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THE CHROMOSOMAL NUMBER FOR RARE SPECIES FROM ROMANIA

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Key words: rare species, chromosomes number, endemic species
Abstract: The cytogenetic data for rare and endemic species from romanian flora are uncertain and contradictory. Is necessary to establish the role of poliploidy and aneuploidy for survival and evolution of these species

INTRODUCTION

In Romanian flora there exist many rare species, some times subjected to disappear. The investigation of these species chromosomes is very interesting and very useful, for some correlations between karyotype and environment. We have considered very interesting to mention the areas of each species because we must know if a species is in the situation to become extinct. Is important the fact that investigated species are from many and very different families.

MATERIAL AND METHODS

It was done a list with rare species existing in Romanian flora and, after that, for each of them it was indicated the x and 2n numbers of chromosomes. On this basis we tried to establis if a population have individuals with some degrees of poliploidy and/or aneuploidy.

RESULTS AND DISCUSSIONS

We found informations for 95 rare species existing in the our flora but, in many cases, the informations are uncomprehensive and very different from one author to the other. Examining the table we may see that from the 95 registered species, for 45 of them is not a concordance between x and 2n. For instance at *Allium flavum* ssp. *tauricum* there are mentionned the numbers x = 7, 8 and 9 (Levan, 1929, 1931, 1935, 1937; Ono, 1935; Delay 1947; Tschermak-Woess, 1947) and 2n = 16. Of course x=8 is concordance with 2n=16 but we can not find a concordance between x=7 or x=9 and 2n=16. A concordance between x and 2n we have found only for 39 species (from those mentionned in table). We must underline that 17 of them present poliploide forms and the rest of 22 are diploide only.For instance the species *Acanthus balcanicus* Heyw et Richardson, *Asphodeline lutea* (L.) Rchb., *Beta trigyna* W et K, *Clypeola Jonthlaspi* L., *Crambe maritima* L., *Dianthus spiculifolius* Schur, *Digitalis ferruginea* L., *Galanthus elwesii*

Hook., *Helleborus odorus* Wet. K., *Laburnum alpinum* (Mill) Gris., *Laburnum anagyroides* Medik, *Menyanthes trifoliata* L., *Peltaria alliacea* Jacq., *Petrorhagia saxifraga* (L) Link., *Prunus tenella* Batsch., *Pulsatilla vulgaris* Mill. Ssp. *grandis* (Wend) Zam., *Ruscus hypoglossum* L., display different degrees of poliploidy.

The species *Adonis vernalis* L., *Alyssum borzeanum* Nyar., *Angelica arhangelica* L., *Colutea arborescens* L., *Dianthus nardiformis* Janka, *Globularia punctata* Lapeyr, *Glaucium flavum* Cr., *Larix decidua* Mill., *Opopanax bulgaricus* Velen., *Paconia daurica* Andr., *Paeonia tenuifolia* L., *Paliurus spina christi* Mill., *Polemonium coeruleum* L., *Potentila rupestris* L., *Pyrus eleagrifolia* Pall., *Scandix pecteN-Weneris* L., *Schiverckia podolica* (Bess) Andrz., *Scorzonera purpurea* L., ssp. *rosea* (W et K) Nym., *Silene nutans* L., ssp. *dubia* (Herb) Zapal, *Sorbus aria* (L) Cr., *Veratrum nigrum* L., *Waldsteinia geoides* Willd are dipliode (they present a concordance between x and 2n.

On the other hand, we have met a great variability for the diploide chromosome number and unconcordance between x and 2n. For instance, for *Anthericum liliago* L. Species are mentionned 2n = 30, 32, 60 and 64 and x = 8 and 15. May be a case of aneuploidy 8 being the basis number. From it could appeared the tetraploid 2n=32 and the octoploid 2n=64 From the diploid 2n=16 could appeared the monosomic 2n=15 after that the tetraploid 2n=30. But all these are only suppositions. For other species the situation is more unclear. Fo instance at *Sedum album* L. are mentionned the numbers **x = 6, 7, 8, 10, 11, 17** şi **2n = 32, 64.** We may find correspondence only between 8 and 32 or 64, the others x values being without correspondence with 2n. For these situations are necessary new investigations.

For the endemic species we have found the following situation: 11 of them (*Dianthus spiculifolius* Schur., *Erysumum witmanii* ZaW., *Erysumum comatum* Panc., *Minuartia graminifolia* (Ard) JaW., *Pinus nigra* Arn., ssp. *banatica* (Borb) Novak., *Salvia* transsilvanica (Schurr ex Griseb) Schur., *Serratula bulgarica* Acht et Stoj., *Silene nutans* L. ssp. *dubia* (Herb) Zapal., *Silene zavadzkii* Herb., *Syringa josikaea* Jack. F. Ex. Reichenb.) are endemic species in Romania (some of them only in Carpathian mountains), an argument more for new investigations.

Ones from these 95 species are spread in Europe, North part of Africa and in Western Asia.

CONCLUSIONS

The cytogenetic data for rare and endemic species from romanian flora are uncertain and contradictory.

We consider that are necessary new investigations for establish the real number of chromosomes for rare and endemic species from romanian flora (a condition for citogenetic characterisation of these species).

Is necessary to establish the role of poliploidy and aneuploidy for survival and evolution of these species.

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No.	The species	The chromosomes number		The author	Area	
		x	**2n**			
1	*Acanthus balcanicus* Heywet Richrdson	14	56	Grant, W.F., 1955	Balcani	
2	*Adonis vernalis* L.	8	16	Langlet, 1927, Tureson 1938, Larsen 1954, Jaworska 1964, Skalinska,1964	Central Europe. Siberia, Western Asia	
3	*Adonis volgensis* Steve	4, 8	16	Szabo, 1972	România, Hungary, SSSR, Central Asia	
4.	*Allium flavum* L. Ssp. *tauricum* (Besser et Reichenb.), Stearn	7, 8, 9	16, 32	Levan, 1929, 1931, 1935, 1937; Ono, 1935; Delay, 1947; Tschermak-Woess, 1947.	S-E Europe	
5	*Allium obliquum* L.	7, 8, 9	16	Levan, 1931, 1935;Geitler, 1935; Sato, 1942	Eurasia	
6	*Alyssum borzeanum* Nyar.	8	16	Manton, 1932	România, Bulgaria, SSSR	
7	*Angelica archangelica* L	11	22	Schulz-Goebel, 1932; Love et Loves, 1948, 1956;Garde et Malheiros-Garde, 1949; jorgensen, et al., 1958	Central Europe, Siberia	
8	*Anthericum liliago* L.	8,15	30, 32, 60, 64	Bowdwn, 1940, 1945; Delay, 1947; Strandhede, 1963; Eldvers, 1932; Tischler, 1934	Central and South Europe, Asia Minor, North Africa.	
9	*Asparagus verticillatus* L	10	20, 24	Bozzini, 1959; Delay, 1947	România, Balcani, Ukraine, Asia Minor	
10	*Asphodeline lutea* (L) Rchb	7	14, 28,56	Sussenguth, 1921; Prozina, 1936; Sat, 1942; Delay, 1947; La Cour, 1952; Mitra, 1964; Kozumanov et Popova, 1968; Borhidi, !968	Mediterana, Algeria	
11	*Astragalus dasyanthus* Pall.	8, 12	16	Cehov, 1935; Pavlova, 1988	Balcani, SSSR	
12	*Bellevalia sarmatica* (Pall) Woron	4,5	9	Buvat, 1945;Zaharieva, Makusenko, 1968	România, Bulgaria, SSSR	
13	*Beta trigyna* W et K	9	36, 54	Zasimovici, 1934, 1938, 1965; Bleier, 1928; Sirotina, 1934, 1936; Walther, 1963	Rusia, România, Galicia	
14	*Campanula romanica* SăW.	8, 10, 17	34	Podlech, Damboldt, 1963	Central Europe, Siberia	
15	*Centaurea marschalliana* Spreng	8, 9, 10, 11, 12	20	Ciuksanova et al., 1968	SSSR, România, Galicia	

16	*Centaurea ruthenica* Lam.	8, 9, 10, 11, 12	30	Podubnaia-Arnoldi, 1931	Central Asia, Central Europe	
17	*Clypeola Jonthlaspi* L.	8	16, 32	Jaretzki, 1928; Bonnet, 1963	Mediterana	
18	*Colutea arborescens* L	8	16	Cehov, 1930, 1935; Hindacova, 1967	Central Europe, S-W Asia	
19	*Convolvulus persicus* L.	10, 11	20, 22	Cezmedziev, 1976	Black Sea and Caspian	
20	*Coronila emerus* L. Ssp.*emeroides* (Boiss et Sprun) Hay.	5, 6, 7	18	Ciuksanova, 1967	Mediterana	
21	*Coronilla scorpioides* (L) Koch	5, 6, 7	12	Larsen, 1955	Mediterana	
22	*Coronilla vaginalis* Lam	5, 6, 7	12	Baksay, 1956	Central Europe	
23	*Corylus columa* L.	7, 11	14	Woodworth, 1929	South Europe, Asia Minor,Caucasia, Himalaia, China	
24	*Crambe maritima* L.	15	30, 60	Tarnavschi, 1948; Jaretski, 1932; Manton, 1932;Tischler, 1934; Wulf, 1937; Litardiere, Doulat, 1942	Europe	
25	*Crocus chrysanthus* (Herb) Herb	4, 5, 7	8, 9, 10	Darlington, 1937; Karasawa, 1937, 1961; Mather, 1932; Bowles, 1952	Balcani	
26	*Cytissus ratisbonensis* (Schaf)Rothm	6, 8, 10	48	Mattick, 1950	Central Europe, South Russia, Siberia	
27	*Dianthus nardiformis* Janka	15	30	Rohweder, 1934; Gentscheff, 1937; Carolin, 1957	Bulgaria	
28	*Dianthus spiculifolius* Schur.	15	60	Rohweder, 1934; Gentscheff, 1937	Endemic in Carpathiam mountains	
29	*Dictamus albus* L	9	30, 36, 72	Negodi, 1939; Bowden, 1940, 1945; Desai, 1960	Eurasia	
30	*Digitalis fernginea* L.	7	56, 70	Buxton, Dark, 1934; Yakar, 1945	Balcani	
31	*Ecbalium ellaterium* (L) A. Rich	12	18, 24	Kojuhov, 1934; McKay, 1930, 1931,; Whitaker 1933; Delay, 1947	Mediterana	
32	*Echinops banaticus* Roch. Ex Schrad	8	30	Move, Frankton, 1962	Balcani, Asia Minor, Caucasia	
33	*Ephedra distachya* L	10, 12	16, 24, 28	Jaccard, 1894; Beridge et Sanday, 1907, Sigrianki, 1913; Florin, 1932; Resende, 1937	Eurasia	
34	*Erysimum wittmanii* ZaW.	7, 8	14	Favarger, 1964; Jankun, 1965; Polatschek, 1966	Endemic in Carpathian mountains	
35	*Erysimum comatum* Panc.	7, 8	14	Polatschek, 1966	Endemic in Carpathian mountains	
36	*Ferula sadleriana* Ldb	10, 11	22	Baksay, 1956	România, Bulgaria	

37	*Galanthus elwesii* Hook	12	24, 48	Heitz, 1926; Sato, 1937, 1938, 1942; Sveşnikova, 1967	Balcani	
38	*Genista radiata* (L) Scop.	6, 7	48	Santos, 1945	Balcani	
39	*Globularia punctata* Lapeyr.	8	16	Schwarz, 1964; Murin, Uhrikova, 1967; Hindakova, 1967	Central and South Europe, Caucasia	
40	*Glaucium flavum* Cr.	6	12	Sugiura, 1931, 1936; Smith, 1950; Rodrigues, 1953; Larsen, 1954; Băra et al., 1990	Balcani, Mediterana, Asia Minor, Crimeea, Caucasia	
41	*Gymnospermium altaicum* (Pallas) Spach.	6, 8	16	Toren, 1962	România, Bulgaria	
42	*Helleborus odorus* Wet. K.	8	32	Langlet, 1932	S-E Europe	
43	*Hyacinthella leucophaea* (C. Koch) Schur	9, 10	18, 20	Buvat, 1945; Popova, 1972	South Europe, Russia, Asia Minor	
44	*Iris graminea* L. Ssp. *brandze* (Prod) D. Web. Chater	5, 6, 7, 11, 17	10	Tarnavschi, 1938	Central and South Europe	
45	*Iris halophila* Pall.	5, 6, 7, 11, 17	44, 46, 48	Simonet, 1934; Lenz, 1963; Day, 1963; Tarnavschi, 1938	S-E Europe	
46	*Iris sibirica* L.	5, 6, 7, 11, 17	28	Kazao. 1928, 1929; Simonet, 1928, 1932, 1934; Randolph, 1934; Woislo, 1964.	Eurasia	
47	*Iris sintenisii* Janka	5, 6, 7, 11, 17	16	Randolph & Randolph, 1956.	România, Balcani, Asia Minor	
48	*Laburnum alpinum* (Mill.) Gris.	6	48	Cehov, 1931; Gilot, 1965.	Central Europe	
49	*Laburnum anagyroides* Medik.	6	48	Gilot, 1965	Central Europe	
50	*Larix decidua* Mill.	12	24	Nemec, 1910; Sax, 1932, 1933; Hruby, 1933; Smolska, 1927	Alpi, Silezia	
51	*Menyanthes trifoliata* L.	9	54	Matsuura, Sato 1935; Palmgren, 1943; Love & Love, 1944, 1956; Delay, 1947; Rork, 1949	Europe, Mediterana	

52	*Minuartia graminifolia* (Ard.) JaW.	8, 9, 10, 11, 12, 13, 15, 23	32	Favarger, 1962	Endemic in România	
53	*Narcissus angustifolius* Curt	7, 10, 11	14, 14+1-2B	Geitler, 1935; Grif unpublished	Europe	
54	*Nectaroscordium siculum* (Ucria.) Lindt. Ssp. *bulgaricum* (Janka.) Stearn.	9	16, 18	Mensincai, 1939, 1940; Cesmedziev, 1970	România, Balcani, Crimeea, Asia Minor	
55	*Opopanax bulgaricus* Velen	11	22	Garde, 1957	România, Bulgaria	
56	*Ornithogalum fimbriatum* Wild.	6, 7, 8, 9	12, 14	Delaunay, 1926; Neves, 1956; Narkova, Radenkova, Ivanova, 1972, 1974	Balcani, Crimeea, Asia Minor	
57	*Paeonia daurica* Andr.	5	10	Barber, 1941	Crimeea, Caucasia	
58	*Paeonia peregrina* Mill. Var.*romanica* Brândză	5	20, 16	Gajewscki, 1948; Wefelscheid, 1911; Tarnavschi unpublished	România (Dobroudja)	
59	*Paeonia tenuifolia* L.	5	10	Gajewscki, 1948	Balcani, Ukraina, Crimeea, Caucasia	
60	*Paliurus spina-Christi* Mill.	12	24	Dolcher, 1947, 1955	South Europe, Western Asia	
61	*Peltaria alliacea* Jacq.	7	28	Manton, 1932	Alpes, Balcani	
62	*Periploca graeca* L.	11, 12	22, 24	Bowden, 1940, 1945; Pardi, 1933; Lopane, 1951	Mediterana	
63	*Petrorhagia saxifraga* (L.) Link	15	60	Blackburn, 1931; Favarger, 1946; Larsen, 1954; Nagl, 1962	Balcani	
64	*Pinus nigra* Arn. ssp. *banatica* (Borb.) Novak.		24	Ferguson, 1924	Endemic in România	
65	*Polemonium caeruleum* L.	9	18	Winge, 1923; Clausen, 1931; Heitz, 1932; Sakai, 1935; Flory, 1937; Greiesinger, 1937; Turesson, 1938; Love & Love, 1956	Europe, Caucasia, Siberia, Japan, North America.	
66	*Potentilla rupestris* L.	7	14	Tischler, 1929; Simotomei, 1930; Clausen et al., 1932, 1939, 1940; Popov, 1935, 1939; Gagnieu, 1959	Eurasia, North America.	
67	*Prunus tenella* Batsch.	8	16	Koebel, 1927, 1928	Central Europe, Transcaucasia, Central Asia, East Siberia.	
68	*Pulsatilla vulgaris* Mill. Ssp. *grandis* (Wend.) Zam.	8	32	Tarnavschi, 1948	Europe.	
69	*Pyrus eleagrifolia* Pall.	17	34	Râbin, 1926; Adate, 1933	S-E Europe, Asia Minor, Caucasia	

70	*Ranunculus constantinopolitanus* (DC) D'UrW.	7, 8	14	Langlet, 1936, 1942; Laster, 1932	Balcani	
71	*Rumex scutatus* L.	4, 5, 7, 8, 9, 10	20	Noda, 1926; Jaretzky, 1928; Ono, 1935; Love, 1942; Mattick, 1950	Europe, Asia Minor, Caucasia, Transcaucasia, North Africa	
72	*Ruscus aculeatus* L.	10	36, 40	Fernandes, 1929, 1930, 1931; Nakajima, 1936; Sato, 1942; Martinoli, 1951	Europe, North Africa.	
73	*Ruscus hypoglossum* L	10	40	Martinoli, 1951	Central Europe, Balcani, East Africa., Asia Minor	
74	*Salvia ringens* Sibth et Sm	6, 8	12, 14	Scheel, 1931; Ialovleva, 1933; Markova et Ivanova, 1982	Balcani, Asia Minor	
75	*Salvia transsilvanica* (Schur et Griseb.) Schur	6, 8	16, 18	Scheel, 1931; Ialovleva, 1933; Hruby, 1935; Benoist, 1937	Endemic	
76	*Scandix pecteN-Weneris* L.	8	16	Melderis, 1930;Schulz-Gaebel, 1930; Vanscher, 1931;Tischler, 1934; Delay, 1947; Vitaker, 1948; Kordium, 1967	Europe, Mediterana	
77	*Schivereckia podolica* (Bess.) Andrz.	8	16	Manton, 1932	România, Russia till Ural	
78	*Scorzonera purpurea* L ssp. *rosea* (W et K) Nym.	7	14	Favarget et Huynh, 1964;Favarger, 1965; Ciuksanova et al., 1968	Central Europe, Balcani, România	
79	*Scutellaria orientalis* L ssp. *sosnovskyi* (Takht.) Fed.	8, 11, 17	16	Quezel, 1957	S-E Europe, Caucasia, Asia Minor, Siberia	
80	*Sedum album* L.	6, 7, 8, 10, 11, 17	32, 64	Baldwin, 1935, 1939	Europe, Asia Minor, N-W Asia, N.Africa	
81	*Serratula bulgarica* Acht. et Stoj.	10, 11	22, 24	Narkova et al., 1972	Endemic in România	
82	*Serratula radiata* W et K.) M.B.	10, 11	30, 60	Podubnaia-Arnoldi, 1939; Baksay, 1956, 1957	România, Balcani, Caucasia, W. Siberia	
83	*Serratula wolffii* Andrae.	10, 11	22	Tarnavschi, 1938; Arano, 1964, 1965; Ciuksanova et al., 1968	România, Siberia, W. Russia.	
84	*Silene nutans* L. Ssp.*dubia* (Herb.) Zapal.	12	24	Blackburn, 1928, 1929; Tischler, 1934; Rockweder, 1939; Vladesco, 1941	Endemic in Carpathiam mountains	

85	*Silene zawadzkii* Herb.	6, 7, 8, 10, 11, 17	24	Heitz, 1926	Endemic in Carpathian mountains.	
86	*Sorbus aria* (L) Cr.	17	34	Sax, 1931; Poucques, 1951; Liljefors, 1953; Baksay, 1956; Moffet, 1931	Europe	
87	*Spiraea crenata* L.	5, 9	36	Sax, 1936	Europe, Russia	
88	*Spiraea salicifolia* L.	5, 9	36	Sax, 1936	Central Europe., Siberia, N-W. America.	
89	*Syringa josikaea* Jacq. f. ex. Reichenb.	11, 23	44, 46, 48	Tischler, 1930; Sax et Abbe, 1932	Endemic in Carpathian mountains	
90	*Taxus baccata* L.	8, 12	16, 24	Overton, 1892; Strasburger, 1904; Newton, 1927; Darlington, 1930; Dark 1932; Sax, 1933;	Europe, W. Asia., N. Africa.	
91	*Veratrum nigrum* L.	8	16	Miller, 1930	Alpes, Central Europe, Balcani, Siberia	
92	*Vicia narbonensis* L	5, 6, 7	14	Sveşnicova, 1927; Heitz, 1931; Seneaninova-Korceaghina, 1932; Kumar, 1960; Srivastava, 1963; Martin et Shanks, 1966; Ciuksanova, 1967; Băra et al., 2001	Europe	
93	*Vicia tenuifolia* Roth. Ssp. *stenophilla* Velen.	5, 6, 7	12	Baksay, 1954	Balcani, Crimeea, Caucasia	
94	*Waldstenia geoides* Willd.	7	14	Polya, 1949; Reese, 1925	România, Balcani, Crimeea	
95	*Zizyphus jujuba* Mill.	12	24, 40, 48, 60, 72, 96	Morinaga et al., 1929; Bowdwn, 1940, 1945; Srinivasachar, 1940; Srinivasan, 1952; Khoshoo et Singh, 1963		