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## Locality of the taxon *Seseli elatum* ssp. *osseum* (Apiaceae) on the Lapjak ridge (South Papuk, Croatia)

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**Abstract.** During floristic studies within the Papuk Nature Park protected area (Northeast Croatia), on the Lapjak ridge, at an altitude of 452 m, a locality of the taxon *Seseli elatum* L. ssp. *osseum* (Crantz) P.W.Ball has been documented. This taxon is very rare on the Papuk Mt: it grows in the boulder cracks or between rocks in the rocky grasslands. The locality has southern exposition, with an inclination of 30%–40%, and a carbonated baserock (dolomite) with very scanty shallow brown carbonated soil (rendzina). The area is 20×30 meters in size. The research was conducted on 20<sup>th</sup> August, 2015 and a list of plant taxa species was compiled and compared to earlier lists (in 1993 and 1997). The floristic elements, life forms and ecological factors have been determined according to Ellenberg. Plants from the South European floristic element dominated the grassland flora (35.7%). *Hemicryptophytes* were the dominating life form (48.6%), while in terms of ecological factors, light-loving plants dominated. The plant is very rare in the Republic of Croatia and that locality is the single documented site of *Seseli elatum* L. ssp. *osseum* (Crantz) P.W.Ball in the area of Požega Valley and the surrounding mountains.

**Key words:** Croatia Lapjak, Papuk Nature Park, *Seseli elatum*

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### Introduction

Požega Valley is located in the Slavonian subregion of the East Pannonian macro region in Croatia and belongs to the western hilly part of Slavonia (Nikolić & al., 1998). The biogeographical position of the Valley is determined by its location on the border of three different climatic influences, as well as by variable geomorphological and geological conditions. The Alpine climatic influence from the west and Dinaric from the south, combined with the more arid Pannonian influence from the north and east, have contributed all to the great richness and diversity of the region's flora and vegetation. Floristically, the Valley, as well as most of Croatia, have features of the Euro-Siberian – North American floristic regions, but also with certain Mediterranean and Aral-Caspian

influences (Ilijanić, 1977). Floristic studies of the Požega Valley and surrounding mountains have registered 1654 floristic species and subspecies (Tomašević, 2016). *Seseli elatum* L. ssp. *osseum* was registered for the first time on 29<sup>th</sup> June 1993 as *Seseli osseum* Crantz on the Lapjak ridge, and confirmed on 15<sup>th</sup> July 1997 (Tomašević, manuscript) and 20<sup>th</sup> August 2015. *Seseli elatum* L.ssp. *osseum* (Crantz) P.W. Ball is biennial to perennial herbaceous plant with an upright stem, 30 to 120 cm high. Stem rounded, densely ridged, grey-greenish in colour, branched in the upper part. Lower leaves form a rosette, about 15 cm long, dispersed feather-like in multiple ways, on round petioles. Barbs linear-lanceolate, 15–20 mm long, about 1 mm wide, rounded or with pointed tips, grey-greenish, naked, with a notable middle fibre. Upper leaves gradually get smaller, dispersed feather-like, with leaflets. Corymb

inflorescences medium-sized, with 7–15 beams on long thin pedicels. Flowers are white, without involucre, or with only one leaf involucre. Involucre leaf is of the same length as the flower. Fruits are achenes, 2.5–3 mm long, with notable ribs. Flowering in (VI) VII–IX month of the year (Fig. 1).



Fig. 1. *Seseli elatum* L.ssp. *osseum* (Crantz) P.W.Ball.

The genus *Seseli* (family *Apiaceae*, order *Apiales*) is represented in the Croatian flora by 13 species and six subspecies (Nikolić, 2018). Maly (1908) recorded the taxon *Seseli osseum* Crantz in the Illyrian flora. Nikolić (1973) in Josifović & al. reported the taxon *Seseli osseum* Crantz (= *S. devenyense* Simonk.) and its presence in Vojvodina, Fruška Gora, Syrmia, and in the areas surrounding Belgrade and Niš. According to *The Flora of Serbia*, it is generally distributed in Central and Southeast Europe. This taxon belongs to the Pannonian mountain element. According to *The Flora Europaea*, it has three subspecies, one of which is *Seseli elatum* L. ssp. *osseum* (Crantz) P.W.Ball, (= *S. osseum* Crahtz; *S.devenyense* Simonk.). Data on its presence on the territory of Croatia are very scanty. In *Flora Croatica*, Schlosser & Vukotinović (1869) elaborated on the taxon *Seseli elatum* L. In the *Flora Croatica Database*, Nikolić (2018) registered the subspecies *Seseli elatum* L. ssp. *gouani* (Koch) P.W.Ball and *Seseli elatum* L. ssp. *osseum* (Crantz) P. W. Ball (Fig. 2). During floristic studies of the Požega Valley and surrounding mountains, for the first time on 29<sup>th</sup> June 1993 (Tomašević, manuscript), the taxon *Seseli osseum* Crantz was recorded on the Lapjak ridge (Southern Papuk). According to *Flora Europaea*, the taxon *Seseli osseum* Crantz is considered a subspecies of the *Seseli elatum* L.ssp. *osseum* (Crantz) P.W.Ball. *Flora Europaea* has not reported that taxon for the territory of the Republic of Croatia.

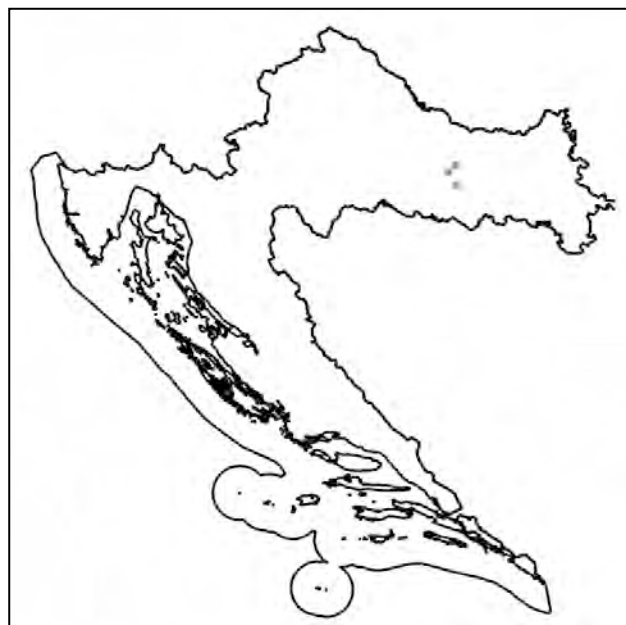


Fig. 2. Localities of the species in the Republic of Croatia (Nikolić, 2018).

## Material and methods

At an altitude of 675 m, Lapjak is one of the Papuk hilltop ridges, which stretches in the north-south direction, between the streams of Veličanka in the west and Dubočanka in the east. Its southern slopes, up to 500 m a.s.l., are composed of carbonated rocks, while the other higher slopes are of non-carbonated rocks. Rather thin forest areas of Downy Oak (*Quercus pubescens*) and Manna Ash (*Fraxinus ornus*), interspersed with Sessile Oak (*Quercus petraea*) and Black Pine (*Pinus nigra*), grow on the southern carbonated slopes. The terrain of these southern slopes is undulated, open, with southern exposition and inclination of 30–40°. Rocky grassland formations have developed in the rockeries and among the stone boulders.

The plants were determined according to the standard determination keys: Domac, (1967); Josifović & al., (1970–1976); Ehrendorfer (1973); Javorka & Csapody (1975). They were confirmed by the Division of Botany of the Zagreb University's Faculty of Science (PMF), in 1997. The taxon has been registered as *Seseli osseum* Crantz (Tomašević, 1998). Its name was determined then according to Ehrendorfer (1973) and subsequently adjusted to *Flora Europaea*. The specimen of *Seseli elatum* L.ssp. *osseum* (Crantz) P.W.Ball from the Lapjak locality was stored in the Herbarium Croaticum in Zagreb. The present research was conducted on 20<sup>th</sup> August 2015 and a list of plant taxa species was compiled and compared to earlier lists (in 1993 and 1997). The list of floristic species from the rocky grasslands was adapted according to the species nomenclature in Flora Croatica Database (Nikolić, 2018) and *Flora Europaea* (Tutin & al., 1964–1980). Distribution of life forms followed Šegulja (1977) and is as follows:

H – <i>Hemicryptophytes</i>	G – <i>Geophytes</i>
T – <i>Therophytes</i>	P – <i>Phanerophytes</i>
Ch – <i>Chamaephytes</i>	Hy – <i>Hydrophytes</i>

Classification of plants in terms of floristic elements followed Horvatić et al (1967/68), Šegulja (1977), Horvatić & Trinajstić (1967–1981), and Trinajstić (1975–1986). In the list of plant species, the numbers in bold printed after the species name correspond to the following floristic elements:

1. *Mediterranean*
2. *Illyrian-Balkan*
3. *South European*
4. *Atlantic*

5. *East European-Pontic*
6. *Southeast European*
7. *Central European*
8. *European*
9. *Eurasian*
10. *Circum-Holarctic*
11. *Widespread plants*
12. *Cultivated and adventitious plants*

The taxons have been graded according to Ellenberg's ecological factors for light (L), temperature (T) and humidity (F) (Ellenberg & al., 1991).

## Results and discussion

During floristic studies of the Požega Valley, the taxon *Seseli elatum* L. ssp. *osseum* (Crantz) P.W.Ball was recorded on the Lapjak ridge (Southern Papuk) as part of floristic formations on the rocks and in rocky grasslands. The locality was 20 × 30 m in surface. The habitat was distinctively thermophile. The taxon *Seseli elatum* L. ssp. *osseum* (Crantz) P. W. Ball was very well adapted to the ecological factors of the area. It was a Pannonic mountainous plant. The plant's general habitat was in Central and Southeast Europe (Josifović & al., 1970–1976). According to *Flora Europaea* (1964–1980), the area was EC Europe. The observations conducted on 29<sup>th</sup> June 1993, then on 24<sup>th</sup> April 1994, on 15<sup>th</sup> July 1997, and on 20<sup>th</sup> August 2015 did not show any changes in the taxon's distribution on the terrain, with the exception of locations on which there was a succession of some bush-like floristic species (Table 1). The site of finding was located on carbonated base-rock (dolomite) with some very scanty shallow brown carbonated soil (rendzina). The locality was 600 m<sup>2</sup> in size, close to an old fortress. On smaller grassland areas, the succession of bush-like floristic species consisted of, for example: *Cornus sanguinea*, *Prunus spinosa*, *Crataegus monogyna*, *Rosa canina*, etc. The taxon *Seseli elatum* L.ssp. *osseum* (Crantz) P.W.Ball seldom exists among bush-like species, (Fig. 3).

In terms of phytogeographical distribution and ecological factors, plants belonging to the South European floristic element dominated the flora of rocky grasslands (35.7%). There was also a significant presence of plants belonging to the Euroasian floristic element (24.3%) and the European floristic element (12.9%) (Fig. 4).

Table 1. The list of plant taxa on rocky grasslands.

Locality: Lapjak-South Papuk				Ecological factors		
Number of research	1	2	3	L	T	F
Altitude	452	452	452			
Slope (°)	30–40	30–40	30–40			
Aspect	southeast					
Cover (%)	90	60–70	60			
Date	24.6.1993	15.7.1997	20.8.2015			
Number of species	40	61	46			
Surface of research (m2)	600	600	600			
<i>Quercus pubescens</i> Willd., P;3	+	+	+	7	8	3
<i>Corylus avellana</i> L., P;8	–	+	–	6	5	×
<i>Fraxinus ornus</i> L., P;3	+	+	+	5	8	4
<i>Rosa canina</i> L., P;11	–	+	+	8	5	4
<i>Cornus sanguinea</i> L., P;8	–	+	–	7	5	5
<i>Prunus spinosa</i> L., P;9	–	+	–	7	5	4
<i>Juniperus communis</i> L., P;10	+	+	+	8	x	4
<i>Crataegus monogyna</i> Jacq, P;9	+	+	+	7	5	4
<i>Viburnum lantana</i> L., P;3	+	+	+	7	5	4
<i>Rosa arvensis</i> Huds., P;7	+	+	–	5	5	5
<i>Festuca rupicola</i> Heuff., H;6	+	+	+	9	7	3
<i>Thymus pulegioides</i> L., Ch;3	+	+	+	8	x	4
<i>Sedum album</i> L., Ch;9	+	+	+	9	x	2
<i>Seseli elatum</i> L. ssp. <i>osseum</i> (Crantz) P.W.Ball, H;3	+	+	+	9	8	2
<i>Centaurea rhenana</i> Boreau, H;7	+	+	+	9	7	2
<i>Melica ciliata</i> L., H;3	+	+	+	8	7	2
<i>Galium lucidum</i> All., H;3	+	+	+	7	6	3
<i>Allium oleraceum</i> L., G;9	+	+	+	7	6	3
<i>Arabis hirsuta</i> (L.) Scop., H;11	+	+	+	7	5	4
<i>Alyssum montanum</i> L. ssp. <i>gmelinii</i> (Jord.) Em. Schmid., Ch;5	+	+	+	9	6	2
<i>Allium vienale</i> L., G;11	–	+	+	5	7	4
<i>Helianthemum nummularium</i> (L.) Mill. ssp. <i>obscurum</i> (Čelak.) Holub., Ch;3	+	+	+	8	5	3
<i>Anthericum ramosum</i> L., H;7	+	+	+	7	5	3
<i>Allium carinatum</i> L., G;8	+	+	+	8	5	3
<i>Medicago minima</i> (L.) Bartal., T;11	+	+	+	9	7	3
<i>Dichanthium ischaemum</i> (L.) Roberty., H;3	+	+	+	9	7	3
<i>Sedum hispanicum</i> L., Ch;3	+	+	+	8	6	2
<i>Teucrium chamaedrys</i> L., Ch;3	+	+	+	7	6	2
<i>Verbascum lychnitis</i> L., H;8	+	+	+	7	6	3
<i>Hieracium bupleroides</i> C.C.Gmel., H;2	+	+	–	9	x	4
<i>Vicia tetrasperma</i> (L.) Schreber, T;9	+	+	–	6	6	5
<i>Eryssimum odoratum</i> Ehrh., H;7	+	+	–	9	7	2
<i>Euphorbia cyparissias</i> L. H;9	+	+	+	8	x	3
<i>Campanula bononiensis</i> L., H;9	+	+	–	7	6	3
<i>Tamus communis</i> L., G;3	+	+	–	6	8	5



Table 1. Continuation.

Locality: Lapjak-South Papuk				Ecological factors		
Number of research	1	2	3	L	T	F
Altitude	452	452	452			
Slope (°)	30–40	30–40	30–40			
Aspect	southeast					
Cover (%)	90	60–70	60			
Date	24.6.1993	15.7.1997	20.8.2015			
Number of species	40	61	46			
Surface of research (m2)	600	600	600			
<i>Hypericum montanum</i> L., H;9	+	+	–	5	6	4
<i>Campanula sibirica</i> L., H;5	+	+	–	7	6	3
<i>Stachys recta</i> L., H;3	+	+	–	7	6	3
<i>Festuca rubra</i> L., H;10	+	+	+	8	6	4
<i>Trifolium campestre</i> Schreber, T;11	+	–	+	8	6	4
<i>Alyssum alyssoides</i> (L.) L., T;3	–	+	+	9	6	3
<i>Sanguisorba minor</i> Scop. ssp. <i>muricata</i> Briq., H;3	+	+	+	8	8	2
<i>Arabis turrata</i> L., H;3	–	+	+	6	7	3
<i>Cardaminopsis arenosa</i> (L.) Hayek, T;8	–	+	+	9	x	4
<i>Arenaria serpyllifolia</i> L. T;9	–	+	+	8	x	4
<i>Veronica chamaedrys</i> L., Ch;9	–	+	–	6	x	5
<i>Acinos arvensis</i> (Lam.) Dandy, T;8	–	+	–	9	6	2
<i>Allium sphaercephalon</i> L., H;3	–	+	+	9	8	3
<i>Sedum acre</i> L., Ch;9	+	+	+	8	6	2
<i>Asperula cynanchica</i> L., H;3	–	+	–	7	x	3
<i>Hieracium pavichii</i> Heuff., H;6	–	+	–	7	5	X
<i>Inula conyza</i> DC., H;3	–	+	–	6	6	4
<i>Fragaria viridis</i> Duchesne, H;9	–	+	–	7	5	3
<i>Coronilla varia</i> L., H;8	–	+	–	7	6	4
<i>Hedera helix</i> L., P;8	–	+	–	4	5	5
<i>Hieracium piloselloides</i> Vill., H;9	–	+	–	9	6	4
<i>Fumana procumbens</i> (Dunal) Gren et Godr. Ch;3	–	+	–	9	7	2
<i>Hippocrepis comosa</i> L. Ch;3	–	+	–	7	5	3
<i>Asplenium trichomanes</i> L., H;11	–	+	+	5	x	5
<i>Asplenium ruta-muraria</i> L., H;10	–	+	+	8	x	3
<i>Eryngium campestre</i> L., H;3	+	–	+	9	7	3
<i>Vicia lutea</i> L., T;3	+	–	+	7	7	4
<i>Hieracium lactucella</i> Wallr., H;9	+	–	–	8	x	6
<i>Jovibarba globifera</i> (L.) J.Parnell ssp. <i>hirta</i> (L.) J. Parnell Ch;7	–	+	+	9	6	2
<i>Leontodon incanus</i> (L.) Schrk., H;9	–	+	+	7	x	3
<i>Medicago falcata</i> L., H;9	–	–	+	8	6	3
<i>Petrorhagia prolifera</i> (L.) P.W.Ball et Heywood, T;9	–	–	+	8	7	3
<i>Muscari neglectum</i> Guss. ex Ten., G;3	–	–	+	7	8	3
<i>Elymus hispidus</i> (Opiz) Melderis H;3	–	–	+	7	6	3
<i>Echium vulgare</i> L. H;8	–	–	+	9	6	4



Fig. 3. Habitat of the species.

Analysis of life forms has shown dominance of *Hemicryptophytes* (48.6%), followed by *Chamaephytes* (15.7%), *Phanerophytes* (15.7%) and *Therophytes* (12.9%) (Fig. 5). *Hemicryptophytes* demonstrated adaptation of the plants to a moderate climate, while *Therophytes* indicated dryness of certain areas. With regard to Ellenberg's ecological factors, the plants of well-lighted (L), thermophilic habitats (T) and dry soils (F) dominated (40 species (57.1%) belonged to plants of fully illuminated habitats and 47 species (67.1%) of plants of dry habitats).

## Conclusions

The terrain where *Seseli elatum* L. ssp. *osseum* grows was open, undulated, exposed to the south, distinctly thermophile, with inclination of about 30–40°. The base was rocky, with few boulders. The taxon was rare; it grew in the boulder cracks or between rocks in the

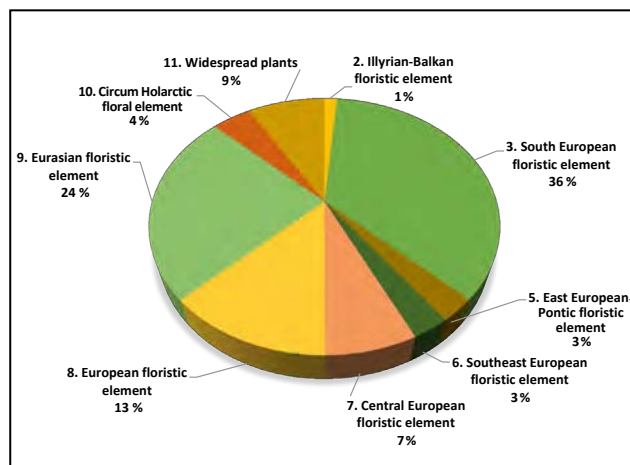


Fig. 4. Analysis of the floristic elements.

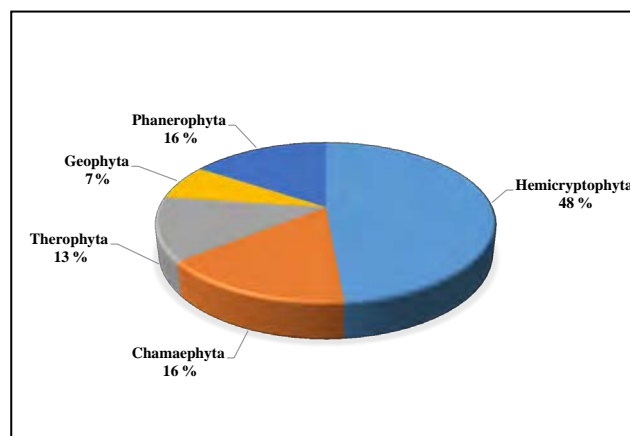


Fig. 5. Spectrum of life forms of the vascular plants.

grasslands. The baserock was carbonate (dolomite), with some very scanty brown carbonated soil (rendzina). According to Ellenberg's ecological factors for light (L), temperature (T) and humidity (F), the taxon *Seseli elatum* L. ssp. *osseum* (Crantz) P.W.Ball was a light-loving plant (L-9) in thermophilic habitats (T-8), which preferred dry soils (F-2). According to the same ecological factors, most plant species in these rocky formations had similar characteristics. This was the only documented finding of the taxon *Seseli elatum* L. ssp. *osseum* (Crantz) P.W.Ball in the Požega Valley.

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