to develop into botanical repellents to control pest damage in warehouses and grain stores (Lu et al., 2021). For these purposes, collecting materials of this species from its newly introduced ecosystems may both support the local people financially and contribute to controlling invasions in the Black Sea Region.

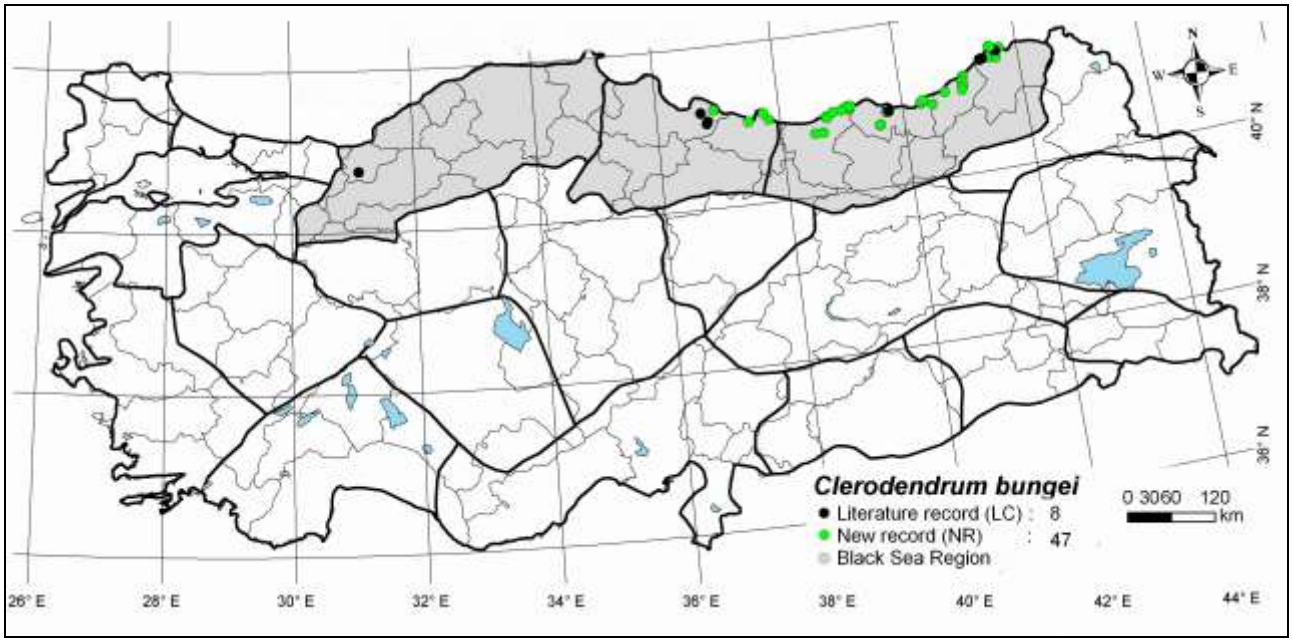

Figure 2. Distribution map of *Clerodendrum bungei* in Black Sea Region.
Şekil 2. Clerodendrum bungei'nin Karadeniz Bölgesi'ndeki yayılış haritası.

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Statement Contribution of the Authors

The authors declare the contribution of the authors is equal.

Statement of Conflict of Interest

The authors have declared no conflict of interest

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