CROSSWORDS

THE GESNERIAD HYBRIDIZERS ASSOCIATION

NEWSLETTER

Volume 4, Issue 3, September 1980

The American Gloxinia and Gesneriad Society Convention at Seattle, Wa., provided the opportunity for a number of GHA members to get together in our organization's annual meeting. Discussion was free-ranging, but relatively little business was in need of transaction. The Coordinating Committee was instructed to arrange for the GHA to 'pay its own way' for future Annual Meetings, rather than to rely, as we have in the past, on the AGGS for the charitable donation of meeting space, and was authorized to arrange for the purchase of a modest quantity of printed stationary and other supplies. An ad hoc committed composed of Ron Myhr, Gloria Kahle, Dave Masterson, Howard Burins, and Larry Skog met briefly to consider the development of an awards system for gesneriad hybrids, and Dave Masterson was delegated to draft a concrete proposal to be communicated to the members in the near future.

At the convention itself, *Streptocarpus* 'Mighty Mouse', a hybrid of *johannis* and *cyanandrus* exhibited by Ted Khoe, was given the GHA award for best new hybrid. Hopefully, a full description of this intriguing plant will be published in *CrossWords* shortly.

All back volumes of *CrossWords* are now available for $5.00 each. Requests should be addressed to Zelda Mines.

All right! Summer's over. Get out pen and paper and start writing those articles for *CrossWords*.

Ron Myhr
Anne Crowley

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SEED EXCHANGE

David Zaitlin
Tucson, AZ

With the seasonal extremes that summer brings every year to Arizona (temperatures approaching 110 degrees!), things have been a bit slow for the gesneriads in the greenhouse. Although growth rates have not been adversely affected, the flowers tend to suffer from the heat. Not only do the corollas of sinningia flowers display signs of scorch, but oftimes buds will abort on certain cultivars long before they are mature. The most interesting phenomenon however, is the apparent temperature-sensitive nature of the germinal cells within the anthers of some plants. I've noticed time and again that this heat stress can severely reduce the amount of viable pollen produced from otherwise normal, fertile plants. I would be interested to know the cause of this if anyone is familiar with the mechanisms involved. Anyway, it goes without saying that my cacti and euphorbias are healthy and unaffected.

Despite the prevailing weather conditions, I did manage to set some seed on several sinningias prior to the onset of 100 degree days. These crosses are listed below and represent the sole offerings for this issue, as I have not yet heard from any of our contributing members.

(1) *Sinningia* (('Rex' X Pink eumorpha) X 'New Zealand') X *S. cardinalis* 'Innocent'

(2) *Sinningia* (('Rex' X Pink eumorpha) X 'New Zealand') X Pink eumorpha

(3) *Sinningia* (('Rex' X Pink eumorpha) X 'New Zealand') X 'New Zealand' selfed

Due to the convenience and relatively low cost, I am sure that many of you cultivate your gesneriads under artificial illumination. All of mine that are raised from seed begin their lives there, sown directly on fine vermiculite that has been saturated with a dilute nutrient solution. Because I have access to a greenhouse, my experience with light gardens virtually ends with the plants at the stage requiring transplant and removal to the greenhouse. Even with this in mind, I thought that I would pass along a practical method that I have found successful. Within the past several years, most large growers of succulents have turned to horticultural pumice as the major constituent of their potting mixtures. This product is commonly combined with equal parts of peat, redwood chips or shredded bark and has proven to be the medium of choice for the cultivation of cacti and other succulents in containers. As purchased commercially, pumice closely resembles Perlite and is also available in several size grades. It differs in the fact that it is much denser than Perlite and therefore will not float. I have recently begun to use pumice with gesneriads, and am happy to report excellent results with sinningias and saintpaulias. It has proven especially beneficial for growing *Chirita sinensis*, which is semi-succulent by nature. I use it in a mixture with equal parts vermiculite and a prepared, fibrous potting soil. If pumice is available in your area, I heartily recommend it as a satisfactory alternative to Perlite.

CHEMISTRY AND GESNERIADS

Alan LaVergne
Berkeley, CA

At one time it was hoped that chemistry would provide simple and objective standards to bring order out of the confusion and controversy surrounding taxonomy. The idea was that the distribution of some characteristic substances would earmark plants as belonging to one category or another. These hopes proved to be over-optimistic, but nonetheless there have been numerous cases in which chemistry has provided considerable valuable information regarding plant relationships, and the gesneriad family is one of the groups in which this has occurred.

I first propose to describe a classical example of the success of chemistry in unraveling taxonomical relationships, and then to examine several applications of chemistry to the gesneriad family. No knowledge of chemistry will be necessary to follow the explanations.

Most of the water-soluble pigments in flowering plants are *anthocyanins*. For instance, gesneriad flowers owe their colors to anthocyanins, and the reddish color on the backs of many gesneriad leaves is due to this class of pigments. However, the deep red of beets (genus *Beta*) was discovered to be due to a different type of water-soluble pigment. Subsequently discovered in a number of other plants, these pigments were originally termed beta-anthocyanins, and then when it was realized that they were completely unrelated to regular anthocyanins, the name was changed to betalains. Two striking facts suggested that possession of betalains was taxonomically significant. First, anthocyanins were completely absent from any plant found to contain betalains. Second, this trait ran only in a small number of plant families, and if one member of a family possessed betalains, all the members did (or at least contained no anthocyanins). The fact that betalains were virtually universal among these families, and found nowhere outside of them suggested a close relationship among those families that possessed them. Thus betalains were found to be responsible for the brightly colored bracts of bougainvillea (family Nyctaginaceae), the red leaves of beets and chard (Chenopodiaceae), leaves and flowers of celosia (Amaranthaceae), moss rose (Portulacaceae), iceplants and lithops (Aizoaceae), and pokeweed (Phytolaccaceae). Most of these families had already been considered close relatives, grouped in an order usually called Centrospermae, based on the free-central or basal placentation (seed attachment within the fruit) of some of them. The cactus family has a different type of placentation and was often classified elsewhere, but because it possesses betalains, most taxonomists now include it with the Centrospermae (now usually called Caryophyllales). The question of the affinities of the Didiereaceae, a small family of succulents from Madagascar, was resolved when this family too was shown to possess betalains.

Gesneriads contain a very unusual type of anthocyanin, called 3-deoxyanthocyanins (which we will call 3-DA's for short). These 3-DA's have been found in *Alloplectus*, *Chrysothemis*, *Columnea*, *Episcia*, *Nautilocalyx*, *Achimenes*, *Koellikeria*, *Smithiantha*, *Kohleria*, *Gesneria*, and *Sinningia* (including *Rechsteineria*), but not in *Aeschynanthus*, *Chirita*, *Boea*, *Dichiloboea*, *Ornithoboea*, *Saintpaulia*, and *Streptocarpus*. This pattern is very striking: all the 3-DA genera are New World plants, and none of the Old World plants contain 3-DA's.

This distribution pattern is particularly important, because it has implications for the division of the Gesneriaceae into subfamilies. About 1900, Fritsch divided the family into two subfamilies on the basis of superior vs. inferior ovary. In 1962, Burtt advanced a revision of these subfamilies, based on the possession of an accrescent cotyledon (that is, a cotyledon which continues to grow after germination while the other remains small). The main effect of this revision was to transfer episcia, columnea, and some related genera from one subfamily to the other. The evidence of the 3-DA's supports Burtt's reclassification, since all the 3-DA genera are in his Gesnerioideae subfamily. It is particularly convincing because most of the 3-DA analysis was done *after* Burtt published his reclassification, so that his system provided a successful prediction. Predictions (much less successful ones) are not very common in taxonomy.

According to J. B. Harborne, who did the 3-DA analysis, "the most likely explanation is that these pigments are synthesized in the Gesneriaceae in response to selection from brilliant scarlet flower colour, which is favoured by bird pollinators".

Wiehler's breakdown of the Gesneriaceae, reproduced in *CrossWords* (1979, No.4), contained a third subfamily, the Coronantheroideae. Three of its species have been analyzed for 3-DA's, and the results do not lend any support to this grouping. The petals of *Sarmienta repens* contained a 3-DA. *Rhabdothamnus solandri* possessed normal anthocyanins, but no 3-DA's, and anthocyanins were completely absent from *Fieldia australis*.

The biggest taxonomical puzzle in the family, *Titanotrichum oldhamii* (because nobody has ever seen a titanotrichum cotyledon), does not contain any 3-DA's.

Aurones and chalcones are two other types of anthocyanin relatives. Harborne found them only in the Cyrtandroideae (that is, the accrescent-cotyledon subfamily). He also found a few other chemical types which were restricted apparently to one subfamily or the other.

Thus the chemical evidence strongly supports Burtt's division of the family.

The other main line of chemical evidence in the Gesneriaceae involves *Streptocarpus dunnii*. J. B. Harborne again, describing the research of Lawrence and Sturgess: "*S. dunnii* is the exceptional species; its flowers are brick red in colour... All other (Streptocarpus) species examined have blue flowers... All the other species have the *dunnii* flower pigments in their stems and leaves". *S. dunnii* is also "very distinct morphologically, being the only species with green filament colour and sticky pollen".

Since the general trend in Old World gesneriads is toward blue flowers, in association with bee pollination, this red flower trait led Lawrence and Sturgess to designate *S. dunnii* as a relatively primitive species of "relict" in the genus Streptocarpus. This is also consistent with the interpretation that rosulate streptocarpus species evolved from unifoliate ones. Another distinctive feature of *S. dunnii* is the red pigment *dunnione* on the underside of its leaves. Only one other species (*S. pole-evansii*) was found to contain dunnione. "The unique floral pigmentation of *S. dunnii* has provided the basis of most of the colour variation present in the garden streptocarpus, which is a complex hybrid derived from *S. dunnii*, *S. rexii*, and *S. parviflorus*."

Chemical evidence must be weighed in conjunction with other lines of reasoning. Both 3-DA's and dunnione occur sparingly outside the gesneriad family, but not too much can be deduced from this. For instance, although 3-DA's are very rare among plants, they have been found in a number of ferns. Nobody would claim on that basis that ferns were closely related to gesneriads, which are considered very advanced among flowering plants. In fact, 3-DA's are considered a relatively primitive type of pigment, and their isolated presence in New World gesneriads requires some sort of explanation, such as the bird-pollination argument mentioned above.

3-DA's have been found in a few species in other families, including one in the family Bignoniaceae, usually believed to be a close relative of the gesneriads. This might be significant if 3-DA's were more widespread in the Bignoniaceae; however, analysis of 16 representative species of this family failed to turn up any others with 3-DA's. 3-DA's do seem to be absent from the Scrophulariaceae and Orobanchaceae, the other two closest relatives of the gesneriads. On the other hand, dunnione has recently been found in the leaves of calceolaria (Scrophulariaceae). This seems to be its only occurrence outside the two streptocarpus species mentioned above.

As a final footnote, two researchers working for Coca-Cola have published procedures for synthesizing 3-DA's in the laboratory from chemical byproducts of the citrus industry. It seems that 3-DA's are being evaluated as possible food colors.

WHITHER X *GOMIOCHARIS*?

Larry Skog
Washington, DC

In a recent article on alpine gesneriads in the Bulletin of the Alpine Garden Society of Great Britain (Vol. 47(2) 1979, pp. 122-152), Mr. H. Ferns briefly discussed and illustrated an intergeneric hybrid whose name has been overlooked in compiling lists of intergeneric hybrids in the Gesneriaceae.

X *Gomiocharis calliandra* was the name given to a reputed cross between *Briggsia aurantiaca* and *Opithandra primuloides* made by O. Schwarz and published by him in 1977 in Bulletin of the Alpine Garden Society of Great Britain (Vol. 45(1), pp. 49-55).

Do any GHA members know of this hybrid and its present availability in the United States? I recently wrote to Bill Burtt at the Royal Botanic Garden in Edinburgh to ask if he knew of the plant's existence. He replied that he had seen the original article by Schwarz, but did not know if the plant had persisted. In a later letter Burtt wrote that the hybrid is currently being propagated and distributed by Schwarz.

If the plants still exist, there is a problem with the generic name, X *Gomiocharis*. Instead of following the rules for the formation of names of bigeneric hybrids as set down in the International Code of Botanical Nomenclature, Schwarz chose to honor Mr. Gomi, a Japanese plant collector. To be a legitimate or usable name according to Article H.7 of the Code, the name must be "a condensed formula formed by combining the names of the two parent genera, i.e. the first part or whole of one name and the last part or the whole of the other, into a single word." As an example of the application of this rule, the correct name X *Achimenantha* had to be adopted to replace the incorrect name X *Eucodonopsis* for hybrids between *Achimenes* and *Smithiantha*. Schwarz should have combined in some way the names *Briggsia* and *Opithandra*, and because he did not, the name X *Gomiocharis* cannot be used. Until the cross becomes widely available, one should refer to the bigeneric hybrid by its formula name *Briggsia* X *Opithandra*, rather than use the incorrect name. Burtt wrote that he will attempt to write to Schwarz to ask him to give a new generic name to this intergeneric hybrid of *Briggsia* and *Opithandra*.

Isla Montgomery
Denver, CO

To Penny Shampaigne (*CrossWords*, Vol. 3, No. 4, 1979) and her attempts to cross *Saintpaulia* with *Streptocarpus*, this is the "discouraging word" which should "never be heard", and it is coming from Home on the Range territory.

My life's goal has been and still is to cross *Saintpaulia* with *Sinningia cardinalis*; to transfer that red velvet texture of the *S. cardinalis* blossom to a blossom on an African Violet.

Dr. Carl Clayberg offered a solution (*The Gloxinian*, Vol. 23, No. 4, P. 14, 1973) and it seemed like the perfect technique for my project and my capabilities. I attempted to follow his suggested procedure to kill the pollen of the seed parent and mix the dead pollen with live pollen from another genus. The seed parent would recognize its own pollen and accept them both. Since *Saintpaulia* has the shorter style, I chose it as the seed parent. And it is not easy to kill *Saintpaulia* pollen.

After nearly a year it was dead enough that it would not produce a seed pod after several attempts. When I used the mixed *S. cardinalis* pollen there were many failures but at least one seed pod developed enough to produce viable seeds. The seed pods were longer and thinner than most *Saintpaulia* seed pods. The offspring were all *Saintpaulia*. At this point I remembered that the first generation might not be showing all of its characteristics so I selfed the seedlings. Again, all *Saintpaulia*.

Dr. Miriam Denham at Boulder is a member of our local chapter and is my mentor. She suggested that *Saintpaulia* is so sensitive it probably created a viable seed pod with no pollen whatsoever. She then suggested another procedure (similar to the one suggested by Ted Bona in *CrossWords*, Vol. 2, No. 2, 1978) in which the style of *S. cardinalis* is shortened by removing a segment and sticking the style back together with sugar water, long enough to get *Saintpaulia* pollen through the shortened style.

Possible problem: If *S. cardinalis* is as sensitive as *Saintpaulia*, all that manipulation might create another pollenless seed pod. I have not attempted this procedure.

Perhaps the editors can get permission to reprint the article by Dr. Clayberg. I second Penny's plea for help.

GESNERIACEAE CHROMOSOME NUMBERS I. Achimenes to Ancylostemon

Laurence E. Skog
Washington, DC

Since the first counts of chromosomes in the Gesneriaceae were published in 1923 by F. Oehlkers, hundreds of counts have been made and the results published in several journals. Up to this point these counts have not been organized into one list or readily available to GHA members.

It is useful for hybridizers to know the chromosome complement in the parents of potential crosses to determine the possibility that such a cross might take. Therefore, the chromosome numbers of species of Gesneriaceae will be published from time to time in Crosswords to benefit hybridizers. As can be seen below, the chromosome counts will be arranged by genus and species in alphabetic order with the species name followed by the author of the name. The number as published by the original counter is given in the middle two columns, with n= referring to the haploid number of chromosomes in the sex cells usually counted from developing pollen; and 2n= referring to the diploid number of chromosomes usually counted in the somatic cells of root tips. The right-hand column is of the references to the publications where the counts were given. The complete reference will be given only the first time it appears. Readers will be directed back to earlier parts of this series for references not appearing in later parts.

The names of the genera and species will be those currently in use, but the name of the plant under which the count first appeared will also be given with a cross reference to the current name of the species.

Typographical errors have been corrected where possible. Please inform the author of any counts or publications that have been overlooked.

Genus, species, author	n=	2n=	References
ACHIMENES			
andrieuxii DC. =Eucodonia andrieuxii (DC.) Wiehl.	12		Cooke, in Lee 1962a; Cooke & Lee 1966
antirrhina (DC.) Morton	11		Cooke, in Lee 1962a
baum. var. coerulea Sean. [sic]	11		Eberle 1956

Genus, species, author	n=	2n=	References
ACHIMENES (continued)			
bella Morton =Eucodonia verticillata (Martens & Gal.) Wiehl.	24		Cooke & Lee 1966
candida Lindl.	11		Lee & Grear 1963
cettoana H. E. Moore	11		Cooke, in Lee 1962a
coccinea (Scop.) Pers. =Achimenes erecta (Lam.) H. P. Fuchs	22		Lee 1962b
dulcis Morton	11		Lee 1962b
ehrenbergii (Hanst.) H. E. Moore =Eucodonia verticillata (Martens & Gal.) Wiehl.	12		Cooke, in Lee 1962a
ehrenbergii (Hanst.) H. E. Moore =Eucodonia verticillata (Martens & Gal.) Wiehl.		±24	Fussell 1958
erecta (Lam.) H. P. Fuchs as Achimenes coccinea (Scop.) Pers.	22		Lee 1962b
fimbriata Rose ex Morton	11		Cooke, in Lee 1962a
flava Morton	11		Cooke, in Lee 1962a
ghiesbrechtii Lindl. (?)	11		Eberle 1956
glabrata (Zucc.) Fritsch	11		Lee & Grear 1963
grandiflora (Schiede) DC.	11		Eberle 1956
heterophylla (Mart.) DC.	11		Lee 1962b; Lee & Grear 1963
hirsuta DC. [?]	11		Eberle 1956
longiflora DC.	11		Eberle 1956
mexicana (Seem.) Benth. & Hook. f. ex Fritsch	11		Lee & Grear 1963
mexicana var. coerulea Sean. [sic]	11		Eberle 1956

Genus, species, author	n=	2n=	References
ACHIMENES (continued)			
misera Lindl.	22		Lee 1966a
obscura Morton	11		Lee & Grear 1963
patens Benth.	11		Lee & Grear 1963
pedunculata Benth.		±34	Fussell 1958
pedunculata Benth.		34	Cooke & Lee 1966
skinneri Lindl.		±22, ±34	Fussell 1958
warszewicziana (Regel) H. E. Moore (incorrectly identified as Achimenes misera Lindl.)		22	Fussell 1958
woodii Morton	11		Cooke 1962
AESCHYNANTHUS			
albidus (Bl.) Steud.		30	Milne 1975
ellipticus Lauterb. & K. Schum.		64	Ratter 1963
ellipticus Lauterb. & K. Schum.		96	Ratter & Prentice 1964
ellipticus Lauterb. & K. Schum.		32	Milne 1975
fecundus P. Woods	16		Ratter & Milne 1970; Ratter 1975
grandiflorus (D. Don) K. Spreng. =Aeschynanthus parasiticus (Roxb.) Wallich		30	Rogers, in Lee 1962a
grandiflorus (D. Don) K. Spreng. =Aeschynanthus parasiticus (Roxb.) Wallich	16		Eberle 1956
horsfieldii R. Br.		32	Milne 1975
hosseussii Pellegrin		32	Ratter 1963
javanicus Hort. Rollisson ex Hook.	32		Eberle 1956

Genus, species, author	n=	2n=	References
AESCHYNANTHUS (continued)			
lamponga Miq.	32		Eberle 1956
lineatus Craib		30	Milne 1975
lobbianus Hort. Veitch ex Hook.	32		Eberle 1956
longicalyx Ridl.		32	Milne 1975
longicaulis R. Br. as Aeschynanthus marmoratus T. Moore		30	Rogers 1954; Ratter & Prentice 1964
longicaulis R. Br. as Aeschynanthus marmoratus T. Moore	14		Eberle 1956
longiflorus (Bl.) A. DC.		30	Fussell 1958; Ratter 1963
marmoratus T. Moore =Aeschynanthus longicaulis R. Br.		30	Rogers 1954; Ratter & Prentice 1964
marmoratus T. Moore =Aeschynanthus longicaulis R. Br.	14		Eberle 1956
myrmecophilus P. Woods		64	Milne 1975
nummularius (Burk. & S. Moore) K. Schum.		64	Ratter 1963; Ratter & Milne 1970
obconicus C. B. Cl.	16		Ratter & Prentice 1967
papuanus (Schltr.) B. L. Burtt		32	Milne 1975
parasiticus (Roxb.) Wallich as Aeschynanthus grandiflorus (D. Don) K. Spreng.		30	Rogers, in Lee 1962à
parasiticus (Roxb.) Wallich as Aeschynanthus grandiflorus (D. Don) K. Spreng.	16		Eberle 1956
parviflorus (D. Don) K. Spreng.		32	Ratter 1961
parvifolius R. Br.	64		Ratter & Milne 1970

Genus, species, author	n=	2n=	References
AESCHYNANTHUS (continued)			
perakensis Ridl.		30(28&21)	Ratter & Prentice 1964
praelongus Kraenzl.	16		Ratter & Milne 1970
pulcher (Bl.) G. Don		60	Rogers 1954
pulcher (Bl.) G. Don		64	Ratter 1963
pulcher (Bl.) G. Don	32		Eberle 1956
radicans Jack	15	32	Ratter & Milne 1970
sikkimensis Stapf		32	Ratter 1963; Ratter & Milne 1970
speciosus Hook.	32		Eberle 1956
X splendidus T. Moore (incorrectly identified as Aeschynanthus parasiticus (Roxb.) Wallich)		32	Ratter 1963; Ratter & Prentice 1964; Ratter 1975
tricolor Hook.		32	Ratter & Milne 1970
tricolor Hook.	16		Eberle 1956; Eberle 1957a
sp. (G-260, received as Aeschynanthus micranthus C. B. Cl.)	15		Lee 1962a
sp. (from New Guinea)		60	Borgmann 1964
AGALMYLA			
borneensis (Schlecht.) B. L. Burtt as Dichrotrichum sp. C4045	16		Ratter & Prentice 1967
borneensis (Schlecht.) B. L. Burtt as Dichrotrichum sp. C4045		32	Ratter & Prentice 1964
parasitica (Lam.) O. Kuntze	16		Fussell 1958
parasitica (Lam.) O. Kuntze		32	Ratter 1963
sp., as Dichrotrichum sp. 60-811 and Dichrotrichum amabile S. Moore		32	Ratter & Prentice 1964; Ratter 1975

Genus, species, author	n=	2n=	References
ALLOPLECTUS			
ambiguus Urban =Columnea ambigua (Urban) B. Morley		36	Morley 1967
ambiguus Urban =Columnea ambigua (Urban) B. Morley	18		Lee 1964
calochlamys J. D. Sm.	9		Lee 1967
capitatus Hook. =Corytoplectus capitatus (Hook.) Wiehl.	9		Eberle 1956
coccineus (Aubl.) Mart. var. fusco-maculatus Leeuw. =Drymonia coccinea (Aubl.) Wiehl.		18	Gadella & Kliphuis 1964
cristatus (L.) Mart.		18	Morley 1967
cristatus (L.) Mart. var. brevicalyx Morton	9		Wiehler 1972
domingensis Urban =Columnea domingensis (Urban) B. Morley		18	Ratter 1963; Rogers 1954
grisebachianus (O. Kuntze) Urban =Columnea grisebachiana O. Kuntze		18	Morley 1967
hispidus (Kunth) Mart.	9		Wiehler 1972
ichthyoderma Hanst.	9		Davidse 1970
lynchii Hook. f. =Nautilocalyx lynchii (Hook. f.) Sprague	17-18		Eberle 1956
nummularia (Hanst.) Wiehl. =Neomortonia nummularia (Hanst.) Wiehl.	9		Wiehler 1972
schlimii Planch. & Linden	9		Lee 1962b
speciosus Poepp. =Corytoplectus speciosus (Poepp.) Wiehl.	9		Lee 1962a

Genus, species, author	n=	2n=	References
ALLOPLECTUS (continued)			
tetragonus (Hanst.) Hanst.	9		Wiehler 1972
teuscheri (Raym.) Wiehl.	9		Wiehler 1972
vittatus Linden & Andre =Corytoplectus speciosus (Poepp.) Wiehl.	9		Eberle 1956; Eberle 1957a
zamorensis Linden & Andre =Corytoplectus congestus (Linden ex Hanst.) Wiehl.	9		Wiehler 1972
ANCYLOSTEMON			
convexus Craib	17	34	Ratter & Prentice 1964

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Fussell, C. P. 1958. Chromosome numbers in the Gesneriaceae. Baileya 6: 117-125.

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Lee, R. E. 1962b. Achimenes coccinea, a tetraploid; and additional counts of chromosome numbers in the Gesneriaceae. Baileya 10: 146.

Lee, R. E. 1964. Additional chromosome numbers in the Gesneriaceae. Baileya 12: 159.

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