

Notes on the species distribution of genus *Angelica* in Bulgaria

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Abstract. Genus *Angelica* has been investigated in the Bulgarian flora. The morphology of the mericarp is the main distinguishing feature between the species. Confirmed is the so far reported distribution of *A. panicii* and *A. sylvestris* in the floristic regions of the country. *Angelica archangelica*, referred to as Extinct in the *Red Data Book of PR Bulgaria*, was incorrectly reported for the country and should be excluded from the list of the Bulgarian flora and from the list of the extinct species in Bulgaria.

Key words: *Angelica*, Bulgarian flora, revision

Introduction

In the period 1997–2003 an attempt has been made to cultivate representatives of genus *Angelica* distributed in the Bulgarian flora. Owing to the contradictory data in literature and in the herbaria, the number of species from that genus has to be specified in the process of study, as well as their key characteristics and the areas of distribution in the country.

The present communication comprises some of the results from the studies and covers the number of species, the areas of their distribution and the morphological specificities of the mericarps regarded as key characteristics for family *Apiaceae*.

The object of study was chosen owing to the fact that the species of genus *Angelica* are valuable essential-oil and medicinal plants used in the Bulgarian folk medicine (Stojanov & Kitanov 1960). *Angelica archangelica* L. and *A. panicii* Vandas were entered in the *Red Data Book of PR Bulgaria* (Andreev 1984): the first in the Extinct category and the second, which is a Balkan endemic, in the Rare plants category.

A review of the contemporary status of biodiversity of higher plants in Bulgaria (Peev & al. 1993) listing

the extinct, endangered by extinction and rare vascular plants in the Bulgarian flora, referred *A. archangelica* to the Extinct section, *A. panicii* to the Rare and Endangered plants sections, and *A. sylvestris* L. to the group of medicinal plants.

Data on the species distribution of genus *Angelica* in Bulgaria have been included in a string of publications by different authors (Velenovský 1891; Stojanov & Stefanov 1924, 1933, 1948; Hayek 1927; Stojanov & al. 1967; Cannon 1968; Peev 1982; Andreev 1993).

Cannon (1968) was the first to note that *A. archangelica* did not occur in Bulgaria and to reject *A. panicii* as an independent species; instead, he referred it to *A. sylvestris*.

Peev (1982) reported three species of genus *Angelica* distributed in the Bulgarian flora: *A. sylvestris*, *A. panicii* and *A. archangelica*. *Angelica sylvestris* and *A. panicii* were cited as distributed across the country, while *A. archangelica* was reported only from five areas (with single localities): the Black Sea Coast, Northeast Bulgaria, Central and Eastern Balkan Range, Mt Vitosha and Western Rhodopi Mts.

Andreev (1993) also confirmed the distribution of *A. archangelica* in Bulgaria.

Material and methods

Collected live samples have been compared to the herbarium vouchers stored in the Bulgarian herbaria (SOM, SO и SOA). Four areas have been investigated, with six localities of *A. sylvestris*, and seven areas with nine localities of *A. pancicii* (Table 1).

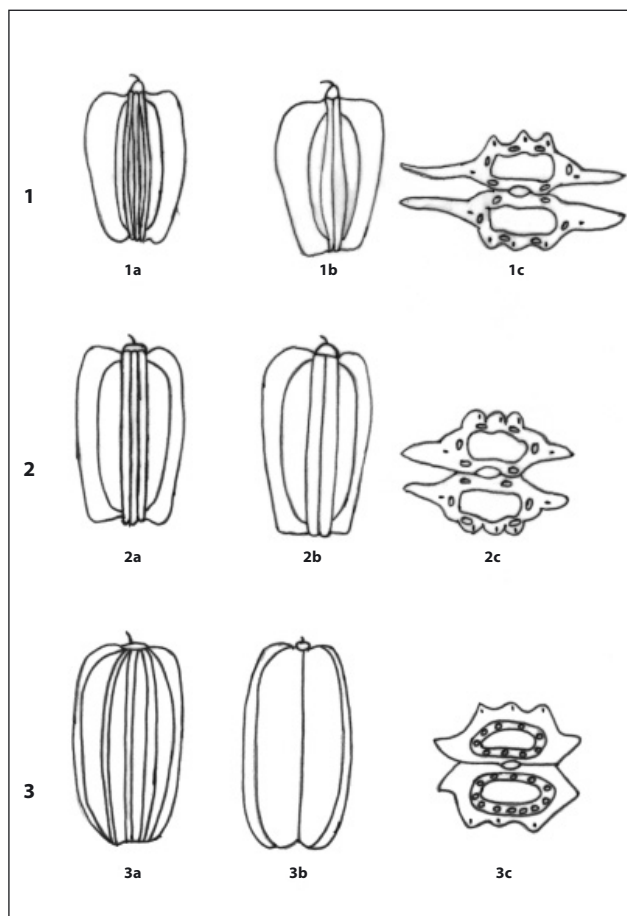
Foreign herbarium vouchers (Table 1) and fruits of *A. archangelica* ordered from *Index seminum* have been measured.

Table 1. Origin of the studied species.

Species	Population no.	Regions, localities & vouchers
<i>A. sylvestris</i>	Northeast Bulgaria	
	2	Byal Bryag village, Shoumen district – SOM 159115
	3	Between Zhulud and Arkovna villages – SOM 159117
	Central Balkan Range	
	4	On the way to Vezhen chalet – SOM 159114
	Sofia Region	
5	Bezden village – SOM 159112	
Vitoshka Region		
6	Vladaya village – SOM 159118	
<i>A. pancicii</i>	Western Balkan Range	
	7	Petrohan – SOM 156911
	8	Peak Midzhour – SOM 159109
	Pirin	
	9	Vihren chalet – SOM 159107
	Sofia Region	
	10	Mt Lozen – SOM 159108
	Vitoshka Region	
	11	Aleko chalet – SOM 156909
	Rila Mts	
	12	Borovets – SOM 156910
	13	Lake Ribno – SOM 159106
	Western Rhodopi Mts	
	14	Beglika chalet – SOM 159110
	Central Rhodopi Mts	
15	Kesten village – SOM 159111	
<i>A. archangelica</i>	16	Denmark – SOM 107436
	17	Greenland – SOM 122825
	18	The Netherlands – SOM 116084
	19	Poland – SOM 142426

Results and discussion

The results of phenological studies and investigation of the morphological characteristics of the three species (Table 2; Figs 1-3) have led us to the conclusion that, irrespective of altitudinal differentiation between *A. sylvestris* and *A. pancicii* (0–1000 m for *A. sylvestris* and 750–2000 m for *A. pancicii*), they showed no phenological differences. The morphological differences were obviously quantitative: stem size, number of rays in the composite umbel, size of leaf sheaths.



Figs 1-3. Fruit of *Angelica* species:

1, *A. sylvestris*: 1a – upper view of the fruit; 1b – lower view of the fruit; 1c – cross-section of the mericarp; 2, *A. pancicii*: 2a – upper view of the fruit; 2b – lower view of the fruit; 2c – cross-section of the mericarp; 3, *A. archangelica*: 3a – upper view of the fruit; 3b – lower view of the fruit; 3c – cross-section of the mericarp.

The shape of the central umbel was a more important characteristic: it was spherical in *A. archangelica* and shield-shaped in *A. pancicii* and *A. sylvestris*.

The three species differ mainly by their mericarps: a corky mericarp in *A. archangelica*, and membranous in *A. pancicii* and *A. sylvestris*. The major distinguishing characteristic for species differentiation is the shape and size of mericarp ridges, which in *A. archangelica* are equally prominent (Fig. 3), while in *A. pancicii* and *A. sylvestris* the two lateral ones are more prominent than the three dorsal ones (Figs 1, 2). The ridges in *A. pancicii* and *A. sylvestris* are also well differentiated: in *A. pancicii* (Fig. 2c) the dorsal ridges are wider and more prominent, while in *A. sylvestris* (Fig. 1c) the lateral ones are more prominent and narrower.

Table 2. Morphological characteristics of the *Angelica* species.

Species	<i>A. sylvestris</i>	<i>A. panicii</i>	<i>A. archangelica</i>
Morpho-logical features			
Root	spindle-shaped, vertical or inclined	spindle-shaped, vertical or inclined	radish-shaped
Stem (height, cm)	50–180	80–200	50–300
Leaf	2-pinnate, with big unbloated vaginellas	2-pinnate, with big strongly bloated vaginellas	3-pinnate, with big strongly bloated vaginellas
Umbel	shield-shaped , principal rays 20–50, unequal	shield-shaped , principal rays 40–80, unequal	spherical , principal rays 30–50, equal
Bracts (number)	6–8	8–12	missing
Flower (petal)	beaked, with distinctly incurved apex	heart-shaped, with distinctly incurved apex	ellipsoid, with short distinctly incurved apex
Mericarp			
1. length (mm)	4.0–6.0	5.0–5.5	6.0–8.0
2. width (mm)	3.5–4.5	4.0–4.8	4.5–6.0
3. lateral wings	membranous, wider than the mericarp	membranous, as wide as the mericarp	corky, narrower than the mericarp
4. dorsal ridges	three, prominent – one right in the centre and two bow-shaped	three, parallel, strongly prominent	three, filamentary, bow-shaped, faintly prominent
5. secretory canals	6, big	6, big	numerous, small
Stylopodium	cupola-shaped	irregular	flat
Phenology			
1. flowering	June–August	June–August	June–August
2. fruiting	August–October	August–October	August–October
3. distribution	0–1000 m	750–2000 m	

Note: The main distinguishing features between the three species are given in **Bold**.

A revision of the species of genus *Angelica* in the Bulgarian herbaria (SOM, SO and SOA) has shown 136 herbarium sheets from Bulgarian populations of *A. panicii* and *A. sylvestris*. On the basis of their study, as well as from own collections, the distribution of *A. sylvestris* and *A. panicii* across the country has been confirmed, as well as their altitudinal localisation (Figs 4, 5).

No herbarium sheets has been found with the characteristics of *A. archangelica*. The voucher cited by Jordanov (1924) as *A. archangelica* (Northeast Bulgarian – Omourtag district, MH-57, 04 09.1923, coll. D. Jordanov, SO 55210) and revised earlier by Vyhovtsevskiy in 1974, belonged to *A. sylvestris*. The voucher reported by Andreev (1993) from Northeast Bulgaria (Byal Bryag village, Shoumen district, NH-06, SOM 150617) as *A. archangelica* was not found in SOM.

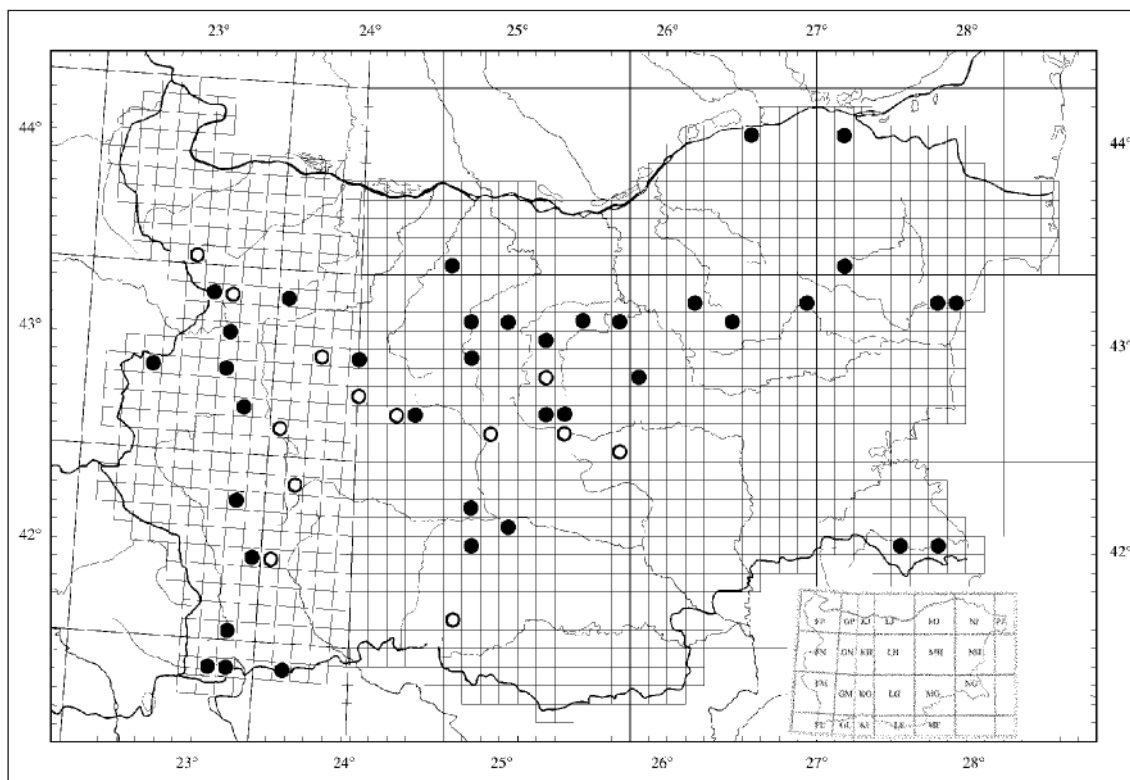


Fig. 4. Map of the distribution of *A. sylvestris* in Bulgaria. ● – herbarium data, ○ – literary data

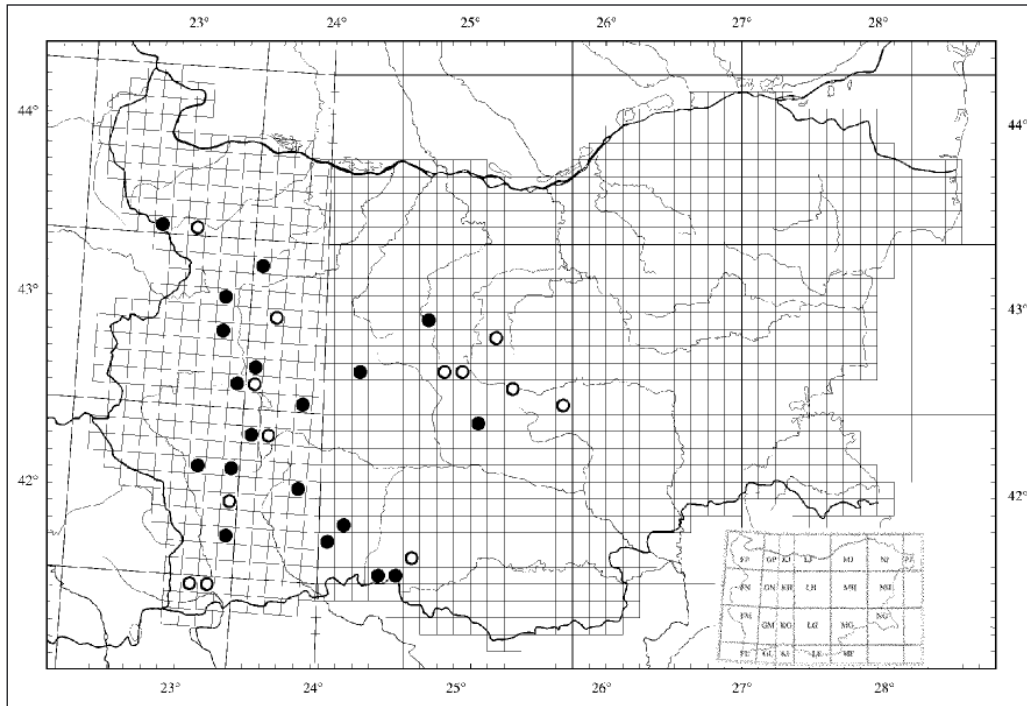


Fig. 5. Map of the distribution of *A. pancicii* in Bulgaria.

● – herbarium data
○ – literary data

The plants collected by us from the localities described as areas of distribution of *A. archangelica* in their morphological characteristics corresponded to *A. sylvestris*.

Conclusion

The results of our studies confirm the status and species distribution in all floristic regions of Bulgaria only of *A. pancicii* and *A. sylvestris*. The distribution of *A. archangelica* has not been confirmed and thus it should not be considered an element of the Bulgarian flora.

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