

Polyploid cytotypes of *Senecio jacobaea* in Central and Eastern Europe



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Senecio jacobaea

- **distribution:** Eurasia, introduced to America, South Africa, Australia and New Zealand
- **morphology:** biennial (perennial) herb, basal leaves lyrate-pinnatifid, withered at anthesis, marginal achenes usually glabrous, inner achenes densely hairy
- **classification:** *Senecio* sect. *Jacobaea* (most recently a separate genus *Jacobaea*) - an Eurasian group of 26 species
- **taxonomy:** two subspecies recognized:
 - **subsp. *jacobaea*:** ray florets present; widespread throughout Eurasia
 - **subsp. *dunensis*:** ray florets absent; coasts of North and Baltic Sea
- **cytology:** four cytotypes reported (Fig. 1):
 - **2n = 4x = 40:** the most common ones (Fig. 2)
 - **2n = 8x = 80:** records from Pannonian Basin and adjacent areas, Podillya highlands (Fig. 3, 4)
 - **2n = 2x = 20:** one record from Bulgaria
 - **2n = 32:** one record from Ireland

Research questions

- ? Are the individual cytotypes morphologically differentiated?
- ? If so, which morphological characters contribute to their differentiation?

Sampling & Methods

- **study area:** Pannonian Basin and adjacent areas (Czech Republic, Austria, Slovakia, Hungary, Ukraine, Romania) and Podillya highlands (Ukraine) (Fig. 5)
- **material sampled:** *Senecio jacobaea* subsp. *jacobaea* (56 populations; 470 individuals)
- **methods:** karyology (chromosome counting, flow cytometric estimates of ploidy levels), morphometrics (6 floral characters)
- **characters evaluated:** length of bracts, length and width of ray florets, number and length of tubular florets, indument of outer achenes



Fig. 2, 3, 4. Tetraploid (left), and octoploid (middle, right) plants of *S. jacobaea* subsp. *jacobaea* from Podillya highlands (Ukraine).

Results

- **two groupings** in principal component analysis of populations (Fig. 6): (1) Pannonian tetraploid and octoploid populations and tetraploids from Podillya, (2) octoploids from Podillya;
- differentiation evident at the population level; blurred at the level of individuals (Fig. 6);
- octoploids from Podillya differentiated by larger capitula (more tubular florets, larger bracts, ray florets and tubular florets) (Fig. 2, 3, 7);
- octoploids from Pannonia and Podillya differentiated from tetraploids by more hairy outer achenes (Fig. 8)

Conclusions & future perspectives

- ✓ octoploid plants from Podillya morphologically differentiated from Pannonian tetraploid and octoploid populations and also from tetraploids from Podillya

→ **future perspectives:** to clarify the origin [monophyletic or polyphyletic (multiple)] and taxonomic placement of the octoploid plants on the basis of molecular (AFLP) markers

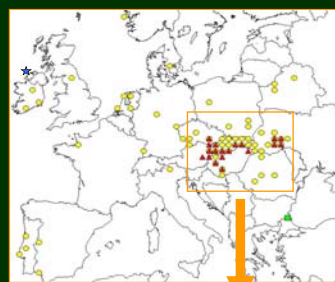


Fig. 1. Distribution map of previously published data on chromosome numbers in *S. jacobaea* in Europe: 2n = 40 (yellow circles), 2n = 80 (red triangles), 2n = 20 (green square) and 2n = 32 (blue star).

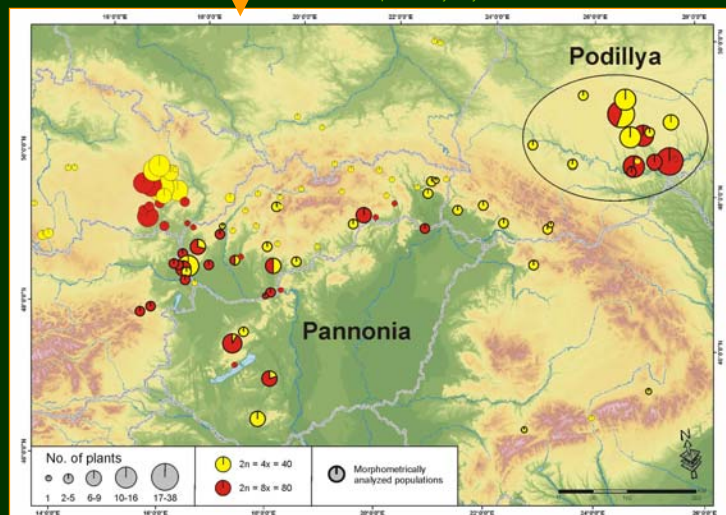


Fig. 5. Distribution map of cytologically and morphologically investigated populations of *S. jacobaea* in Pannonia, Podillya and adjacent areas. Pie diagrams represent the proportion of tetraploid (yellow) and octoploid (red) plants in each population. Sizes of the diagrams are equal to the population sample sizes. Bold marked pie diagrams – populations with morphometrically analyzed individuals.

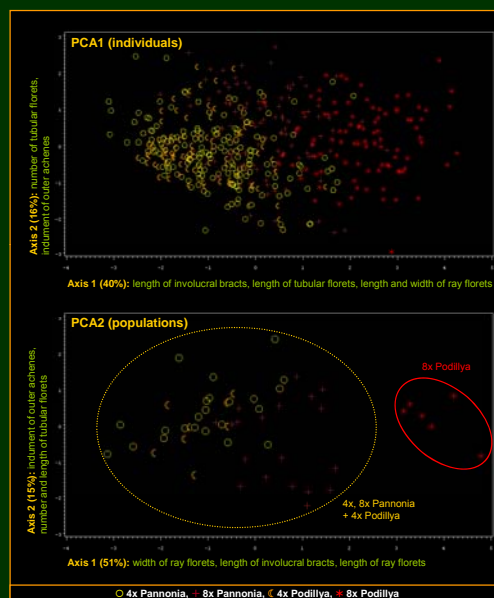


Fig. 6. Principal component analysis of 470 individuals (PCA1) and 56 populations (PCA2) of *S. jacobaea* subsp. *jacobaea* based on 6 characters.

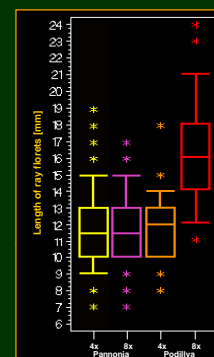


Fig. 7. Variation in length of ray florets. Rectangles: 25 and 75 percentiles; horizontal lines: median; whiskers: 10 and 90 percentiles; asterisks: extreme values.

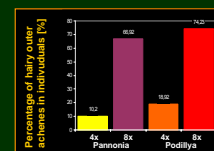


Fig. 8. Variation in indument of outer achenes.