

A contribution to the knowledge of the distribution of some rarer neophytes in the Canton Sarajevo

Anis Hasanbegović¹ , Dario Pintarić² , Aldin Boškailo³ 

¹National museum of BH, Zmaja od Bosne 3, Sarajevo, B&H

²Secondary School of Environment and Wood Design, Vilsonovo 11, Sarajevo B&H

³Victoria University Mostar, Zalik 11, Mostar, B&H

e-mail: anishasanbegovic@yahoo.com

SUMMARY

In the period from 2022 to 2024, field research of neophytes was carried out in the Sarajevo Canton. In this paper, we present new data for the following five species: *Commelina communis* L., *Cosmos bipinnatus* Cav., *Helianthus tuberosus* L., *Oenothera biennis* L. and *Senecio inaequidens* DC. For all species, other parameters are given: altitude, longitude and latitude, soil type and phytocoenological order. The aim is to contribute new data on their distribution as well as the ecological conditions under which these species develop. A total of three localities for *Commelina communis* L. and *Cosmos bipinnatus* Cav., two localities for *Helianthus tuberosus* L. and *Oenothera biennis* L., and six for *Senecio inaequidens* DC. have been recorded. It is necessary to further investigate these field sites in order to obtain concrete results that can affect the quality of their monitoring.

Keywords: distribution, neophytes, Canton Sarajevo, localities.

INTRODUCTION

Neophytes are attracting increasing interest from botanists not only in Bosnia and Herzegovina (Lubarda and Topalić-Trivunović, 2020; Maslo and Šarić, 2020,

2021; Maslo, 2023; Maslo et al., 2024), but also in other countries (Vrbničanin, 2021; Anđelković and Radulović, 2022; Filiz et al., 2022; Ribeiro et al., 2022; Vojnich et al., 2022; Anastasiu et al., 2024; Bogdanović et al., 2024; Pacanoski et al., 2024). Such research provides insights into the presence of these plants as well as their other characteristics: distribution, phenology, mode of dispersal, phytosociological affiliation, and a range of other ecological traits. As expected, relatively few studies have focused on plant species that neither cause substantial agricultural damage nor pose risks to human health. For this reason, in this paper we selected five rarer neophytes: *Commelina communis* L., *Cosmos bipinnatus* Cav., *Helianthus tuberosus* L., *Oenothera biennis* L., and *Senecio inaequidens* DC. The main goal is to contribute new data on their distribution, as well as the ecological conditions under which these species develop.

MATERIAL AND METHODS

Field research on the selected neophytes was conducted in the Sarajevo Canton area between 2022 and 2024. In this paper, we present new localities for five (5) neophytes that can be considered rare in the investigated area, namely: *Commelina communis* L., *Cosmos bipinnatus* Cav., *Helianthus tuberosus* L., *Oenothera biennis* L., and *Senecio inaequidens* DC. All previously published data, as well as information on the localities of herbarium specimens from the „Herbarium of the National Museum of BiH-SARA,” recorded in the Sarajevo Canton, are provided. For each species, characteristic parameters are given, such as altitude, geographic longitude and latitude, soil type, and phytosociological order.

The altitude as well as the geographic latitude and longitude were determined using the GPS device 'MagelaneXplorist 500'. The Latin names were matched with the websites: www.europlusmed.org and www.theplantlist.org.

Nomenclature. For the determination of plants, we used the following literature: Josifović et al. (1973, 1975), Čanak et al. (1978), Webb (1980), Domac (1984), Griebel (2020), and Nikolić et al. (2014). For determining phytocoenological affiliation, we used the following publications: Lakušić et al. (1978), Pavlović-Muratpahić (1995) and Barudanović et al. (2015). Common names were taken from the following works: Šulek (1879), Simonović (1959), and Šugar (2008). The English names of the plants were taken from Wikipedia.com, and for soils: Gračanin and Ilijanić (1977), Škorić (1977), Škorić et al. (1985), Čirić (1991), Pavlović-Muratpahić (1995), and Barudanović et al. (2015).

RESULTS AND DISCUSSION

***Commelina communis* L.- Asiatic Dayflower, Common Dayflower (komelina, obični puzavac).** According to Webb (1980), Sarić et al. (1986), and Oberdorfer (2001). Asiatic

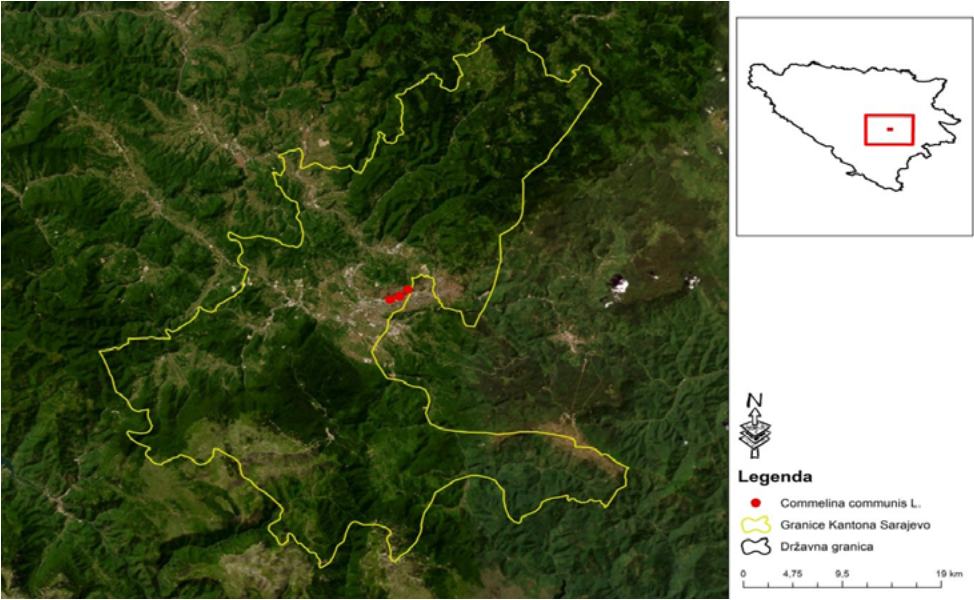
Dayflower is an annual plant with numerous branched stems that are prostrate to ascending, jointed, smooth, and 10-100 cm tall. The leaves are lanceolate to ovate-lanceolate, alternate, pointed, and at the base rounded or slightly sheathed, 3-10 cm long and 1-3 cm wide. The flowers are terminal, solitary, on short stalks, bilaterally symmetrical, with three petals: two larger dark blue ones and a smaller white one. There are six stamens, three fertile and three sterile. The fruit is a two-part capsule. It occasionally exhibits uncontrolled growth, prefers more humid habitats, and can also be found in forests (Oberdorfer, 2001). Hulina (1998) lists it as a neophyte from Asia. Oberdorfer (2001) points out that it originates from East Asia. According to Griebel (2020), this ornamental plant came to England in 1725 and ten years later to Leipzig. In Bosnia and Herzegovina, it has so far been found only in Mostar, on the left bank of the Neretva River, north of the Customs Bridge (Maslo, 2014, 2016a). However, the authors have seen this species in Tuzla, near the railway tracks close to the train station, and we believe that this species, like many other foreign species, has not been the subject of botanical research, and it is certainly more widely distributed. This species is listed on the preliminary list of invasive plants of Montenegro (Stešević and Petrović, 2010). Martinčič et al. (1999) report its presence in Slovenia, Sarić et al. (1986) note it in Vojvodina: Novi Sad, Vršac, Subotica, and Titel, and Nikolić (2015) provides data on the distribution of this species in Croatia.

Prevalence in the Sarajevo Canton: Maslo (2023) and Maslo et al. (2024) report it in Sarajevo.

New locations (Map 1):

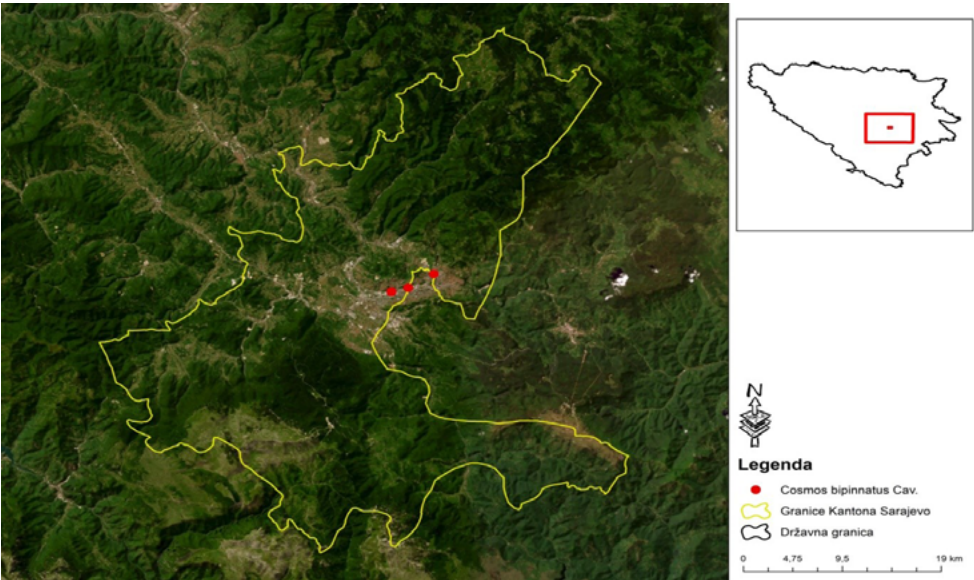
1. Near the café „Firma” on Grbavička Street, 43.851775 N and 18.40115 E, the altitude is 533 m, the soil is hortisol, phytocoenological affiliation *Chenopodietalia*.
2. Opposite the Internet club „All Star” on Paromlinska, 43.853685 N and 18.378572 E, the altitude is 524 m, the soil is hortisol, phytocoenological affiliation *Chenopodietalia*.
3. Next to the café „Ambasador” on Džemala Bijedića Street, 43.850669 N and 18.367231 E, the altitude is 519 m, the soil is hortisol, phytocoenological affiliation *Chenopodietalia*.

***Cosmos bipinnatus* Cav.- Mexican aster, Garden Cosmos, Cosmea (kosmos, meksički kosmos, kosmea).** According to Josifović et al. (1975), Domac (1984), and Griebel (2020), Mexican aster is an annual plant 60-120 (150) cm tall, with upright, branched, and hairy stems. The leaves are doubly pinnate, with narrow-lanceolate and pointed segments. The central flowers are tubular, with 5 teeth, the ligulate ones are three-lobed at the top, pink or white, the pappus has 2-3 bristles, the achene is black with a short beak. Oberdorfer (2001) emphasizes that cosmos is cultivated as an ornamental plant and sometimes becomes naturalized, prefers a warm and humid climate, and is a short-day plant. According to Oberdorfer (2001), this plant originates from Mexico and Texas.



Map 1. Distribution of *Commelina communis* L. in the study area.

It is widespread throughout Central America and parts of the USA (Griebl, 2020). The same author (Griebl, 2020) emphasizes that this ornamental plant first arrived in Europe in 1789, specifically in Spain, was transferred to England in 1798, and to



Map 2. Distribution of *Cosmos bipinnatus* Cav. in the study area.

Germany in 1808. Josifović et al. (1975) mention it for Serbia, Beldie (1979) mentions it as a cultivated plant in Romania, Nikolić (2015) for Croatia.

Prevalence in the Sarajevo Canton: There is no data on the prevalence of this plant in the Sarajevo Canton.

New locations (Map 2):

1. Next to the Nephrology Department at KCUS, 43.870131 N and 18.414948 E, altitude is 600 m, soil type is hortisol, phytosociological affiliation *Chenopodietalia*.
2. On the ruins of the former Una restaurant within the Campus, 43.857743 N and 18.394059 E, altitude is 532 m, soil type is deposol, phytosociological affiliation *Chenopodietalia*.
3. Next to the building on Fetah Bećirbegović Street, 43.853288 N and 18.370606 E, altitude is 521 m, soil type is deposol, phytosociological affiliation *Chenopodietalia*.

***Helianthus tuberosus* L.- Jerusalem artichoke (topinambur, čičoka, jerusalemska artichoke, morska repa).** According to Josifović et al. (1975), Domac (1984), Griehl (2020), Nikolić et al. (2014), and Boškailo et al. (2025) Jerusalem artichoke is a perennial plant, 1-2 (3) m high, geophyte. The stem is erect, branched, hairy and rough. Leaves with stems, elongated ovate, pointed, serrated, rough and mostly opposite with 3 nerves, 10-25 cm long and 7-12 cm wide. The inflorescence is paniculate, the heads are large (4-8 cm in diameter), erect, solitary, the envelope leaves lanceolate, pointed, green and ciliated. On the periphery of the head there are 12-15 ligulate yellow flowers, 2-2.5 cm long, the central ones are tubular, numerous, also yellow, with about 6 mm long corolla tube. They contain 5 stamens attached to the corolla and a sub-adult pistil made of two fertile leaves. The fruit is a cypsela with 1-4 ciliated bristles. Rhizome with edible tubers. It spreads with rhizomes and tubers (Hulina, 1998).

Pavlović-Muratspahić (1995) points out that Jerusalem artichoke is a species that increasingly occupies the habitats of pedunculate oak forests and mesophilous sessile oak forests in suburban areas and along the banks of rivers and streams. Redžić et al. (2008) highlights Jerusalem artichoke as one of the species that „cause particularly negative impacts on the habitats of hygrophilous forest ecosystems of willows, black poplars, and poplars.”

Boškailo et al. (2025) note that *Helianthus tuberosus* L. belongs to invasive species that find their optimum for growth predominately in wet and ruderal habitats, while it is also common along roads and in human settlements. Barudanović et al. (2015) emphasize that this species often occurs with Japanese knotweed (*Reynoutria japonica* Houtt.) and forms communities in ruderal habitats.

According to Oberdorfer (2001), Jerusalem artichoke inhabits areas near water, especially in the vegetation of the order *Convulvuletalia*, but also in the subclass *Artemisietalia*. Nikolić et al. (2014) highlight that Jerusalem artichoke „displaces native species, slows

the succession of natural vegetation, promotes erosion of riverbanks, reduces biodiversity, and decreases crop yields (sugar beets, corn, and others)”.

Griebel (2020) points out that the English sailor Walter Raleigh discovered Jerusalem artichoke in 1585 in the Native Americans’ garden. In 1616 it was brought to England (Grlić, 1990). Griebel (2020) notes that in the 17th century, the plant was already cultivated for its edible tubers. Nikolić et al. (2014) provide the information that Jerusalem artichoke originates from North America (Canada, USA) and has been naturalized in Africa, Central and South America, Australia and New Zealand, East Asia, and many European countries. Beck (1885) emphasizes that Jerusalem artichoke is cultivated in Bosnia and Herzegovina, and Beck et al. (1983) state that this plant is grown as a crop for human and animal consumption. According to Grlić (1990), tubers are used for food and can be prepared in the same way as potatoes, while the edible spring shoots are eaten in Japan. Hulina (1998) emphasizes that tubers are very nutritious and contain a number of vitamins as well as carbohydrates, especially inulin, so they are recommended for diabetics. Josifović et al. (1975) provide the information that „one plant produces 15-20 tubers per year, and when it is rainy, 1 hectare produces 20-28.000 kg of tubers and 6.000 kg of dry stems”. Pahlow (1989) and Hulina (1998) cite this species as medicinal.

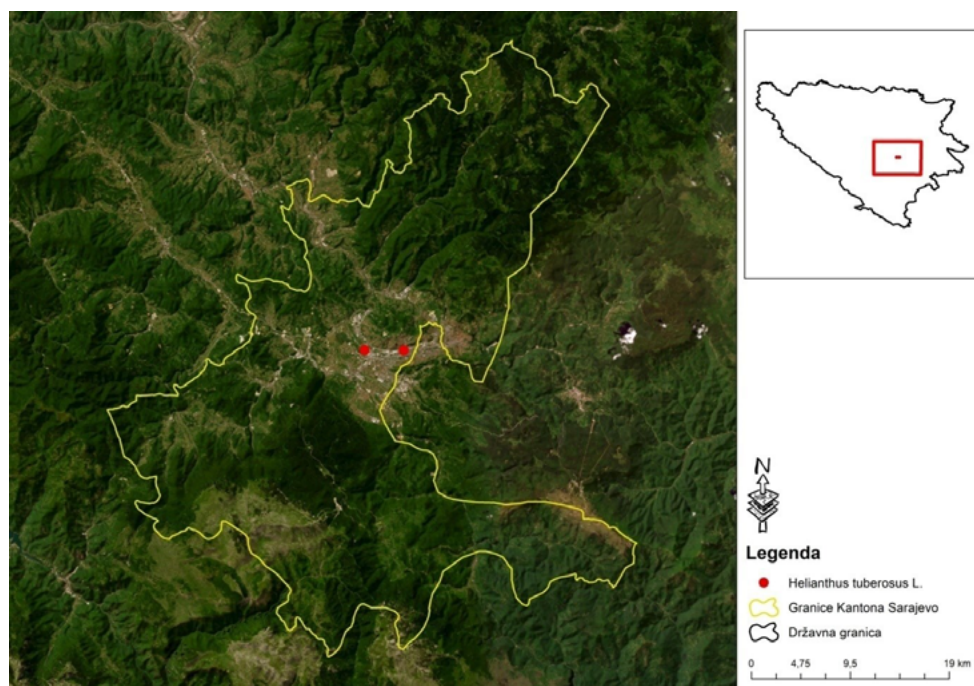
Ascherson and Kanitz (1877) mention this plant for Bosnia without specifying particular locations. Likewise, Redžić et al. (2008) report that this species has been recorded in BiH and that it belongs to the group of horticultural species that have escaped human control. Vojniković (2009) classifies it on the „Black List of Flora of BiH,” while Maslo (2016b) includes it on the „Preliminary List of Invasive Alien Species (IAS) in BiH.” Boškailo (2023) emphasizes that it has been recorded in Bosnia and Herzegovina at a large number of locations across all biogeographical regions. Đug et al. (2019) classifies it as part of the group of invasive plant species in the Federation of Bosnia and Herzegovina, and Boškailo (2023) lists it among the invasive plant species of Bosnia and Herzegovina. This species is included in the preliminary list of invasive plants in Montenegro (Stešević and Petrović, 2010). It is also on the „Preliminary List of Invasive Plant Species of Serbia”, where it is marked as highly invasive (Lazarević et al., 2012). Furthermore, Vrbničanin et al. (2009) and Vrbničanin (2013) note that this plant is one of the most widespread alien species in Serbia. Jerusalem artichoke is on the preliminary list of invasive alien species in Croatia (Boršić et al., 2008), with Nikolić (2015) providing data on the distribution of this species in Croatia. Pacanoski and Mehmeti (2020) report it in North Macedonia. Beldie (1979) records it as a sub-spontaneous plant in Romania. It is also part of the invasive flora of Albania (Zhuri and Imeri, 2022).

Prevalence in the Sarajevo Canton: This plant was first mentioned in Sarajevo by Hofmann (1882). Suljić et al. (2016), Sarajlić and Jogan (2017), Boškailo (2023), Maslo

et al. (2024) found it in the city area as well as in the canton, and Hasanbegović et al. (2024) found it in Butmir, in a corn crop field.

New locations (Map 3):

1. Across from the building in the Kvadrant settlement, 43.851805 N and 18.364099 E, altitude is 518 m, soil is deposol, phytosociological affiliation *Chenopodietalia*.
2. In Bačići, by the road, 43.852184 N and 18.317092 E, altitude is 497 m, soil is deposol, phytosociological affiliation *Chenopodietalia*.



Map 3. Distribution of *Helianthus tuberosus* L. in the study area.

***Oenothera biennis* L.- Evening primrose (pupoljka, noćurak, dvogodišnja pupoljka, žuti noćurak).** According to Josifović et al. (1973), Čanak et al. (1978), Domac (1984), Nikolić et al. (2014), and Boškailo et al. (2025), the Evening primrose is a thermophilic, ruderal, biennial plant, 1-1.3 m high, which blooms from June to September. The root is fleshy and spindle-shaped. In the first year, it forms a basal rosette, and in the second year, a stem grows that is upright, unbranched, hairy, and ridged. The basal leaves are oblong-ovate, narrowing at the base into a long petiole and shortly pointed at the top. Stem leaves have short petioles or are almost sessile, oblong-lanceolate, finely serrated, hairy, light green, up to 10 cm long and 3.5 cm wide. Flowers are large, 2-3 cm long, yellow, and fragrant. They have an intense fragrance at night and attract nocturnal moths. They open in the evening and usually wilt by morning. Petals are obovate to

cordate-ovate, slightly shorter than the sepals, longer than the stamens, while the sepal lobes are sparsely hairy. There are 8 stamens, the ovary is inferior and quadripartite. The fruit is a linearly elongated capsule, up to 3 cm long, bluntly four-angled, and hairy. Seeds are irregular, 1.5 mm long, dark gray to dark brown.

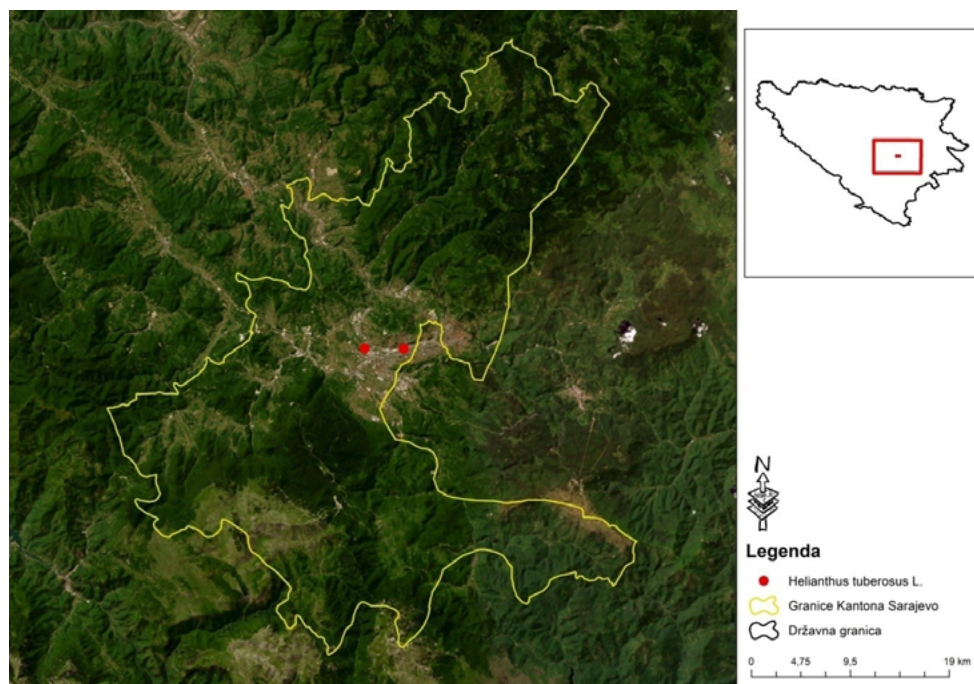
Beck (1927) notes that the Evening primrose is „*Introducta ex America boreali*”, Nikolić et al. (2014) provide information about Evening primrose originating from North America, from Canada to Texas, and that it was brought to Europe at the beginning of the 17th century to the botanical garden in Padua. Regarding phytocenology, Oberdorfer (2001) classifies the Evening primrose in the phytocenological alliances *Dauco-Melilotion* and *Sysimbrion*. Hulina (1998) states that „the evening primrose retains the ability to germinate even after 60 years”. Beldie (1977) emphasizes that the bud is „mesotrophic, mesoxerophytic, oligotrophic xerophyte”. According to Josifović et al. (1973), the Evening primrose is today widespread in Europe, northern and central Russia, western and eastern Asia, North America up to Mexico, while Nikolić et al. (2014) emphasize that it is „widely naturalized in temperate and subtropical areas of Europe, Asia, and Australia.”

Bosch (2020) provides the information that „to obtain one gram of valuable seed oil from the bud, about 20,000 seeds are needed”. Grlić (1990) emphasizes the edibility of the young leaves of the basal rosette and the roots of the bud in many cultures. Bosch (2020) states that „young bud leaves can be used as salad, herbal butter, stew, soups, and in sauces”. Tucakov (1973) highlights that this species is medicinal and recommends it in the diet of people with diabetes. Beldie (1977) mentions it as a honey plant. Vojniković (2009) places it on the „Black List of Flora of BiH”, while Maslo (2016b) and Boškailo (2023) include it on the list of invasive alien species (IAS) in Bosnia and Herzegovina. Đug et al. (2019) classify it as an invasive species in the BiH. Nikolić et al. (2014) point out that the Evening primrose is a „weed that reduces the yields of agricultural crops”.

The Evening primrose is on the preliminary list of invasive plants of Montenegro (Stešević and Petrović, 2010). It is also on the „Preliminary List of Invasive Plant Species of Serbia”, where it is marked as sporadically invasive (Lazarević et al., 2012). The Evening primrose is on the preliminary list of invasive alien species in Croatia (Boršić et al., 2008), and Nikolić (2015) provides data on the distribution of this species in Croatia. Soó (1966) notes that the Evening primrose is widespread in Hungary, Beldie (1977) provides data for Romania, and Martinčič et al. (1969) for Slovenia. In Bosnia and Herzegovina, it was first recorded in the 1880 (Freyn and Brandis, 1888). Boškailo (2023) emphasizes that in Bosnia and Herzegovina it has been recorded at a large number of sites across all biogeographical regions.

Prevalence in Canton Sarajevo: Tanović (1995), Tanović-Hadžiavdić (2006), Sarajlić and Jogan (2017), Lepić (2018), Boškailo (2023), and Maslo et al. (2024) mention it for Sarajevo.
New locations (Map 4):

1. Sarajevo, near „Merkator” and along almost the entire length of the railway to the overpass, 43.857407 N and 18.381938 E, elevation 531 m, soil is deposol, phytocoenological order is *Artemisietalia*.
2. Sarajevo, next to the mosque in Hrasno, 43.850065 N and 18.379781 E, elevation 521 m, soil is deposol, phytocoenological affiliation *Chenopodietalia*.



Map 4. Distribution of *Oenothera biennis* L. in the study area.

***Senecio inaequidens* DC.- South African ragwort, narrow-leaved ragwort (nejed-nakozubi kostriš).** According to Chater and Walters (1976) and Griebel (2020), this ragwort is 20-100 cm tall, a short-lived perennial with linear leaves 2-7 cm long and 0.1-0.5 cm wide, with finely serrated edges, often twisted. The stem is upright, glabrous, often highly branched. The head is numerous, often 80-100 per plant, with 10-13 ligulate flowers, the calyx with 10-20 outer, sharp bracts with dark tips. The flowers are yellow, the achene cylindrical, 2-2.5 cm long, pappus 2-3 times longer than the achene, white.

Species *Senecio inaequidens* DC. originates from South Africa, where it appears on skeletal parts of steep, wet, and grassy slopes, as well as sandy and gravelly banks of periodic streams (Hilliard, 1977). It was imported to Europe at the end of the 19th century with the import of sheep wool - between 1889 and 1895 it was brought into Hanover with combed wool, and in 1896 to Bremen. This ragwort is a member of several

ruderal and secondary alliances and orders, such as: *Dauco-Melilotion*, *Agropyretalia*, *Convolvuletalia*, and *Arrenatheretalia* (Oberdorfer, 2001). Đug et al. (2019) classify it as an invasive species in the Federation of Bosnia and Herzegovina. Boškailo (2023) lists it as an invasive alien species (IAS) in Bosnia and Herzegovina. Maslo (2014) first reported it in BiH, specifically in Mostar. This species has been recorded in Montenegro (Stevanović et al., 1991), Croatia (Borovečki-Voska, 2013; Milović and Pandža, 2014; Nikolić, 2015), and Slovenia (Kaligarić, 1992). Boškailo (2023) emphasizes that in Bosnia and Herzegovina it has been recorded in the Mediterranean and Alpine biogeographical regions.

Prevalence in Canton Sarajevo: Sarajlić and Jogan (2017) and Maslo (2023) and Maslo et al. (2024) reported it in Sarajevo.

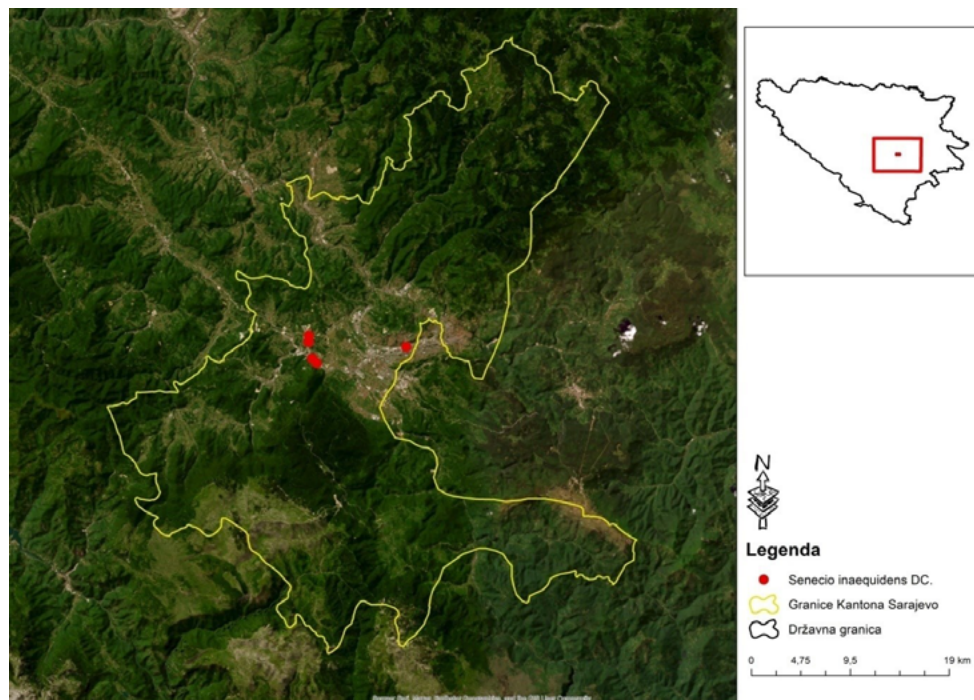
Herbarium specimens from the „Herbarium of the National Museum of BiH (SARA)”: Sarajevo: Krivoglavci (leg. et det. S. Maslo and Š. Šarić, October 2019 – No. 51993; SARA);

New locations (Map 5):

1. Vlakovo, by the road in front of „Phoenix Pharma”, 43.856714 N and 18.250177 E, altitude 519 m, soil is deposol, phytosociological affiliation *Chenopodietalia*.
2. Vlakovo, along the banks of the Trnava stream, 43.856531 N and 18.250851 E, altitude 518 m, soil is alluvium, phytosociological affiliation *Salicetalia purpureae*.
3. Vlakovo, near the turnoff to the A1 highway, 43.862171 N and 18.250746 E, altitude 520 m, soil is deposol, phytosociological affiliation *Chenopodietalia*.
4. Blažuj, at the beginning of the entrance to the settlement, 43.838258 N and 18.259981 E, altitude 505 m, soil is deposol, phytosociological affiliation *Chenopodietalia*.
5. Blažuj, near the restaurant „Mujanić”, 43.842367 N and 18.254444 E, altitude 508 m, soil is deposol, phytosociological affiliation *Chenopodietalia*.
6. Sarajevo, Kvadrant settlement near the railway, 43.852072 N and 18.367046 E, altitude 521 m, soil is deposol, phytosociological affiliation *Chenopodietalia*.

Most of the localities of the species *Senecio inaequidens* DC. have been recorded in Blažuj and Vlakovo, which are two nearby settlements, and only one in Sarajevo. Significant highways pass through both of these places, so it is possible that traffic significantly influences the spread of this ragwort.

There are certainly a larger number of field sites for the abovementioned species; however, these species are often not the subject of botanical research, which is one of the reasons for the limited knowledge, or complete lack of knowledge, of the distribution area of these species. Additionally, a major problem is that some studies do not provide specific coordinates for these plants; they are only mentioned, which further reduces the possibility of effective monitoring, obtaining distribution maps, and other ecologically important parameters.



Map 5. Distribution of *Senecio inaequidens* DC. in the study area.

CONCLUSION

New field sites have been identified for the five selected rarer neophytes, namely: three localities for *Commelina communis* L. and *Cosmos bipinnatus* Cav., two localities for *Helianthus tuberosus* L. and *Oenothera biennis* L., and six localities for *Senecio inaequidens* DC. Most of the surveyed plants grow on deposol soil and phytosociologically belong to the *Chenopodietalia* order. Unfortunately, it must be noted that the overall number of existing field sites, as well as herbarium specimens, is small, and it is necessary to further investigate these species in order to obtain more detailed results, which can influence the quality of monitoring of these species.

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Prilog rasprostranjenosti nekih rjeđih neofita u Kantonu Sarajevo

REZIME

U periodu od 2022. do 2024. godine vršena su terenska istraživanja neofita na području Kantona Sarajevo. U radu predstavljamo nove podatke za pet slijedećih vrsta: *Commelina communis* L., *Cosmos bipinnatus* Cav., *Helianthus tuberosus* L., *Oenothera biennis* L. i *Senecio inaequidens* DC. Za sve vrste su dati i ostali parametri: nadmorska visina, geografska dužina i širina, tip zemljišta i fitocenološki red. Cilj je da se doprinese novim podacima o njihovoj rasprostranjenosti kao i ekološkim uslovima pod kojima se ove vrste razvijaju. Ukupno je zabilježeno za: *Commelina communis*-3, *Cosmos bipinnatus*-3, *Helianthus tuberosus*-2, *Oenothera biennis*-2 i *Senecio inaequidens*-6 lokaliteta. Potrebno je dalje istraživati ove vrste da bi se dobili što precizniji rezultati rasprostranjenosti koji mogu uticati na kvalitetniji monitoring istih.

Ključne riječi: rasprostranjenost, neofite, Kanton Sarajevo, lokaliteti.