

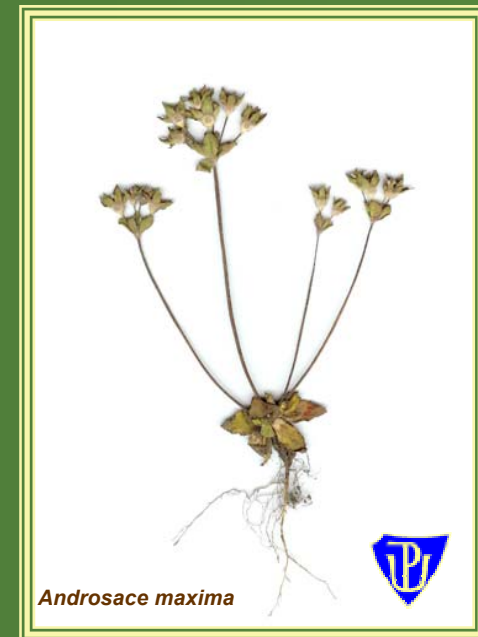


***Ex situ* conservation of wild plant species and research programs in Botanic Garden of Palacký University in Olomouc (CR)**

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Structure of presentation



1. History of Botanic Garden
2. Recent situation and activities
3. Examples of *ex-situ* plant conservation – special plant collections in Botanic Garden
4. Role of botanic gardens in *ex-situ* conservation of plants

1. History

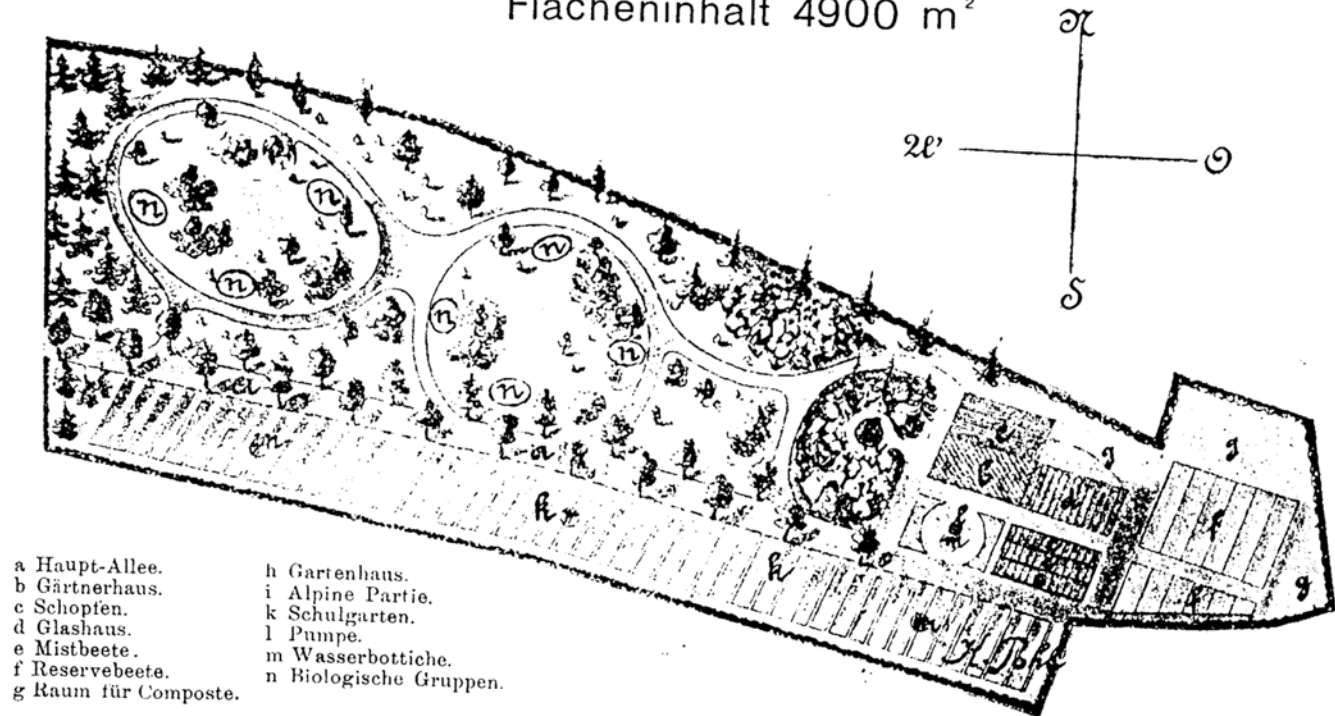
- Since **1901** thanks to efforts of **Botanical Association in Olomouc** (Botanischer Verein in Olmütz) the Botanical Garden was re-established.
- **leading personalities:**
pharmacist **Edmund Tuma**
municipal gardener **Karel Pohl**
first gardener **Josef Pauer**
- **1906** – small greenhouse
- **1908** – house for gardener

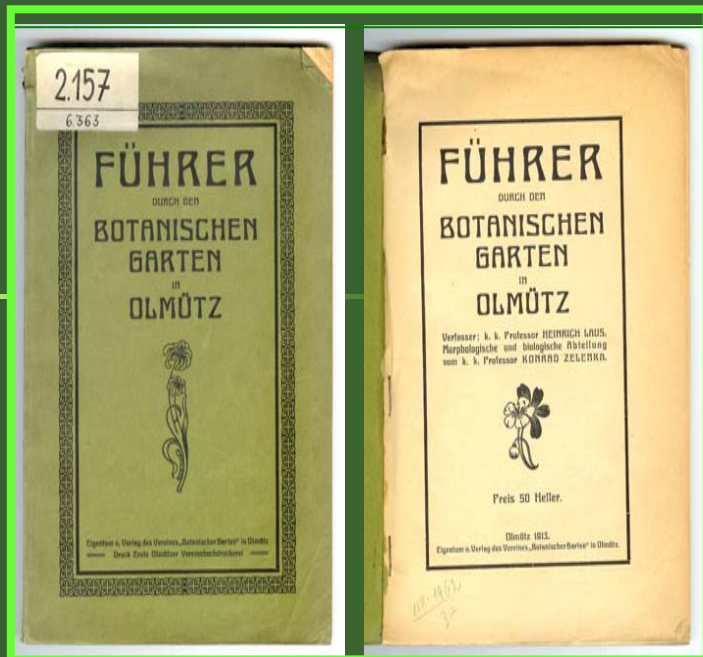


Hugo Lanner: Über die Bedeutung und Einrichtung Wissenschaftlicher Gärten und die Anlage des Botanischen Gartens in Olmütz. (Olomouc 1901)

Botanischer Garten in Olmütz.

Flächeninhalt 4900 m²





First plants for
greenhouses – gift from
gardens in Shönbrunn,
Lednice na Moravě.

Development of activity of
Botanical Association –
prof. **Josef Podpěra**

1913 – first guide with list
of plants

Till 1945 – garden was
developed and more
less maintained in
relatively good
condition.



After exodus of German inhabitants from the city, interest in Botanical Garden decreased.

1948 - the Botanical association transferred the Garden to the municipality of Olomouc.

Since 1956 the acting of the Botanical Garden has been connected with the **University in Olomouc**.

Since 1959 the Garden is a part of the **Faculty of Science, Palacký University, and the Department of Botany**.

1974 – greenhouse was removed because of construction of a new pavilion (H) of „Fair Grounds Flora Olomouc“

During the whole period the Botanical Garden was involved in teaching activities, i.e. education of students of Palacký University, and connected with activities of the best botanists – professors of the University.

2. Recent situation and activities

<http://botany.upol.cz>

At about 2000 species (trees, shrubs, semi-shrubs, herbs) grown in the area of 0.6 ha

Collection of plants representing flora of Central Europe, flora of North-East part of North America

Seed collecting, storage and curation activities are developed by staff members of the Department of Botany and Botanical Garden as its integral part. Special plant collections located also in University campus in Olomouc – Holice.



Equipment and facilities supporting operations with plant and seed material



1. Equipment for plant cultivation (Olomouc – Holice)

- growth chambers
- cold and heated greenhouses
- experimental field (ca 1 ha) with appropriate agricultural machines



2. Equipment and facilities for seed and plant testing



- chambers with controlled temperature and light conditions for germination tests and cultivation of plants



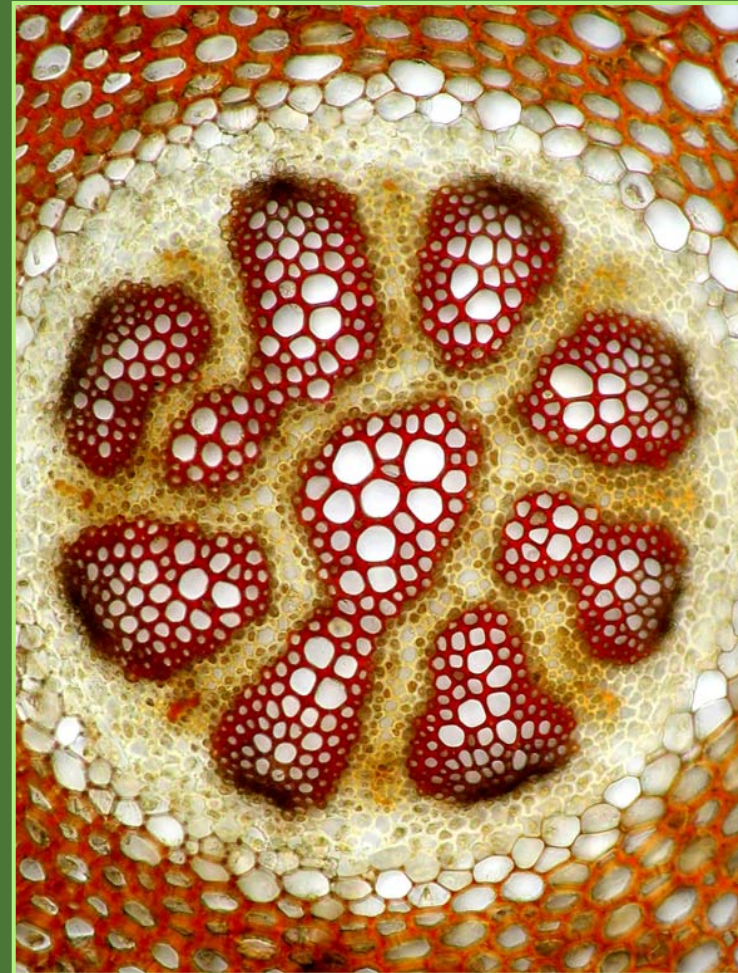
3. Conditions for seed storage

- seed drying with silica-gel
- storage:
- in +5 °C (working collections, store room ca 18 m³)
- in -20 °C (long term storage, store room ca 18 m³)
- deep freezers with the capacity about 600 l), potentially in -80 °C (ca 20 l)
- hermetically closed bags, jars



Activities developed by Botanic Garden:

- participation in teaching of students
- inventarization of plants, new information system (labels), computerization
- plant database
- printed materials, leaflets, *Index seminum*
- research projects
- exhibitions for public (in occasion of horticultural exhibitions Flora)





Carnivorous plants – genus *Saraccenia* – permanent exhibition in the greenhouse Fairgrounds Flora Olomouc

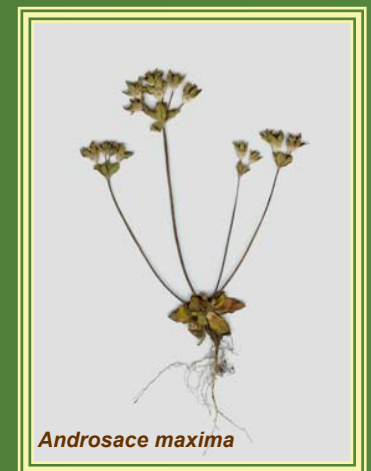


**Temporal exhibition of plants from
greenhouses of the Department of Botany**

3. Examples of *ex-situ* plant conservation

1. Species maintained spontaneously in the garden (self-sowing)

- *Androsace maxima* L. A1 (EX - extinct in wild in the CR)
- *Heliotropium europaeum* L. A1
- *Caucalis lappula* (*C. platycarpus*) C2(EN), A2(?EX)
- *Scandix pecten-veneris* A2 (?EX)
- *Bupleurum rotundifolium* C1(CR)
- *Coronopus squamatus* C2 (EN)
- *Scrophularia chrysantha*



2. Collections raised from- and illustrating taxonomic studies of the Department of Botany, permanently located in Botanic Garden

a. *Dianthus* spp.

- 30 accessions of 20 species
- origin – botanical gardens, own collecting
- material for research and education
- role of wild species in plant breeding



a. „Klatovské karafiáty“

- Seeds from France (Nancy) in 1815
- original Czech breeding from 19th and 20th centuries
- specific position of second part of collection: to demonstrate work of breeders to public



b. Genus *Taraxacum*



- about 30 accessions of almost 30 species
- original collection of Dr. Bohumil Trávníček (Czech Republic, Denmark)
- taxonomical studies
- seed collected from plants for *Index seminum* and regeneration of the collection

c. Genus *Molinia*



Molinia caerulea

- about 250 accessions of 3 taxons :
- *M. caerulea* (L.) Moench
- *M. arundinacea* Schrank subsp. *arundinacea*
- *M. arundinacea* subsp. *horanskyi* (Milkovits) Dančák ined.
- collection created in 1997 – 2005 by dr. Martin Dančák Ph.D. study „Taxonomy and chorological study of the genus *Molinia* in the Central Europe“
- origin of plant material – 16 European countries, incl. CR, Slovak Republic
- material from Balkan is of an exceptional value

d. Grasses from Patagonia



- 21 accessions of about 12 species (*Alopecurus*, *Briza*, *Bromus*, *Deschampsia*, *Festuca*, *Hierochlœe*, *Hordeum*, *Melica*, *Phleum*, *Stipa*, *Vulpia*)
- originally collected in Chile and Argentina by MSc. Ladislava Filipová (Ph.D. studies)

aims:

- education of students
- study of relationships of floras from two geographically distant areas
- study of practical use of new genotypes

Grasses from Patagonia



3. Collections kept for re-introduction programmes

a. Chive *Allium schoenoprasum* L. subsp. *riparium* (Opiz)

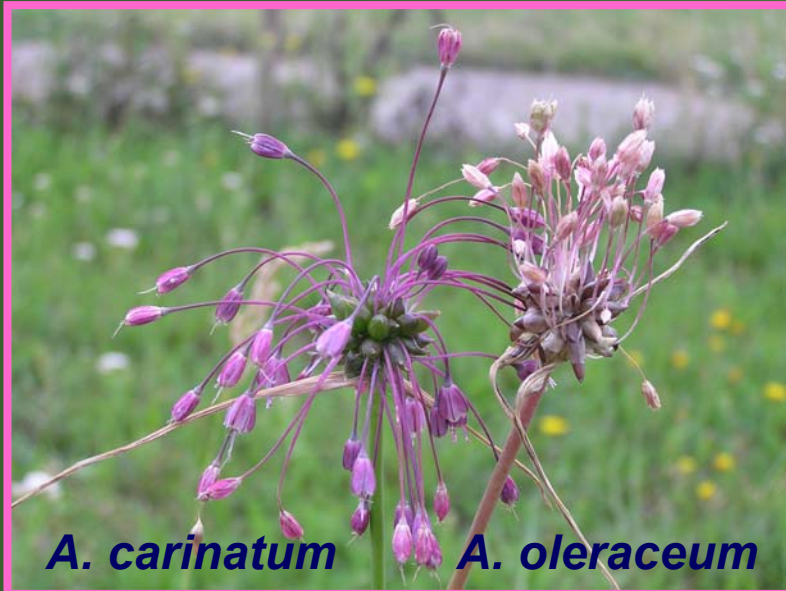


- 12 accessions
- **origin** - natural habitat from near Praha-Zbraslav on Vltava riverbank
- Morphological and caryological studies proved the **presence of plants with white-flowered** and typical violet-flowered forms, and genotypes bearing B-chromosomes
- **The locality** - together with the bordering protected natural area Krňák - **was totally destroyed** during catastrophic flooding in August 2002.
- **The collection can be re-introduced to original habitats and selected genotypes can be used for breeding purposes.**

4. Collections located in Olomouc – Holice, temporarily presented in the Botanical Garden, seed material (bulbils) offered in *Index seminum*

a. wild *Allium* species

A. vineale, *A. carinatum*, *A. oleraceum* – assessment of morphology and phenology in the experimental field



Evaluation of field collection of *Allium oleraceum*

b. *Lactuca* spp.



- about 700 accessions of 17 wild species (some acc. from gene banks and bot. gardens, majority from own collecting)
- study of eco-geography, biodiversity in natural habitats, collecting
- study of taxonomy, morphology, anatomy, karyology, molecular variation
- interaction with lettuce downy and powdery mildews

4. Role of botanic gardens in *ex-situ* conservation of plants

- gene banks (IPGRI) – cultivated plants, crop wild relatives (CRW)
- botanic gardens (BGCI) – wild plant species, (CWR)
- depends upon capacity of botanic garden, technical equipment, staff, financial support
- decision – which part of plant life we can successfully keep
- institutional – national – international (political) decisions, agreements, activities
- elaboration of case studies

Example: *Lactuca* spp.

Initiated by Prof. A. Lebeda in seventies,
developed by team of his co-workers and
students



- genus *Lactuca* – approx. 100 species
- *L. serriola* (IGP), *L. saligna* (IIGP), *L. virosa* (IIIGP) – close to cultivated *L. sativa*
- some are endemiteic
- some are fast spreading weeds

Example 1: Verification of taxonomic status of *Lactuca* spp. kept by world gene banks (EU project GENE-MINE 2001-2004)

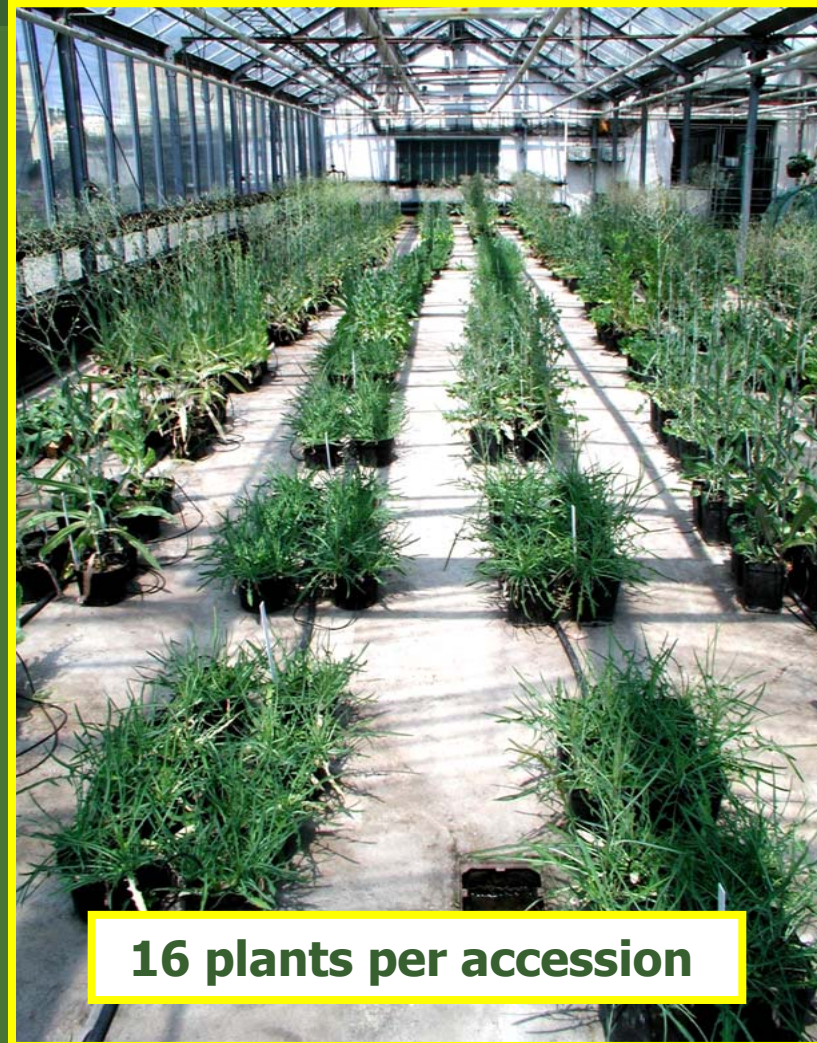
95 accessions provided by gene banks (CZ, GER, GB, NL, USA)

12 species:

L. aculeata, *L. altaica*,
L. dentata, *L. dregeana*,
L. indica, *L. livida*, *L. perennis*,
L. quercina, *L. saligna*,
L. serriola, *L. tatarica*,
L. virosa

Morphological assessment:

- descriptor list
- continuously at different developmental stages
- visually, photodocumentation
- scanning



16 plants per accession

Results

Correct determination of species –
essential for correct interpretation of
other evaluation data (e.g. reaction
to pathogens)

37 accessions re-determined

L. saligna ►
L. serriola f. *serriola* + *L. saligna*



L. dregeana + *L. serriola*
f. *integrifolia*

L. serriola ►
L. serriola f. *integrifolia* + *L. dregeana*

L. serriola ►

dark seeds – mixture of *L. serriola*
f. *serriola* + f. *integrifolia*



light seeds – *L. serriola* f. *serriola*
(x *L. sativa*)



Example 2: Morphological variation within and between 50 wild *L. serriola* populations from the European distribution area (GENE-MINE)

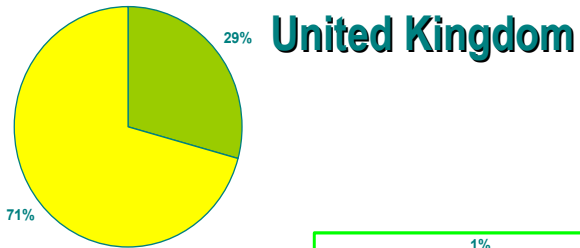
Origin of *L. serriola* samples – countries



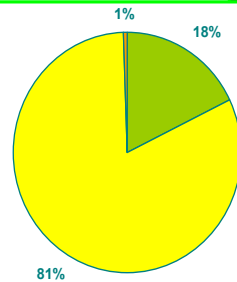
- *L. serriola* polymorphic f. *integrifolia*, f. *serriola*
- ruderal habitats, disturbed soil, fast spreading weed
- source of valuable traits for breeding of cultivated lettuce

CZ 16 50 *L. serriola* populations (16 individuals each) collected
GER 16 775 individual plants grown in field trials,
NL 8 and morphologically described
UK 10

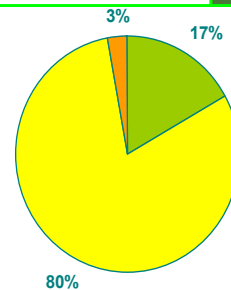
Stem – form of branching, at a stage of full flowering



■ from the base and in upper part ■

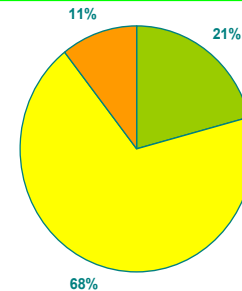


■ from the base and in upper part ■ along the whole stem

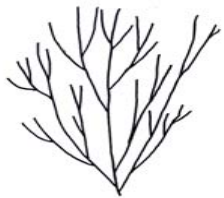


■ from the base and in upper part ■ along the whole stem ■ in the upper part only

Germany



■ from the base and in upper part ■ along the whole stem ■ in the upper part only



from the base and
in the upper part

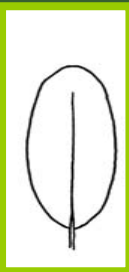


along the whole
stem



in the upper part
only

Divided cauline leaf – depth of incisions (fully developed leaf from the middle part of stem at a stage of full flowering)



entire



pinnatilobed



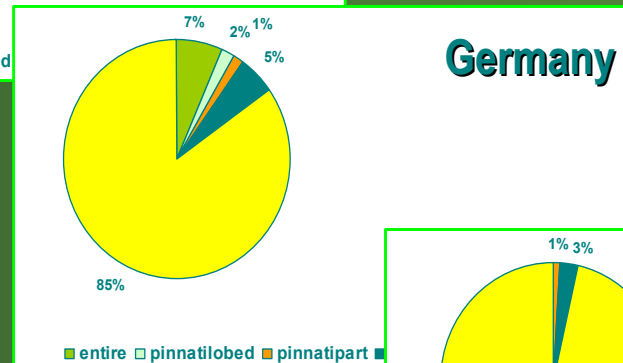
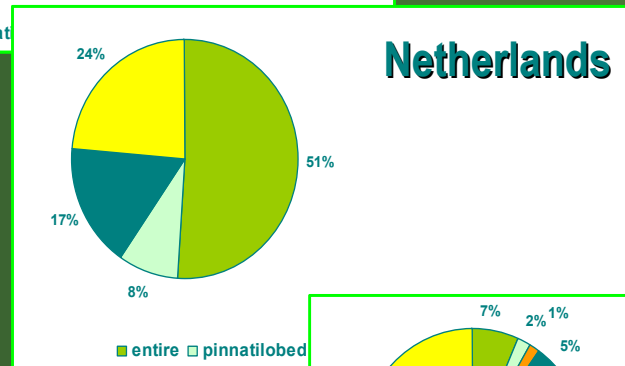
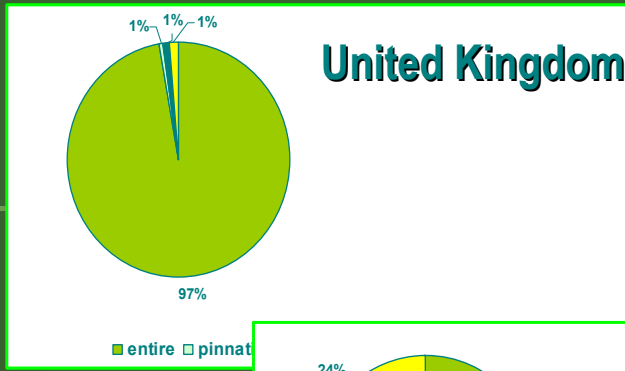
pinnatipart



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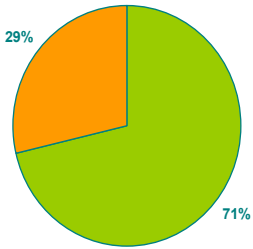


pinnatisect



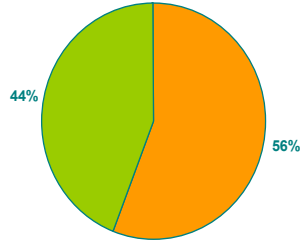
Inflorescence of heads – type (at a stage of full flowering)

United Kingdom



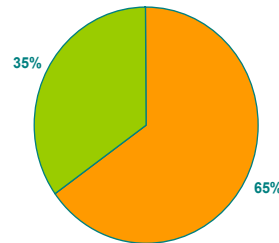
■ corymbose panicle ■ pyramidal p

Netherlands



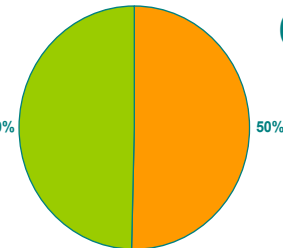
■ corymbose panicle ■ pyra

Germany

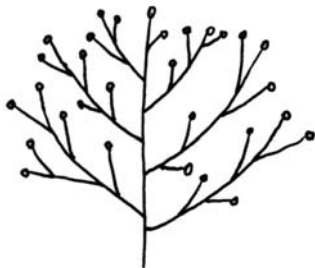
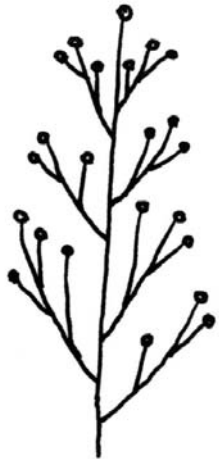


■ corymbose panicle ■ py

Czech Republic



■ corymbose panicle ■ pyramidal panicle



pyramidal panicle corymbose panicle

- expression of the majority of characters seems to be related to the country of origin of *L. serriola* samples
- morphological variation observed also within populations

Example 3: Morphological variation in *Lactuca saligna* from Italy and France

Lactuca saligna L. – secondary gene pool of *Lactuca sativa*

polymorphic:

L. saligna var. *runcinata* – pinnatilobed to pinnatisect leaves

L. saligna var. *saligna* – entire leaves:

- f. *saligna* – with spines

- f. *wallrothii* – without spines (V. Feráková)

74 seed samples from 28 locations in Italy and France

morphological assessment in greenhouse – 36 traits, photodocumentation



Results

- 8 not germinating
- 20 *L. serriola*
- 46 *L. saligna*



phenotypic expression of morphological traits - examples:

low level of variation:

- type of composed inflorescence (spike-like panicle of heads)
- type of branching (from the base and along the whole main stem)
- colour of stamen tube (dark brown, exceptionally light brown)

medium level of variation:

- colour of ligules (pale yellow)

high level of variation:

- shape of leaves (rosette, cauline)
- presence, quality, density of trichomes on the midrib (on cauline leaf)

for more exact conclusions – we need to assess plants from broader area of distribution

Conclusion from Examples 2 and 3

**Knowledge of morphological
variation within and between
populations should serve a base
for our decision :**

- **where collect**
- **what collect**
- **how much collect**

Concluding remark

role of botanic gardens in
ex-situ plant conservation
also in study of CWR



**We thank you for
your kind attention**