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Endemic, steno-endemic and relict plants in serpentines of Kosova

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Key words: endemic, neoendemic, stenoendemic, relict serpentinophytes, serpentines, Kosova's flora, *Aristolochia merxmuelleri, Bornmuellera dieckii, Centaurea albertii, Convolvulus cochlearis,Rubus ipecensis, Stipa mayeri.*

Summary: In the territory of Kosova there are many serpentine massifs. The largest complexes are found in valley of the Ibër River, and the same are continued in a discontinuous chain through Koznica and Golesh to the southwest of the territory of Kosova (KRASNIQI, E. & MILLAKU 2007). Flora of serpentines is rich with rare species, which are different from other species of Balkan and Europe. Flora of Kosova's serpentines are characteristic and interesting in scientific aspect in particular relating to the endemic aspects. (REXHEPI 1979, 1985, 2000, 2004, KRASNIQI, E. & MILLAKU 2004). Except endemic species, in Kosova's serpentines are spread also stenoendemic species as: *Aristolochia merxmuellerii, Bournmullera dieckii, Centaurea albertii, Convolvulus cochlearis, Linum elegans, Rubus ipecensis, Stipa mayeri.* Kosova's serpentines are rich with relict serpentinophytes, as there are: *Forsythia europaea, Fumana bonapartei, Genistra hassertiana, Halacsya sendtnerii, Potentilla visianii, Euphorbia glabriflora, Convolvulus cochlearis.*

1. Introduction

1.1. General information for serpentines

Kosova as a part of Balkans is represented with serpentines which from the floristic and vegetation point of view are very interesting.

The serpentine rocks are spread all over the world and scientists are dedicating special attention for researching the geologic, chemical and petrographical aspects of the flora and fauna structure. Serpentine is rare on the surface of the earth (RUNE 1953, KRUCKEBERG 1985). Especially serpentines are found in Europe and Balkans is distinguished with this characteristic. In the Balkan Peninsula there are found serpentine rocks which are very interesting and rich in

the aspect of flora and vegetation. It means that Kosova (which is situated in the central part of the Balkans) has very interesting serpentine territory (REXHEPI 1985, KRASNIQI, E. & MILLAKU 2007). Considering the climate, altitude and anthropogenic factors, the resulting flora and vegetation of serpentine are very interesting.

The serpentine rocks in the Kosovo territory, belong to the cretaceous age. It means there exists a minimal percentage of biogenic elements necessary for plant life, which confirms the fact that serpentine terrains are not suitable for the development of plants. Such a chemical structure is the main reason for unique flora and vegetation development in these terrains (REXHEPI 1978, KRASNIQI, E. & MILLAKU 2007).

Flora and vegetation in serpentine terrains in Kosova have been investigated by many researchers: BLEČIĆ et al. (1969), BLEČIĆ & KRASNIQI, F. (1971), KRASNIQI, F. (1972), REXHEPI (1978, 1979, 1982, 1994, 2000, 2004), REXHEPI & KRASNIQI, E. (2004), KRASNIQI, E. (2003, 2006), KRASNIQI, E. & MILLAKU (2004, 2007) etc.

1.2. Data on Kosova's serpentines

Kosova's serpentines are dry and warm lands with alkaline reaction. These territories are poor with Potassium, Sodium, Nitrates whilst in these territories is lack of chlorides and sulfates. Kosova's serpentines are poor regarding to the water capacities. These territories are located within mountainous massifs in altitude between 300-2000 m.

Through out the territory of Kosova there are many basic and ultra basic rocks, which are known by their common name as "serpentine" (Figure 1). The largest complexes of serpentines in the Kosova are situated in the valley of the Ibër river, Golesh, the Sharr Mountains (Maja e Pashallarëve-Ostrovicë), the Albanian Alps, Koznik, the Mirusha region, Mushtisht, Gjakova surroundings, Koznicë, Guranë, Badovc and the Drenica Mountain (REXHEPI 1978, 1979, 1985, KRASNIQI, E. 2003, 2006, KRASNIQI, E. & MILLAKU 2007).

Kosova's serpentines can be divided into two categories:

- Serpentines with less than 3% CaO, where typical serpentinophyta species are dominant, whereas species from carbonate rocks are missing.
  Serpentines with over 3% of CaO, where typical serpentine species re dominant, but also characteristic species for carbonate rocks are present.

Analyzes made by PAVICEVIC (1974) show that chemical structure of Kosova's serpentines is same as analyzes made by authors: KRETSCHMER (1930), NOVAK (1926), LÄMMERMAYR (1926, 1927). The percentage of Mg is 40, Si is 45, whilst except Fe which participates as fero and feri components other elements are present at a very low rate.

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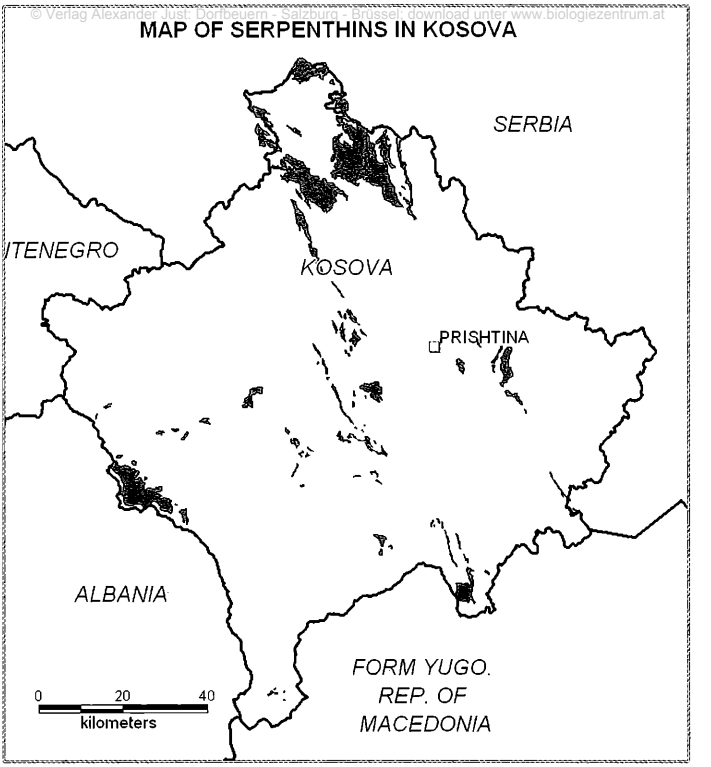

Figure 1: Map of serpentines in Kosova (by F. ISUFI 2008).

1.3. Species of serpentine terrains

According to NOVAK (1937) the serpentine flora is characteristic and distinct from flora of other rocks. This is recognized not only by botanists but as well as by other authors. TAUSCH (1839) emphasize the specie *Asplenium serpentine,* whilst GRIESEBACH (1848) pointed out the Balkan endemic specie *Gypsophila spergulifolia.*

The serpentine flora is investigated by many other authors as: WEISBECKERA (1891), LAMMERMAYER (1928, 1930), HAYEK ((1906), KRETSCHMER (1930), then by Italians as: PAMPANINI (1912), FIORI & PAMPANINI (1914), MESSERI (1936), RUNE (1953), KRUCKEBERG (1985) etc.

The flora of Kosovo's serpentines is developed under specific conditions. This made possible a specific and rich flora with endemic and stenoendemic species.

Referring to the researches of the floristic composition in serpentine terrains, we single out some plant categories such as: relict serpentinophytes, typical (exclusive) serpentinophytes, plants which are predominantly connected with serpentines, indifferent plants (very often to be found on serpentine settlements) and serpentinemorfoza. Also, within the vegetation of the serpentine

terrains there are forest and bush (shrub) communities and the vegetation of herbaceous communities (REXHEPI 1985, KRASNIQI, E. & MILLAKU 2007).

2. The research target and researching methods

The target of the research was the serpentine terrains of Kosovo, and in particular endemic, steno-endemic and relict plants in Kosovo serpentines.

The research is made in these localities: Ibër river, Golesh, the Sharr Mountains (Maja e Pashallarëve-Ostrovicë), the Albanian Alps, Koznik, the Mirusha region, Mushtisht, Gjakova surroundings, Koznicë, Guranë, Badovc and the Drenica mountain. In the localities where species are evidenced are made measurements with GPS. The determination of species is made by using adequate literature as: HAYEK, A. (1927-1933), JOSIFOVIC et al. (1972, 1977), PAPARISTO, K. et al. (1988, 1992), TUTIN, T.G. et al. (1980), VANGJELI, J. et al. (2000), POLUNIN, O. (1997), QOSJA, Xh. et al. (1996), SARIC, M. et. (1986). Whereas the floristic composition research where abovementioned species are evidenced and its synthaxonomic position is described by the method of Swiss–French school, Zurich-Montpellier (BRAUN–BLANQUET, 1964).

3. Results and discussion

The aim of the research of endemic, steno-endemic and relict plants in Kosova's serpentines was to recognize the real state of these species. We confirmed data from different authors relating to the known localities concerning to the species and we evidenced new localities. For each species is researched the areal, phytocoenoses, vitality, the threatens from anthropogenic and other factors and proposed measures.

3.1. Endemic plants propagated in Kosova's serpentines

Kosova's serpentines are rich with endemic species. Some of these species have wide spreading areal and for this reason they are considered as Balkan endemics. Among these species exists thus which are preserved from glacial and post glacial periods (Relict serpentinophytes). Some other species have very small areal (stenoendemic plants). In this paper we are not describing the morphology of all endemic species. We are describing species which are to a specific interest for the botanical science and which have a small areal.

Species found: *Aristolochia merxmuellerii, Aster albanicus, Bournmullera dieckii, Centaurea albertii, Convolvulus cochlearis, Euphorbia glabriflora, Forsythia europaea, Fumana bonapartei, Genistra hassertiana, Halacsya sendtnerii, Linum elegant, Polygala doerfleri, Potentilla rupestris* L., var. *mollis, Potentilla visianii, Rubus ipecensis, Sanguisorba albanica,Sedum serpentini, Stipa mayeri, Veronica andrasovszkyi.*

3.2. Relict serpentinophytes

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The climate changes in Europe during the glacial period resulted large changes in floristic structure. Concerning to the Balkans and to the Kosovo the glacial and post glacial period had a different character. The influence of Polar and Mediterranean climate in Kosova's territory and its controversial interactions, made Kosovo to be an important refugial area, where many plants species are preserved (hosted). Relict serpentinophytes are characterized with a filogenetic isolation. This is because of the lack of close family species, are because they are situated geographically far away from species of the same genre. These species are propagated only in typical disrobed serpentines. These are paleoendemic species which are met only in serpentine refugiums (REXHEPI 1979).

To this category belongs species: *Euphorbia glabriflora, Forsythia europaea, Fumana bonapartei, Genistra hassertiana, Halacsya sendtnerii, Potentilla visianii Panc.*

3.2.1. *Forsythia europaea* DEG. et BALD.

The first who evidenced this endemorelict species was BALDACC 1897, in the surroundings of Mirdita, in the north of Albania. KOSANIN (1913) evidenced this specie in the territory of Kosova, in the Drini i Bardhë river valley, in several localities, then in the Erenik river valley in Gjakova surroundings. Later on (1917), CSIKI found this specie in Albanian Alps (Gubavc). Nowadays, this specie is well known in other localities, where its areal is spread in the north up to the Golesh, next to Prishtina. Its vertical propagation is between 400 and 800 m. we found that this heliophyte specie in Kosovo is closely linked with serpentine terrains, where it is a dominant specie in terms of number, sociability and coverage. It is well adapted in ecological conditions of these terrains. We found that in Kosovo territory *Forsythia europea* (foto 1) as a good vitality, a constant areal and it is not threatened by anthropogenic factor. An interesting fact is that in all localitites where this specie is found, it is associated by species *Polygala doerfleri* and *Sanguisorba albanica*. Due to this reason the phytocoenose is named *Polygalo-Forsythietum europaeae* (BLEC & KRASNIQI, 1972, REXHEPI 1994, 2007).

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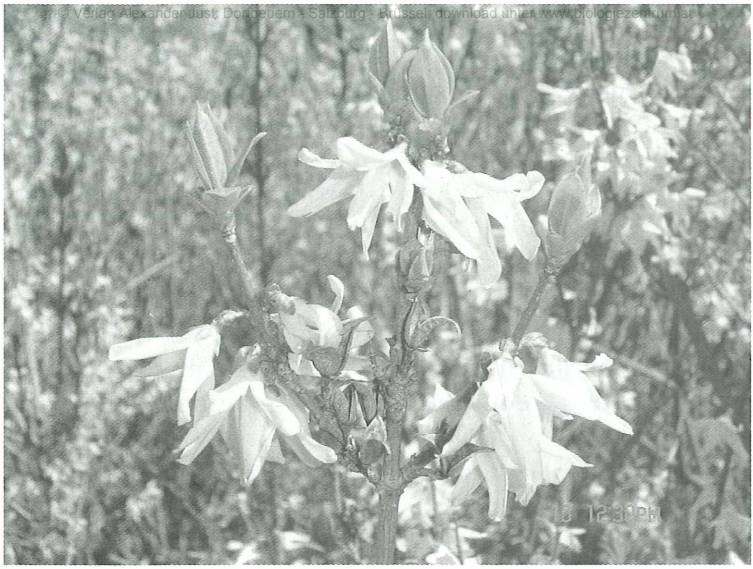

Foto 1: *Forsythia europaea* (Foto by E. KRASNIQI).

3.3. Neoendemic plants

Are endemics with small areal which due to geographical and ecological isolation couldn't enlarge their areal. From these species in Kosovo serpentines are found: *Sanguisorba albanica* and *Centaurea albertii.*

3.3.1. *Sanguisorba albanica* ANDRAS et JAV.

Herbaceous multiyear's plant, highness 30-50 cm. Kosova's and Albania's endemic plant. It is discovered in 1920, by ANDRASOVSZKY and JAVORKA from material collected in north-eastern Albania and South western Kosova. In Kosova it is spread in serpentine terrains within phytocoenose Polygalo-Forsithyetum europaea.

3.3.2. *Centaurea albertii* REXHEPI

Herbaceous multiyear's plant, highness 1.5 m, it flowers in June-July, bears fruits in August-September. Kosova's stenoendemic plant, it is propagated in Deve and Golesh. It is discovered by Kosovar botanist F. REXHEPI (1980, 1977), from the material collected in Deve and Golesh. It ie developed in rocky and grassy hilly terrains up to 1000 m altitude above sea level. It is developed only in serpentine substrates. It is propagated in phytocoenoses: Hyperico-Euphorbietum glabriflorae and Polygalo-Genistetum hassertianae.

3.4. Kosova's stenoendemic plants in serpentine substrates.

Except endemic (paloendemic and neoendemic) plants which have a wide areal, in Kosova's serpentines are present plant species with a very small areal, and these species are named stenoendemic (Figure 2). These species are: *Aristolochia merxmuelleri* GREUTER et MAYER, *Bornmuellera dieckii* DEG., *Convolvulus cochlearis* GRISEB., *Rubus ipecensis* RECH., *Stipa mayeri* MART.

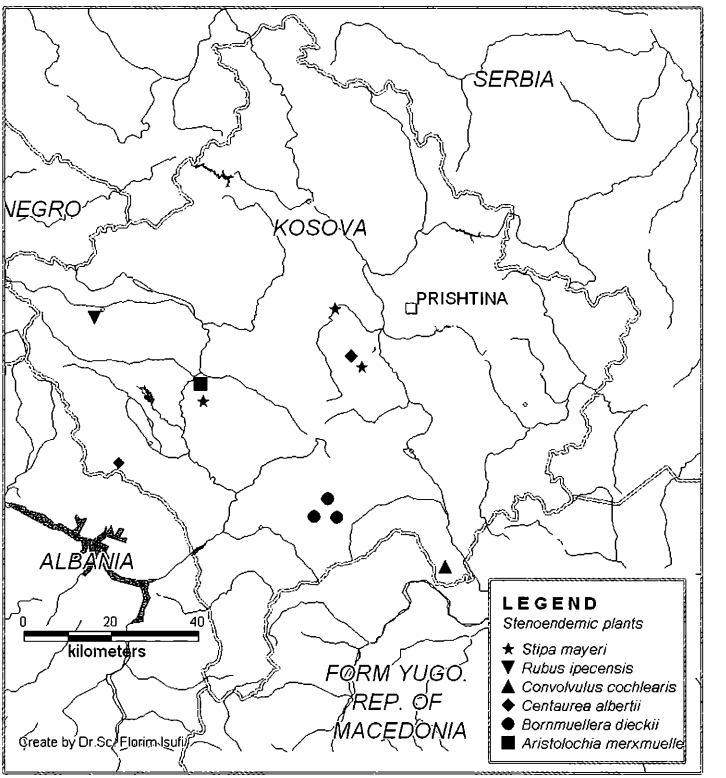

Figure 2: Map of stenoendemic plants (by F. ISUFI 2008).

3.4.1. *Aristolochia merxmuelleri* GREUTER et MAYER

Herbaceous multiyear's plant, geophyte, (photo 2), it flowers in April, bears fruits in May-June. Kosovo endemic Plant, Discovered by German botanist W. GREUTER and Slovenian botanist E. MAYER, in 1985, from material collected in Koznik. It is developed in gritty-rocky terrains, near by shrubs in serpentine terrains. It is found in the phytocoenose Astero-Juniperetum oxycedrii.

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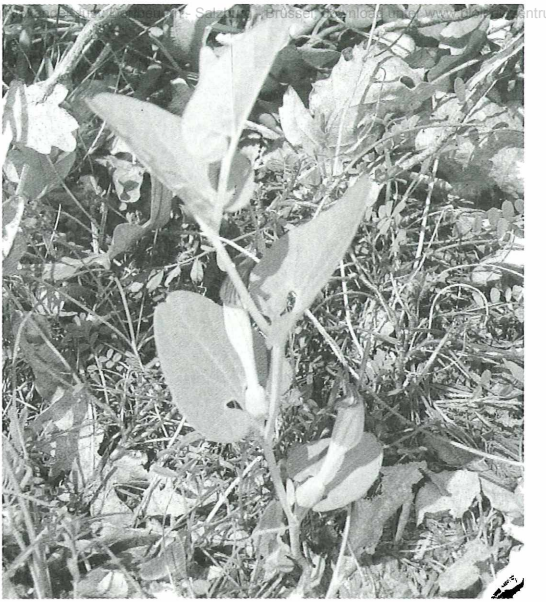

Foto 2: *Aristolochia merxmuelleri* (Foto by E. KRASNIQI).

3.4.2. *Bornmuellera dieckii* DEG.

Semi shrub plant (photo 3), it flowers in June-July, bears fruits in August. Kosova's endemic plant. It is discovered by Hungarian A. DEGEN in 1990, in serpentine terrains near by Mushtisht. In Kosovo it is spread in Maja e Pashallareve (Ostrovice), in altitude 1500-1900 m. It is developed in rocky serpentine terrain of sub-alpine mountains. It is located in the phytocoenose Sedo-Bornmuellerietum dieckii BLEČ. et al. 1969, where together with Sedum serpentini created this phytocoenose.

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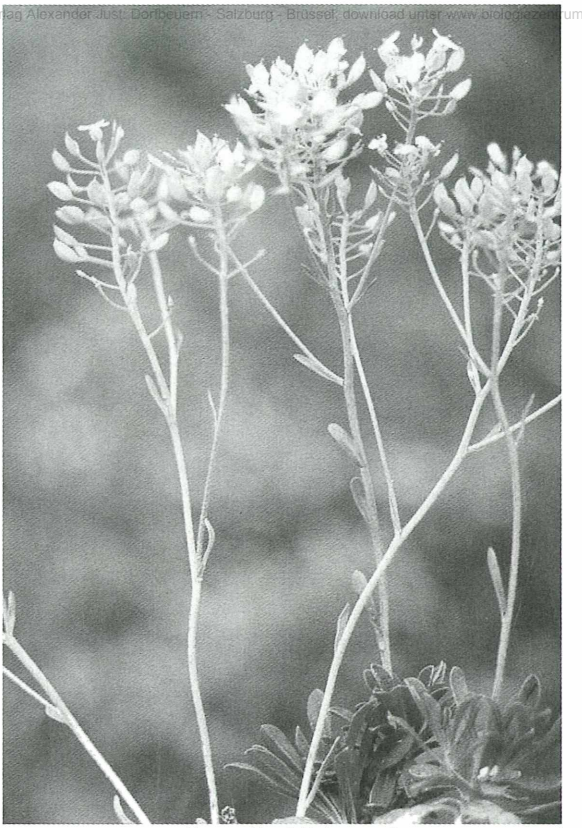

Foto 3: *Bornmuellera dieckii* (Foto by F. REXHEPI).

3.4.3. *Convolvulus cochlearis* GRISEB.

A semi shrub plant, covered with silver-silky hairs (photo 4), it flowers in June-July, bears fruits in August. A stenoendemic plant, propagated in cross border area of Kosova and Macedonia. It is discovered by German Botanist GRISEBACH in 1844, from material collected in Kosova. It is located only in the locality Guranë (Hani i Elezit). It is found in grassy and rocky hilly serpentine areas.

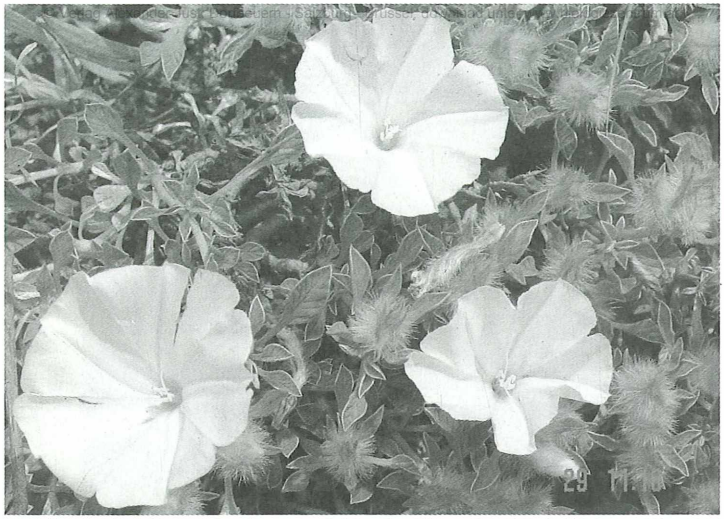

Foto 4: *Convolvulus cochlearis* (Foto by F. MILLAKU).

3.4.4. *Rubus ipecensis* RECH.

Multiyear Shrub or semi shrub plant in Kosova, which is distinct from the species of the genre *Rubus* by the presence of the red color flower. Stenoendemic plant of Kosova. It is discovered by Austrian botanist RECHINGER in 1935. So far this specie is found only in Gubavc (near Peja) in a very small serpentine locality nearby the water stream.

3.4.5. *Stipa mayeri* MART.

A multi year herbaceous plant, highness up to 55 cm, without bloom. It flower in May-June, bears fruits in July. It is Kosova endemic Plant. It is discovered by Czech botanist MARTYNOVSKY, in 1971, from previously collected material from Slovenian botanist E. MAYER, so it took his name. In Kosova it is propagated in Koznik, Mirushë. Godanc, Gllanasellë etc. It is developed in serpentine natural pastures. It is found in phytocoenoses: Polygalo–Forsythietum europaea BLEČ. et KRAS. 1972, Astero–Juniperetum oxycedrii REXHEPI 1990, Hyperico–Euphorbietum glabriflorae REXHEPI 1978, Potentillo–Fumanetum bonapartei REXHEPI 1979 and Polygalo–Genistetum hassertianae BLEČ. et al. 1969.

4. Conclusions

The researches shows that Kosova is rich with serpentine terrains.

Kosova's serpentines are very rich in floristic and vegetative aspects.

In floristic aspects are important Balkan endemic species, and especially relict, neoendemic and stenoendemic species.

Relict species are: *Euphorbia glabriflora, Forsythia europaea, Fumana bonapartei, Genistra hassertiana, Halacsya sendtnerii, Potentilla visianii.*

Neoendemic species are: *Sanguisorba albanica* dhe *Centaurea albertii* ndersa specie stenoendemike janë: *Aristolochia merxmuelleri, Bornmuellera dieckii, Centaurea albertii, Convolvulus cochlearis, Rubus ipecensis, Stipa mayeri.*

According TUTIN, T.G. et al. (1964-1980) in Flora Europaea 1-5, are excluded species: *Aristolochia merxmuelleri, Centaurea albertii, Convolvulus cochlearis* and *Rubus ipecensis.*

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ZOBODAT - www.zobodat.at

Zoologisch-Botanische Datenbank/Zoological-Botanical Database

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