

KARYOTYPE AND IDIOGRAM IN *CHELIDONIUM MAJUS* L

ANGELA PAVEL*, MARIA BUTNARU*

Key words: *Chelidonium majus*, karyotype, idiogram.

Abstract: Cytogenetical studies have been concentrated on the karyotype and idiogram making up. All analysed metaphasis cells have revealed $2n=12$ chromosomes, being according to the literature data. *Chelidonium majus* karyotype is made up of five median chromosome pairs and a submedian chromosome pair, being symmetric and primitive. The first chromosome pair is considered a identify marker of this species. The *C.majus* idiogram has included two chromosome clusters which depend of centromere placing and can be synthetized as following: two median chromosome pairs and four chromosome pairs belong to submedian type (one pair of them contains secondary constrictions with satellites).

INTRODUCTION

By other medicinal plants, *Chelidonium majus* species belongs to essential phytotherapeutic plants (1). Probably, it is the motivation for which the most investigations have followed in time, clearing up the pharmaceutical, physiological, and biochemical aspects (alkaloids separation, active substances extraction from drugs), and less the aspects connected to populational, ecological, cytogenetical studies or the cytotaxonomy of this species.

Our researches had followed the establishing of the chromosome typology, the *C.majus* karyotype and idiogram making up, with a view to estimation of evolutive steadiness degree of this plants.

MATERIALS AND METHODS

Vegetable material had been constituted from *C.majus* seeds derived from experimental micropopulation belonging to Botanical Garden - Iași.

Cytogenetical analysis of the root tips had carried out by *Feulgen* method of chromosomes staining in mitosis.

Vegetable material staining had accomplished to *Carr* Reactive (modified carbol-fuchsin) (7).

Microscopic preparations had carried out by squash method (2, 4, 7).

Photographs had performed at immersion objective, with "Zenit" camera, on *Azo-Mureș* black-white film and *Kodak* color type.

Karyotype had carried out corresponding to the methodology described of Dordea and al. (2).

RESULTS AND DISCUSSIONS

The diploid chromosome number in all the root tips has been 12, and basic chromosomal number has been 6.

The karyotype study, made up rely on a single metaphases measurements (Fig. 1), has presented chromosomes with a enough different morphology as against to other genus species.

Chromosomes size varied between 7.30 and 6.43 μm in Ist chromosome pair and between 6.43 and 5.05 μm in the VIth pair. Centromeric index varied from 97.74% in the Vth chromosome pair to 54.66% in the IInd chromosome pair.

Chromosomes relative length has maintained between following limits: 18.00% in Ist chromosome pair, and 15.07% in the VIth chromosome pair. Mean length of the haploid chromosome complement has been 38.32 μm .



Fig1. Metaphasic chromosomes in *C. majus* L.

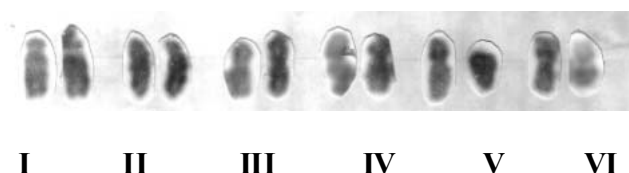


Fig. 2. Karyotype of *C. majus* L.

Arms difference ranged from 1.41 μm in the IInd chromosome pair, and 0.06 μm in the Vth chromosome pair.

Measurements of the chromosome complement are presented in Table 1.

Arms ratio has been comprised between 1.83 in the IInd chromosome pair and 1.02 in the Vth chromosome pair.

The secondary constriction was present on the first pair of chromosomes, about 1.27 μm from the primary constriction and was quite conspicuous in both the homologues of the cell.

Based on the location of the primary constriction (centromere), secondary constriction (nucleolar organizing region - NOR), and size of the chromosomes, the following karyotypic formula was developed for *Chelidonium majus* L.:

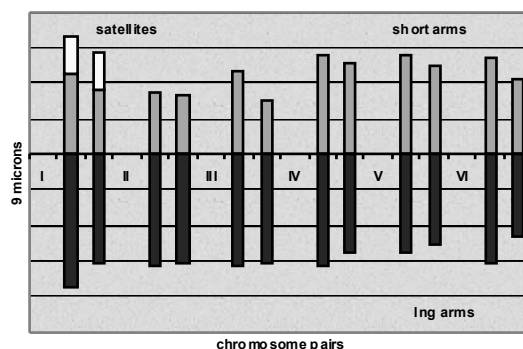


Fig. 3. Karyogram of *C. majus* L.

$K(n=6) = 5m + 1sm$; where m and sm signify median and submetacentric chromosomes (Fig. 2).

Due to the low variability of the chromosomes type and to its amount in the chromosomal complement, the karyotype can be defined as being symmetrical and primitive (Fig. 2 and 3).

Based on quantitative analysis of the mitotic chromosomes belonging to 10 metaphases, the idiogram study in *Chelidonium majus* L. species has revealed different results against to a single metaphasic cell karyotype in this species.

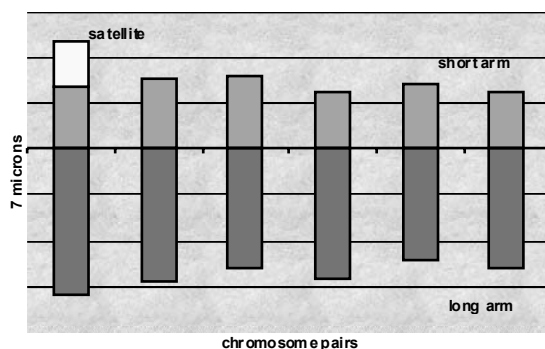


Fig. 4. Idiogram of *Chelidonium majus* species

In spite of all studied metaphases the chromosomal complement number was 12, the analyzed parameters have registered different values of the karyotypes. The chromosome pairs have been arranged in decreasing order of the total length (Table 2, Fig. 4). Thus, mean length of the 1st pair was 4.94 μ m, with limits of the variability between 5.33 and 4.55 μ m. Total mean length of the VIth chromosome pair was 4.01 μ m, with limits of the variability from 4.15 to 3.88 μ m.

Table 1. Somatic chromosome measurements in *Chelidonium majus* L.

Chromosome pair	Total length (μ)	Limits of Variability	Long arm (μ)	Limits of Variability	Short arm (μ)	Limits of Variability	Ratio of arms	Centromere index (%)	Relative length (%)	Arms difference	Chromosome type
I	6,86	7,30-6,43	3,40	3,76-3,05	2,04	2,25-1,83	1,67	60,00	18,00	1,36	m
II	6,78	6,90-6,66	3,11	3,17-3,06	1,70	1,74-1,65	1,83	54,66	17,70	1,41	sm
III	6,66	6,90-6,43	3,11	3,17-3,05	1,88	2,30-1,47	1,65	60,45	17,38	1,23	m
IV	6,48	6,90-6,07	2,98	3,17-2,79	1,13	2,75-2,52	1,13	88,25	17,01	0,35	m
V	5,80	6,07-5,51	2,66	2,79-2,53	2,60	2,75-2,43	1,02	97,74	15,13	0,06	m
VI	5,74	6,43-5,05	2,68	3,05-2,32	2,63	2,71-2,06	1,12	88,80	15,07	0,30	m

Table 2. Morphometric characteristics of the mitotic chromosomes from 10 metaphase cells

Chromosome pair	Total length (μ)	Limits of Variability	Long arm (μ)	Limits of Variability	Short arm (μ)	Limits of Variability	Arms ratio	Centromere index (%)	Relative length (%)	Arms difference	Chromosome Type
I	4,94	5,33-4,55	3,20	3,35-3,06	1,34	1,51-1,17	2,38	41,87	18,31	1,86	sm
II	4,77	5,10-4,44	2,89	3,12-2,67	1,51	1,61-1,42	1,91	52,24	17,68	1,38	sm
III	4,56	4,83-4,30	2,63	2,76-2,50	1,57	1,66-1,48	1,67	59,69	17,00	1,06	m
IV	4,39	4,71-4,07	2,82	3,04-2,60	1,22	1,31-1,13	2,31	43,26	16,27	1,60	sm
V	4,31	5,02-3,60	2,41	2,85-1,98	1,44	1,61-1,27	1,67	59,75	16,07	0,97	m
VI	4,01	4,15-3,88	2,60	2,65-2,55	1,26	1,31-1,21	2,06	48,46	14,86	1,34	sm

Centromere index varied between 59.75% in the Vth pair and 41.87% in the Ist pair. Relative length has been comprised between 18.31% in the Ist pair and 14.86% in the VIth chromosome pair, being the smallest chromosome pair of the complement. In this case, haploid complement length was 26.98µm, being smaller than the same parameter calculated to a single metaphase of the karyotype.

Arms difference has maintained between 1.86 value in the first pair and 0.97 in the Vth chromosome pair.

Arms ratio has presented the highest values in the first chromosome pair being 2.38, and the lowest values in the IIIrd and Vth pairs, with 1.67 value each one.

Secondary constrictions have presented on the first chromosome pair, attached to the short arms and measuring 1.05µm on the average.

Chromosome types have been defined on the basis of the ratio of arms, which has established the primary constrictions position (centromere position).

The differences between the karyotype and idiogram characteristics do not are essential. They refer to chromosome size, the two chromosome types frequency (median or submedian), and to the parameter values as arms ratio and centromere index, which proceed one from others.

The satellited chromosome presence in the first chromosome pair to all metaphase cells analysed, persuade us to find out that this trait is hard and characterize this species.

Differences in relation to the two types of chromosomes is probably due of the processing metaphase time, as well as of differentiated condensation of the nucleoproteic structure of the chromosomes.

CONCLUSIONS

Cytogenetical studies offered remarkably clear and important details as regards chromosome typology and karyotype evolution.

All analysed metaphase cells have revealed 2n=12 chromosomes, being according to the literature data.

Chelidonium majus karyotype is made up of five median chromosome pairs and a submedian chromosome pair, being symmetric and primitive.

The satellite presence in *C. majus* species signify a novelty comparatively to other studies in the same species (1). The first chromosome pair is considered a identify marker of this species.

The *C. majus* idiogram (Fig.4) has included two chromosome clusters which depend of centromere placing and can be synthesized as following:

- Two median chromosome pairs (pairs III and V);
- Four chromosome pairs belong to submedian type (I, II, IV, and VI), one pair of them contains secondary constrictions with satellites (pair I);

First chromosome pair which also presents the largest length of the complement, can be considered a marker in cytogenetical characterization of the *C. majus* species.

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* "Gr.T.Popa" University of Medicine and Pharmacy, Faculty of Medical Bioengineering, 16, Universității Blvd., 6600 - Iași, Romania