

# TAXON

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## **A revised classification of Santalales**

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## ■ CHROMOSOME NUMBERS FOR SANTALALES

### 1. Family Erythralaceae

Chromosome numbers have been reported for *Heisteria parvifolia* pollen mother cells and pollen (Mangenot & Mangenot, 1958):  $n = 16$ .

### 2. Family Strombosiaceae

Chromosome numbers have been reported from root cells of *Strombosia glaucescens* var. *lucida* (Mangenot & Mangenot, 1958):  $n = 20$  (also 40, likely from endopolyploidy).

### 3. Family Coulaceae

No chromosome numbers have been reported.

### 4. Family Ximeniaceae

Chromosome numbers have been reported for *Malania oleifera* (Yang & al., 2003):  $n = 13$ ; *Ximenia americana* (Robertson, 1982; Hunziker & al., 1985):  $n = 13, 26$ . Kondo & al. (1981) reported slightly different numbers for that species:  $n = 12, 24$ .

### 5. Family Aptandraceae

No chromosome numbers have been reported.

### 6. Family Olacaceae

Chromosome numbers have been reported for *Olox nana* (Khosla, 1978; Mehra, 1976):  $n = 12, 24$  and *Olox hypoleuca* (Carr & McPherson, 1986) with the same numbers.

### 7. Family Octoknemaceae

No chromosome numbers have been reported for *Octoknema*.

### 8. Family Schoepfiaceae

Chromosome numbers have been reported for *Schoepfia fragrans* (Mehra, 1976):  $n = 12$  and *Arjona patagonica* (Moore, 1981):  $n = 14$ .

### 9. Family Misodendraceae

Chromosome numbers have been reported for *Misodendrum punctulatum*:  $n = 8$  (Wulff, 1990), and  $n = 6$  (Moore, 1981).

### 10. Family Loranthaceae

#### 10.1. Tribe Nuytsieae

Chromosome numbers have been reported for *Nuytsia floribunda*:  $n = 12$  (Barlow, 1963).

#### 10.2. Tribe Gaiadendreae

The gametophytic chromosome number for *Atkinsonia ligustrina* is  $n = 12$  (Barlow & Wiens, 1971). A diploid population of *Gaiadendron punctatum* in Ecuador is  $n = 12$  whereas in Costa Rica both diploid and tetraploid ( $n = 24$ ) races were recorded (Barlow & Wiens, 1971).

#### 10.3. Tribe Elytrantheae

Chromosome numbers were reported for *Alepis flavida*, *Amylothea* (two species), *Decaisnina* (three species), and *Elytranthe capitellata* by Bir & al. (1982), for *Elytranthe parasitica* (Soman & Ramachandran, 1987), as well as the following from Barlow & Wiens (1971): *Lepeostegeres gemmiflorus*, *Lysiana* (five species), *Macrosolen* (two species; for two additional species see Sanjappa, 1979; Sarkar & Datta, 1990), and *Peraxilla tetrapeta* and all are  $n = 12$ .

#### 10.4. Tribe Psittacanthae

##### 10.4.1. Subtribe Tupeinae

The chromosome number for *Tupeia antarctica* originally reported as  $n = 11$  by Barlow & Wiens (1971) was erroneous and later corrected to  $n = 12$  (Beuzenberg & Groves, 1974).

##### 10.4.2. Subtribe Notantherinae

Chromosome numbers, both from Barlow & Wiens (1971), are as follows: *Desmaria mutabilis*  $n = 16-18$ , *Notanthera heterophylla*  $n = 12$ . The *Desmaria* number requires confirmation, as well as whether this taxon is a polyploid (Barlow & Wiens, 1971, 1973).

##### 10.4.3. Subtribe Ligarinae

Chromosome numbers, all from Barlow & Wiens (1971), are as follows: *Ligaria cuneifolia*  $n = 10$ ; *Tristerix aphyllus*, *T. corymbosus* [as *T. tetrandrus*], and *T. longibracteatus*  $n = 12$ .

##### 10.4.4. Subtribe Psittacanthinae

Chromosome numbers have been reported for *Aetanthus nodosus*, *Dendropemon pycnophyllus*, *Oryctanthus* (5 species), *Phthirusa* (1–5 species), *Psittacanthus* (6–9 species), *Struthanthus* (11 species), and *Tripodanthus flagellaris* and *T. acutifolius* (all from Barlow & Wiens, 1971). An additional count by Wiens was reported in Kuijt (1975) for *Cladocolea inconspicua*. All genera have  $n = 8$ , with the exception of a population of *Phthirusa pyriformis* in Costa Rica that is apparently tetraploid.

#### 10.5. Tribe Loranthae

##### 10.5.1. Subtribe Ileostylinae

The chromosome numbers for *Ileostylus micranthus* and *Muellerina* (three species) were determined by Barlow & Wiens (1971):  $n = 11$ . Based on these data, the two genera were placed in an unnamed tribe that also included *Lepidoceras* (Santalaceae) and *Tupeia* (subtribe Tupeinae above).

##### 10.5.2. Subtribe Loranthinae

Chromosome numbers have been reported for *Cecarria obtusifolia* (Barlow & Wiens, 1973) and *Loranthus europaeus* (Pisek, 1924), both  $n = 9$ .

##### 10.5.3. Subtribe Amyeminae

Chromosome numbers have been reported for *Amyema* (34 species), *Benthamina alyxifolia*, *Dactylophora novae-guinaeae*, *Diplatia furcata*, *D. grandibracteata*, and *Sogerianthe*

*sogerensis* (all from Barlow & Wiens, 1971) and all are  $n = 9$ . The number for *Helicanthes elastica* was the same (Bir & al., 1982).

#### 10.5.4. Subtribe Scurrulinae

Chromosome numbers have been reported for *Scurrula parasitica* (Soman & Ramachandran, 1987), *S. pulverulenta* (Bir & al., 1980), *Taxillus* (seven species, see Barlow & Wiens, 1971; Bir & al., 1982; Chatha & Bir, 1986; Soman & Ramachandran, 1987) and all are  $n = 9$ .

#### 10.5.5. Subtribe Dendrophthoinae

Chromosome numbers have been reported for *Dendrophthoe* (four species, see Wiens, 1975; Bir & al., 1982; Sarkar, 1984; Soman & Ramachandran, 1987) and *Helixanthera* (five species, see Barlow & Wiens, 1971; Soman & Ramachandran, 1987; Wiens, 1975) and all are  $n = 9$ .

#### 10.5.6. Subtribe Emelianthinae

Chromosome numbers, all from Wiens (1975), have been reported for *Erianthemum dregei*, *Globimetula* (two species), *Moquiniella rubra*, *Oliverella* (three species), *Phragmanthera* (two species), and *Spragueanella rhamnifolia* and all were  $n = 9$  except *Spragueanella* which is a tetraploid ( $n = 18$ ).

#### 10.5.7. Subtribe Tapinanthinae

Chromosome numbers, all from Wiens (1975), have been reported for *Actinanthella* (two species), *Agelanthus* (six species), *Bakerella* (four species), *Englerina* (four species), *Oncella* (incl. *Botryoloranthus*, two species), *Oncocalyx* (including *Danserella*, *Odontella*, *Tieghemia*, five species), *Plicosepalus* (three species), *Septulina glauca*, and *Tapinanthus* (three species), and all are  $n = 9$ .

### 11. Family Opiliaceae

Chromosome numbers have been reported for *Agonandra racemosa* (Löve, 1975):  $n = 10$ , *A. silvatica* (Hiepko, 2000):  $n = 20$ , *Cansjera leptostachya* (Oginuma & al., 1999):  $n = 10$ , *Lepionurus sylvestris* (Khosla, 1978)  $n = 10$ , and *Opilia amentacea* (Mangenot & Mangenot, 1958):  $n = 10$ .

### 12. Comandraceae

Chromosome numbers have been reported for *Comandra umbellata* as  $n = 14$  (Piehl, 1965),  $n = 13$  (Kondo & al., 1981); *C. umbellata* subsp. *pallida*  $n = 26$  (Löve & Löve, 1982); and *Geocaulon lividum* (Löve & Löve, 1982) with  $n = 13$ .

### 13. Thesiaceae

Chromosome numbers have been reported for several species of *Thesium*: *T. alpinum*,  $n = 6$  (Vachova, 1976; Nikolov, 1991),  $n = 7$  (Franzen & Gustavsson, 1983); *T. bergeri*,  $n = 8$  (De Montmollin, 1984); *T. divaricatum*,  $n = 8$  (García Martín & Silvestre, 1985),  $n = 8$  (Pastor & al., 1990); *T. ebracteatum*,  $n = 12$  (Semerenko, 1990); *T. humile*,  $n = 9$  (Ruíz de Clavijo, 1990); *T. italicum*,  $n = 8$  (Corrias, 1980); *T. linophyllum*,  $n = 12$  (Vachova, 1978).

### 14. Cervantesiaceae

No chromosome numbers have been reported.

### 15. Nanodeaceae

No chromosome numbers have been reported.

### 16. Santalaceae

Chromosome numbers have been reported for *Antidaphne viscoidea*:  $n = 13$  (Wiens & Barlow, 1971), *Antidaphne andina* [as *Eremolepis glaziovii*]:  $n = 10$  (Wiens & Barlow, 1971), *Lepidoceras chilense*:  $n = ca. 11$  (Barlow & Wiens, 1971), *Exocarpos gaudichaudii*:  $n = 10$  (Carr, 1978), *Osyris arborea*:  $n = 20$  (Bedi & al., 1981), *O. quadripartita*:  $n = 20$  (Valdes-Bermejo, 1980), *O. wightiana*:  $n = 15$  (Mehra, 1976), *Santalum acuminatum*:  $n = 10$  (Harbaugh, 2008), *S. album*:  $n = 20$ , 20+B (Selvaraj & Subramanian, 1982), *S. ellipticum*:  $n = 20$  (Carr, 1978), *S. freycinetianum*:  $n = 20$  (Carr, 1978), *S. paniculatum*:  $n = 20$  (Carr, 1978), and *S. spicatum*  $n = 10$  (Harbaugh, 2008). For a discussion of polyploidy in *Santalum*, see Harbaugh (2008).

### 17. Amphorogynaceae

No chromosome numbers have been reported.

### 18. Viscaceae

Chromosome numbers have been reported for several species of *Arceuthobium* and all have  $n = 14$  (Hawksworth & Wiens, 1977; Wiens & Barlow, 1971). Counts for ten species of *Dendrophthora* and over 40 species of *Phoradendron* were reported in Wiens & Barlow (1971). All but one accession, *P. henslovii*, a tetraploid from the Galápagos Islands, showed a gametophytic number of 14. Three species of *Korthalsella* were reported by Wiens & Barlow (1971) as  $n = 13-14$  and two species of *Notothixos* as  $n = 12-13$ . Over 24 species of *Viscum* are known and their gametophytic numbers vary, depending upon the species, from 10, 12, 14, and 20 (Wiens & Barlow, 1971). Several species of dioecious *Viscum* show translocation heterozygosity that determines plant sexuality and sex ratios in populations (Wiens, 1979; Wiens & Barlow, 1979; Aparicio, 1993).

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