

# Chorology and critical notes on genus *Orobanche* (*Orobanchaceae*) in Bulgaria

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**Abstract.** New collected material of genus *Orobanche* sect. *Orobanche* subsect. *Glandulosae* and both specimens existing in Bulgarian herbaria and data published before are revised and used for creation of maps. One new subspecies (*O. alba* subsp. *xanthostigma*) and two forms (*O. alba* f. *lutescens* and f. *rubiginosa*) are reported as new taxa in the flora of Bulgaria. The chorological data about the species and intraspecific taxa are reconsidered. The host plants are discussed comparing both herbarium data and literature reviewed.

**Key words:** chorology, determination key, distribution map, *Glandulosae*, host plants, intraspecific taxa, *Orobanche*, parasitic plants

## Introduction

In the Bulgarian flora are known four species of genus *Orobanche* L. sect. *Orobanche* subsect. *Glandulosae* (Beck) Teryokhin – *O. alba*, *O. reticulata*, *O. pancicii* and *O. serbica*. *Orobanche alba* is a polymorphic species which is not fully examined in Bulgaria. The aim of this study is to revise and represent the known chorological data about the members of subsect. *Glandulosae* in Bulgaria as well as to analyze the information about their host plants.

## Material and methods

The new material used in this study was collected during 2002–2005 in Bulgaria. An examination of specimens maintained in the Bulgarian herbaria – SOM, SOA, SO was carried out. The chorological data were processed in UTM-grid, according to Kozhuharov & al. (1983) and presented in abbreviated MGRS code. Using these data further maps were created by dSOA computer program (Stoyanov 2003). The collections were cited and grouped as follow: floristic region (in **bold**), MGRS coordinates, locality, altitude, host plant, date, author, herbarium acronym and number. The floristic regions as described and numbered by *Flora Reipublicae Popularis Bulgaricae* (vols 3–9) and *Flo-*

*ra Reipublicae Bulgaricae* (vol. 10) were shown in the maps (Figs 1–5). The Floras and determination books were featured with abbreviations: CBVF (Dimitrov 2002); FB1, FB3 (Stojanov & Stefanov 1925, 1948), FB4 (Stojanov & al. 1967), FV (Kitanov 1963), FD (Kitanov 1980), FRB (Delipavlov 1995), KPB (Cheshmedzhiev 2003), KVPB (Kozhuharov 1992). The author's names were featured with abbreviations as accepted in the International Plant Names Index (2005), except: GS – G. Stoychev, KS – K. Stoyanov, TzR – Tz. Raycheva.

## Results and discussion

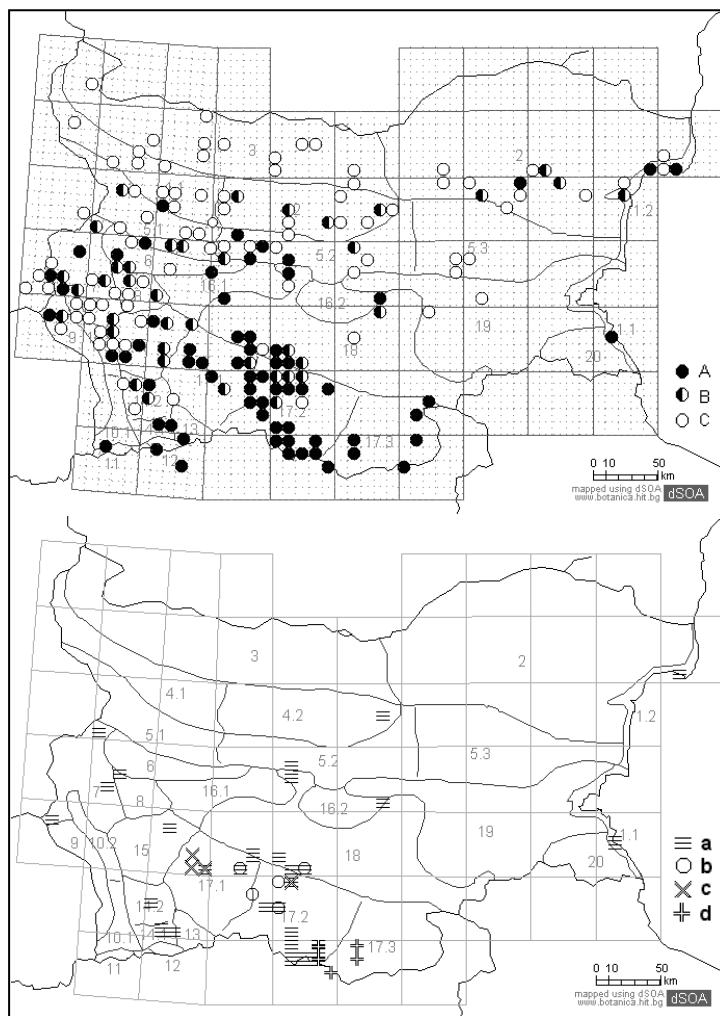
### *Orobanche alba* Steph. (Figs 1, 2)

New and unpublished data: **1.1:** (f. *maxima*, f. *rubra*); **11:** (f. *capitata*); **12:** (f. *capitata*); **13:** GL-39. 3 km in North from the frontier-post Ilinden, 550 m, 17.06.2005 (KS) SOA 56985; **14.1:** GM-10. Pirin village, 750 m, host *Thymus*, 18.06.2005 (KS) SOA 57056; (see also f. *communis*, f. *maxima*, f. *rubra*); **17.3:** MF-07. Above Choukoura River, 1400 m, 09.07.1930 (T. Georgiev) SOA 10428; MF-19. Crossway Kroumovgrad–Kobilino–Ivaylovgrad, in oak forest, 460 m, 14.07.2005 (KS) SOA 56986; MG-11. Rocky terrain in Kartal Konak locality, on the land of Vulche Pole village, 299 m, 28.06.1940 (Kitan.) SO 68515; (see also f. *rubiginosa* and subsp. *xanthostigma*).

This species is reported for: 1.2 (T. Georgiev 1937; Velen. 1891, 1898), 2 (Baev 1947; FD; Davidov 1905; T. Georgiev 1937; Urum. 1904, 1905b, 1909), 4.1 (Urum. 1902, 1917, 1935a), 4.2 (T. Georgiev 1937; Urum. 1897, 1912, 1913a, b, 1926, 1928; Velen. 1898), 5.1 (T. Georgiev 1937; Urum. 1901a, 1905a, b, 1906, 1909, 1913b, 1926, 1935a), 5.2 (Baev 1947; Neichev 1908; T. Georgiev 1937; Toshev 1903; Urum. 1901b, 1926, 1928), 6 (Urum. 1905b, 1909; Velen. 1891), 7 (Baev 1947; T. Georgiev 1937; Toshev 1903; Urum. 1905b, 1913a, 1935b), 8 (FV; T. Georgiev 1937; Urum. 1905b, 1929a, 1930, 1935b; Velen. 1891), 9 (Urum. 1904, 1935b), 10.2 (Urum. 1935b), 14.2 (T. Georgiev 1937), 15 (T. Georgiev. 1937; Urum. 1906, 1935b), 16 (T. Georgiev 1937), 16.1 (Urum. 1929a), 17.1 (Urum. 1906; T. Georgiev 1937), 17.2 (Stransky 1921; T. Georgiev 1937; Urum. 1912, 1913b; Velen. 1898), 18 (T.

Georgiev 1937; Urum. 1908, 1912, 1926; Velen. 1891, 1898). The literature data without herbarium sheets are found for the regions: 3 (Urum. 1902, 1912, 1917, 1926, 1928, 1935a), 5.3 (Urum. 1905b, 1909; Velen. 1891) and 19 (Urum. 1912, 1926).

This species is indicated for the whole country in the Floras and keys (FB1; FB4; KVPB; FRB; KPB; CVFB) up to 2000 m alt. There are missing data for region 20. The own collections and herbarium data confirm the regions 1, 2, 4.2, 5.1, 5.2, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17 and 18. This species is usual on grassy lands, shrubs and meadows (FRB; KPB), alpine and subalpine pastures (Velen. 1891), parasitizing on *Lamiaceae* (FB1; PFB; T. Georgiev 1937; FB4; KVPB; FRB; KPB) – *Thymus* (FRB). The herbarium sheets and own collections confirm the host plants *Thymus* spp., *Origanum vulgare*, *Acinos suaveolens* and *Satureja* spp. (Fig. 1).



**Fig. 1.** *Orobanche alba*: Distribution data: A – new and unpublished data; B – confirmed data; C – data from literature; Host plants: a – *Thymus*; b – *Acinos*; c – *Origanum*; d – *Satureja*.

***O. alba* var. *alba* f. *alba***

Syn.: *Orobanche alba* L. var. *substenophylla* T. Georgiev. Lectotypus: 14.2: FM-93. Razlozhki Souhodol (Mehomiiski Souhodol), 2000 m (T. Georgiev) SOA – missing!

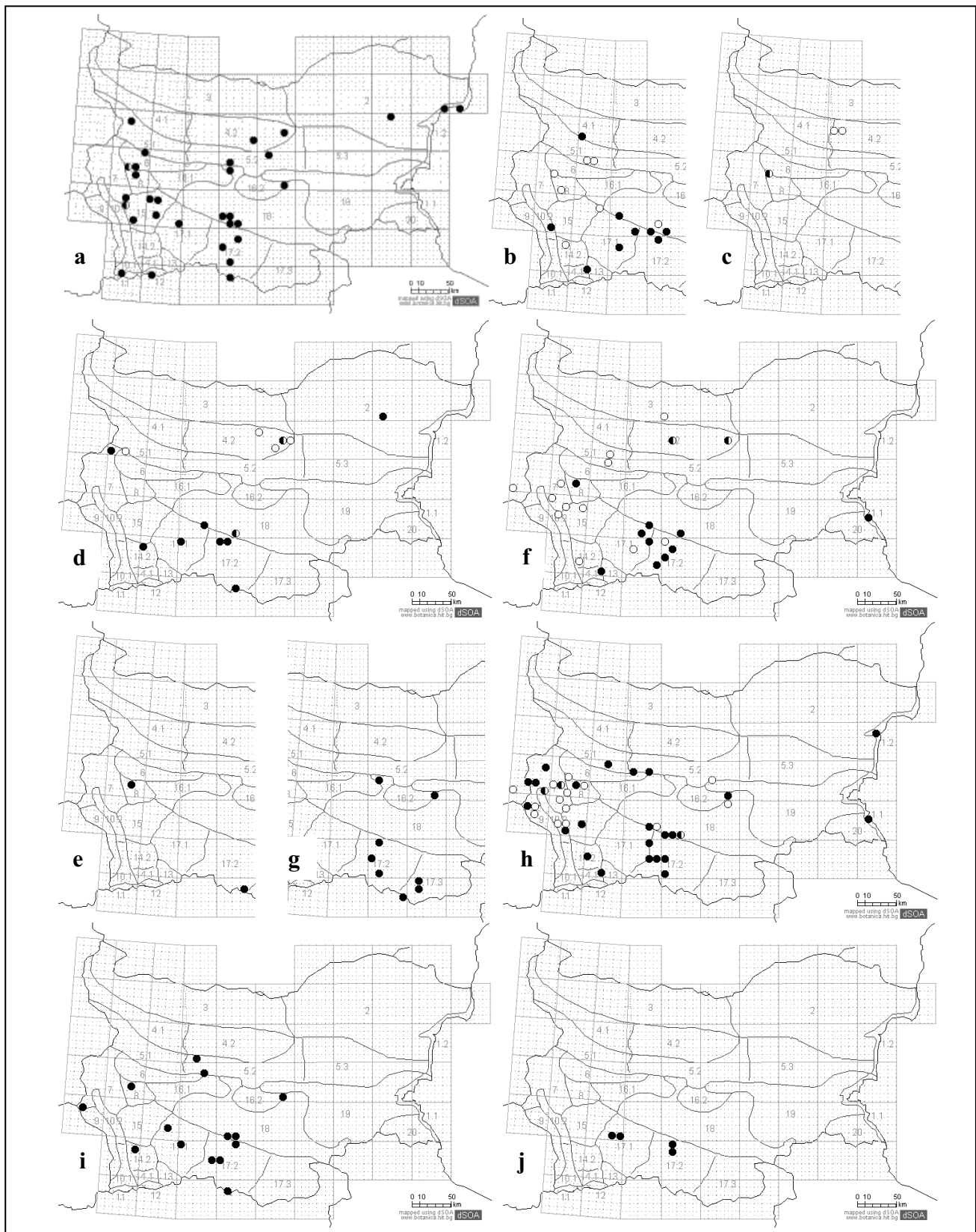
The description of the lectotype above coincides to the description of f. *alba* which is spread in the area of the species. The known host plants are *Thymus*, *Acinos* and *Satureja*.

***O. alba* var. *alba* f. *campanulata* Beck**

This form is not confirmed by herbarium sheets and is indicated for the regions 6, 8, 16 (T. Georgiev 1937; FB4; FRB).

***O. alba* var. *alba* f. *capitata* Beck**

New data: 1.2: NJ-90. Balchik, 199 m, 20.05.1901 (Davidov / T. Georgiev) SOM 69580; PJ-10. Kalekairyak, 40 m, host *Thymus*, 18.06.2004 (KS) SOA 56987; 2: NH-29. Nevsha, 100 m, 18.05.1902 (A. Yavashov / T. Georgiev) SOM 69604; NJ-90. Povelianovo (Imirler), Padina (Kopuschii), etc., 200 m, 06.1913 (Davidov / T. Georgiev) SOM 69603; 4.2: LH-46. Sevlievo, 230 m, 05.1910 (? / T. Georgiev) SOM 69585; LH-87. Above Samovoden, 181 m, 1900 (Urum.) SOM 69574, 69619, 69620; (Urum.) SOM 69574; 5.1: FN-78. Petrohan, 1444 m, 01.08.1903 (Dren.) SOM 69605; GN-07. Refuge Purshevitsa, 1300 m, 05.09.2004 (KS) SOA 56988; GN-08.



**Fig. 2.** Intraspecific taxa of *Orobanchae alba*:

**Figs a-h** – subsp. *alba*: **a** – f. *capitata*; **b** – f. *communis*; **c** – f. *lactea*; **d** – f. *longibracteata*; **e** – f. *lutescens*; **f** – f. *maxima*; **g** – f. *rubiginosa*; **h** – f. *rubra*; **i** – var. *bidentata*; **j** – subsp. *xanthostigma*.

Vilya Glava, 14.07.1930 (Stoj. / Acht.) SOM 69628; **5.2:** LH-12. Pochivaloto, 1300 m, 14.06.2003 (KS) SOA 56343; 1400 m, host *Thymus*, 28.07.2003 (KS) SOA 56989; 07.07.2004 (KS) SOA 56990; LH-64. Gabrovo, Sokolut, 329 m, 30.07.1930 (A. Yurkovskiy) SOM 69589; Malousha peak, 329 m, 28.07.1928 (A. Yurkovskiy) SOM 69590; **11:** FL-78. Belasitsa, 500 m, 10.05.1980 (IB) SOM 139654 (sub *Lathraea squamaria*); **12:** GL-18 Mt Slavyanka (Alibotush) – summer post, 1200 m, 07.1932 (Dren.) SOM 69570; **17.1:** GM-45. Park Kleptouza, 810 m, host *Thymus*, 05.07.2003 (KS) SOA 56991; **17.2:** LF-18. Mochoure, 1200 m, host *Thymus*, 03.09.2005 (KS) SOA 56992; LG-02. Below Chepelare, 1100 m, 31.05.2003 (KS) SOA 56993; LG-23. Luki, 660 m, 16.06.1965 (M. Popova / ?) SOA 24493, 24494; LG-25. Asenovgrad (Stanimak), 300 m, 27.04.1914 (I. Mrkvichka / T. Georgiev) SOM 69618; 06.05.2004 (KS) SOA 56994; near Asenova Krepost, 400 m, host *Thymus*, 09.05.2004 (KS) SOA 56995; 08.05.2002 (KS) SOA 56997; **18:** LG-06. Purvenets, 250 m, host *Thymus*, 16.05.2004 (O. Todorov / KS) SOA 56998; LG-16. Plovdiv – Dzhendema, 164 m, 06.1896 (Stříbrný) SOA s.n.; LH-80. Above Ayazmoto, 250 m, 23.05.1943 (A. Yurkovskiy) SOM 69589; 01.06.2004 (KS) SOA 56999.

This form is reported and confirmed by herbarium sheets for the regions 6 (FB4; FRB), 8 and 15 (T. Georgiev 1937). The new data add the regions 1.2, 2, 4.2, 5.1, 5.2, 11, 12, 17.1, 17.2 and 18. The herbarium sheets and own collected materials confirm a vertical distribution between 40 m and 2000 m alt. The confirmed host plants are *Thymus* and *Acinos*.

#### ***O. alba* var. *alba* f. *communis* Beck**

New records: **10.2:** FM-75. Blagoevgrad (Gorna Dzhoumaya), 650 m, 01.05.1930 (Davidov / T. Georgiev) SOM 69598; **14.1:** GM-20. Between Dobrotino and Popovi Livadi, 1120 m, host *Thymus*, 17.06.2005 (KS) SOA 57000; **17.1:** KG-63. Beglika, 1600 m, 07.1935 (N. Antonov / T. Georgiev) SOA 19071; KG-85. South from Bratsigovo, 599 m, 05.08.1930 (I. Mrkvichka / T. Georgiev) SOM 69584; **17.2:** LG-05. Zdravets hut, 1200 m, 17.06.1973 (St. Dimitrov) SOA 33083 (sub *O. rapum-genistae*); Akademik hut, 393 m, 22.05.2004 (M. Lacheva / KS) SOA 57001; LG-25. Above Asenovgrad, 300 m, 18.05.1983 (Delip.) SOA 38274; host *Acinos suaveolens*, 11.05.2003 (KS) SOA 56345; LG-14. Narechenski Bani, on rocky slope, 913 m, 02.07.2005 (KS) SOA 57002.

Indicated as widespread in the area of the species (FB1; FB4; FRB). This form is reported for the region 5.1 and 18 (T. Georgiev 1937). Chorological records without confirming herbarium sheets are found for the regions 8, 14.2 and 15 (T. Georgiev 1937). This form is vertically distributed between 260 m and 1600 m alt. Confirmed host plants of this form are *Thymus* and *Acinos*.

#### ***O. alba* var. *alba* f. *lactea* Beck**

This form is indicated for the regions 4.2 and 6 (T. Georgiev 1937; FB4; FRB), and confirmed by one herbarium sheet from region 6: FN-72. Lyulin – meadows, host *Thymus*, 06.1924 (Stoj. & Stef.) SOA 10431.

#### ***O. alba* var. *alba* f. *longibracteata* Beck**

New and unpublished data: **2:** NJ-10. Novi Pazar, 156 m, 16.05.1905 (Davidov / T. Georgiev) SOM 69577; **7:** FN-55. The southern slope of Chepun, above Dragoman, 710 m, host *Thymus*, 30.06.2004 (KS) SOA 58140. **14.2:** GM-03. Dolen Yalovarnik, 1740 m, 23.07.1951 (Jordanov / Kitan.) SO 68524 (left specimen – sub *O. rapum-genistae* rev. Delip. sub *O. gracilis*); **17.1:** KG-54. Below Kleptouza peak, 900 m, 02.07.2004 (KS) SOA 57003; **18:** KG-86. Above Sinitovo, 400 m, host *Thymus*, 01.06.2005 (KS) SOA 57004, 57005, 57006.

Reported for 4.2 (Urum. 1912, 1913a, b, 1928) and 17.2 (FB1; FB4; FRB). Indicated for 5.1 (T. Georgiev 1937), 5.2 (FB1; FB4; FRB) and 6 (FB4; FRB). The confirmed vertical distribution of this form is between 156 m and 1740 m alt. The only known host plant of this form is *Thymus*.

#### ***O. alba* var. *alba* f. *lutescens* (Boreau) Beck (1890) Monogr. Orob. 212**

New data: **8:** FN-81. Hotel Moreni, 1800 m, host ?*Thymus*, 25.07.2004 (KS) SOA 57007; **17.2:** LF-38. Above Zlatograd near Presoka, 941 m, host *Satureja cinerea*, 28.07.2005 (KS) SOA 57008. This form is new for the flora of Bulgaria.

#### ***O. alba* var. *alba* f. *maxima* Beck**

New data: **1.1:** NG-67. Cape Karaagach, 15 m, host *Thymus*, 15.07.2003 (GS / KS) SOA 57010; **8:** FN-81. Kladnitsa, 1154 m, 26.06.2004 (GS / KS) SOA 57011, 57012; **14.1:** GM-20. Refuge Popovi Livadi, 1420 m, 18.05.2005 (TzR / KS) SOA 57013; **18:** KG-86. Elenski peak, 400 m, host *Thymus*, 01.06.2005 (KS) SOA 57014.

This form is reported for: 4.2 (Urum. 1912, 1913a; FB1), 17.1 (T. Georgiev 1937; FRB) and 17.2 (T. Georgiev 1937; FB4; FRB). Indicated for the regions: 3 (Urum. 1912; FB1; FRB), 5.1 (Urum. 1913b; FB1), 5.2 (FB4; FRB), 7 (Urum. 1935a; FRB), 10.2 (Urum. 1935a), 14.2 (H. Uhlich pers. comm.) and 15 (Urum. 1935a; FRB). The confirmed vertical distribution is between 15 m and 1420 m alt. Established host plants are *Acinos suaveolens* and *Thymus*.

***O. alba* var. *alba* f. *rubiginosa* (A. Dietr.) Beck (1890) Monogr. Orob. 212**

New data: **5.2:** LH-12. Pochivaloto, 1300 m, 14.06.2003 (KS) SOA 56343; 07.07.2004 (KS) SOA 57015, SOA 57016; **17.2:** LG-14. Narechenski Bani, 913 m, host *Thymus*, 02.07.2005 (KS) SOA 57017; LG-02. Choukata near Bogoutevo, 1100 m, host *Acinos suaveolens*, 31.05.2003 (KS) SOA 57018, 57019; LG-10. Chokmanovo, 973 m, host *Thymus*, 15.06.2003 (Y. Guteva / KS) SOA 56359, 57021; **17.3:** LF-47. between Gorski Izvor, Koushla and Granchitsa, 440–560 m, host *Satureja pilosa*, 29.07.2005 (KS) SOA 57022, 57023, 57024; LF-68. Gorsko Dyulevo – Chorbadzhiisko, 500 m, host *Satureja cinerea*, 14.07.2005 (KS) SOA 57025; LF-69. Gorsko Dyulevo, 400 m, host *Satureja cinerea*, 14.07.2005 (KS) SOA 57026, 57027; host *Thymus*, 14.07.2005 (KS) SOA 57028; **18:** LH-80. Park Ayazmoto, 250 m, host *Thymus*, 01.06.2004 (KS) SOA 57029; 420 m, 05.05.2005 (KS) SOA 57030.

This form is new for the Bulgarian flora. The Bulgarian keys lead incorrectly to *O. rapum-genistae* (T. Georgiev 1937; FB4) or *O. panicii* (KVPB; FRB) instead of this form.

***O. alba* var. *alba* f. *rubra* (Hook.) Beck**

New and unpublished data: **1.1:** NG-67. Kiten, 15 m, 23.05.1963 (Cheshm.) SOA 18591; 27.05.1963 (Delip.) SOA 18587, 18588, 18589, 18590; Chouka peak, 20 m, 27.05.1963 (D. Gramatikov) SOA 18586; Cape Karaagach, 15 m, host *Thymus*, 15.07.2003 (GS / KS), SOA 57009; **1.2:** NH-78. Mt Avrenska above Galata, 140 m, 07.05.1901 (Davidov / T. Georgiev) SOM 69627; **5.1:** GN-24. Mourgash peak, Stanchiv Preslap locality, 1101 m, 12.07.1952 (Acht. & Velchev) SOM 90538; **5.2:** KH-63. Below Golyam Kordun peak, 1650 m, 16.07.1952 (Acht. & Velchev) SOM 91851; KH-83. Maluk Vurtop, Kamenitsa near Klisoura, 740 m, 07.1920 (S. Baev / Acht.) SOM 69576; **14.1:** GM-20. Up from Dobro Pole above Pirin village, 1800 m,

25.07.1935 (Acht.) SOM 69677, 69680; **17.1:** KG-84. Ravnogor, 1300 m, 20.07.1949 (?) SOA 18612 (sub *O. rapum-genistae*).

This form is reported for: 7 (FB1; T. Georgiev 1937; Urum. 1913a, 1935b), 8 (T. Georgiev 1937; Urum. 1935b), 9 (Urum. 1935b), 14.2 (T. Georgiev 1937), 15 (Urum. 1935b), 17.2, 18 (FB1; T. Georgiev 1937; Urum. 1912). It is indicated for the regions: 10.2 (Urum. 1935b), 16 (T. Georgiev 1937) and 19 (FB1; Urum. 1912).

The Floras indicate the taxon too generally as widespread in the species area (FB4; FRB), but data lack for 14 subregions. This form is vertically distributed between 15 m and 1900 m alt. The taxon is very often identified incorrectly as *O. purpurea* Jacq. (because of confusion with *O. purpurea* Hook., nom. amb.) or as *O. gracilis* Sm. (because of the corolla hue). The confirmed host plant is *Thymus*.

***O. alba* var. *bidentata* Beck**

New and unpublished data: **5.2:** KH-75. Teteven, 498 m, 1910 (Urum. / Stoj.) SOM 104240; KH-83. Maluk Vurtop, Kamenitsa, 740 m, 07.1920 (S. Baev / Acht.) SOM 69576 (the 4<sup>th</sup> sample left to right); **8:** FN-81. Bai Krustyu locality, 1300 m, 19.08.2003 (KS) SOA 57057; hotel Moreni, 1800 m, host *Thymus*, 25.07.2004 (KS) SOA 57031; **9:** FM-28. Gurlyano – Vrattsa, 1000 m, 19.06.2005 (KS) SOA 57032; **14.2:** FM-93. Refuge P. Yavorov, 1700 m, host ?*Thymus*, 14.07.2003 (TzR. / KS) SOA 56418; **17.1:** GM-36. Starina locality, near the road, 1090 m, host *Origanum vulgare*, 27.07.2003 (KS) SOA 57033; KG-54. Sivata voda locality, 900 m, host *Thymus*, 900 m, 02.06.2004 (KS) SOA 57034; **17.2:** KG-92. Zaburdo, 1373 m, host *Thymus*, 28.08.2005 (TzR / KS) SOA 57035; LF-18. Peak Lishava Chuka SW from Chepintsi, 1134 m, 05.09.2005 (KS) SOA 57036; LG-02. Chepelare, 1090 m, host *Acinos suaveolens*, 31.05.2003 (KS) SOA 57037; LG-15. Markovo, 400 m, host *Thymus*, 01.06.2003 (KS) SOA 57038; LG-24. Near Chervenata Stena Reserve, 460 m, 26.06.2004 (KS) SOA 57039; **18:** LG-25. Asenovgrad, 300 m, 4.05.2003 (KS) SOA 57040; 300 m, host *Thymus pulegioides*, 06.05.2004 (KS) SOA 57041; LH-80. Park Ayazmoto, 250 m, host *Thymus*, 01.06.2004 (KS) SOA 58141.

This variety is indicated for 16 (T. Georgiev 1937; FB4; FRB) without evidence of herbarium sheets. The vertical distribution of this taxon is between 250 m and 1800 m alt. The known host plants are *Acinos*, *Thymus* and *Origanum vulgare*.

***O. alba* subsp. *xanthostigma* Rätzel & Uhlich (2004) Feddes Repert. 115 (1–2): 189–211**

New data: 17.1: GM-35. Between Yundola and Avramovo, 1300 m, host *Origanum vulgare*, 27.07.2003 (KS) SOA 57042; GM-45. Sivata Voda locality, 1100 m, host *O. vulgare*, 05.07.2003 (KS) SOA 57043; 900 m, host *O. vulgare*, 02.06.2004 (KS) SOA 57044; 17.2: LG-13. Forest near Yugovo, 680 m, host *O. vulgare*, 17.07.2004 (TzR / KS) SOA 57058; LG-14. Narechenski Bani, 913 m, host *O. vulgare*, 02.07.2005 (KS) SOA 57045.

This subspecies is new for the flora of Bulgaria. The Bulgarian keys determine it incorrectly as *O. rapumgenistae* (T. Georgiev 1937), *O. pancicii* (FB4; KVPB; FRB) or *O. amethystea* (KPB).

***Orobanche reticulata* Wallr. (Fig. 3)**

New and unpublished data: 1.1: NG-67. Kiten, 15 m, 27.05.1963 (Cheshm.) SOA 18606; 1.2: PJ-10. Kalekairyak, 80 m, host *Cirsium*, 07.09.2003 (KS) SOA 57046; 12: GL-28. Mt Slavyanka (Alibotush), 1300–1400 m, 23.06.1929 (Dren. / ?) SOM 69785; 18: KG-86. Below

Elenski peak, 340–400 m, host ?*Cirsium*, 01.06.2005 (KS) SOA 57047; (see also subsp. *pallidiflora*); 20: NG-36. Zvezdets (Gyok-Tepe), 320–330 m, 17.07.1934 (Jordanov sub *O. cernua*) SO 68498.

This species is reported for the regions: 3 (FRB; T. Georgiev 1937), 5.1, 6 (CVFB; FB1; FB4; FRB; T. Georgiev 1937; Urum. 1909; Velen. 1891), 7 (FB4; T. Georgiev 1937), 14 (CVFB; FB4; FRB), 14.2 (T. Georgiev 1937), 15 (CVFB; FB1; FRB; Velen. 1891) and 17.2 (FB1). It is indicated without confirming material for: 2 (CVFB; FD; FRB; T. Georgiev 1937), 4 (CVFB; FB1; FB3; FB4; FRB; T. Georgiev 1937; Velen. 1891), 4.2 (Urum. 1898) and 8 (CVFB; FB4; FRB; FV; T. Georgiev 1937; Urum. 1930).

The own collections and the herbarium data confirm the regions 1, 3, 5.1, 6, 7, 12, 14.2, 15, 17.2, 18, and an altitude between 15 m and 2000 m. This species can be found on grassy and rocky slopes, in shrubs, up to the subalpine area. The records in literature indicate host plants of *Asteraceae* (KPB) – *Cirsium*, *Carduus* (FB1; FB4; PFB; T. Georgiev 1937) and *Dipsacaceae* (FB1; FB4; PFB; KPB; T. Georgiev 1937) – *Knautia*, *Scabiosa* (FRB; PFB). The herbarium sheets and the own collections confirm the hosts *Achillea pectinata* and *Cirsium*.

***O. reticulata* subsp. *reticulata***

This subspecies is confirmed for 1, 5.1, 6, 7, 8, 12, 14.2, 15, 17.1, 17.2, 18, 20. The literature data indicate it for the regions 2, 3, 4, 6, 5.1, 8, 14, 15 (KPB) or as widespread (FRB).

***O. reticulata* subsp. *pallidiflora* (Wimm. & Grab.) Beck**

New data: 18: LG-25. Asenovgrad, 300 m, host *Cirsium*, 29.05.2003 (KS) SOA 57048; host *Achillea pectinata*, 06.05.2004 (KS) SOA 57049; KG-96. Novo Selo, 200 m, host *Cirsium arvense*, 11.05.2003 (K. Kishelov / KS) SOA 57050; 15.05.2003 (KS). SOA 56349.

This subspecies is reported for the region 3 (FRB; KPB; T. Georgiev 1937). It is indicated for 2 (T. Georgiev 1937), 4 (FRB; KPB), 4.1 (Urum. 1898), 7 and 8 (T. Georgiev 1937) without confirmation.

The key in FRB leads incorrectly to *O. alba* instead to this subspecies.

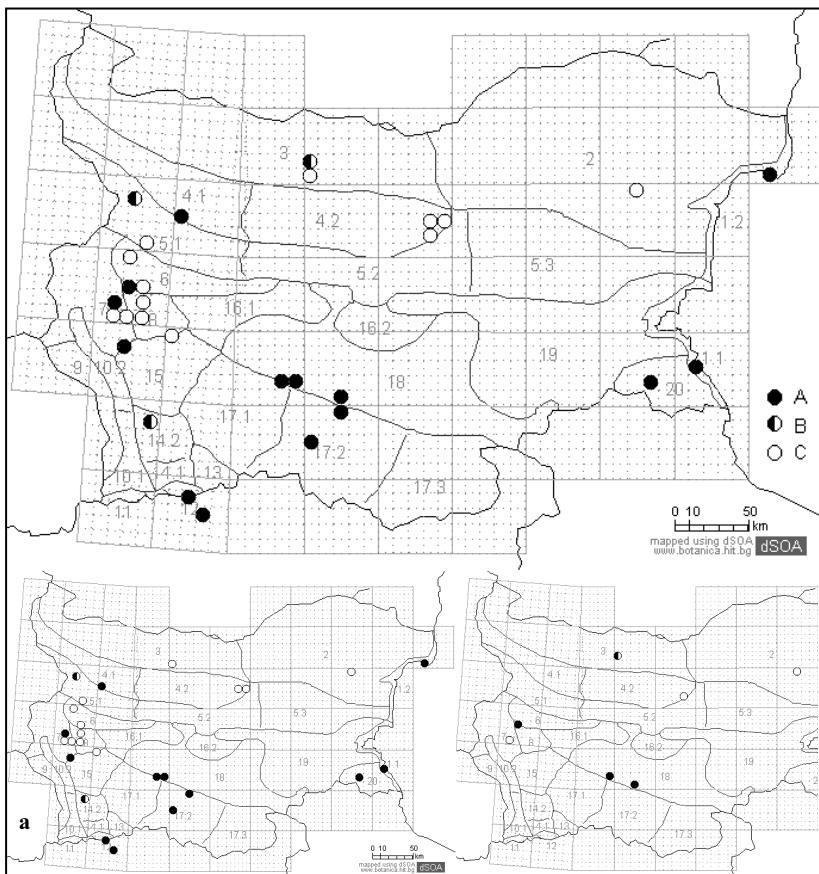


Fig. 3. *Orobanche reticulata*: a – subsp. *reticulata*; b – subsp. *pallidiflora*. A – new and unpublished data; B – confirmed data; C – data from literature.

### *Orobanche serbica* Beck & Petrovič (Fig. 4)

Syn.: *O. serbica* var. *laxiflora* T. Georgiev. Lectotypus: 7: FN-55. On the chalky slopes of Mt Chepan, above Dragoman, 710 m, 20.06.1930 (Stoj. / T. Georgiev) SOA 49665 – !.

This species is confirmed only from two localities of Znepole region (7) – Mt Chepan above Dragoman and Mt Zemen (CVFB; FB1; FB4; FRB; T. Georgiev 1937; KPB; KVPB; Urum. 1913a, 1935b; Kovachev 1984) on altitudes between 600 m and 1000 m. The unconfirmed data are from: 2 (Urum. 1912), 3 (FB1; Urum. 1917, 1926, 1935a; Kovachev 1984), 4 (CVFB; FB1; FRB; KPB; KVPB; Kovachev 1984), 4.1 (Urum. 1917, 1926, 1935a), 4.2 (Urum. 1912, 1913a, 1928, 1935a), 5.1 (CVFB; FB1; FRB; KPB; KVPB; Urum. 1917, 1935a), 6 (Urum. 1913b, 1926; FB1; Kovachev 1984), 8 (Urum. 1930), 9 (Urum. 1913b, 1935b), 15 (Urum. 1935b), 18 (CVFB; KPB; KVPB; FB1; FRB; Urum. 1912, 1913b, 1929b; Kovachev 1984), 19 (CVFB; FB1; KPB; KVPB; Urum. 1912).

As mentioned by T. Georgiev (1937), Urumov indicates the species for many localities in Bulgaria but without confirmation of herbarium material. One herbarium sheet (SOM 69740) is revised by Delipavlov as *O. serbica* but it tallies with the description of *O. minor* Sutt. Probably the other indicated localities are based on incorrectly identified *O. alba* or *O. minor*. This rare species is endemic for the Balkan Peninsula, with a few known localities. The only confirmed host plant for this species is *Artemisia* (KVPB) – *A. alba* [= *A. camphorata* (FB1; FB4; PFB; T. Georgiev 1937; Kovachev 1984); = *A. lobelii* (FRB)] (KPB). The unproved hosts *Genista*, *Chamaecytisus*, *Alchemilla* (Kovachev 1984) are indicated, probably on the basis of incorrectly determined *O. minor* and *O. crenata*, or by the plants in neighbourhood.

### *Orobanche pancicii* Beck (Fig. 5)

New and unpublished data: 17.1: KG-75. Peshtera, 750 m, 29.06.2005 (KS) SOA 57051; 18: KG-77. On the hills above Pazardzhik (Tatar Pazardzhik), 215 m,

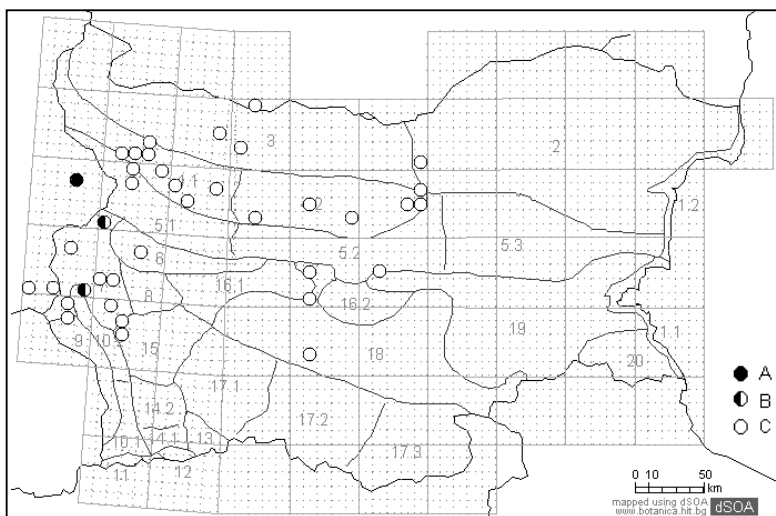


Fig. 4. *Orobanche serbica*: A – new and unpublished data; B – confirmed data; C – data from literature.

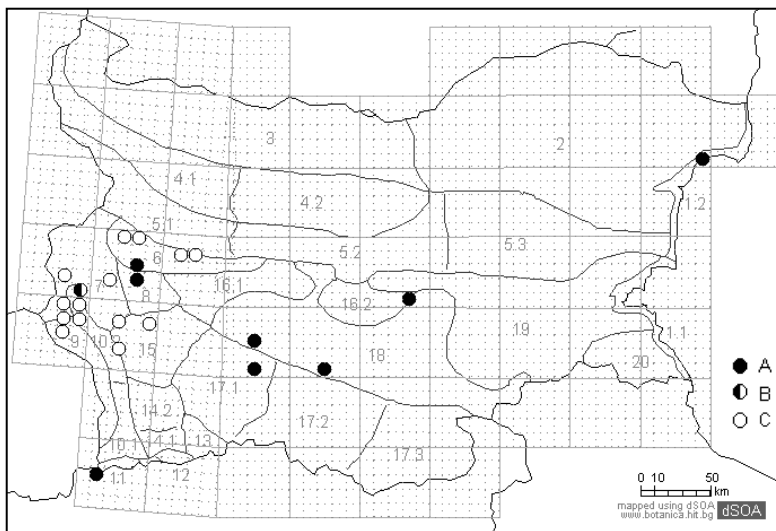


Fig. 5. *Orobanche pancicii*: A – new and unpublished data; B – confirmed data; C – data from literature.

19.04.1914 (I. Mrkvichka) SOA 48504; LG-25. Asenovgrad, 300 m, host ? *Pistacia terebinthus*, 29.05.2003 (KS) SOA 57052; host *Cephalaria flava*, 29.05.2003 (KS) SOA 57053; 01.05.2003; LH-80. Park Ayazmoto, 250 m; 01.06.2004 (KS) SOA 57054, 57055.

This species is reported for the regions: 1.2 (CVFB; FB3; FB4; FRB; KPB; KVPB; T. Georgiev 1937), 6 (CVFB; FRB; KPB; KVPB; Urum. 1912), 7 (CVFB; FRB; KPB; KVPB; Urum. 1913a, b, 1935b), 8 (CVFB; FB4; FRB; FV; KPB; KVPB; T. Georgiev 1937; Urum. 1930; Velen. 1891), 11 (CVFB; KPB). It is indicated for: 9 (Urum. 1913b, 1935b); 10 (KVPB; KPB; CVFB), 10.2 (Urum. 1913a, 1935b), 15 (Urum. 1935b), 20 (FB3); in altitude up to 1800 m. The herbarium sheets and the own collections confirm the regions 1.2, 6, 7, 8, 11, 16.2, 17.1 and 18, between 190 m and 1800 m alt.

The indicated host plants are *Ligustrum vulgare* (FB1; FB4; FRB; PFB; T. Georgiev 1937), *Euonymus latifolia* (FB4; FRB; T. Georgiev 1937), *Dipsacaceae* (KVPB) – *Scabiosa* (FRB; KPB) – *S. leucophylla* (FB1; FB4; PFB; T. Georgiev 1937). One herbarium sheet (in SOA) has a twig of *Euonymus*. The other sheets have not data about the host

plant. The own collections confirm the host *Cephalaria*. One plant was found near the roots of *Pistacia terebinthus*.

A summary of the specified chorological data is shown in Table 1. The known host plants are given in Table 2. On the basis of the specified data an identification key was compiled.

**Table 1.** Distribution of *O. subsect. Glandulosae* in Bulgaria – comparison by floristic regions (the new data are signed with \*).

No.	Taxon	Floristic regions indicated	Floristic regions confirmed	New data	Altitude (m)
1.	<i>O. alba</i>	3, 4.1, 5.3, 19	4.2, 5.1, 5.2, 6, 7, 8, 9, 10.2, 14.2, 15, 16.1, 17.2, 17.2, 18	1.1, 11, 12, 13, 14.1, 17.3	15–2000
	f. <i>campanulata</i>	6, 8, 16	–	–	–
	f. <i>capitata</i>	–	6, 8, 15	1.2, 2, 4.2, 5.1, 5.2, 11, 12, 17.1, 17.2, 18	40–2000
	f. <i>communis</i>	8, 14.2, 15	5.1, 18	10.2, 14.1, 17.1, 17.2	260–1600
	f. <i>lactea</i>	4.2	6	–	–
	f. <i>longibracteata</i>	5.1, 5.2, 6	4.2, 17.2	2, 7, 14.2, 17.1, 18	150–1740
	f. <i>lutescens*</i>	–	–	8, 17.2	900–1800
	f. <i>maxima</i>	3, 7, 5.1, 5.2, 10.2, 14.2, 15	4.2, 7, 17.1, 17.2	1.1, 8, 14.1, 18	15–1420
	f. <i>rubiginosa*</i>	–	–	5.2, 17.*, 17.3, 18	400–1400
	f. <i>rubra</i>	10.2, 16, 19	7, 8, 9, 14.2, 15, 17.2, 18	1, 5.1, 5.2, 14.1, 17.1	15–1900
	var. <i>bidentata</i>	16	–	5.2, 8, 9, 14.2, 17.1, 17.2, 18	300–1800
	subsp. <i>xanthostigma*</i>	–	–	17.1, 17.2	900–1300
2.	<i>O. reticulata</i>	2, 4.2, 6, 17.1, 17.3	3, 4.2, 5.1, 7, 8, 14.2, 15, 17.2	1, 12, 18, 20	15–2000
	subsp. <i>reticulata</i>	2, 3, 4.2, 6, 7	5.1, 8, 14.2, 15, 17.1, 17.2	1, 12, 18, 20	15–2000
	subsp. <i>pallidiflora</i>	2, 4.1, 7, 8	3	18	100–300
3.	<i>O. serbica</i>	2, 3, 4, 5.1, 6, 8, 9, 15, 18, 19	7	–	700–1000
4.	<i>O. pancicii</i>	6, 9, 10.2, 15, 20	1.2, 7, 8, 11	17.1, 17.2, 18	190–1800

**Table 2.** Host plants of *O. subsect. Glandulosae* in Bulgaria (new data are signed with \*).

No.	Taxon	Indicated host plants	Confirmed host plants
1.	<i>O. alba</i>	<i>Lamiaceae: Thymus</i>	<i>Lamiaceae: Thymus, Origanum vulgare*</i> , <i>Acinos suaveolens*</i> , <i>Statureja cinerea*</i> , <i>S. pilosa*</i>
	f. <i>campanulata</i>		–
	f. <i>capitata</i>		<i>A. suaveolens, Thymus</i>
	f. <i>communis</i>		<i>A. suaveolens, Thymus</i>
	f. <i>lactea</i>		<i>Thymus</i>
	f. <i>longibracteata</i>		<i>Thymus</i>
	f. <i>lutescens*</i>		<i>Thymus, S. cinerea</i>
	f. <i>maxima</i>		<i>A. suaveolens, Thymus</i>
	f. <i>rubiginosa*</i>		<i>Thymus, A. suaveolens, S. pilosa</i>
	f. <i>rubra</i>		<i>Thymus</i>
	var. <i>bidentata</i>		<i>A. suaveolens, O. vulgare, Thymus</i>
	subsp. <i>xanthostigma*</i>		<i>O. vulgare</i>
2.	<i>O. reticulata</i>	<i>Asteraceae: Cirsium, Carduus; Dipsacaceae: Knautia, Scabiosa</i>	<i>Asteraceae: Achillea pectinata*</i> , <i>Cirsium</i> spp.
	subsp. <i>reticulata</i>		<i>Cirsium</i>
	subsp. <i>pallidiflora</i>		<i>Achillea pectinata*</i> , <i>Cirsium arvense</i>
3.	<i>O. serbica</i>	<i>Asteraceae: Artemisia – A. alba; Fabaceae: Genista, Chamaecytisus; Rosaceae: Alchemilla</i>	<i>Asteraceae: Artemisia alba</i>
4.	<i>O. pancicii</i>	<i>Oleaceae: Ligustrum vulgare; Celastraceae: Euonymus latifolia; Dipsacaceae: Scabiosa</i>	<i>Celastraceae: Euonymus latifolia; Dipsacaceae: Cephalaria; ?Anacardiaceae: ?Pistacia terebinthus*</i>



### Identification key of genus *Orobanche* subsect. *Glandulosae* in Bulgaria

1. Stigma brightly yellow and remains yellow after the bloom ..... 2
- 1\*. Stigma red, purple or whitish, sometimes yellow but in this case it darkens after bloom and the host plant is from *Lamiaceae* ..... 3
2. Corolla 18–26 mm long, often with straight part of the dorsal line. Filaments inserted on 2–2.5 mm up of the corolla base. Upper lip lobes bent outwards. Stigma often with red aureole ..... *O. pancicii*
- 2\*. Corolla 17–19 mm long, with uniformly curved dorsal line. Filaments inserted on 3–5 mm up of the corolla base. Upper lip lobes not bent outwards. Stigma without red aureole ..... *O. serbica*
3. Calyx parts with unclear nerves; become dark brown *in sicco*. Corolla yellow with violet nerves and deeply incised upper lip. Filaments inserted 2–4 mm up of the corolla base; in the upper half with diluted glandular hairs. Host plants from *Asteraceae* ..... *O. reticulata* ... a
  - a. Upper lip intense violet or purple ... subsp. *reticulata*
  - a\*. Upper lip white or pale-yellowish ... subsp. *pallidiflora*
- 3\*. Calyx parts with 1–3 nerves, *in sicco* light brown. Corolla rose-reddish or yellowish with slightly incised upper lip. Filaments inserted less than 3 mm of the corolla base, with dense glandular hairs on the top half. Host plants from *Lamiaceae* ..... *O. alba* ... b
  - b. Calyx parts long about 7 mm, entire, equal to the half of the corolla tube. Corolla with uniformly curved dorsal line. Stigma brightly yellow ..... subsp. *xanthostigma*
  - b\*. Calyx parts 8–20 mm long, usually entire, sometimes bidentate, usually equal with the corolla tube. Corolla with straight part in the dorsal line. Stigma usually red or purple, rarely yellow or white ..... subsp. *alba* ... c
  - c. Calyx parts bidentate. Teeth often dissimilar. Bracts equal to the corolla. .... var. *bidentata*
  - c\*. Calyx parts monodentate. .... var. *alba* ... d
  - d. Stigma yellow or white ..... e
  - d\*. Stigma red, purple or pink ..... f
  - e. Whole plant yellow as the stigma ..... f. *lutescens*
  - e\*. Corolla reddish or red, coloured as the type ..... f. *rubiginosa*
  - f. Bracts vastly longer than the corolla ..... f. *longibracteata*
  - f\*. Bracts not longer than the corolla ..... g
  - g. Corolla 25–30 mm long ..... f. *maxima*
  - g\*. Corolla shorter than 20 mm ..... h
  - h. Spike rotundate or ovate, compact, with no many flowers ..... f. *capitata*
  - h\*. Spike elongated, cylindrical, usually with many flowers ... i
  - i. Corolla pale yellow or white ..... j
  - i\*. Corolla pink or purple to red ..... k

- j. Corolla white ..... f. *lactea*
- j\*. Corolla pale yellow ..... f. *alba*
- k. Spike dense, elongated ovate, short, with a little flowers. Stem thin ..... f. *communis*
- k\*. Spike ± lax, cylindrical, elongated with many flowers. Stem thick ..... l
- l. Corolla short, long almost as wide ... f. *campanulata*
- l\*. Corolla 1.5–2 times longer than wide ..... f. *rubra*

### Conclusion

The big intraspecific diversity of *O. alba* and *O. reticulata* shows that the hue of stigma is not a reliable criterion for identification of the species in this section. Although *O. alba* is found to be distributed in the whole country according to Floras and keys, practically records or herbarium sheets from some regions are missing. *Orobanche alba* f. *rubiginosa*, *O. alba* f. *lutescens* and *O. alba* subsp. *xanthostigma* are new taxa for the flora of Bulgaria. The new data add 3 regions (5 subregions) to the distribution area of *O. alba*. The taxa of *O. alba* subsp. *alba* are revised. One of the known forms, *O. alba* f. *campanulata*, is not confirmed by herbarium material. Three regions (4 subregions) are added to the distribution area of *O. reticulata*, and the data about *O. reticulata* subsp. *pallidiflora* are specified to 2 regions. *Orobanche serbica* is found only in two isolated localities of Znepole region. Two regions are added to the distribution area of *O. pancicii*. The review of existing herbarium data about host plants of genus *Orobanche* subsect. *Glandulosae* in Bulgaria presents that occasionally the information is not sufficient. A large part of the specimens are not supported by information concerning host plant. In other cases the information on the specimen label is not proved with enclosed host. Probably most of the data about host plants are based on the plants found in neighbourhood to the parasite. The information obtained in the study shows a clear specificity according to the host plants. *Orobanche alba* parasitizes only on *Lamiaceae*, *O. reticulata* – only on *Asteraceae*. The highest specificity displays the endemic *O. serbica* which parasitizes only on *Artemisia alba*. The information about the host of *O. pancicii* is not clear and needs research in future.

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