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CONTRIBUTIONS TO THE CARYOLOGIC STUDY OF THE GENUS ORNITHOGALUM

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In this paper are presented the results of caryological researches undertaken in species of Ornithogalum genus, spontaneous and cultivated in Romania, as well as considerations regarding the taxonomic framing and problems of polyploidy.

The material for this paper belongs to Dr. C. Zahariadi's collection of Liliaceae, kindly put at the disposal of the Botanical Garden of Bucharest an that we studied from caryological point of view. Our discussions will be carried exclusively on the basis of the number of chromosomes identified by us in the species mentioned in the following table :

Name of species	Origin of material	Kind of material	Number of chromosomes: The author	Number of chromosomes: Other authors
Subgenul *Beryllis* (Salisb.) Bak. emend. Zahariadi				
Secția *Involuta* Zahariadi				
1. O. flavescens Lam.	România : Ilfov, Rîioasa forest and Desmățuiului valley.	bulbs spont.	18	12, 16, 24, 32 18
2. O. sphaerocarpum Kern.	U.S.S.R. : Cultivated in Botanical Garden Moscow 1961	seeds spont.	18	—
3. O. pyrenaicum L.	German Democratic Republic : Cultivated in Botanical Garden Leipzig 1962	seeds	24	16,32

Name of species	Origin of material	Kind of material	Number of chromosomes: The author	Number of chromosomes: Other authors
Secţia *Galactea* Zahariadi				
4. O. brevistylum Wolfn.	România: Dobrogea, Bărăganul Dobrogii	bulbs spont.	24	24, 32, 54, 14 16, 18
(= O. pyramidale auct. non L.)	România: Sibiu, Bazna	„	18	—
5. O. narbonense L.	Portugal : Cultivated in Botanical Garden Lisbon 1965	seeds	18	14, 16, 54, 52 65
6. O. ponticum Zahar. (=O. pyrenaicum auct. Ross. non L.	U.S.S.R. : Cultivated in Botanical Garden Ialta 1964	seeds	18	24
Secţia *Albedo* Zahariadi				
7. O. fischerianum Kraschenn. et Schischkin	U.S.S.R. : Ucraina, nature conservation area Kamenie Moghila, 1958	bulbs spont.	24	—
Subgenus *Eustachys* (Salisb.) Zahariadi				
8. O. arcuatum Stev.	U.S.S.R. : Novorossiisk 1963	bulbs spont.	36	32, 34, 26, 28
9. O. magnum Krasch. et Schischkin	Italy : Cultivated in Botanical Garden Palermo 1962	seeds	28	32
10. O. schelkownikovii Grossh.	U.S.S.R. : Armenia, Aragat	bulbs spont.	26	26
Subgenus *Oreogalum* Zahariadi				
11. O. platyphyllum Boiss.	U.S.S.R. : Cultivated in Botanical Garden Leningrad 1961	seeds	18	20
12. O montanum Cyr.	Romania : Banat, Bozovici and Reşiţa	bulbs cult.	18	16, 18, 14
13. O. nyssanum Petr.	Bulgaria : Sofia	bulbs spont.	12	—
14. O. cuspidatum Bert.	Italy : Cultivated in Botanical Garden Palermo 1962	seeds	14 28	—
15. O latifolium L.	Norway : Cultivated in Botanical Garden, Oslo	seeds	20	—
Subgenus *Hypogaeum* Zahariadi				
16. O. sintenisii Freyn.	U.S.S.R. : Caucasus, Talis.	bulbs spont.	12 24	12
17. O. amblyocarpum Zahar.	U.S.S.R. : Batumi	bulbs spont.	16	—
Subgenus *Amphibolum* Zahariadi				
18. O. amphibolum Zahar.	Romania : Dobrogea, Cochirleni	bulbs spont.	18	—

Name of species	Origin of material	Kind of material	Number of chromosomes: The author	Number of chromosomes: Other authors
Subgenus *Anosmium* Zahariadi				
19. O. oreoides Zahar.	Romania : Dobrogea, Gura Dobrogei	bulbs spont.	18	—
20. O. sibthorpii Greuter (= O. nanum Sibth. et Sm.)	Romania : Dobrogea, Istria	bulbs spont.	12 24	12, 24, 16 19, 20, 28
Subgenus *Heliocharmos* Baker em. Zahariadi				
21. O. comosum Torn. ssp. pseudoarcuatum Rad.	Romania : Dobrogea, Hagieni	bulbs spont.	18	—
22. O. Kochii Parl. (= O. tenuifolium auct. Fl. Eur. med. non Guss.)	Romania : Banat, Bozovici	bulbs spont.	18	16, 18, 19, 20, 27, 28 (tenuif)
	Romania : Braşov, Tîmpa and Piatra Craiului Mts.	„	36	—
23. O. psammophilum Zahar.	Romania : Ialomiţa, Săveni	seeds spont.	18	—
24. O. divergens Bor.	Romania : Bucureşti	bulbs spont.	42	18, 27, 36, 45, 44, 54, 72
25. O. refractum Kit.	Romania : Ialomiţa, Lacul Greaca	seeds and bulbs. spont.	54	—
Subgenus *Myogalum (Kunth) Baker*				
26. O. boucheanum (Kunth) Aschers.	Romania : Dobrogea, Gura Dobrogei	bulbs spont.	28	28

From the caryologic study it results that within the *Ornithogalum* genus in the studied material, one can find two basic numbers of chromosomes (x = 6 and x = 7), that makes us consider that there are two evolution directions of the *Ornithogalum* species.

The first direction would group together the types in which X = 6 is the basis, namely the diploid species with 2n = 12 : *O. nyssanum, O. sintenisii* and *O. sibthorpii ;* the triploid ones 2n = 18 : *O. flavescens, O. sphaerocarpum, O. brevistylum, O. narbonense, O. ponticum, O. platyphyllum, O. montanum, O. amphibolum, O. oreoides, O. comosum, O. Kochii* and *O. psammophilum,* continuing with the tetraploid species, 2n = 24 : *O. pyrenaicum, O. fischerianum,* and finally with the hexaploid *O. arcuatum* and ending with species which in our opinion belong to this series as heptaploid, *O. divergens* and octoploid *O. refractum.*

In this group we have found species present in the same locality having both diploid and tetraploid types : *O. sibthorpii,* or triploid and hexaploid, *O. Kochii* (Braşov) or there are triploid and tetraploid forms in different localities : *O. brevistylum.*

The second group includes species with x = 7 chromosomes as for instance *O. cuspidatum* and *O. boucheanum.*

The species *O. schelkownikovii, O. latifolium* and *O. amblyocarpum,* make exception from this group, where probably some supernumerary chromosomes or the last of some chromosomes occured ; it is also possible that these should be of a hybrid nature.

In the material we studied, it is obvious that in the Romanian flora prevails the evolution direction beginning with plants having x = 6 chromosomes reaching as far as octoploid plants.

One single species of this genus from the Romanian flora, *O. boucheanum,* belongs to the category with x = 7 chromosomes.

We want to add to the present paper also some comments made by Dr. C. ZAHARIADI, based on the number of chromosomes stated by us.

1. The subgenus *Beryllis* according to the data I. LUNGEANU presents a satisfactory uniformity (2n = 18, 24 ; x = 6). From cytologic point of view this uniformity is in accordance with the delimitation of the subgenus, morphologicaly and micromorphologicaly determined.

In exchange, according to literature data, the uniformity is no more maintained : 2n = 54 (the paper of SVECHNICOVA from the ANDR. A. FEDOROV collection, the paper of CULLEN and RATTER 1967 and of GARBARI 1969).

This could point out some errors in the taxonomic determination and in the cytological analysis of the respective authors.

2. The subgenus *Eustachys* with the species *O. arcuatum, O. magnum* and *O. schelkownikovii* is very even from morphological and anatomical point of view. The number of chromosomes (26—36) obviously differs from those of the subgenus *Beryllis,* fact which confirms the separation of the pointed out species and their grouping in a separate subgenus.

Numerous authors, among which CULLEN and RATTER, consider the mentioned species belonging also to the genus *Beryllis,* taking their stand especially upon the form of the inflorescence and disregarding the other features.

Within the subgenus the numbers vary greatly according to species : for example according to LUNGEANU data, the fundamental figure of the *O. arcuatum species* (x = 6) differs from that of O. *magnum* species (x = 7) although they are very close and could be considered as subspecies or even varieties. A revision of the above mentioned species is necessary.

The subgenus *Oreogalum* is heterogenous from cytological point of view (2n = 12, 14, 18, 20, 28). The species *O. cuspidatum* and *O. latifolium* (x = 7) resulting from the seeds issued by the botanical gardens, although morphologically they are similar to the other species (11, 12, 13 from the table). A minute revision is here necessary too.

Species *O. Kochii* (subgenus *Heliocharmos)* from central and southeast Europe was probably mistaken for the species *O. tenuifolium* (O. gussonei) from an other subgenus — *Anosmium* — (see also Flora Repu-

blicii Socialiste România XI, 1966). That seems to be one of the reasons why the figures of the literature vary within very wide ranges and therefore cannot be taken into account for the species from Romania.

The variations of the chromosome numbers and ± valid causes of these, like polysomy, polysomaty, the presence of diploid series, of supernumerary or semisupernumerary chromosomes do not allow the assignment of a satisfactory importance to this feature, necessary to the creation of a rational taxonomic scheme.

The determination of the chromosome number represents only the first step, which must be completed also by the other ways of cytological study (idiograms, threedimensional investigation, etc. etc.).

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CONTRIBUŢII LA STUDIUL CARIOLOGIC AL GENULUI ORNITHOGALUM

Rezumat

Se prezintă rezultatele cercetărilor cariologice întreprinse la specii ale genului Ornithogalum spontane şi cultivate în România şi consideraţii privind încadrarea taxonomică cît şi probleme de poliploidie.