CHROMOSOME NUMBERS OF MADAGASCAR PLANTS[1]

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ABSTRACT

Chromosome numbers are reported for 19 species in eight families of flowering plants of Madagascar. Included are first reports for 14 species. First counts for the genera *Kaliphora* ($n = 16$) and *Haronga* ($n = 10$) also are presented. A new low number ($n = 7$) is reported for the genus *Vernonia*, and the possible allopolyploid origin of New World taxa of the genus based on $x = 17$ is discussed.

Although the flora of Madagascar contains many interesting and poorly known genera and families, chromosome counts are available for relatively few species. The present paper inaugurates what is intended to be a sustained effort to record the chromosome numbers of Madagascar plants so they will be available to assist in interpretation of phytogeographic and evolutionary relationships.

MATERIALS AND METHODS

With two exceptions, chromosome numbers reported here were determined from microsporocytes undergoing meiotic divisions. The two counts in the genus *Aloe* were made from microcytes undergoing the first mitotic division of microgametogenesis. All floral bud materials used for chromosomal determinations were preserved in a modified Carnoy's fixative (6 chloroform : 3 absolute ethanol : 1 glacial acetic acid). These were stored in the fixative under refrigeration until they were transported to the University of Hawaii where acetocarmine slide preparations were made according to a modification of Beeks' method (Beeks, 1955). Observations were made with a Zeiss Photoscope III equipped with phase contrast optics. Voucher specimens of all cytological determinations have been deposited in the Herbarium of the Service de Botanique, Université de Madagascar, Tananarive (TAN).

RESULTS

The results are listed in Table 1.

DISCUSSION

Clusiaceae. The count of $n = 10$ for *Haronga madagascariensis* (Table 1) is the first count for this monotypic genus of tropical Africa and Madagascar. The same chromosome number characterizes the related genera *Hypericum* and *Vismia* (Moore, 1973, 1977; Goldblatt, 1983).

Ericaceae. First reports here of $n = 12$ for *Vaccinium emirnense* and *V. secundiflorum* agree with many other reports for the genus (Fedorov, 1974; Moore, 1973; Goldblatt, 1981, 1983).

Crassulaceae. The report of $n = 18$ given here for *Kalanchoë beharensis* (Table 1) agrees with two previous counts for this species (Baldwin, 1938; Friedmann, 1971).

Thymelaeaceae. The report here for the Madagascar endemic, *Gnidia bakeri,* agrees with an earlier report of $n = 9$ for *Gnidia carinata* Thunb. (Venkateswarlu, 1946). This number is also characteristic of at least five other genera of the family (Moore, 1977; Goldblatt, 1981, 1983).

Cornaceae. The chromosome number of *Kaliphora madagascariensis,* an endemic monotypic genus, is here determined to be $n = 16$. *Aucuba* appears to be the only other genus in the family known to possess this number (Fedorov, 1974; Moore, 1973; Goldblatt, 1983).

Compositae. The Madagascar endemic, *Anisopappus anemonifolius,* is here reported to have $n = 7$. The only other report for the genus appears to be $2n = 28$ for *A. africanus* (Hook. f.) Oliv. & Hiern (Auquier & Renard, 1975). Apparently on the basis of this latter count, Merxmüller et al. (1977) proposed the base number of $x = 7$ for the genus. Our determination for *A. anemonifolius* supports their proposal. The first report here for the endemic *Conyza garnieri* is the same as that found in many other species of this genus previously investigated (Fedorov, 1974; Moore, 1973, 1977; Goldblatt, 1981, 1983). A first report of $n = 5$ for the Madagascar endemic, *Emilia citrina* (Table 1) is a number that (along with $n =$

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TABLE 1. Chromosome numbers of Madagascar plants.

Taxon	*n*	Collection Data
Clusiaceae		
Haronga madagascariensis Choisy	10	142–84[1] Ambohitantely
Ericaceae		
Vaccinium emirnense Hook.	12	145–84 Ambohitantely
Vaccinium secundiflorum Hook.	12	148–84 Ambohitantely
Crassulaceae		
Kalanchoë beharensis Drake	18	Cultivated, Université de Madagascar
Thymelaeaceae		
Gnidia bakeri Gilg	9	152–84 Ambohitantely
Cornaceae		
Kaliphora madagascariensis Hook.	16	120–84 Ambohitantely
Compositae		
Anisopappus anemonifolius (DC.) G. Taylor	7	Ankatso
Conyza garnieri Klatt	9	Tsimbazaza
Helichrysum sp.	7	139–84 Ambohitantely
Emilia adscendens DC.	15	Ankatso
Emilia citrina DC.	5	Ankatso
Mikania scandens Willd.	19	143–84 Ambohitantely
Vernonia appendiculata Less.	7	Tananarive
Vernonia diversifolia Bojer	9	101–84 Ambohitantely
Vernonia garnieriana Klatt	30	114–84 Ambohitantely
Vernonia pectoralis Baker	10	Ankatso
Aloeaceae		
Aloe deltoideodonta Baker	7	Station Manambaro[2]
Aloe divaricata Berger	7	Fort Dauphin[2]
Orchidaceae		
Calanthe silvatica Lindley	20	133–84 Ambohitantely

[1] All collection numbers are those of the senior author.
[2] Collected by Lydia Rason.

10) is well established in the genus (Fedorov, 1974; Moore, 1973, 1974, 1977; Goldblatt, 1981, 1983). However, the number $n = 15$ reported here for *E. adscendens* is apparently otherwise known only in *E. sonchifolia* (L.) DC. (Torres & Liogier, 1970). The report here for *Mikania scandens* is in agreement with earlier reports for the species (Fedorov, 1974; Moore, 1973; Goldblatt, 1981). The counts here of $n = 9$ for *Vernonia diversifolia* and $n = 10$ for *V. pectoralis* appear to represent first reports for these endemic species. These numbers agree with previous reports and are found to be frequent in Old World taxa of the genus (Jones, 1979). *Vernonia garnieriana,* another endemic reported for the first time, has $n = 30$ (Table 1). This number appears to have been reported previously for only two species of *Vernonia,* i.e., *V. glabra* (Steetz) Vatke (Jones, 1979) and *V. travancorica* Hook. f. (Narayana, 1979). That these are hexaploids based on $x = 10$ is suggested by the report of both $n = 10$ and $n = 30$ in *V. glabra* by Jones (1979). The first report here of $n = 7$ for the endemic *Vernonia appendiculata* represents a number that is otherwise unknown in the genus. Moreover, this number represents the lowest haploid number known in *Vernonia* and allows speculation of a new, low base number of $x = 7$ for the genus. Jones (1979) has suggested that New World taxa based on $x = 17$ may have originated through aneuploidy from tetraploids based on $x = 9$. However, the discovery of $x = 7$ in *Vernonia appendiculata* offers an alternative explanation. New World taxa based on $x = 17$ could have arisen by way of allopolyploidy involving taxa with $x = 7$ and $x = 10$. In this connection, it may be mentioned that Humbert (1960) divided the 96 species listed for Madagascar into six groups,

according to apparent affinities. The group that includes *V. appendiculata* contains 38 other endemic species. It would be tempting to speculate that at least some of those also exhibit $x = 7$. As Jones (1979) pointed out, much cytological work remains to be done in the Vernonieae.

Aloeaceae. The endemic species *Aloe deltoideodonta* and *A. divaricata* are reported here to have $n = 7$, a number that agrees with previous reports for these and many other species of the genus (Amano et al., 1972).

Orchidaceae. The first report here of $n = 20$ for *Calanthe silvatica* agrees with previous reports for the genus (Fedorov, 1974; Moore, 1973, 1974, 1977; Goldblatt, 1981, 1983).

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