

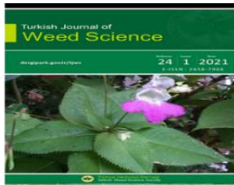
## PAPER DETAILS

TITLE: *Impatiens balfourii* (Balsaminaceae): First recording from the Western Black Sea Region of Turkey

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## ***Impatiens balfourii* (Balsaminaceae): First recording from the Western Black Sea Region of Turkey**

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### **ABSTRACT**

In here, it has been presented a new first record of *Impatiens balfourii* Hook.f. (Balsaminaceae) in Turkey, which is the native range in the western Himalayan region. *I. balfourii* was detected in four different sites in the Düzce province of the Western Black Sea region of Turkey at the beginning of August 2020. It was deliberately introduced to the area where it was first detected (Beyköy) and used as a garden ornamental plant. Then, a survey was conducted to determine whether the related taxon was used in different gardens of Beyköy and the second site was determined. After these determinations, the place where the plant was brought to be used as an ornamental plant was questioned and it was determined that the seeds of the plant were collected from the forest edge habitat of a mountain village (Uğur village). Finally, it was detected by chance on the roadside (Konuralp), ca25 km from the first site. Based on these records, the habitats of *I. balfourii* are forest edge, stream edge and artificial habitats (roadsides, parks, gardens). This study also provides a botanical identification of *I. balfourii*. The future spread of this taxon in Düzce should be monitored, considering its high-level plant properties.

**Keywords:** alien plant, Black Sea region, establish, *Impatiens balfourii*, ornamental

### **INTRODUCTION**

Detection of the alien plant species existing on a national scale may allow the determination of the status of these taxa in different directions in the relevant areas (Celesti-Grampow *et al.* 2009, Pyšek *et al.* 2012, Seebens *et al.* 2017, Uludağ *et al.* 2017, Güneş Özkan & Yazlık 2020). Especially, considering the high environmental and socioeconomic impacts (Rumlerová *et al.* 2016, Yazlık *et al.* 2018) that may be caused by alien species, it is important to monitor these plants and plan management activities when necessary. Many studies have emphasized that the different abilities of alien taxa (e.g., propagule pressure - Jacquemart *et al.* 2015, competitive ability - Pyšek & Prach 1993, Adamowski 2008, Adamowski & Tokarska-Guzik 2008, Adamowski 2009, Čuda *et al.* 2016, Najberek *et al.* 2018, allelopathic features - Hierro & Callaway 2003) are effective in their spread rapidly in new areas. Moreover, it is also reported that the invasive status of an alien taxon in a certain region is based on population growth and propagation measures in the new region (Richardson *et al.* 2000; Pyšek *et al.* 2004). For instance; the ability of annual alien plant species to create, maintain and spread their populations with high propagule pressure were reported for the taxa within the *Impatiens* genus (Jacquemart *et al.* 2015, PLADIAS, 2020). Additionally, it is emphasized that

preventing seed propagation in the invasion of *Impatiens* taxa will affect their invasion (Adamowski 2008, Čuda *et al.* 2016, Najberek *et al.* 2017, 2018). Considering these situations, it is important to define alien taxon records on the national / regional basis, to determine their habitats and to keep them under surveillance based on these records.

Here, information about *Impatiens balfourii* Hook.f., belonging to the genus *Impatiens* from the Balsaminaceae family (Tabak & von Wettberg 2008), which was determined as an alien taxon in Düzce, is presented.

Balfour's impatiens or Kashmir balsam native range has in the west Himalayan region (PLADIAS, 2020). It is naturalized six globally temperate regions, and its invaded ranges as S & W Europe (to locally in France, Italy, Croatia, Albania, Bulgaria, Kosovo, Greece, Serbia, Slovakia, UK, the Netherlands, Germany, and Austria), in more northern countries like Denmark and Estonia, as well as Japan, N America, SE Australia. In addition, it has been naturalized and spread in southeast Europe (in Albania, Bulgaria, Kosovo, Greece, Serbia, Slovakia - Adamowski 2009, Schmitz & Dericks 2010, Jacquemart *et al.* 2015, Čuda *et al.* 2016, 2017, Najberek *et al.* 2018, Najberek *et al.* 2020a).

Depending on the genus *Impatiens* in Turkey were mentioned five taxa, which were *Impatiens noli-*

*tangere* L., *Impatiens balsamina* L., *Impatiens holstii* Engl. & Warb., *Impatiens sultanii* Hook.f. and *Impatiens walleriana* Hook.f. (Yıldırım 2000). But two of the mentioned taxa (*I. holstii* and *I. sultanii*) are synonymous of *I. walleriana* (The Plant List, 2020). In addition, Aksoy & Uludağ (2016) also mentioned the presence of the *I. grandifolia* taxon. However, two taxa (*I. noli-tangere* and *I. walleriana*) belonging to the relevant genus are recorded in Bizim Bitkiler (Bizim Bitkiler 2020), one of the national data banks in Turkey. Considering all of these cases, according to the arrangement made here, there are four taxa (*I. noli-tangere*, *I. balsamina*, *I. walleriana*, *I. grandifolia*) registered to the genus *Impatiens* in Turkey until this study.

With this study, a new *Impatiens* taxon record for Turkey is presented. In addition, some suggestions about the current status, botanical description and some management activities of *I. balfourii* in Düzce are presented.

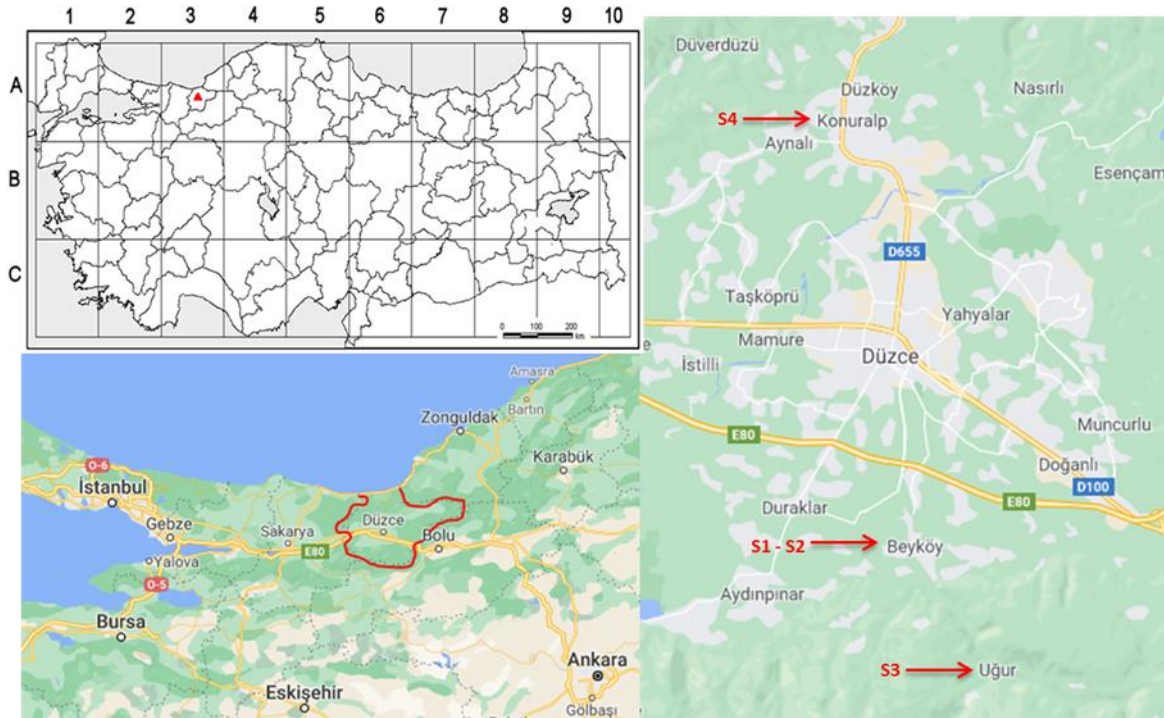
## MATERIALS and METHODS

Herbarium samples of *I. balfourii* were taken from four different sites in Düzce, the Western Black Sea region, from early August 2020 to late October 2020. These

sites were recorded as site I - II (Beyköy, 40°46'09.2"N 31°10'23.9"E – altitude 222 m), site III (Uğurköy, 40°44'15.5"N 31°12'36.0"E - altitude 306 m) and site IV (Konuralp, 40°54'21.0"N 31°08'42.0"E - altitude 210 m). The sites are located in A3 grid (Figure 1), which is based on the grid system of the Flora of Turkey (Davis 1967). The herbarium specimens, collected by the author, were deposited the herbarium DUOF (Düzce University, Faculty of Forestry - as accession herbarium numbers DUOF ID 1: 0009186, ID 2: 0009187, ID 3: 0009185 (code according to Thiers, 2020 [continuously updated])).

The Turkish name of the plant is suggested as "Duyarlı edagüzeli". Two cases were taken into account in the suggestion of this name. First, "*Impatiens walleriana*" used as an ornamental plant in Turkey is called "cam güzeli" that means the plant's flowers are delicate / charming, like *I. balfourii*. The second case is that the fruits of "*I. balfourii*" are very sensitive / susceptible, with this feature, seeds can be scattered easily. Because of this feature, the word "sensitive", which is the Turkish word for "duyarlı" to the plant, has also been added.

EPPO code: IPABF (EPPO 2020).



**Figure 1.** The sites of Düzce located in A3 grid, based on the grid system of the Flora of Turkey (Davis, 1967). Beyköy: Site 1 – Site 2, Uğur village: Site 3 and Konuralp: Site 4.

### Habitats and Distribution in Düzce

It was understood that *I. balfourii* (Figure 2), which was determined in four different sites within the province of Düzce, was a deliberate introduction to the area where it was first identified (Beyköy - Site I) and used as a

garden ornamental plant. Then, a survey was made to see if the relevant taxon was used in different gardens in Beyköy, and a second site (Site II) was determined. In the interviews held here, it was stated that the plant could transmit with the *Gerbera* spp. the seed package, which was purchased from a florist, or stream water



used in this garden (for site II). After these determinations, the place where the plant was brought deliberately was investigated. As a result of the research, it was understood that the plant seeds were collected by one person from the Uğurköy mountain village (site III) close to the forest area. Then, I contacted this person and visited the area where the seeds were collected in the Uğurköy village. In this area, it was understood that the plant existed in the forest verge. The plant was last discovered by chance at the roadside (Konuralp - site IV), ca 25 km from the first site.

One of the areas where it has been determined to be used as a garden ornamental plant is the open park area with internal surface waters (creek, stream). The

water is transferred to the agricultural irrigation canals from the stream passing by the edge of this park area in certain periods and these waters are used by the local people for irrigation of the agricultural areas. Considering this situation, a short survey was made in the agricultural habitats located along the rivers, but the related plant was not found. Although the plant was not encountered in the agricultural habitat, there is a risk that the plant may be in the relevant habitat near future.

Considering the general detections in Düzce and the EUNIS habitat classification system (EUNIS, 2020), I confirm that *I. balfourii* is located the forest edge habitats, grasslands (not arable fields), inland surface water and artificial habitats (roadsides, parks, gardens) in Turkey.



**Figure 2.** Habitats, flowers, fruits and leaves of *Impatiens balfourii*.

#### **Botanical description of *I. balfourii***

*Impatiens balfourii* (Figure 2); Annual herb, up to 1.5 m tall, glabrous. Leaves elliptic-ovate to lanceolate, alternate, lamina 40-100 x 18-42 mm, serrate-crenate, with 8-13 pairs of lateral nerves, petiole up to 55 mm long. Racemes subterminal on peduncles up to 130 mm long. Flowers white, pink, with yellow marks or not, 18-27 mm long. Bracts ca 3 mm long. Lateral sepals 2.5

mm long; spurred lower sepal 22-25 mm long, conical, tapering into a slender straight spur 10-15 mm long. Anterior petal 5.5-6 x 10-13 mm; lateral united petals unequal, 20-25 mm long; the lower one prolonged, larger than the upper petal. Capsule broadly linear, 20-24 mm long, erect. Seeds (Figure 3) 2.5-3 mm long, ovoid (Nasir 1980, the values measured by the author and N. Güneş Özkan).



**Figure 3.** Fruit capsule, popped fruit capsule and seeds of *Impatiens balfourii*.

## DISCUSSIONS AND CONCLUSION

*Impatiens balfourii* is used for ornamental purposes in the picnic areas newly established by the local people. This situation is pointing that human intervention has great importance for this plant distribution. In addition, considering the spreading feature of seeds (source), especially in some newly established park areas along the streams as an ornamental plant, there are significant risks in terms of additional spread apart from human intervention such as transporting seeds with water. Those detected on the roadside are usually single plant spread. This indicates that the seeds of the plant have been transmitted from the main sites. For instance; it is possible that the seeds stick to the car wheels used by the visitors to the picnic areas and these seeds are transported to the roadsides. Therefore, the strong spreading properties of the plant should be explained to the local people first and an awareness should be created for this and similar plants. Then, the second step is to take measures to prevent the spread of the plant. These measures can also be supported by people living in villages. In addition, warning signs can be hung in picnic areas to prevent people from removing and carrying plants that they see differently in the relevant area.

Human intervention is of great importance in the spread of this taxon, which is introduced as an ornamental plant (site I). Moreover, the fact that *Impatiens*, which is used as an ornamental plant in gardens, is also cultivated on the banks of streams with internal surface waters will be effective in transporting the seeds of this plant to different areas in a short time. Especially the fact that the plant has the feature of seed scattered by the cracking of the fruit shell after the ripening of the fruit (Jacquemart *et al.* 2015) increases the possibility of the seeds to contaminate streams waters and move from there to different areas. As a matter of fact, site I-II populations, where were located on streamside, is an important evidence. Therefore, seeds carried by streams can also be a crucial source of propagation of this taxon. Regarding this situation Najberek *et al.* 2020a, 2020b emphasized that the future spread of this species may be strongly associated with streams. Indeed, *I. balfourii*'s floating ability may increase over time after the seeds introduction a specific area. Moreover, the rate of spread can rise significantly and become an invasive alien species (Najberek *et al.* 2020a). *I. balfourii*, which has a high potential for use as an ornamental plant, may likely to spread to other areas, especially in agricultural habitats, and affect the

biological diversity of the relevant areas as a dominant species in Düzce.

The measures to be taken to prevent the establishment of the alien taxa with invasive or invasive potential are of particular importance (Shine *et al.* 2010, Pergl *et al.* 2017). As with *I. balfourii*, the plants introduced as ornamental plants in different areas can easily naturalize and even spread to different habitats due to their conditions in new areas (Dehnen-Schmutz *et al.* 2007, Adamowski 2009, Najberek *et al.* 2017, Guo *et al.* 2019). As a matter of fact, alien plants that deliberately moved to a new environment can adapt to local conditions with their horticultural choices and are more likely to naturalize. Moreover, their subsequent invasion situations may be facilitated by horticulture (Čuda *et al.* 2016). Therefore, awareness activities and prevention should be the first priority to start management to *I. balfourii* in Düzce. Prevention studies can play a major role in the management of the *I. balfourii*. Awareness activities will be beneficial to prevent the plant from being transported to different areas as ornamental plants, especially with human intervention. As a second precaution, it may be suggested that the plants existing in the areas where the identified populations are located should be mowed before seeding. It is known that mowing practice is an important factor in preventing the spread of the plant (Najberek *et al.* 2017), considering this situation, it will be beneficial to cut the populations determined on rivers and roadsides at certain intervals. In addition, the pots

placed on the streamside in the picnic areas should not be settled in the relevant environment. As a matter of fact, *I. balfourii* with throwing feature of seeds may easily transfer its seeds to the stream without the need for any other factor. In general, three step hierarchical strategies based in the CBD (Convention on Biological Diversity); prevention, early detection and rapid response, long-term control and containment (Shine *et al.* 2010), will be beneficial to interference of this new alien taxon in Turkey.

*Impatiens balfourii*'s should be regarded not only ornamental plant, but also risk for relevant areas, due to aggressive features. It may remain to spread rapidly and establish in habitats. For this reason, the awareness and management activities should be initiated for *I. balfourii*. In addition, a risk analysis may be performed for *I. balfourii* to determine its invasive status in Turkey. Finally, I would like to emphasize that this study provide additional taxon for alien flora in Turkey (Uludağ *et al.* 2017) and the genus *Impatiens* are represent five taxa in Turkey with *I. noli-tangere*, *I. balsamina*, *I. walleriana*, *I. grandifolia* and *I. balfourii*.

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