

Karyological studies in *Parnassia palustris* L.

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The purpose of the present study was to give a contribution to the knowledge of the chromosome number of *Parnassia palustris* L., a species widely distributed in Poland.

T a b l e 1

| No | Habitats | North Latitude ca. |
|----|---|-----------------------|
| | Tatra Mts.: | 49°10'—49°18' |
| 1 | Kominy Tylkowe (c. 1.820 m o. s. l.) | |
| 2 | Kościeliska Valley: way to Grota Mylina (c. 930 m o. s. l.) | |
| 3 | Mała Łąka Valley (c. 930 m o. s. l.) | |
| 5 | Valley of Biały (c. 930 m o. s. l.) | |
| 7 | Lejowa Valley (c. 1.100 m o. s. l.) | |
| 11 | Wielicka Valley (c. 1.750 m o. s. l.) (coll. Z. Radwańska-Paryska) | |
| 16 | Kuźnice (c. 1.000 m o. s. l.) | |
| 19 | Ludźmierz, near Nowy Targ (coll. I. Kucowa) | 49°28' |
| 17 | Maków Podhalański; near the way to Kamienna Góra | 49°43' |
| 18 | Maków Podhalański; Kamienna Góra | 49°43' |
| 13 | Łańcut | 50°6' |
| 14 | Kudowa (coll. K. Satczek) | 50°26' |
| 15 | Zgierz near Łódź | 51°50' |
| 20 | Border of the Lake Tomickie near Poznań (coll. T. Michalski) | 52°25' |
| 22 | Vicinity of Gdańsk (coll. W. Fengler) | 54°22' |

Cytological studies done hitherto on *P. palustris* L. s. l. have led to establish for this collective species two chromosome numbers: the

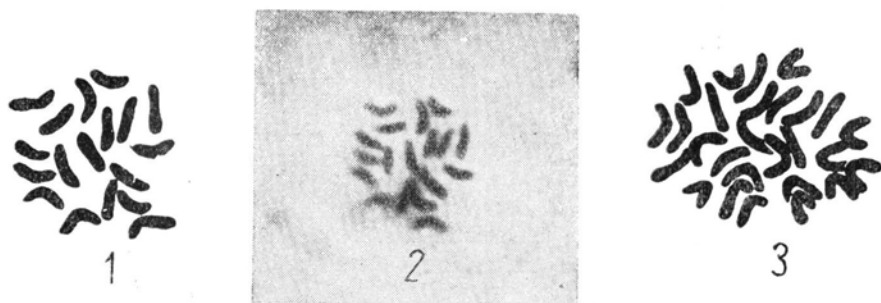
diploid — $2n = 18$ and the tetraploid one — $2n = 36$. Rozanova (1940, cited from Löve 1951; 1946) and Löve (1950, 1951) expressed the opinion, that the diploid number is typical of *P. palustris* L. s. str. whereas the tetraploid should be assigned to a separate species *Parnassia obtusiflora* Rupr.

According to Erlandsson (1942) and Löve (1950) the diploids have a more southern distribution than the tetraploids; the diploids are mainly Eurasian, on the other hand all tetraploid forms are circumpolar (maps in Löve, 1950).

Thus, it could be anticipated that in the flora of Poland only diploid biotypes of *P. palustris* L. will be found. It should be added that hitherto the cytology of the Polish representatives of *P. palustris* was not studied. The determination of the karyological type of plants from Poland permit to verify the results of the above authors.

The results obtained in the course of the present work are based on materials originating from 15 natural habitats ranging from the Tatra Mts. in the south to the Baltic coast in the north (Table 1).

The somatic chromosome numbers have been established on metaphase plates in root tips. The material was fixed in the Navashin fixative. Paraffin sections 10μ thick were stained with Newton's gentian violet.



Figs 1—3. *Parnassia palustris* L.: somatic metaphases in root tips. Figs 1, 2. — $2n = 18$; Fig. 3 — $2n = 27$ (the magnification of the drawings 3.500 \times ; the magnification of the microphoto 2.500 \times).

Plants from all habitats enumerated in Table 1 proved to be diploid; they had 18 somatic chromosomes (Figs. 1, 2). In one habitat only (No 17) in addition to diploid plants a single triploid individual with the somatic number $2n = 27$ has been found (Fig. 3).

The first exact determination of the chromosome number of *Parnassia palustris* was done by Matsura and Sutô (1935, cited from Erlandsson 1942); These authors found in root tips of *P. palustris* var. *multisetata* Ledeb. from Mt Zawô in Japan, $2n = 18$. The haploid

number $n = 10$ given previously by P a c e (1912) has not been confirmed by other authors.

R o z a n o v a (l. c.) has established in Russia the occurrence of diploid and tetraploid types of *P. palustris*. The former originated from Central Russia; the latter was found in Arctic Russia on the Island of Kolgujef and was assigned by R o z a n o v a to the species *P. obtusiflora* R u p r.

Cytological and phytogeographical studies of E r l a n d s s o n (l. c.) deal with *P. palustris* L. and its Scandinavian var. *tenuis* W h l b g. The ample material studied by this author originated from Scandinavia and Denmark. According to the results obtained, in Denmark only the diploid type of *P. palustris* seems to exist. In Scandinavia *P. palustris* f. *typica* is differentiated into two chromosomal types: one is diploid ($2n = 18$) the other is tetraploid ($2n = 36$). It should be added that the two varieties: var. *tenuis* and var. *rosea* are likewise tetraploid. E r l a n d s s o n found also two plants with deviating chromosome numbers: a triploid — $2n = 27$ and a hexaploid — $2n = 54$. According to this author (map of distribution, Fig. 8) the two karyotypes of *P. palustris* f. *typica* show differences concerning their areas of distribution; the diploids have a predominant southern distribution; the tetraploids a rather northern one. The latter seem to extend southwards only to the highland of Småland. Var. *tenuis* occurs partly in the Scandinavian mountains, and on the coast of the Arctic Ocean, partly on sea shores on the coast of the Gulf of Bothnia. The author mentions also that the diploids and tetraploids of *P. palustris* f. *typica*, as well as var. *tenuis*, represent with regard to their morphology three separate groups.

L ö v e and L ö v e (1944) report the occurrence in Sweden (Pajala, Norbotten) of the tetraploid type of *P. palustris* L. (s. lat.). Their later studies have shown that in Iceland this is the only existing type (L ö v e, 1950; L ö v e and L ö v e, 1951). L ö v e (1950, pp. 40—44) summarized the results of previous cytological and phytogeographical studies on *P. palustris* L. (s. lat.). His further investigations were undertaken in order to clear the problem of the general distribution of the two karyotypes of this species and to give their taxonomical interpretation. Studies performed by this author on herbarium material were based on taxonomical works of F e r n a l d (1937, cited from L ö v e, 1950) and H u l t é n (1945). They led him to establish, that all tetraploid forms are circumpolar, while the diploids are mainly Eurasian, although they are found also on the coast of the Bering Sea region of Alaska (maps: Fig. 10, 11).

On the basis of karyological, morphological and phytogeographical differences existing between the two karyotypes of *P. palustris* L. s. lat.

L ö v e expresses the opinion that only its diploid strains represent the true Linnaean species *P. palustris* L. s. str. on the other hand the tetraploids should be assigned to a separate species *P. obtusiflora* R u p r. (L ö v e 1950, 1951). This opinion is in accordance with that of R o z a n o v a (l. c.). In connection with these considerations L ö v e gives some taxonomical data concerning these two species (1950, pp. 43, 44): „*Parnassia palustris* L. em. L ö v e = the diploid Eurasian type as described by F e r n a l d (1937, p. 311) under the name of *P. palustris* (typical). Locus class: „Habitat in Europae uliginosis“. Distribution map in Fig. 11. *Parnassia obtusiflora* R u p r. em. L ö v e = the tetraploid circumpolar type (cf. R u p r e c h t, 1845, p. 23), as closely described by F e r n a l d (1937, p. 311) under the name of *P. palustris* var. *neogaea* F e r n., including also *P. palustris* var. *tenuis* of W a h l e n b e r g (1812) Locus class.: Kolgufef, Arctic Russia, Distribution map in Fig. 10). Cf this latter species two subspecies have to be set up, viz.: *P. obtusiflora* ssp. *typica* L ö v e ssp. *nova* (= *P. palustris* var. *neogaea* F e r n a l d, 1937, p. 311, sensu stricto) and ssp. *tenuis* (W g.) L ö v e ssp. *nova* (based on *P. palustris* var. *tenuis* W a h l e n b e r g, 1812, p. 74).“

In accordance with the above results of L ö v e, H a m e l (1953) established the occurrence of the diploid type — $2n = 18$ in plants of *P. palustris* L. em. L ö v e originating from the Maritime Alps and from Samoens.

Likewise the results obtained in the course of the present study give a further confirmation concerning the general distribution of the diploid species *P. palustris* L. established by L ö v e (l. c.).

SUMMARY

Cytological studies done hitherto on *Parnassia palustris* L. s. lato have led to establish for this collective species two chromosome numbers: the diploid — $2n = 18$ and the tetraploid — $2n = 36$.

In the flora of Poland *P. palustris* is represented only by the diploid karyotype ($2n = 18$), in accordance with the general distribution of the diploid species *P. palustris* L. em. L ö v e.

Diploid forms of *P. palustris* s. lato are mainly Eurasian while all tetraploid forms are circumpolar (R o z a n o v a 1940, 1946; L ö v e 1950, 1951).

According to the opinion of R o z a n o v a (l. c.) and L ö v e (l. c.) only the diploid strains represent the true Linnaean species *P. palustris* L. s. str. On the other hand the tetraploids should be assigned to a separate species *P. obtusiflora* R u p r.

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