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Chromosome numbers in *Begonia*. 3*

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Summary

The somatic chromosome numbers of 34 species of *Begonia* were counted. The following numbers were found: 26, 38, 52 (African species), 22, 30, 44 (Asiatic species), 26,28, 52, 56, 68 and possibly 104 (American species). All numbers could be fitted into previously established polyploid series. In the discussion it is emphasized that triploidy must have played an important role in the evolution of *Begonia* species.

Introduction

In previous publications (Legro & Doorenbos, 1969, 1971) the somatic chromosome numbers of 190 species of *Begonia* were given. The variation was found to be considerable. Twenty-two different numbers were counted, ranging from 16 to 156. This complicated situation is considerably clarified if the species are arranged into sections. Most sections were found to be characterized by one basic chromosome number, from which the other numbers within the section (if any) have been derived by polyploidy.

Since our second paper a number of species have become available for study which had never been examined cytologically. Among these are species belonging to four sections not represented in previous work.

Material and methods

Much of the material for the present study was generously supplied by the directors of the botanic gardens at Edinburgh, Glasgow, Kew, München and Frankfurt. The McKelly Seed Fund of the American Begonia Society, Mr R. Ziesenhenne and Mrs Thelma O'Reilly kindly sent to us material from private American collections. The following species were grown from plants or seed collected in nature: an unidentified species collected by Dr W. J. J. O. de Wilde in Cameroun; *B. squamulosa* Hook.f. collected near Ebolowa, Cameroun, also by Dr de Wilde; *B. rostrata* Welw., collected at Misa Höhe, Togo, by Mr F. J. Breteler; *B. laciniata* Roxb. collected in N. Thailand, about 150 km SE of Vientiane and sent by Mrs T. van den Eelaart-de Sitter; *B. naumoniensis* Irmsch., collected in New Guinea by Mr J. F. U. Zieck; and *B. rosaeflora* Hook.f., collected by Dr Barbara Pickersgill in Ayacucho, Peru.

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The species were identified with the help of the available descriptions, not by comparison with type material. Voucher specimens have been deposited in WAG, the herbarium of the Department of Plant Taxonomy and Plant Geography at Wageningen. Colour transparencies and photographs are available at the Department of Horticulture.

The cytological methods applied were similar to those described in the first paper of this series.

Results

The results are summarized in Table 1. As in the two previous papers, the sections have been grouped in the order given in Irmscher's review (1925). Within each section, the order of the species is alphabetical. The somatic chomosome number of each species is given. Brackets around a number indicate that only a small number of clear metaphase plates could be found, which was considered to be insufficient for definitive conclusions. All species listed have been studied cytologically for the first time, except *B. sulcata* Scheidw., already counted by Legro & Doorenbos (1969), but with an erroneous result which now can be corrected.

Table 1. Somatic chromosome numbers in *Begonia*.

African species	
Mezierea	
B. seychellensis Hemsl.	26
Squamibegonia	
B. poculifera Hook.f.	38
Scutobegonia	
B. sp. from Cameroun	26
B. sp . from Liberia	52
Tetraphila	
B. mauricei Ziesenhenne	38
B. molleri (C.DC.) Warb.	38
B. squamulosa Hook.f.	38
Rostrobegonia	
B. rostrata Welw.	38
Quadrilobaria	
B. sp. from Madagascar	(38)
Asiatic species	
Reichenheimia	
B. morelii Irmsch.	30
B. nuri Irmsch.	44
Platycentrum	
B. laciniata Roxb. from N. Thailand	22
B. sikkimensis A.DC.	22
Petermannia	
B. naumoniensis Irmsch.	30
American species	
Steineria	
B. caraguatatubensis Brade	(56)
B. confertiflora Gardner	(56)
Doratometra	
B. wallichiana Steud.	26
Scheidweileria	
B. inciso-serrata A.DC.	56
Pritzelia	
B. capanemae Brade	(56)
B. dietrichiana Irmsch.	(56)
B. odeteiantha Handro	(56)
Bradea	
B. rufosericea Toledo	(56)
Huszia	
B. rosaeflora Hook.f.	28
Hydristyles	
B. sp.	52
Ruizopavonia	
B. roezlii Regel	52
Gireoudia	
B. bettinae Ziesenhenne	28
B. hispida-villosa Ziesenhenne	28
B. pinetorum A.DC.	28
B. pruinata A.DC.	28
Saueria	
B. sulcata Scheidw.	68
Begoniastrum	
B. guaduensis HBK	(104)
B. paulensis A.DC.	(52)
B. serratifolia C.DC.	(104)
B. venosa Skan	(52)

Discussion

Among the African species, two belong to sections not previously studied: Mezierea (*B. seychellensis,* 2n = 26), and Quadrilobaria (*B.* sp. from Madagascar, 2n = 38). The latter, received from the Botanic Garden at Münich as 'species from Bekulosa', could not be matched with any of the species of Quadrilobaria described so far. It appears to be related to *B. francoisii* Gagnep., but the leaves are not quite so large and are completely smooth. The prevalent chromosome numbers among the African Begonias appear to be 26 and 38. It is tempting to regard 38 as having evolved from 26 as a triploid number (39, with subsequent loss of the odd chromosome). This possibility was underlined by the discovery that an unidentified species of the section Scutobegonia, collected by Dr W. J. J. O. de Wilde in Cameroun, has 26 chromosomes, while another species of this section (received without name or habitat from the late Dr. E. Irmscher's collection of living plants, but present among herbarium material in WAG collected by Mr F. J. Breteler in Liberia) has 52 chromosomes. We venture the hypothesis that the basic number of Scutobegonia is 2n = 26, and that the previously determined numbers of 2n = 34 – 38 have been derived from the triploid level.

In the large section Tetraphila only 2n = 38 has been found so far. It should be noted that a few times 2n = 36 has been counted, usually in plants that also had cells with 2n = 38. A possible explanation is that contraction is retarded in one pair of chromosomes, but this hypothesis could not be tested.

B. mauricei has been included among the African species although it is stated that it was collected on Trinidad. Ziesenhenne formed a new section Irmschera for it. To us, however, it seems to be a representative of Tetraphila, and as we find it hard to believe that it would hitherto have been overlooked on Trinidad, we doubt the American origin until this is confirmed by further evidence.

Among the Asiatic species studied, *B. nuri* Irmsch. should be noted as the first species of Reichenheimia with 2n = 44 chromosomes. This again is a case in which triploidy must have played a role, unless the ancestor of *B. nuri* had 22 chromosomes, in which case the species of Reichenheimia with 30–34 chromosomes represent the triploid level. However, so far no species of Reichenheimia with 2n = 22 has been found.

B. laciniata Roxb. from N. Thailand has been included because the forms commonly cultivated come from further south. The present form is an upright plant, 50 to 70 cm high, which could not be matched with any of the varieties distinguished by Irmscher (1939).

A plant from seed sent by Mr Zieck from New Guinea tallies in every respect with the description of *B. naumoniensis* Irmsch., except that the picture accompanying the description shows a female flower with 5 tepals, whereas the present plant has only 3. Species of Petermannia with 3 female tepals are not numerous. The present plant, if not *B. naumoniensis,* could possibly be *B. eliasii* Warb. but the description of the latter is too short to permit identification.

The following American species merit further comment. *B. wallichiana* Steud. was believed by its author to come from India, but in confirmity with most authorities we assume here that it is of American origin. The species of the section Doratometra, to which *B. wallichiana* belongs, are closely related to those of Begoniastrum. This is confirmed by the chromosome number of 2n = 26, which is probably the basic number of both sections, although it has not yet been found in Begoniastrum. After many fruitless efforts, a few clear metaphase plates could be found in four Begoniastrum

species the chromosomes of which had so far been elusive. For these species 52 and 104 chromosomes were counted, although still better material is required before this can be regarded as absolutely proven. Within Begoniastrum, we now have a polyploid series of 52, 78, 104 and 156. In addition, there are several species, especially from Brazil, which have 2n = 32 and 2n = 34. The latter number we now regard as derived from the triploid number (39), analogous to the situation in other sections, e.g. Scutobegonia. In their turn, these triploid numbers have been doubled and yielded plants like *B. cucullata* Willd. with 2n = 64 and the cultivars of *B. semperflorens* Lk & Otto with 2n = 68 (Zeilinga, 1962). Perhaps *B. sulcata* Scheidw. for which we previously published 2n = 72 but which was now shown to have 2n = 68 has a similar origin, as it seems to be related to Begoniastrum.

From Kew we received a plant under an erroneous name which undoubtedly belongs to the section Hydristyles, although it could not be matched with any of the six species described within this section. It has 52 chromosomes. The same number was found for the first representative of Ruizopavonia to be counted, *B. roezlii* Regel *(B. lyncheana* Hook.f.). Unfortunately, species like *B. convallariodora* C.DC. and *B. cooperi* C.DC., grown in our collection and more typical of Ruizopavonia than *B. roezlii,* could not be counted yet.

Corrections

Since our previous publications we have had second thoughts about the identity of a few species. *B. inflata* Graham and *B. popenoei* Standley should be deleted from the first paper of this series. The first was probably a hybrid of *B. inflata* and *B. roxburghii* A.DC., the second is a true species (it is reproduced by seed) but remains unidentified for the moment. The publication by Ziesenhenne (1972) of the type specimen of *B. lindleyana* Walp. has shown that this is the plant which we have called *B. sparsipila* Baker in our second paper. This leaves us without a name for the plant received from the Irmscher collection as *B. lindleyana* Walp. The species from Brazil identified as *B. crinita* Oliv. we would now prefer to call *B. setulosa* Klotzsch. Finally, a slip of the pen: *B. parviflora* Schott should be *B. parviflora* Klotzsch.

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