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KARYOLOGICAL ANALYSES OF THE ALPINE-DINARIC POPULATIONS OF THE GENUS *IRIS* L., *PALLIDAE* SERIES (A. KERN.) TRINAJSTIĆ *(IRIDACEAE)*

Karyologische Analyse der alpisch-dinarischen Populationen der Gattung *Iris* L., *Pallidae* Serie (A. KERN.) TRINAJSTIĆ *(Iridaceae)*

by

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Key words: Genus *Iris* L., series *Pallidae* (A. KERN.) TRINAJSTIĆ, Alpine-Dinaric populations, Karyological analyses.

Schlagwörter: Gattung *Iris* L., Serie *Pallidae* (A. KERN.) TRINAJSTIĆ, Alpisch-dinarische Populationen, Karyologische Analysen.

Summary:

The karyology of somatic chromosomes of the Alpine-Dinaric and cultivated populations of the genus *Iris*, *Pallidae* series (species *I. cengialti*, *I. illyrica* i *I. pseudopallida* and cultivated species *I. pallida)* was analysed. For all the populations analysed, except the population of Stara Baška, the mitotic number of chromosomes 2n=24 has been established. In the population of Stara Baška, in two plants, the mitotic number of chromosomes 2n=22 was found. Karyotypes of all species, except the clones of cultivated *I. pallida* specimens, showed an inter-population variability. Chromosome morphology similarities between some populations of the *Pallidae* series indicates their common origin and relatively great number of symmetrical chromosomes suggest that the speciation process within the series is not complete. The existence of

genomorphological plasticity justified the possibility of the appearance of hybrids within series (perhaps population of Stara Baška).

Zusammenfassung: Die karyologische Analysen der somatischen Chromosomen von dinarischen und kultivierten Populationen aus der Gattung *Iris*, Serie *Pallidae* (Arten *I. cengialti*, *I. illyrica* *I. pseudopallida* und kultivierte Art *I. pallida)* sind untersucht worden. Für die gesamten analysierte Populationen, außer der Population aus Stara Baška, konnte festgestellt werden, dass die mitotische Chromosomenzahl 2n=24 war. 2n=22 war die herausgefundene Chromosomenzahl in zwei Pflanzen aus der Population Stara Baška. Die Karyotypen aller Arten, außer den Klonen von kultivierten *I. pallida* Exemplaren, zeigten eine Interpopulationsvariabilität. Die chromosomenmorphologischen Ähnlichkeiten zwischen einigen *Pallidae*-Series Populationen indizieren ihre gemeinsame Abstammung, und die verhältnismäßig große Zahl der symmetrischen Chromosomen zeigen, dass der Artenentstehungsprozess innerhalb dieser Serie noch nicht vollendet ist. Durch das Vorhandensein der genomorphologischen Plastizität ist die Hybridenerscheinungsmöglichkeit innerhalb der Serie belegt worden.

Introduction

Alpine-Dinaric populations of the *Iris pallida* Lam. (LAMARCK, 1789) complex, are characterised in the first place by their dryskinned spathe (AMBROSI, 1854; KERNER, 1871; PAMPANINI, 1908, 1909; TRINAJSTIĆ, 1976; WARBER, 1998, 1999). Because of the morphological variability of these populations, taxonomic problems are related to the justifiability of attributing specific or sub-specific status to individual population groups. Some authors have admitted to this complex only one, cultivated and more or less naturalised, species, *I. pallida* LAM., with two subspecies - the typical subspecies *pallida* and the subspecies *cengialti* (AMBR.) FORSTER (HEGI & DUNZINGER, 1909; RANDOLPH & RECHINGER, 1954; EHRENDORFER, 1973; WEBB & CHATER, 1980; MATHEW, 1981). Others have described numerous endemic species of dryskinned spathe irises in the Alpine-Dinaric area (RAC & LOVRIĆ, 1990). Some authors thought that in this area the *I. pallida* complex is represent by two kindred and variable species *I. pallida* and *I. cengialti* (PAMPANINI, 1909; DYKES, 1913; HAYEK, 1933; MAYER, 1952; PIGNATTI, 1982), while other researchers into the flora of Croatia and other regions considered that in the northern part of the Adriatic coast another endemic species exists - *I. illyrica* (TOMMASINI, 1875; ROSSI, 1930; DEGEN, 1936; HORVATIĆ, 1963; SUŠNIK, 1984; SCHULZE, 1988; DOMAC, 1994; VOLARIĆ-MRŠIĆ, 1994; SCORTEGAGNA et al., 1996; TRPIN & VREŠ, 1995).

The irises of the southern part of the Adriatic coast are most frequently named *I. pallida* (RADIĆ, 1976; 1977; HEĆIMOVIĆ, 1981; HEĆIMOVIĆ, 1982; HEĆIMOVIĆ & HEĆIMOVIĆ 1989; DOMAC, 1994) or lower taxonomic categories (ASCHERSON & GRAEBNER, 1898, 1899, 1906; PAMPANINI, 1908, 1909; HAYEK,

1933; KÖHLEIN, 1981; MATHEW, 1981) or *I. illyrica* (RADIĆ, 1974, 1976; VOLARIĆ-MRŠIĆ, 1994). Those irises were distinguished by TRINAJSTIĆ (1976) from the horticultural species *I. pallida* and other taxa with dryskinned spathes; he described them as a new endemic species named *I. pseudopallida* (PAMP.) TRINAJSTIĆ.

KERNER (1871) was the first to suggest that Alpine-Dinaric and cultivated species of the *I. pallida* complex can be put together in a circle of kinship that he called the "*Pallidae* group" For a longer time those irises were placed into the *Elatae* series (LAWRENCE, 1953). TRINAJSTIĆ (1976, 1983) was the first to put them into the separate *Pallidae* series (A. KERN.) TRINAJSTIĆ, with four species: *I. pallida* LAM., distinguished as a horticultural species, *I. cengialti* AMBR. - endemic in the Alpine region, *I. illyrica* TOMM. - endemic to the northern Croatian Littoral and the Dinaric mountains and *I. pseudopallida* TRINAJSTIĆ - endemic to the southern Croatian Littoral.

The cited descriptions of different numbers of taxa of the *I. pallida* complex point to the possibility of the recent differentiation of the *Pallidae* series in the Alpine-Dinaric region, which it was attempted to clarify with the help of morphological, karyological and statistical methods. Results to date have contributed to the opinion about the existence of four species within the *Pallidae* series (MITIĆ & PAVLETIĆ, 1995; SCORTEGAGNA et al., 1996; MITIĆ & PAVLETIĆ, 1999; MITIĆ et al., 1999).

In this research we try to explain karyological features and relationships within the Alpine-Dinaric complex of the *Pallidae* series, with the intention to completing the results of morphological analyses (MITIĆ & PAVLETIĆ, 1999; MITIĆ et al., 1999).

Cytological data have also a great role in the taxonomy of the Genus *Iris* and *Pallidae* series (SIMONET, 1934; MITRA, 1956; MITRA & RANDOLPH, 1959; RANDOLPH & MITRA, 1959; LAUSI, 1964; RICCI, 1970/71; RICCI & COLASANTE, 1974; MAUGINI & BINI MALECI, 1976; BINI MALECI & MAUGINI, 1977; TRINAJSTIĆ & LOVAŠEN-EBERHARDT, 1977; SAUER & LEEP, 1979; SAUER & STEGMEIER, 1979; TRINAJSTIĆ et al., 1980; MITIĆ, 1991; etc.). Hitherto, information from karyological analyses of the taxa of the "*I. pallida* s. l. complex" and from cytological atlases have shown that the chromosome numbers in all cases were 2n=24 (SIMONET, 1934; DARLINGTON & WYLIE, 1955; MITRA, 1956; SUŠNIK, 1962; LAUSI, 1964; BOLKHOVSKIKH et al., 1969; LÖVE & LÖVE, 1974; MITIĆ, 1991; SCORTEGAGNA et al., 1996; MITIĆ & PAVLETIĆ, in press).

Material and Methods

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Twenty-one Alpine-Dinaric populations were sampled (Tab. 1), as well as four control populations of the species *I. pallida* of horticultural origin (Bled, Samobor, Zagreb-Dubrava, Zagreb-Zrinjevac, see Tab. 1), by collecting one to eight specimens for karyological analysis. The samples were collected in the 1992-1997 period, during the flowering time.

Table 1: The populations sampled: name of locality; co-ordinates: Latitude (N) and Longitude (E); no. spec. number of specimens karyologicaly analysed.

Locality (mark)	Latitude (N)	Longitude (E)	no. spec.
Biokovo	43° 17' 18"	17° 03' 22"	5
Bled (cult.)	46° 21' 00"	14° 06' 55"	1
Ćičarija	45° 27' 12"	14° 01' 00"	3
Dubrovnik	42° 38' 13"	18° 08' 20"	5
Grobničko polje	45° 22' 13"	14° 28' 48"	5
Kobarid	46° 16' 30"	13° 33' 05"	5
Komarča	46° 17' 47"	13° 47' 40"	4
Konavle	42° 32' 18"	18° 17' 32"	2
Marušići	43° 24' 50"	16° 46' 42"	3
Matulji	45° 21' 50"	14° 20' 05"	3
Meja	45° 17' 40"	14° 36' 38"	2
Omiš	43° 27' 03"	16° 42' 00"	2
Plomin	45° 08' 22"	14° 10' 50"	2
Ribarica	44° 33' 06"	15° 03' 07"	5
Rovereto	45° 45' 30"	11° 40' 00"	3
Samobor (cult.)	45° 48' 05"	15° 43' 30"	5
Senj	44° 49' 00"	14° 44' 59"	5
Stara Baška	44° 57' 26"	14° 41' 37"	8
Starigrad	44° 46' 07"	14° 54' 00"	5
Trstenik	42° 55' 03"	17° 24' 58"	2
Velika Paklenica	44° 18' 08"	15° 28' 47"	5
Vrulje	43° 24' 10"	16° 53' 12"	4
Zagreb-Dubrava (cult.)	45° 49' 55"	16° 03' 30"	5
Zagreb-Zrinjevac (cult.)	45° 53' 42"	16° 03' 00"	5
Žrnovnica	45° 06' 35"	14° 51' 00"	5

A study of somatic chromosome morphology was made using the root-tip squash technique and aceto-carmine staining, after pre-treatment

with p-dichlorbenzen. The most satisfactory procedure was found to be 3 hours pre-treatment in p-dichlorbenzen at 4°C. Slides were made permanent by first removing the cover glass with the freezing technique (CO_2) and mounting the material in Canada balsam. Morphometric characteristics of chromosomes were worked out based on the analysis of five to ten metaphase plates (according to RAFFINSKI & PASSAKAS, 1976; SAUER & LEEP, 1979). For each population and for each chromosome pair the following parameters were estimated: arithmetical mean of absolute chromosome length (μm), arithmetical mean of absolute length of longer chromosome arm (μm), arithmetical mean of absolute length of shorter arm (μm), relative length (%), arm ratio and centromere position (M-metacentric, SM-submetacentric, ST-subtelocentric chromosome). Photomicrographs were taken for the most successful metaphase plates with microscope OPTON III, and camera lucida drawings of karyotypes were made with the ZEISS apparatus. For idiograms, the homologous chromosomes have been arranged in decreasing order of size.

Results and discussion

For all the populations analysed, except the population of Stara Baška, the mitotic number of chromosomes 2n=24 has been established, which corresponds with previous studies of the somatic chromosomes of the *I. pallida* complex (SIMONET, 1934; MITRA, 1956; SUŠNIK, 1962; LAUSI, 1964; MITIĆ, 1991; SCORTEGAGNA et al., 1996). Also, inter-population variability in chromosome morphology and chromosome heteromorphy for some pairs have been established. In the population of Stara Baška, in two cases, the mitotic number of chromosomes 2n=22 was found.

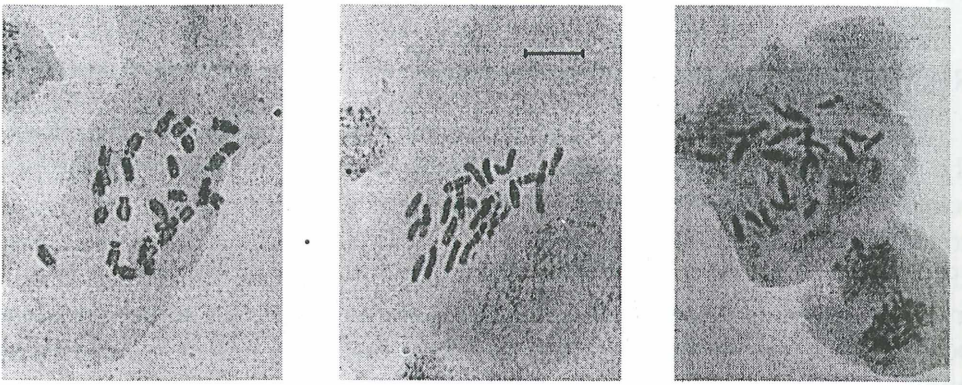
All karyotypes have one metacentric pair of chromosomes (the first pair) and the others are submetacentric or subtelocentric. Karyotypes of all species, except the clones of cultivated *I. pallida* specimens, showed an inter-population variability.

For the species *I. cengialti* inter-population variability in mitotic chromosome morphology, with two groups of idiograms, has been established and worked out in MITIĆ & PAVLETIĆ (in press).

Within the species *I. illyrica,* inter-population variability in chromosome number and morphology was the greatest. All populations, except the population of Stara Baška, have the mitotic number of chromosomes 2n=24, with two groups of karyotypes and idiograms (Figs. 1, 2; Tab. 2). Inter-population variability has been established in a number of chromosome pairs with a satellite. The first group of populations has two chromosome

pairs (the second and the third pair) with satellites. This group included the populations of Ćićarija, Ribarica, Žrnovnica, Senj, Starigrad, Velika Paklenica and Stara Baška (Figs. 1B, 2B; Tab. 2). Their second and fifth pairs are submetantric, as well as the fourth pair in the Ćićarija and Velika Paklenica populations, and the other pairs are subtelocentric (Tab. 2). The second group of the *I. illyrica* populations has three chromosome pairs (the second, the third and the fourth pair) with the satellites. This group included the populations of Plomin, Grobnik, Meja and Matulji (Figs. 1A, 2A; Tab. 2). Their second and fifth pairs are also submetacentric and the others are subtelocentric. Those results correspond with previous karyotype analyses of some populations of the *Pallidae* series (MITIĆ, 1991).

Figure 1: Photomicrographs of somatic chromosomes of the species *I. illyrica*, populations of: A – Plomin, B – Ribarica, C - Stara Baška (– 10 μm).



A B C

Figure 2: Idiograms of somatic chromosomes of the specjes *I. illyrica*, populations of: A – Plomin, B – Ribarica, C – Stara Baška.

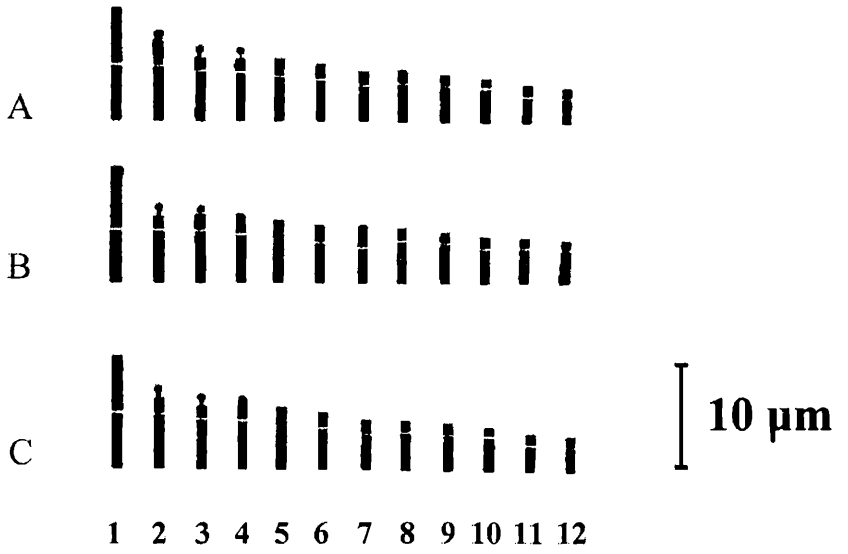


Table 2: Results of chromosome measurements of the *I. illyrica* populations: arm ratio, position of centromere (M-metacentric, SM-submetacentric, ST-subtelocentric chromosome), Chrom. no. the ordinal number of chromosome pair.

Chrom. No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Population												
Ćićarija	1.05	2.68	3.23	2.87	2.61	3.23	3.37	4.07	4.56	3.81	5.11	3.91
	M	SM*	ST*	SM	SM	ST	ST	ST	ST	ST	ST	ST
Plomin	1.01	2.17	3.88	4.50	2.73	3.04	3.33	3.68	4.63	3.64	5.75	4.65
	M	SM*	ST*	ST*	SM	ST	ST	ST	ST	ST	ST	ST
Grobnik	1.02	2.59	3.10	3.13	2.71	3.73	3.96	3.36	4.09	2.93	4.36	5.70
	M	SM*	ST*	ST*	SM	ST	ST	ST	ST	ST	ST	ST
Meja	1.04	2.85	3.68	3.43	2.18	2.66	3.24	3.32	4.41	3.04	3.28	4.21
	M	SM*	ST*	ST*	SM	ST	ST	ST	ST	ST	ST	ST
Matulji	1.06	2.67	3.19	3.19	3.05	3.48	3.82	4.97	3.80	3.40	3.67	3.96
	M	SM*	ST*	ST*	SM	ST	ST	ST	ST	ST	ST	ST
Stara Baška	1.11	2.87	3.16	3.80	2.11	3.43	3.76	4.71	4.09	3.52	3.25	4.76
	M	SM*	ST*	ST	SM	ST	ST	ST	ST	ST	ST	ST
Senj	1.10	2.89	3.17	3.00	1.92	3.35	3.11	3.22	4.18	3.33	4.45	5.17
	M	SM*	ST*	ST	SM	ST	ST	ST	ST	ST	ST	ST
Starigrad	1.08	2.69	3.43	3.09	2.00	2.29	3.10	3.30	4.53	3.40	4.71	4.54
	M	SM*	ST*	ST	SM	ST	ST	ST	ST	ST	ST	ST
Žrnovnica	1.08	2.79	3.16	3.04	2.74	3.06	4.00	2.68	3.67	3.71	3.34	5.78
	M	SM*	ST*	ST	SM	ST	ST	ST	ST	ST	ST	ST
Ribarica	1.02	2.73	3.00	3.18	2.34	3.70	3.89	4.12	3.75	3.31	4.52	5.18
	M	SM*	ST*	ST	SM	ST	ST	ST	ST	ST	ST	ST
Velika Paklenica	1.08	2.92	3.11	2.93	2.85	3.18	3.21	3.78	4.07	3.46	4.23	4.76
	M	SM*	ST*	SM	SM	ST	ST	ST	ST	ST	ST	ST

*- chromosome pairs with satellites

Within the population of Stara Baška, two specimens had the mitotic number of chromosomes 2n=22, while the others were 2n=24 (Fig. 1C; Tab. 2, 3).

Table 3: Results of chromosome measurements of the *I. illyrica*, population of Stara Baška: relative length of chromosomes (RL), arm ratio (AR), position of centromere (PC: M-metacentric, SM-submetacentric, ST-subtelocentric), Chrom. no. the ordinal number of chromosome pair.

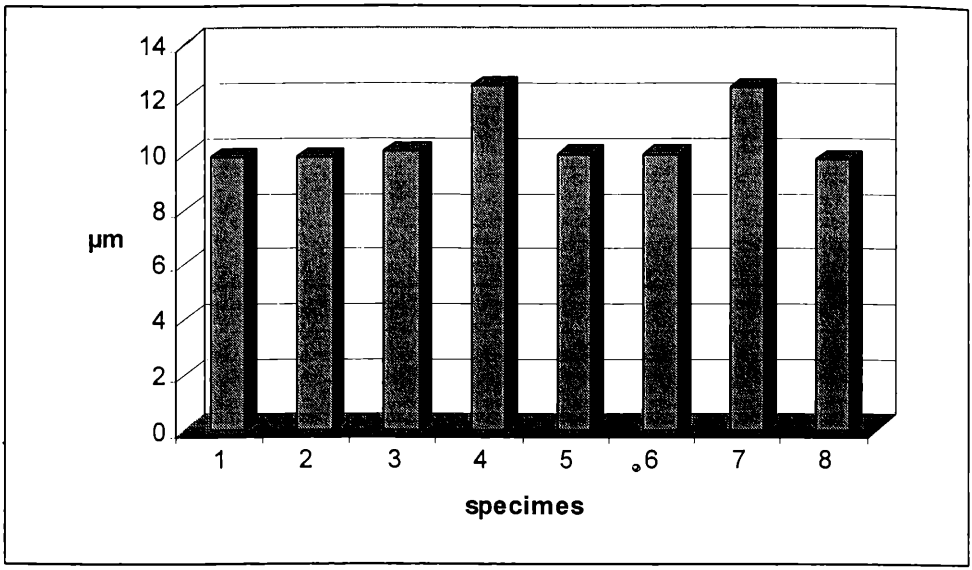
Chrom. No.		1	2	3	4	5	6	7	8	9	10	11	12
Samples with (2n=24)	RL	9.95	7.68	6.67	6.37	6.08	5.23	5.03	4.40	4.68	4.07	3.83	3.17
	AR	1.11	2.87	3.16	3.80	2.11	3.43	3.76	4.71	4.09	3.52	3.25	4.76
	CP	M	SM*	ST*	ST	SM	ST	ST	ST	ST	ST	ST	ST
Samples with (2n=22)	RL	12.45	7.75	6.65	6.30	5.60	5.20	5.05		4.65	4.06	3.90	3.50
	AR		2.54	3.05	3.08	2.06	2.58	3.13		4.11	4.40	3.65	3.60
	CP		SM*	ST*	ST	SM	SM	ST		ST	ST	ST	ST

*- chromosome pairs with satellites

"Normal" idiograms (2n=24) showed similarities with the idiograms of the Ribarica population (Fig. 2B, C), with the populations of the species *I. cengialti* (MITIĆ & PAVLETIĆ, in press) and with the idiograms of the populations of the species *I. pseudopallida* from the northwest part of their area of distribution, for example MARUŠIĆI (Fig. 5A).

In metaphase plates of 2n=22 plants the first pair of chromosomes was enlarged (Fig. 3), and we could not find the eight chromosome pair (Tab. 3).

Figure 3: *I. illyrica* (population of Stara Baška), relative length of the first chromosome pair for each specimen.



We presume that the eight chromosome pair was broken and one part was connected with the first pair and the other part could be lost (translocation), which can be confirmed by future detailed analysis of meiosis. The same phenomenon of translocation was noted for some other *Iris* species (RANDOLPH & MITRA, 1959). Those translocations could not be lethal (RANDOLPH & MITRA, 1959), because in the case of the Stara Baška population, which exists in very extreme climatic conditions and differs from the other populations in its morphology (cf. MITIĆ & PAVLETIĆ, 1999; MITIĆ et al., 1999), it could means the beginning of their speciation.

For all populations of *I. pseudopallida* two groups of karyotypes (Fig. 4) and idiograms (Fig. 5) have been established. On the border of the range (the populations of Omiš, Marušići and Konavle) specimens with two satellite chromosome pairs, on the second and third submetacentric chromosome pairs, were dominant. In the populations of Omiš and Marušići we found five (second to fifth and eighth pair) and in Konavle six (second to fifth, seventh and eight pair) submetacentric chromosome pairs. The other pairs were subtelocentric. In the central part of the range (the populations of Vrulje, Biokovo, Trstenik and Dubrovnik) we found karyotypes with three chromosome pairs with a satellite (on the second, third and fifth submetacentric pairs). Six chromosome pairs are submetacentric (second to fifth, seventh and eight pair) and the others are subtelocentric (Tab. 4). In preliminary

karyotype analyses only karyotypes with three chromosome pairs with satellites were found (MITIĆ, 1991).

Figure 4: Photomicrographs of somatic chromosomes of the species *I. pseudopallida,* populations of A – Marušići, B – Trstenik, C – Konavle (– 10 μm).

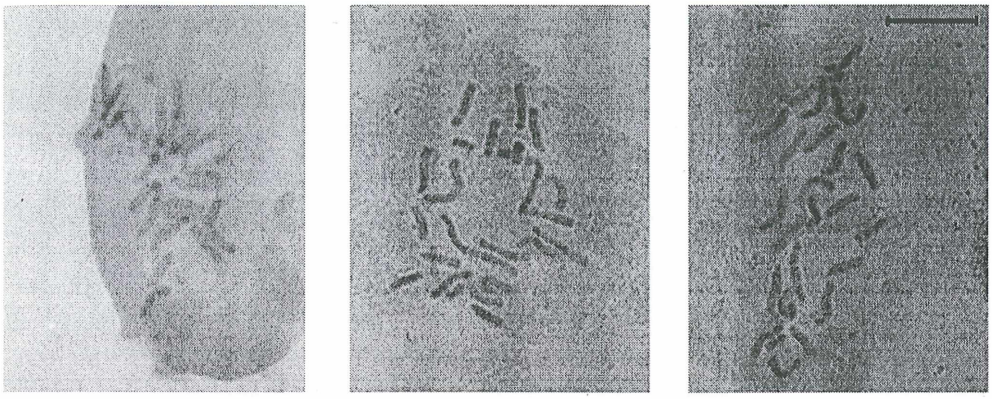


Figure 5: Idiograms of somatic chromosomes of the species *I. pseudopallida,* populations of: A – Marušići, B – Trstenik, C – Konavle.

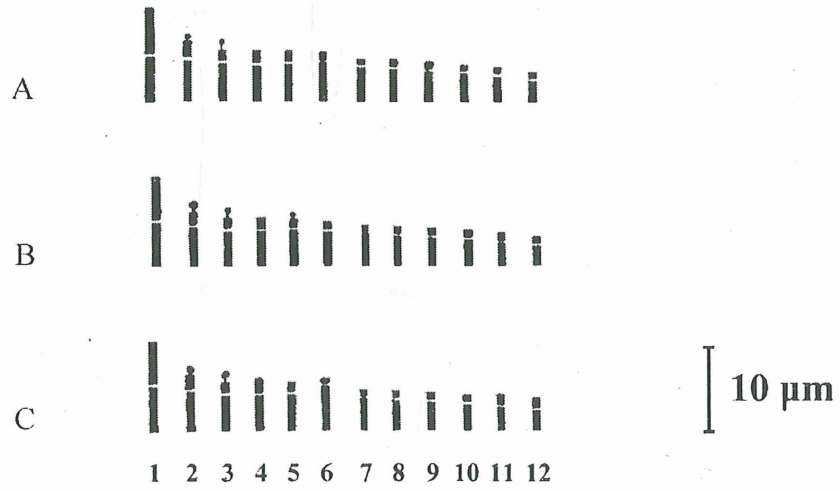


Table 4: Results of chromosome measurements of the *I. pseudopallida* populations: arm ratio, position of centromere (M-metacentric, SM-submetacentric, ST-subtelocentric chromosome), Chrom. no. - the ordinal number of chromosome pair.

Chrom. no.	1	2	3	4	5	6	7	8	9	10	11	12
Population												
Omiš	1.02	2.75	2.45	2.55	2.53	3.51	3.18	2.30	3.44	3.50	4.00	3.06
	M	SM*	SM*	SM	SM	ST	ST	SM	ST	ST	ST	ST
Marušići	1.07	2.90	2.01	2.89	2.42	3.28	3.30	2.79	3.00	3.14	3.08	3.03
	M	SM*	SM*	SM	SM	ST	ST	SM	ST	ST	ST	ST
Vrulje	1.10	1.83	2.38	1.81	2.63	4.19	2.84	2.81	3.81	3.35	3.27	3.52
	M	SM*	SM*	SM	SM*	ST	SM	SM	ST	ST	ST	ST
Biokovo	1.04	1.81	2.59	2.01	2.73	3.57	3.01	3.10	6.56	3.82	3.71	5.75
	M	SM*	SM*	SM	SM*	ST	SM	SM	ST	ST	ST	ST
Trstenik	1.02	2.70	2.18	2.09	2.57	3.16	2.86	3.04	3.07	4.77	3.62	3.48
	M	SM*	SM*	SM	SM*	ST	SM	SM	ST	ST	ST	ST
Dubrovnik	1.03	2.78	2.33	2.05	2.39	3.03	2.59	2.91	4.29	3.81	3.33	3.56
	M	SM*	SM*	SM	SM*	ST	SM	SM	ST	ST	ST	ST
Konavle	1.03	2.78	2.33	2.05	2.39	3.03	2.59	2.91	4.29	3.81	3.33	3.56
	M	SM*	SM*	SM	SM*	ST	SM	SM	ST	ST	ST	ST

*- chromosome pairs with satellites

All horticultural populations of the species *I. pallida* showed a great uniformity of karyotype. They are characterised by one metacentric, four submetacentric (second, third, fifth and sixth pair) and seven subtelocentric pairs of chromosomes. The second submetacentric and the fifth subtelocentric chromosome pairs have satellites (Fig. 6, 7; Tab. 5).

Figure 6: Photomicrograph of somatic chromosomes of the species *I. pallida,* population of Samobor (– 10 μm).

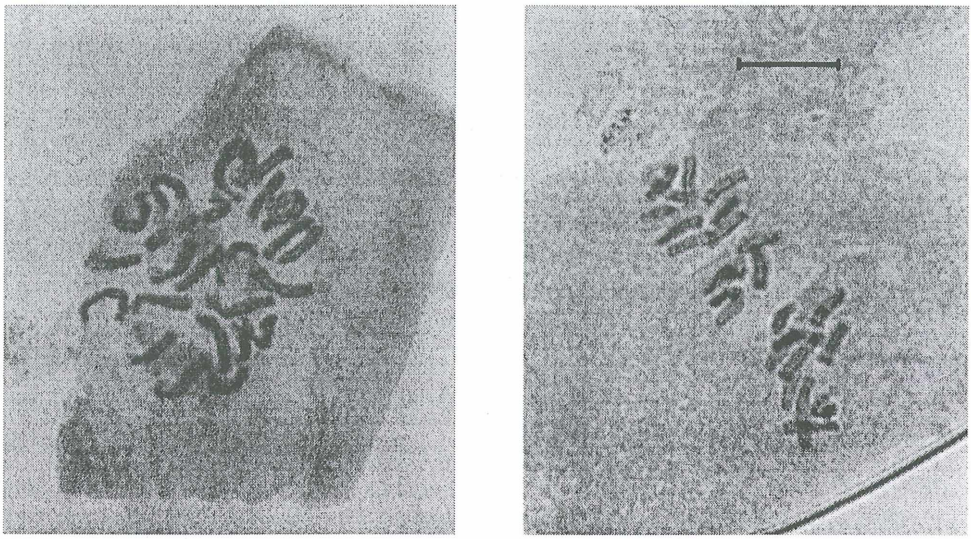


Figure 7: Idiograms of somatic chromosomes of the species *I. pallida,* populations of: A – Zagreb (Dubrava), B – Samobor.

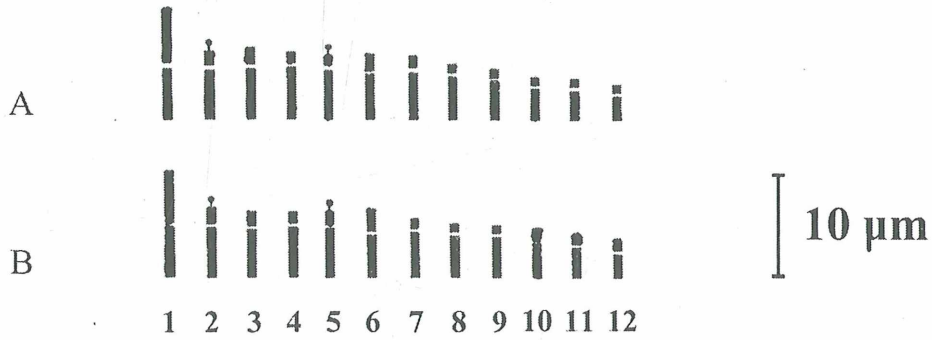


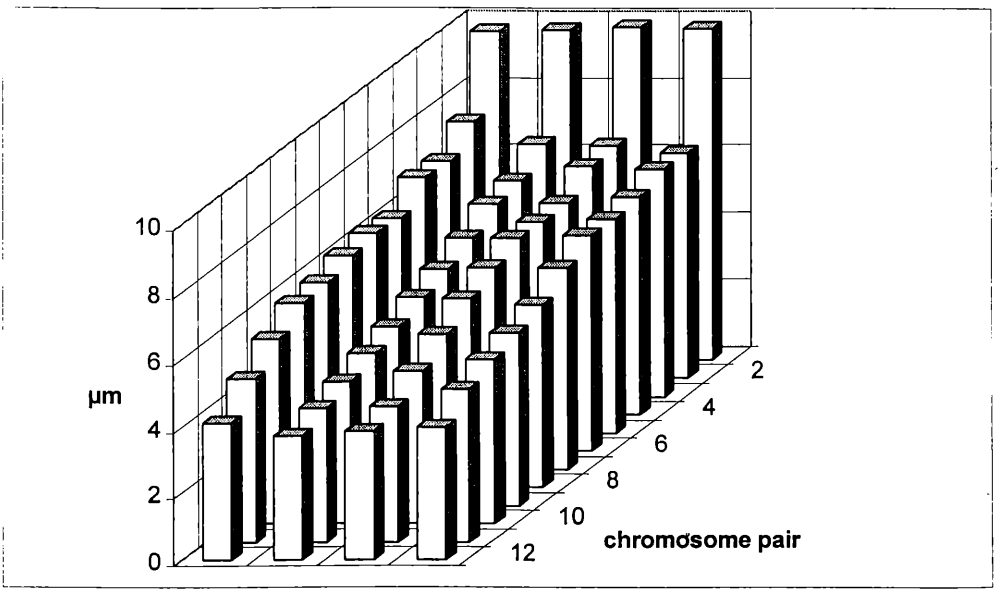
Table 5: Results of chromosome measurements of the *I. pallida* populations: arm ratio, position of centromere, (M-metacentric, SM-submetacentric, ST-subtelocentric chromosome), Chrom. no. - the ordinal number of chromosome pair.

Chrom. No. / Population	1	2	3	4	5	6	7	8	9	10	11	12
Samobor	1.04	2.64	2.71	3.35	2.95	2.29	4.28	5.16	5.91	5.30	4.85	6.48
	M	SM*	SM	ST*	SM	SM	ST	ST	ST	ST	ST	ST
Zagreb (Du)	1.07	2.54	2.97	3.27	2.47	2.13	3.91	5.16	5.73	5.93	5.00	6.92
	M	SM*	SM	ST*	SM	SM	ST	ST	ST	ST	ST	ST
Zagreb (Zrinj.)	1.02	2.54	2.91	3.37	2.93	2.17	3.92	5.6	5.89	6.25	5.11	6.03
	M	SM*	SM	ST*	SM	SM	ST	ST	ST	ST	ST	ST
Bled	1.02	2.85	2.29	3.31	2.9	2.56	4.17	4.79	4.91	5.71	4.98	5.13
	M	SM*	SM	ST*	SM	SM	ST	ST	ST	ST	ST	ST

*- chromosome pairs with satellites

The comparison of the relative lengths of 12 chromosome pairs at the species level confirmed the great similarity of the length of the first and variability of the other chromosome pairs (Fig. 8).

Figure 8: Relationships of the relative lengths of 12 chromosome pairs for species of the *Pallidae* series.



Comparison of all idiograms from this analysis with those shown in former papers about the karyology of the *I. pallida* complex (MITRA, 1956; LAUSI, 1964; MITIĆ, 1991; SCORTEGAGNA et al., 1996), reveals chromosome morphology similarities between some populations of the *Pallidae* series, which indicates their common origin. For example, the idiogram of the Italian population of Cengio Alto (MITIĆ & PAVLETIĆ, in press) resemble the idiograms of the Italian population of Passo di San Uboldo (SCORTEGAGNA et al., 1996) and of *I. illyrica* from the Northwest Adriatic littoral (Fig. 2A), with a very similar fourth satellite chromosome pair. Idiograms of the Slovenian populations (MITIĆ & PAVLETIĆ, in press) resemble those of *I. illyrica* from the Northeast Adriatic littoral (Fig. 2B), as well as the idiogram of the Marušići population *(I. pseudopallida),* (Fig. 5A). Idiograms of the populations from the middle part of the *I. pseudopallida* range (Fig. 5B) resemble those detected by MITRA (1956) for the Ombla population.

All the cultivated populations of the species *I. pallida* from this analyses have idiograms (Fig. 7) that have a lot of similarity both with each other and with the Heinig collection (MITRA, 1956). Those populations have the most stable karyotypes, which is to be expected, because their plants usually reproduce vegetatively. While there is little interchange of genetic material and small chromosomal variability, the indigenous populations have chromosomal variability, the existence of which has been established for different species of the Genus *Iris* (MITRA, 1956; RICCI, 1970/71; RICCI & COLASANTE, 1974; SAUER & LEEP, 1979). The reason for this could be the affinity of large chromosomes for structural mutation (SAUER & LEEP, 1979).

Because genomes with symmetrical karyotypes are considered to be less specialised (SIMONET 1934, MITRA 1956, MITRA & RANDOLPH 1959), and because of the relatively great number of symmetrical chromosomes in the whole *Pallidae* series, we can presume that the speciation process within the series is not complete. Also, the existence of genomorphological plasticity justified the possibility of the appearance of hybrids within *Pallidae* series (perhaps population of Stara Baška).

The results of these analyses are a supplement to the results of morphological research (MITIĆ & PAVLETIĆ, 1999; MITIĆ et al., 1999), and a base for exploration of karyological and molecular relationships within Alpine-Dinaric populations of the *Pallidae* series.

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