

## Distribution and new records of *Pisum sativum* subsp. *elatius* in Serbia

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The taxon *Pisum sativum* L. subsp. *elatius* (Steven ex M. Bieb.) Asch. & Graebn. (syn. *P. sativum* subsp. *biflorum*) was regarded as a separate species, *P. elatius* (1, 2, 3), and now is commonly accepted as a pea subspecies (4). Based on its long, climbing stems (up to 150 cm), *P. sativum* subsp. *elatius* may be translated into English as *tall pea*. This taxon is also regarded as one of ancestral forms of the cultivated pea, *P. sativum* L. subsp. *sativum* (5).

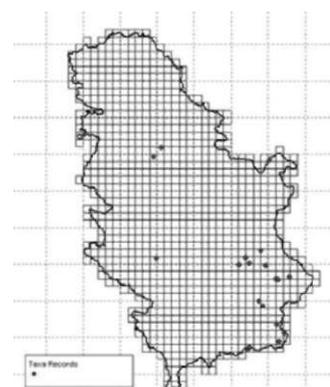
According to its general distribution and ecology, *P. sativum* subsp. *elatius* is a widely dispersed Mediterranean element with native range spreading across the Mediterranean and Oriental-Thuranean floristic regions of the world. More precisely, it is distributed over the coastal region of North Africa (Algeria, Egypt, Libya, Morocco and Tunisia), southwest Asia (Cyprus, Iran, Israel, Lebanon, Syria and Turkey), Caucasus and Crimea (Azerbaijan, Georgia, Russian Federation and Ukraine), southwest Europe (France, Portugal and Spain) and southeast Europe (Italy, Romania and the Balkan Peninsula). The area in southeast Europe that concerns the Balkan Peninsula overlaps mainly with Mediterranean and Sub-Mediterranean parts of Albania, Bulgaria, Croatia, Greece, Macedonia, Montenegro and Serbia (6, 7).

Excluding *P. sativum* subsp. *arvense*, which is doubtfully native (1), *P. sativum* subsp. *elatius* is likely the only wild growing native pea in Serbia (1). *P. sativum* subsp. *arvense* was recorded in the field in the south (8) and is commonly grown as a component of fodder mixtures (with barley or wheat) throughout Serbia (1). *P. sativum* subsp. *elatius* has been considered distinct in Serbia for a long time. The first records of *P. sativum* subsp. *elatius* in Serbia come from the second half of 19th century and belong to Dr. Josif Pancic, a well known Serbian botanist (9). Later literature sources describe it as a widely distributed plant in the flora of Serbia, mostly on untilled land and rather rarely as a cultivated species (1, 10, 11). A special form of *P. sativum* subsp. *elatius*, designed as f. *albiflorum* Beck and with the whole corolla white, was mentioned as appearing sporadically in comparison to the more typical f. *elatius*, with the corolla parts in various hues of pink (1).

In addition to the field survey, herbarium material and numerous literature sources were used to supplement the distribution records of *P. sativum* subsp. *elatius* in Serbia. The distribution is mapped on a 10 x 10 sq. km UTM grid system (UTM Zone 34T). The results were incorporated into the Global Information System (GIS), spatially analyzed and represented in cartographic form. DIVA-GIS 5.2.0.2 software was used for GIS analysis (<http://www.diva-gis.org/>). Nomenclature, synonyms and distribution out of the Balkans are given according to the Germplasm Resources Information Network - (GRIN) database (<http://www.ars-grin.gov/cgi-bin/npgs/html/taxgenform.pl>).

Although it was reported to be widely distributed in Serbia (1), *P. sativum* subsp. *elatius* seems to be more rare or rather regionally threatened as depicted in Figs. 1 and 2. In addition, some of the

Figure 1. Distribution of *P. sativum* subsp. *elatius* in Serbia (UTM, Zone34T, 10x10).



habitats in the northern part of its area, recorded in the vicinity of Belgrade (9) and referring to the first records in Serbia are seemingly destroyed or even endangered by human activities. According to the data collected, the highest density of *P. sativum* subsp. *elatius* populations is located in the southeast and South Serbia (Fig. 1). Recently, a new population of *P. sativum* subsp. *elatius* was located in the valley of the river Pcinja, in the far southeast of Serbia and near its borders with Bulgaria and Macedonia (Fig. 2). This evidence has implications for the recent activities on the wild and semi-wild *Pisum* taxa in the Balkans, resulting in finding 'tall pea' in several neighboring regions of Bulgaria (2, 12) and Macedonia (13).

The lowest, gorge-like, part of the Pcinja valley is characterized by the presence of a significant number of Mediterranean elements of flora (14) and vegetation that comprise different plant communities. The large area of the previous forest habitats is devastated now and is extremely dry and covered by diverse herbaceous vegetation such as thermophilous grassland vegetation and pseudosteppe formations. In relation to its vegetation and floristic peculiarity the Pcinja valley represents a transition area to the Mediterranean region (Fig. 3). Mediterranean influences penetrate in the valleys of great rivers of the Aegean river basin and radiate along their tributaries via Macedonia up to the mountains in South Serbia (15, 16).

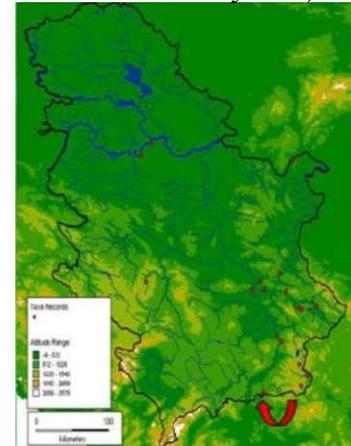
**Figure 3. Thermophilous grasslands of Pcinja valley. *P. sativum* subsp. *elatius* inhabits the lower zone of northerly**



exposed slopes of Mount Kozjak (UTM square EM-78; Fig. 1) on the left side of the valley. The slopes are covered by thermophilous submediterranean forests and scattered scrub vegetation consisted of pubescent oak (*Quercus pubescens*) and prickly juniper (*Juniperus oxycedrus*) overgrowing siliceous rocky ground. Two small groups of the individuals were recorded in the edges of the forests, in open spaces between the trees and shrubs, and on the sides of paths through the foothills (Fig. 4). A wealth of flowering herbaceous plants were in full bloom in May. The following plant list, though not complete, indicates the floristic and ecological flora which occur most commonly with tall pea: *Fumaria petteri* subsp. *thuretii*, *Cardamine graeca*, *Moenchia graeca*, *Scleranthus perennis* subsp. *dichotomus*, *Tuberaria guttata*, *Hypericum montbretii*, *Potentilla laciniosa*, *Comandra elegans*, *Astragalus onobrychis*, *Chamaecytisus triflorus*, *Lens nigricans*, *Vicia tenuifolia* subsp. *dalmatica*, *Jasione heldreichii*, *Campanula lingulata*, *Fritillariagussichiae*, *Iris suaveolens*. Both *Pisum sativum* subsp. *elatius* subpopulations inhabit a relatively small area, restricted exclusively to the gorge of Pcinja, and are included in the Natural Asset "Dolina reke Pcinje" which is protected at the national level as The Landscape of Outstanding Features.

The population of *P. sativum* subsp. *elatius* is not so easily accessible and distant from regularly tilled land, confirming the quotations (6) that this species prefers rocky and grassy slopes, forest and field margins, scrub and ruins, with an altitude of between 0 m and 1700 m. The new *P. sativum* subsp.

**Figure 2. Position of *P. sativum* subsp. *elatius* populations in Serbia related to its hydrographic features (new records indicated by arrow).**



**Figure 4. A *P. sativum* subsp. *elatius* plant from the habitat in the valley of Pcinja (photo by BB. Zlatkovic).**



*elatius* population is temporarily protected from the risk of loss by grazing or some other similar danger related to the activity of man (Fig. 4, Fig. 5).

The future activities for both *in situ* and *ex situ* conservation of *P. sativum* subsp. *elatius* are scheduled for 2011 and will comprise a more detailed study on its population in the valley of PCinja, as well as the expeditions aimed at discovering the new populations in the wider region of southeast Serbia. Significant improvement in the characterization and evaluation of the populations is planned, especially of the traits of agronomic importance such as forage and seed yield and stress tolerance. The threatened status of *P. sativum* subsp. *elatius*, according to the IUCN Red List Categories and Criteria (17) and relevant national legislatives of Serbia should present useful information for plant protection management in the region.

### References

1. Kojic, M. 1972. In: Flora SR Srbije 4. Srpska Akademija Nauka i Umetnosti, Belgrade, Serbia, pp. 386-388.
2. Kozuharov, S. 1976. In: Flora na Narodna Republika B'lgarija 1-7, B'lgarskata Akademija na Naukite, Sophia, Bulgaria, pp. 548-552.
3. Davis, P. H. 1970. In: Flora of Turkey and East Aegean Islands 3, University of Edinburgh, Edinburgh, UK, pp. 370-373.
4. Lehmann, C. and Blixt, S. 1984. *Agri. Hort. Genetica* XLII: 49-74.
5. Zeven, A.C. and Zhukovsky, P.M. 1975. *Dictionary of Cultivated Plants and Their Centres of Diversity*. Centre for Agricultural Publishing and Documentation, Wageningen.
6. Maxted, N. and Ambrose, M. 2001. In: *Plant Genetic Resources of Legumes in the Mediterranean*. Kluwer, Dordrecht, the Netherlands, pp. 181-190.
7. Hayek, A. 1926. In: *Prodromus Florae peninsulae Balcanicae 1. Repertorium specierum novarum regni vegetabilis*. Beihefte 30(1): 673-960.
8. Petrovic, S. 1882. *Flora okoline Nisa*. Kraljevsko-srpska drzavna stamparija, Belgrade.
9. Pancic, J. 1874. *Flora Knezevine Srbije*. Drzavna stamparija, Belgrade.
10. Mikic, A., Angelova, S., Burstin, J., Duric, B., Cupina, B., Lejeune, I., Sabeva, M., Vishnyakova, M. and Duc, G. 2009. *Grain Legumes* 52: 16-17.
11. Jurisic, Z. 1923. *Prilog flori juzne Srbije*. Spomenik Srpske Kraljevske Akademije, FX, Prvi razred, 10: 3-45.
12. Urumoff, I. K. 1935. *Flora des Kustendiler Kreises*. Zbornik na Balg. Akademija na Naukite 20: 1-236.
13. Adamovic, L. 1904. *Beitrage zur Flora von Macedonien und Altserbien*. Kaiserl. Akad. Wiss., Wien, Math.-Naturwiss. Kl., Denkschr. 74: 115-150.
14. Zlatkovic, B. and Randelovic, V. 2004. Records of new species to the flora of Serbia. Abstracts of XI OPTIMA Meeting, Belgrade, Serbia, 5-11 September 2004, 66.
15. Stevanovic, V., Jovanovic, S., Lakusic, D. and Niketic, M. 1999. In: *Crvena knjiga flore Srbije 1. Iscezli i krajnje ugrozeni taksoni*. Ministarstvo za zivotnu sredinu Republike Srbije, Bioloski fakultet Univerziteta u Beogradu, Zavod za zastitu prirode Republike Srbije. Beograd, pp. 9-18.
16. Zlatkovic, B., Randelovic, V. and Stevanovic, V. 2009. Records of the new species to the flora of Serbia, II: Mediterranean and Mediterranean-Pontic species. Book of Abstracts, 5th Balkan Botanical Congress, Belgrade, Serbia, 7-11 September 2009, 45.
17. IUCN 2001. *IUCN Red List Categories and Criteria: Version 3.1*. IUCN Species Survival Commission. IUCN, Gland, Switzerland & Cambridge, UK.

Figure 5. *P. sativum* subsp. *elatius* from the new recorded population, a detail with flowers (photo by BB. Zlatkovic).

