

GENUS *LEPIDIUM* L. IN THE FLORA OF LATVIA

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Genus *Lepidium* L. in Latvia comprises 8 species – *L. campestre* (L.) R. Br., *L. densiflorum* Schrad., *L. latifolium* L., *L. perfoliatum* L., *L. pinnatifidum* Ledeb., *L. sativum* L., *L. virginicum* L. and *L. ruderale* L. 7 of them are alien species and only one – *L. ruderale* is native species. Species nomenclature, habitats, distribution in Latvia as well as in the world is represented. Species identification key also is included.

Key words: *Lepidium*, distribution, habitat, Latvia.

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INTRODUCTION

Genus *Lepidium* L. (Cruciferae) consists of 231 species (Warwick et al. 2006) and is a cosmopolitan genus which is mainly distributed in temperate and subtropical regions (Al-Shehbaz 1986). *Lepidium* is one of the largest genera in family Cruciferae in the flora of Latvia comprising 8 species – *L. campestre* (L.) R. Br., *L. densiflorum* Schrad., *L. latifolium* L., *L. perfoliatum* L., *L. pinnatifidum* Ledeb., *L. ruderale* L., *L. sativum* L. and *L. virginicum* L. First record of *Lepidium* in Latvia is from the 18th century where *L. ruderale* (Fischer 1778) and *Thlaspi campestre* L. (= *Lepidium campestre*) (Fischer 1784) are mentioned. Later, the list of genus species is supplemented by two more species *L. latifolium* (Wiedemann & Weber 1852) and *L. sativum* (Ilster 1893). V. Mühlenbach (1934) mentioned that *L. densiflorum* is found in 1931 and 1932 in Riga and K. Kupffer (1934) points out that *L. densiflorum* is found in the garden as a weed. *L. perfoliatum* is mentioned

in 1934 (Kupffer 1934). *L. pinnatifidum* is found in Riga in landfill as some individuals (Шулц 1972). *L. virginicum* in literature is mentioned in 1988 (Фарапе 1988). The last comprehensive analysis of *Lepidium* has been in 1955 (Elekšis 1955) and it is, therefore, necessary to update the information on the genus.

The aim of the present study is to clarify systematic structure and distribution of genus *Lepidium* in Latvia.

MATERIAL AND METHODS

For the systematic treatment of genus *Lepidium* herbarium material was investigated and field studies carried out, in total 492 herbarium sheets were analysed. Descriptions of species including scientific nomenclature, habitats, distribution in Latvia and in the world were made. Herbarium material from the Laboratory of Botany, the Institute of Biology, University of Latvia (LATV),

the Herbarium of the Museum of Botany, University of Latvia (RIG), the Herbarium of Slītere National park (SVR), the Herbarium of the Natural History Museum of Latvia (LDM), the Herbarium of the Daugavpils University (DAU), the Herbarium of the Latvia University of Agriculture (LLU), as well as private collections of botanists Alfrēds Rasiņš (RAS) and Austra Āboliņa (AB) were analyzed.

Distribution maps were compiled using the square method, which is related to the geographical coordinates and where one square is approximately 7.6 x 9.3 km (Табака и др. 1980). Geographical distribution was characterized according to the geographical regions of Latvia – Coastal Lowland, Western Latvia, Central Latvia and Eastern Latvia (Ramans & Zelčs 1995) (Fig. 1). For species distribution, the evaluation scale accepted by Laboratory of Botany Institute of Biology was used: very rare (1-10 localities), rare (11-30), rather rare (31-100), not rare (101-250), rather frequent (251-500), frequent (501-750), very frequent (more than 751) (Fatāre 1992). For

L. densiflorum and *L. ruderales* distribution maps are prepared using herbarium data divided into three time periods: by 1940, from 1941 to 1990 and from 1991 to the present. Species localities are marked with dot on the maps: ● – herbarium data. For very rare species localities are cited.

Works cited in the nomenclature section are accepted species Latin name, citation of basionym and synonyms from literature where the taxon was mentioned for the first time in the Latvian flora, as well as Latvijas PSR flora (Elekšis 1955), Флора СССР (Буш 1939), Flora Europaea (Vasconcellos 1964, 1993) and Конспект флоры Восточной Европы (Дорофеев 2012). Authors for taxa are named in accordance with R.K. Brummit and C.E. Powell (1992) and not included written unabridged. Abbreviations corresponding to the accepted standard (Mill 1993) and works not included have been formed using similar principles.

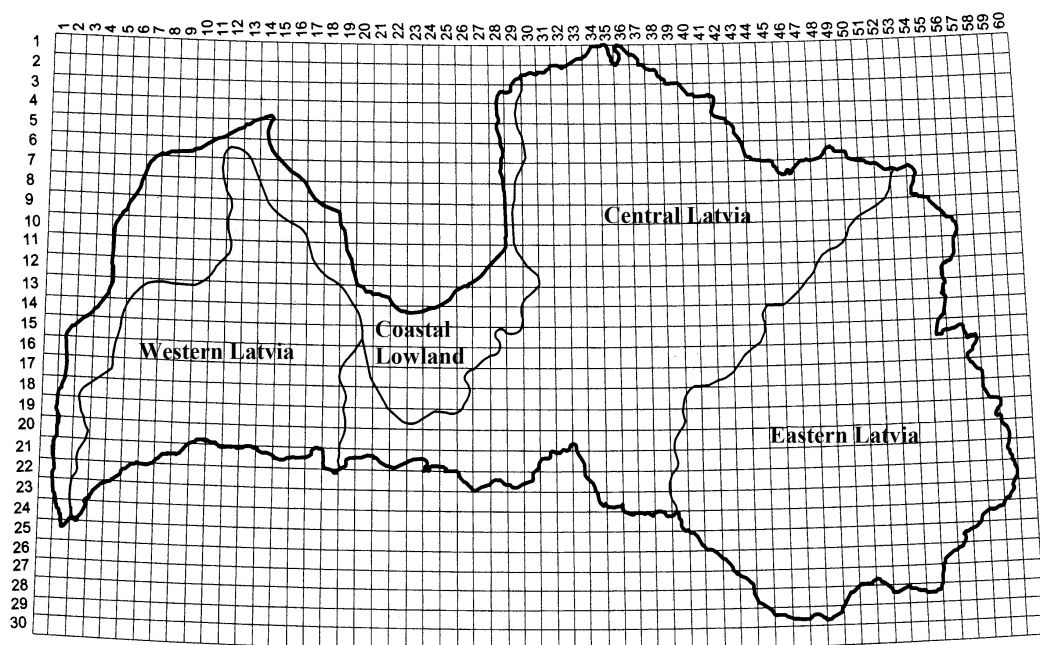


Fig. 1. Geographical regions of Latvia.

RESULTS

Lepidium L. 1753, Sp. Pl. 2: 643; id. 1754, Gen. Pl., ed. 5: 291.

Plants are annual, biennial or rarely perennial. Leaves are entire to pinnatisect divided. Raceme elongated in fruit. Species of *Lepidium* have a different number of stamens. Cruciferae typically has 6 stamens but in *Lepidium* there are also 2 and 4 stamens in flower. Sepals erect with a white margin. Petals are white or yellow, longer than sepals, equal in length or absent. The fruit is silicula and shape varies from orbicular to ovate. Seed ovoid, 1 per locule.

Key to *Lepidium* species

1. Lower leaves 2-pinnatisect, cauline leaves ovate to cordate.....**7. *L. perfoliatum*.**
- Lower leaves entire, pinnatifid or pinnatisect, cauline leaves pinnatifid, pinnatisect or entire.....**2.**
2. Silicula equal in length to the pedicel or longer than pedicel.....**3.**
- Silicula shorter than pedicel.....**4.**
3. Cauline leaves entire, sessile, amplexicaul, auriculate, valves rough, papillate....**1. *L. campestre*.**
- Cauline leaves pinnatifid or pinnatisect, with stalk, not auriculate, valves smooth.....**2. *L. sativum*.**
4. Leaves entire, cauline leaves elliptic to ovate, silicula not winged.....**8. *L. latifolium*.**
- Lower leaves pinnatifid or pinnatisect, cauline leaves oblong lanceolate to lanceolate or linear, silicula winged or not winged..... **5.**
5. Silicula not winged..... **6. *L. pinnatifidum*.**
- Silicula narrowly winged or broadly winged .. **6.**
6. Petals longer than sepals..... **3. *L. virginicum*.**
- Petals equal to sepals or absent..... **7.**
7. Silicula obovate to suborbicular, upper part broadly winged, wing corner obtuse, notch deep**4. *L. densiflorum*.**
- Silicula elliptic to ovoid, upper part narrowly winged, wing corner acute, notch shallow**5. *L. ruderales*.**

1. *Lepidium campestre* (L.) R. Br.

Lepidium campestre (L.) R. Br. 1812, in Aiton, Hort. Kew., ed. 2, 4: 88; Mühlenbach, 1927, Korrb. Naturf.-Ver. Riga, 59: 127; Н. Буш, 1939, Фл. СССР, 8: 506; Eleksis, 1955, Latv. PSR Fl. 2: 323; Vasc. 1964, Fl. Europ. 1: 330; Vasc. rev. Akeroyd and T.C.G. Rich, 1993, Fl. Europ., ed. 2, 1: 399; В.И. Дороф. 2012, Консп. фл. Вост. Европы, 1: 427.

Thlaspi campestre L. 1753, Sp. Pl. 2: 646; J. Fisch. 1784, Zusätze Vers. Naturg. Livl.: 126.

Habitat. Railway verges, weed-laden sites.

Distribution in Latvia. Rare, throughout the territory, alien species.

General distribution. Europe, Caucasus, from meridionale zone to temperate zone. Alien species in North America, Australia.

2. *Lepidium sativum* L.

Lepidium sativum L. 1753, Sp. Pl. 2: 644; Ilster, 1893, Korrb. Naturf.-Ver. Riga, 36: 68; Н. Буш, 1939, Фл. СССР, 8: 508; Vasc. 1964, Fl. Europ. 1: 331; Vasc. rev. Akeroyd and T.C.G. Rich, 1993, Fl. Europ., ed. 2, 1: 400; В.И. Дороф. 2012, Консп. фл. Вост. Европы, 1: 427.

Habitat. Weed-laden sites, fields.

Distribution in Latvia. Very rare. Coastal Lowland – Carnikava (12/28, A. Rasiņš, without the year of collecting, RAS), Rīga (Lucavsala) (14/26, H. Zariņa, 1988, LATV), Liepāja (20/2, L. Tabaka, 1970, LATV); Central Latvia – Salaspils (Botāniskais dārzs) (15/28, J. Strazdiņš, 1987, LATV), Koknese (18/37, V. Mühlenbach, 1931, RIG), escaped cultivated species.

General distribution. Central Europe, Mediterranean region, Caucasus, Asia Minor, the Himalayas, Africa, subtropical zone to temperate zone.

3. *Lepidium virginicum* L.

Lepidium virginicum L. 1753, Sp. Pl. 2: 645; Н. Буш, 1939, Фл. СССР, 8: 512; Vasc. 1964, Fl. Europ. 1: 332; Фатаре, 1988, в Табака и др. Фл. сосуд. раст. Латв. ССР: 59; Vasc. rev. Akeroyd and T.C.G. Rich, 1993, Fl. Europ., ed. 2, 1: 401;

В.И. Дороф. 2012, Консп. фл. Вост. Европы, 1: 426.

Habitat. Grassland, weed in garden.

Distribution in Latvia. Very rare, only at Pēternieki, surroundings of Olaine (16/25, Seidenberg, 1913, RIG; K.R. Kupffer, 1913, RIG), alien species.

General distribution. North America, tropical zone to temperate zone. Alien species in Europe.

4. *Lepidium densiflorum* Schrad.

Lepidium densiflorum Schrad. 1832, Ind. Sem. Horti Gotting.: 4; Mühlenbach, 1934, Acta Horti Bot. Univ. Latv. 7: 112; Eleksis, 1955, Latv. PSR Fl. 2: 326; Vasc. 1964, Fl. Europ. 1: 332; Vasc. rev. Akeroyd and T.C.G. Rich, 1993, Fl. Europ., ed. 2, 1: 401; В.И. Дороф. 2012, Консп. фл. Вост. Европы, 1: 426.

L. neglectum Thell. 1904, Bull. Herb. Boiss. ser. 2, 4: 708; Rasiņš 1954, Latv. PSR nezāļu augļi un sēklas: 107.

L. apetalum auct., non Willd.: Kupffer, 1934, Korrb. Naturf.-Ver. Riga, 61: 210; Н. Буш, 1939, Фл. СССР, 8: 508.

Habitat. Railway verges, street edges, roadsides, weed-laden sites.

Distribution in Latvia. Rather rare, in Coastal Lowland, Central Latvia and Eastern Latvia, alien species (Fig. 2).

General distribution. North America, meridionale zone to boreale zone. Alien species in Europe, Asia.

5. *Lepidium rudemale* L.

Lepidium rudemale L. 1753, Sp. Pl. 2: 645; J. Fisch. 1778, Vers. Naturg. Livl.: 262; Н. Буш, 1939, Фл. СССР, 8: 511; Eleksis, 1955, Latv. PSR Fl. 2: 324; Vasc. 1964, Fl. Europ. 1: 332; Vasc. rev. Akeroyd and T.C.G. Rich, 1993, Fl. Europ., ed. 2, 1: 401; В.И. Дороф. 2012, Консп. фл. Вост. Европы, 1: 426.

Habitat. Weed-laden sites, railway verges, railway tracks, waste dumps, street edges, roadsides.

Distribution in Latvia. Rather rare, throughout the territory (Fig. 3).

General distribution. Europe, Caucasus, Asia, meridionale zone to boreale zone. Alien species in North America.

6. *Lepidium pinnatifidum* Ledeb.

Lepidium pinnatifidum Ledeb. 1841, Fl. Ross. 1: 206; Н. Буш, 1939, Фл. СССР, 8: 512; Vasc. 1964, Fl. Europ. 1: 332; А.А. Шульц, 1972, Охр. прир. Латв. ССР: 92; Vasc. rev. Akeroyd and T.C.G. Rich, 1993, Fl. Europ., ed. 2, 1: 401; В.И. Дороф. 2012, Консп. фл. Вост. Европы, 1: 427.

Habitat. Weed-laden site.

Distribution in Latvia. Very rare, Riga (Krišjāņa Valdemāra iela) (Gorkija iela) (14/27, A. Šulcs, 1961, LDM), Riga (Šarlotes iela) (14/27, A. Šulcs, 1961, LDM), alien species.

General distribution. Caucasus, Central Asia, the Himalayas, meridionale zone to submeridionale zone.

7. *Lepidium perfoliatum* L.

Lepidium perfoliatum L. 1753, Sp. Pl. 2: 643; Kupffer, 1934, Korrb. Naturf.-Ver. Riga, 61: 210; Н. Буш, 1939, Фл. СССР, 8: 512; Eleksis, 1955, Latv. PSR Fl. 2: 380, in adnot.; Vasc. 1964, Fl. Europ. 1: 332; Vasc. rev. Akeroyd and T.C.G. Rich, 1993, Fl. Europ., ed. 2, 1: 401; В.И. Дороф. 2012, Консп. фл. Вост. Европы, 1: 425.

Habitat. Weed-laden site, railway tracks.

Distribution in Latvia. Very rare, Coastal Lowland – Riga, Rūpniecības iela (Industrijas iela) (14/26, A. Grosse, 1930, RIG); Riga (Šķirotava) (15/27, A. Šulcs, 1962, LDM); Eastern Latvia – Daugavpils (27/46) (Шульц, 1972), alien species.

General distribution. Central Europe, Mediterranean region, Caucasus, Asia, meridionale zone to submeridionale zone. Alien species in North America.

8. *Lepidium latifolium* L.

Lepidium latifolium L. 1753, Sp. Pl. 2: 644; Wiedem. und E. Weber, 1852, Besch. Phan. Gew. Esth. Liv. Curl.: 365; Н. Буш, 1939, Фл. СССР, 8: 515; Eleksis, 1955, Latv. PSR Fl. 2: 380, in

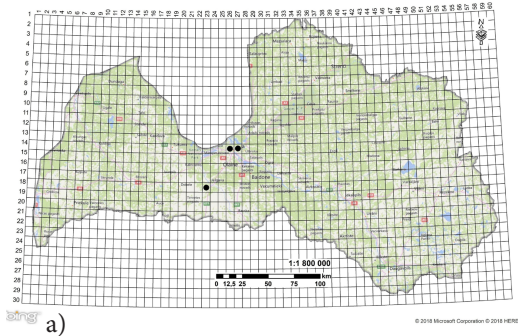
adnot.; Vasc. 1964, Fl. Europ. 1: 332; Vasc. rev. Akeroyd and T.C.G. Rich, 1993, Fl. Europ., ed. 2, 1: 401; В.И. Дороф. 2012, Консп. фл. Вост. Европы, 1: 424.

Habitat. Railway verges, railway tracks, waste dumps, street edges, roadside.

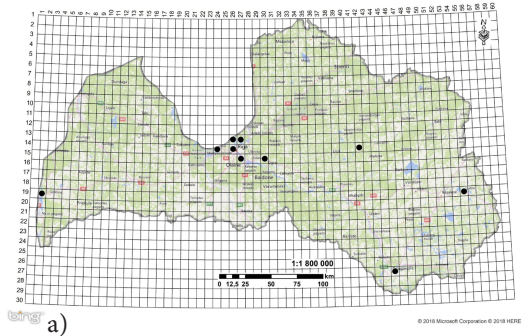
Distribution in Latvia. Very rare, Coastal Lowland – Riga (Bolderāja) (13/26, L. Tabaka, 1982, LATV; V. Šulcs, 1988, LATV; G. Gavrilova, 2002, LATV), Dubulti (14/24, E. Vimba, 1980,

RIG), Riga (Deglava iela) (14/27, I. Šulcs, 1960, 1961, LDM; G. Kļaviņa, 1976, LATV), Riga (Šķirotava) (15/27, A. Šulcs, 1960, RAS), Liepāja (19/2, I. Kabucis, 1990, 1993, 1996, LATV); Eastern Latvia – Daugavpils (27/46, G. Kļaviņa, 1981, LATV; I. Kabucis, 1993, LATV), alien species.

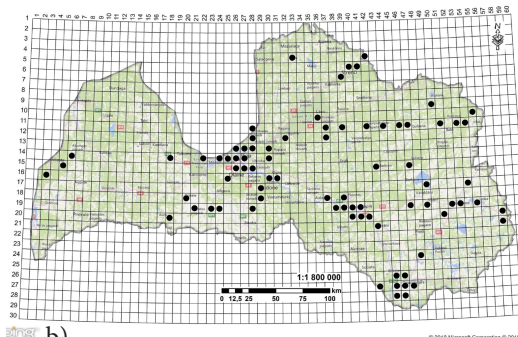
General distribution. Europe, Caucasus, Central Asia, meridionale zone to temperate zone. Alien species in North America.



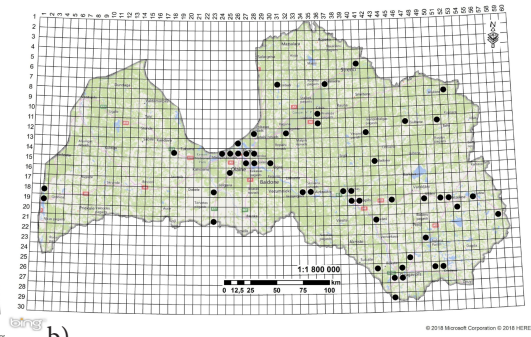
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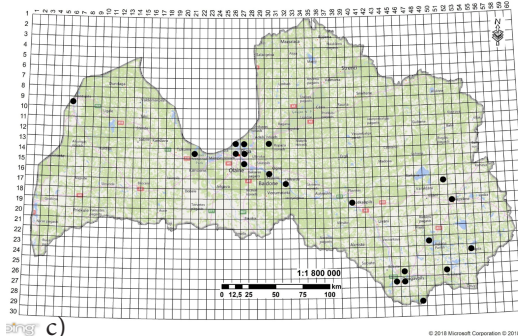
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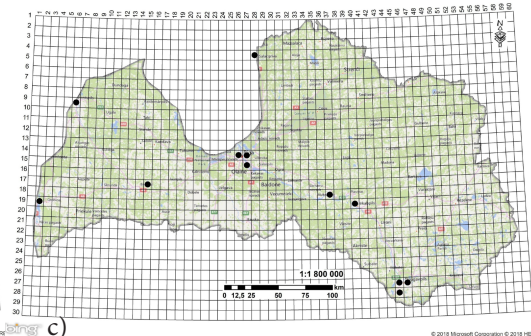
b)



b)



c)



c)

Fig. 2. Distribution of *Lepidium densiflorum* Schrad. in Latvia (a – localities by 1940; b – localities from 1941 to 1990; c – localities from 1991 to the present).

Fig. 3. Distribution of *Lepidium ruderales* L. in Latvia (a – localities by 1940; b – localities from 1941 to 1990; c – localities from 1991 to the present).

DISCUSSION

Lepidium is a morphologically well-separated genus. Evaluating morphological features of *Lepidium* it can be concluded that the most important are leaf form, fruit shape and fruit with or without wing.

Lepidium species distribution in Latvia mainly is related to anthropogenic habitats. Species occur on railway embankments, railway tracks, weed-laden sites, roadsides, landfills as well as a weed in gardens. From all *Lepidium* species in Latvia only *L. ruderale* is native and is distributed throughout the territory rather rare. Distribution mainly is related to cities and other populated areas.

Among 150 most widespread alien plant species in Europa *L. densiflorum*, *L. sativum* and *L. virginicum* are included (Lambdon et al. 2008). The most common alien species of *Lepidium* is *L. densiflorum*. After herbarium material revision it is concluded that *L. densiflorum* has been found already in 1911 and 1912 in Riga by R. Seidenberg. In the period till 1940 *L. densiflorum* was found in three localities. In the period from 1941 to 1990 *L. densiflorum* has spread rapidly and is found mainly in large cities in the Central and Eastern part of the territory. Localities in large cities and in surrounding of them also remain in the period from 1991 to the present. *L. densiflorum* nowadays after herbarium material data is found rare. *L. densiflorum* is widely naturalized in Europe (Vasconcellos et al. 1993), Poland (Tokarska-Guzik et al. 2010), Romania (Sîrbu et al. 2014). In Lithuania *L. densiflorum* also is considered as naturalized species and is distributed in the whole territory (Gudžinskas 1997). In Estonia, *L. densiflorum* is alien species which occurs rare on the railway and near settlements (Kukk & Kull 2005).

As confirmed by herbarium data two species are found very rare – *L. virginicum* in 1913 and *L. pinnatifidum* in 1961. Distribution of *L. campestre* is related to railways and weed-laden sites and as rare species is found throughout the territory. *L. sativum* is grown in gardens and very

rare is found in the wild. *L. perfoliatum* and *L. latifolium* distribution are related to Coastal Lowland and only some individuals are found in the Eastern part of Latvia in Daugavpils.

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