

## Genus *Avena* L. (Oats) in the flora of Bulgaria

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ABSTRACT. The author studies genus *Avena* L. in Bulgaria on live plants, herbarium material collected personally and on the basis of revision of samples kept in Bulgarian herbaria. New taxa (*A. eriantha*, *A. sterilis* L. subsp. *sterilis* and *A. sterilis* L. subsp. *ludoviciana* var. *glabrescens*) are determined for the flora of Bulgaria and new chorological data are given.

KEYWORDS: *Avena*, Poaceae, flora of Bulgaria.

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### Introduction

The genus *Avena* L. is presented in the Bulgarian flora with considerable diversity of species and infraspecific taxa, which up to now have not been in the focus of specialists. According to this I studied its taxonomic diversity, to enrich the herbaria of the Department of Botany at the Faculty of Agronomy of the Higher Institute of Agriculture in Plovdiv, as well as to preserve seed material in the National Gene Bank at the Institute of Plant Introduction and Plant Resources in the town of Sadovo.

### History of *Avena* studies in Bulgaria

Cultivated oats – *Avena sativa* L.- has been known and grown in Bulgaria since ancient times. The Thracians, Slavs and Bulgarians valued it for its grains – an indispensable concentrated fodder for the horses. The remaining oat species, some of which were weeds and others grew in waste grassy places, by bushes and beside roads, were first mentioned some 100 years ago.

The first reliable data on the oat species growing in our country can be found in the works of the Prague professor JOSEF VELENOVSKÝ. He included cultivated oats - *Avena sativa* – in his **Flora bulgarica** (1891, p. 608), a species which was grown in the whole country, as well as *A. fatua* L. (*A. trichophylla* C. K., *A. sterilis*

DEL.), widespread as a weed among the crops. Of the latter species VELENOVSKÝ determined var. *glabrescens* COSS. (*A. byzantina* C. K., *A. hybrida* PETERM.), found among the crops near the town of Radomir.

Three years later VELENOVSKÝ reported in his article **Dritter Nachtrag zur Flora von Bulgarien** (1894, p. 70) one more oat species for the flora of Bulgaria – *A. clauda* DURIEU, distributed “In collibus calcareis calidis supra Tekir” (village of Tekira, now village of Tri voditzi, Pazardjik district).

Data on oats can be found before VELENOVSKÝ in **Reise durch Rumelien und nach Bursa im Jahre 1839**, printed in 1841. Its author, GRISEBACH, reported *A. barbata* POTT for Thrace. Having in mind that Grisebach crossed the territory of Bulgaria only from Rousse to Varna, and he returned from Bursa to Göttingen via Thessaloniki and along the valley of the Vardar river, we should assume that the material he collected originated from Aegean Thrace which is nowadays within the territory of the Republic of Greece.

On the basis of GRISEBACH'S data the Swiss botanist BOISSIER also reported *A. barbata* for Thrace in his main work **Flora Orientalis** (1884, p. 543).

After VELENOVSKÝ oats in Bulgaria was forgotten for a period of 30 years. In 1921 **Cereals of Bulgaria** was published by STOYANOV & STEFANOV. The authors included in it (p. 40) the taxa reported by VELENOVSKÝ and GRISEBACH.

In 1924 the first part of the two-volume work of STOYANOV and STEFANOV **Flora of Bulgaria** was edited. The same taxa were reported there (p. 122).

HAYEK (1933, p. 318-321) pointed that only *A. fatua*, *A. sativa* and *A. clauda* were found in Bulgaria.

The second edition of **Flora of Bulgaria** was printed in one volume. The authors did not include in it *A. barbata* (1933, p. 120-121) because there were no materials from it in Bulgarian herbaria and it had not been collected in the period 1924-1932.

In the summer of 1933, STOJANOFF, ACHTAROFF & GEORGIEFF collected materials along the railroad between the stations Nadezhda and Zlaten dol (now constituting the town of Maritza) which they determined as *A. barbata* BROU. and concluded “angegebene Fundort der einzige, wo diese Art in Bulgarien mit Sicherheit festgestellt worden ist” (1934, p. 63).

The third edition of **Flora of Bulgaria** (1948, p. 124) included the three already known wild-growing species, as well as the cultivated oats. New localities for *A. barbata* were indicated.

Studying weed plants in the district of Sofia KOLEV (1958, p. 148) reported an oat species, new for the flora of Bulgaria – *A. ludoviciana* DURIEU.

In 1963 volume I of the multi-volume **Flora of the People's Republic of Bulgaria** was printed. The genus *Avena* was worked out by GEORGIEV (1963, p. 315-319). He wrote about the oat species known at that time, namely: *A. clauda*, *A. barbata*, *A. ludoviciana*, *A. sativa* and *A. fatua*, including var. *glabrescens* as well. Up to 1963 new chorological data had been given for *A. clauda* and *A. barbata*, but GEORGIEV did not cite them.

The fourth edition of **Flora of Bulgaria** was written by STOYANOV, STEFANOV & KITANOV, again in two parts. Part I (1966, p.101) included the following taxa: *A.*

*clauda*, *A. barbata*, *A. fatua*, *A. sativa* and *A. sterilis*. According to the authors, the latter was represented in Bulgaria “only by var. *ludoviciana* (DURIEU)HUSNOT.” New localities of the cited taxa, known up to that moment, were also indicated.

DELIPAVLOV (1990, p. 314) found out that *A. barbata* is represented in Bulgaria by populations with smaller spikelets (up to 20 mm) which can be determined as subsp. *wiestii* (STEUD) MANSF. of *A. barbata* POTT. Besides having smaller spikelets, subsp. *wiestii* differs in its lemma being toothed at the base of the setae on margins. On the basis of these differences the taxon was accepted as a species.

In 1997 DELIPAVLOV collected materials from the region of Kaliakra cape in Dobroudja which he determined as *A. eriantha* DURIEU – a species new for the flora of Bulgaria.

## Materials and methods

Materials, personally collected for a period of more than 15 years were used to study genus *Avena*, though more systematically they were collected in the last 7-8 years. These materials are kept in the herbarium of the Department of Botany at the Faculty of Agronomy of the Higher Institute of Agriculture in Plovdiv, denoted by us with the index PAF. The exsiccates kept in the Institute of Botany at the Bulgarian Academy of Sciences (SO after *Index Herbariorum*) were also revised, as well as those of the Department of Botany at “Kliment Ohridski” Sofia University (SOM) and the Department of Botany at the former Institute of Agriculture in Sofia (SOA). At the moment the latter is property of the Department of Botany at the Faculty of Agriculture in Plovdiv and is kept there.

The identification of taxa is made on the basis of their morphological features, with the help of modern floras and monographs.

## Results

After studying the materials collected by us and revising the specimens kept in Bulgarian herbaria, we found out that genus *Avena* is represented in Bulgaria by 6 species which can be determined with the help of the following key.

1. Glumes unequal .....2
- + Glumes subequal.....3
2. Spikelets with 2-3 florets. Rachilla disarticulating above glumes but not between florets ..... 1. *A. eriantha*
- + Spikelets with 3-5 florets. Rachilla disarticulating above glumes and between florets..... 2. *A. clauda*
3. Lemma terminating in 2 setae and toothed at the base of the two setae on margins. Spikelets 16-20 mm long, with 2 florets..... 3. *A. wiestii*
- + Lemma bifid or mucronate.....4
4. Rachilla disarticulating at maturity .....5
- + Rachilla not disarticulating at maturity. Rachilla segments breaking at their apices and falling attached to lower floret.....6. *A. sativa*
5. Rachilla disarticulating above glumes and between florets ..... 4. *A. fatua*
- + Rachilla disarticulating above glumes but not between florets ..... 5. *A. sterilis*

**1. *A. eriantha* DURIEU in DUCHARTRE, Rév. Bot. 1: 360 (1845).**

Syn: *Trisetum pilosum* ROEM. & SCHULT., Syst. Veg. 2: 662 (1817); *Avena pilosa* (ROEM. & SCHULT.) BIEB., Fl. Taur.-Cauc. 3: 84 (1819), descr., nom. illegit. Ic: BAUM, Oats (1977, t. 75 – photo of lectotype).

PAF: On grassy places, Kaliakra, near the village of Balgarevo, Dobritch district, 13.06.1997 and near the village of Sv. Nikola, Dobritch district, 14.06.1997, DELIPAVLOV.

**2. *A. clauda* DURIEU in DUCHARTRE, Rév. Bot. 1: 360 (1845)**

HAYEK, Prodr. Fl. Penins. Balc. 3: 321 (1933) – STOYANOV & STEFANOV, Zitrn. rast. na Bulg. 40 (1921) – GEORGIEV in YORDANOV (ed.), Fl. na Nar. Rep. Bulg. I: 315 (1963).

SO: In the locality of Kartaletz, the village of Koulata, Blagoevgrad district, 7.05.1959, VELTCHEV & BONDEV; ad l. d. Pčelina pr. vic. Pripečene, distr. Blagoevgrad, 6.05.1959, VELTCHEV & BONDEV; ad Tekir 05.1895, STRIBRNY.

SOM: In the locality of Kartaletz, the village of Koulata, Blagoevgrad district, 7.05.1959, VELTCHEV & BONDEV; Pr. vic. Pripečene, distr. Blagoevgrad, 6.05.1959, VELTCHEV & BONDEV; Baba bair, 27.05.1896, STRIBRNY; In collis ad Pazardžik, 3.06.1897, STRIBRNY.

PAF: Bessaparski ridove, above the railway station of Ognyanovo, 29.05.1968 and 22.05.1997, DELIPAVLOV; above the village of Novo selo, Plovdiv district, 27.05.1995, DELIPAVLOV.

**3. *A. wiestii* STEUDEL, Sin. Pl. Glum. 1: 231 (1854).**

Syn: *A. barbata* POTT ex LINK var. *wiestii* (STEUDEL) HAUSSKN. in Mitt. Thür. Bot. Ver. N. F., 6: 45(1894); *A. strigosa* SCHREBER subsp. *wiestii* (STEUDEL) THELL. in Vierteljahr. Naturf. Ges., Zürich 56:333 (1912). Ic: BAUM, Oats (1977, t. 204 - photo of holotype).

SO: Near the villages of Kameno and Dolno ezerovo, Bourgas district, 4.06.1967, VELTCHEV & VASSILEV, sub *A. barbata*; southern Pirin, 07.1967, KOZHUHAROV, sub *A. sativa*; above the town of Ivailovgrad, 27.05.1963, YORDANOV & YANEV, sub *A. barbata*; beside crops, to the south of the town of Ivailovgrad, 22.05.1962, YORDANOV & YANEV, sub *A. barbata*; between the villages of Kondolovo and Fazanovo, Bourgas district, 27.04.1977, VELTCHEV & VASSILEV, sub *A. barbata*.

SOM: To the north of the village of Rezovo, 12.07.1936, YORDANOV, sub *A. barbata*; in thin woods, to the north of the village of Primorsko, 12.05.1951, YORDANOV, sub *A. barbata*; on dry slopes above the village of Kulata, 27.05.1983, STOYANOV, sub *A. barbata*; to the north of the railway station of Pirin, 13.05.1963, YORDANOV & YANEV, sub *A. barbata*; among shrubs above the village of Yanovo, Blagoevgrad district, 23.06.1992, PASHALIEV, sub *A. barbata*;

in thin woods, the village of Razdel, near the Toundzha river, 19.06.1941, YORDANOV, sub *A. barbata*.

SOA: Zwischen den Stationen Nadežda und Zlaten dol, 4.06.1933, STOJANOFF, ACHTAROFF & GEORGIEFF, sub *A. barbata*.

PAF: Petritch district, 3.06.1987, DELIPAVLOV, sub *A. barbata*; above Ivailovgrad, 28.05.1964, DELIPAVLOV, sub *A. barbata*; near the town of Sozopol, 1.08.1960, DELIPAVLOV, sub *A. barbata*; beside the railway line, town of Karlovo, 6.06.1967, DELIPAVLOV, sub *A. barbata*; beside the railway line, Filipovo, 31.05.1992, DELIPAVLOV; near the village of Belopolyane, Ivailivgrad district, 19.06.1996, DELIPAVLOV; Laouta, Plovdiv, 22.05.1968, TCHESHMEDZHIEV, sub *A. barbata*; Kozhouha, Petritch district, 9.07.1983, TCHESHMEDZHIEV, sub *A. barbata*; near the village of Mezek, Svilengrad district, 29.05.1983, DELIPAVLOV & TCHESHMEDZHIEV, sub *A. barbata*; town of Harmanli, 4.08.1978, DELIPAVLOV, sub *A. barbata*; beside the railway line, station of Septemvri, 2.06.1980, DELIPAVLOV & TCHESHMEDZHIEV, sub *A. barbata*; near the town of Kresna, 2.05.1981, DELIPAVLOV & TCHESHMEDZHIEV, sub *A. barbata*; near Ivailovgrad, 23.07.1982, and 19.06.1996, DELIPAVLOV, sub *A. barbata*; near the town of Ahtopol, 21.07.1968, TCHESHMEDZHIEV, sub *A. barbata*; town of Melnik, 14.07.1970, DIMITROV & DELIPAVLOV, sub *A. barbata*; near Ognyanovo, 29.05.1968, 15.05.1997 and 26.05.1997, DELIPAVLOV, sub *A. barbata*; to the north of Plovdiv, 15.05.1997, DELIPAVLOV, sub *A. barbata*; town of Sadovo, 4.06.1997 DELIPAVLOV, sub *A. barbata*; town of Karnobat, 20.07.1996, DELIPAVLOV, sub *A. barbata*; at Zhelezni vrata in the vicinity of the town of Kardzhali, 5.05.1964, DELIPAVLOV, sub *A. barbata*.

#### 4. *A. fatua* L., Sp. Pl.: 80 (1753)

STOYANOV & STEFANOV, Zitni rast. na Bulg. 40 (1921).

HAYEK, Prodr. Fl. Penins. Balc., 3, 319 (1932). – GEORGIEV in JORDANOV (ed.), Fl. na Nar. Rep. Bulg. I: 316 (1963).

In Bulgaria it is represented by 2 varieties:

1. Lemmas hairy, especially on the lower half ..... **var. *fatua***
- + Lemmas completely glabrous ..... **var. *glabrata***

##### **Var. *fatua***

SO: Ad Tarnovo, 1898, URUMOV; prope pag. Požarevo, distr. Sofia, 18.06.1978, VICHOTCEVSKY, sub *A. sativa*; town of Stara Zagora, no date, ACHTAROV; town of Sadovo, 07.1915, STRIBRNY, sub *A. sterilis*.

SOM: Town of Novi Pazar, 23.06.1923, YORDANOV; above the village of Belidie han, Sofia district, 2.06.1970, VICHOTCEVSKY, sub *A. sativa*; ad pag. Dragoman, 13.06.1892, GEORGIEFF; near the town of Kostenets, Sofia district, 7.07.1893, GEORGIEFF.

PAF: Near the village of Vrav, Vidin district, 22.06.1996, ANTONOVA; near Laouta, Plovdiv, 1.06.1968, TCHESHMEDZHIEV; in the outskirts of Plovdiv, 8.06.1968, DELIPAVLOV; near Plovdiv, 29.06.1996, DELIPAVLOV; to the north of Plovdiv, 19.06.1997, DELIPAVLOV.

**Var. *glabrata* PETERM., Fl. Bienitz 13 (1841).**

SO: ad Kaliakram, 21.05.1911, DAVIDOV.

PAF: Near the village of Markovo, 13.08.1997, DELIPAVLOV; near the railway station of Ognyanovo, 20.06.1997, DELIPAVLOV; beside crops near Karnobat, 20.06.1996, DELIPAVLOV.

**5. A. *sterilis* L., Sp. Pl. ed. 2:118 (1762).**

Syn: *A. macrocarpa* MOENCH, Meth. Pl. 196 (1794); *A. sterilis* subsp. *macrocarpa* (MOENCH) BRIQ., Prodr. Fl. Cors. 1:105 (1910).

In the Bulgarian flora it is represented by 2 subspecies:

1. Spikelets 30-45 mm; lowest lemma 25-35 mm ..... **subsp. *sterilis***  
+. Spikelets 20-30 mm; lowest lemma 20-25 mm ..... **subsp. *ludoviciana***

**Subsp. *sterilis*.**

SOM: Along the border with the Republic of Greece near the village of Belopolyane, Ivailovgrad district, 22.05.1962, YORDANOV & YANEV, sub *A. barbata*.

SOA: Near the Kislovodsk holiday house, town of Velingrad, 5.07.1978, BLAGOEV, sub *A. fatua*; along roads near Velingrad, 5.07.1978, BLAGOEV & GEORGIEV, sub *A. fatua*.

PAF: Near the town of Kardjali, at Zhelezni vrata, 5.05.1967, DELIPAVLOV; near the border with the Republic of Greece at Ivailovgrad, 19.06.1996, DELIPAVLOV; near the village of Belopolyane, Ivailovgrad district, 19.06.1996, DELIPAVLOV; near the village of Markovo, Plovdiv district, 3.07.1997, DELIPAVLOV.

**Subsp. *ludoviciana* (DURIEU) GILLET & MAGNE. Nouv. Fl. Fr. ed. 3: 532 (1873).**

Syn: *A. ludoviciana* DURIEU in Act. Soc. Linn. Bord. 20: 41 (1855) – HAYEK, Prodr. Fl. Penins. Balc. 3: 319 (1932) – GEORGIEV, Fl. na Nar. Rep. Bulg. 1: 316 (1963); *A. persica* STEUD. Syn. Pl. Glum. 1: 230 (1854).

Represented in the flora of Bulgaria by 2 varieties:

1. Lemmas hairy, especially on lower half .....var. *ludoviciana*  
+. Lemmas glabrous.....var. *glabrescens*

**Var. *ludoviciana***

SO: Ad pontum, Varna, 5.06.1901, DAVIDOV, sub *A. fatua*; Maslen nos, 11.05.1967, VELTCHEV & VASSILEV, sub *A. fatua*; cca urb. Novi pazar, 6.06.1901, DAVIDOV, sub *A. fatua*; the town of Kazanlak, no date, YURKOVSKIY, sub *A. fatua*; near the Osam river at the village of Varbovka, no date, BAEV, sub *A. fatua*.

SOA: Town of Dragoman, 1919, STOYANOV & STEFANOV, sub *A. fatua*; along the railway at Podouene, Sofia, 08.1988, STOYANOV, sub *A. fatua*.

PAF: Near Kavarna, 17.07.1997, DELIPAVLOV; near the village of Sv. Nikola, Dobritch district, 14.06.1997, DELIPAVLOV; near the village of Markovo, Plovdiv district, 5.07.1997, DELIPAVLOV; in the outskirts of Plovdiv, 16.07.1998, DELIPAVLOV.

**Var. *glabrescens* GREN. & GODR.**

PAF: In crops near the town of Aitos, 5.07. and 13.07.1997, DELIPAVLOV; near the village of Tchernograd, Aitos district, 30.06.1996, DELIPAVLOV; near crops,

town of Sadovo, 4.07.1997, DELIPAVLOV; in the outskirts of Plovdiv, 9.07. and 15.07.1997, DELIPAVLOV; near the village of Markovo, Plovdiv district, 4.07.1997, DELIPAVLOV; near the village of Topolitza, Aitos district, 29.06.1996, DELIPAVLOV.

#### 6. *A. sativa* L. Sp. Pl. 79 (1753).

Syn: *A. fatua* L. var. *sativa* (L.) HAUSSKN. in Mitt. Geogr. Ges. Thür. 3: 238 (1885); BAUM, Oats (1977, t.294 – photo of lectotype).

It is cultivated throughout the country for the grain that is used as animal food, in the food industry, etc.

### Discussion

According to the authors of the recent taxonomic studies – GEORGIEV (1963), STOYANOV, STEFANOV & KITANOV (1966), ANDREEV & al. (1992) and DELIPAVLOV & al. (1992) – the genus *Avena* is represented in the flora of Bulgaria by: *Avena clauda*, *A. barbata*, *A. fatua*, *A. fatua* var. *glabrescens* (GEORGIEV 1963, p. 316), *A. ludoviciana* [*A. sterilis* L. var. *ludoviciana* (STOYANOV, STEFANOV & KITANOV 1966, p. 101)] and *A. sativa*.

As a result of our study we ascertained the following taxa in the flora of Bulgaria: *Avena clauda*, *A. eriantha*, *A. wiestii*, *A. fatua*, *A. fatua* var. *fatua*, *A. fatua* var. *glabrata*, *A. sterilis*, *A. sterilis* subsp. *sterilis*, *A. sterilis* ssp. *ludoviciana*, *A. sterilis* subsp. *ludoviciana* var. *ludoviciana*, *A. sterilis* ssp. *ludoviciana* var. *glabrescens* and *A. sativa*.

Three of the taxa mentioned are new for the flora of Bulgaria, namely: *A. eriantha*, *A. sterilis* L. subsp. *sterilis* and *A. sterilis* L. subsp. *ludoviciana* var. *glabrescens*.

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