A Cytological Study of Some Plants from Papua New Guinea

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Abstract. Somatic chromosome numbers for 12 species in 12 genera and 12 families native to Papua New Guinea, and karyotypes of 9 of those species, in meristematic cells of young leaves and root tips are reported. Four endemic genera, Holochlamys, Lamiodendron, Sericolea, and Eriandra, were included in the study. Of the 12 species investigated, 10 were studied for the first time cytologically. The chromosome number of 2n=22 was found in Anisoptera thurifera (Dipterocarpaceae), 2n=30 in Carpodetus arboreus (Carpodetaceae), 2n=44 in Corynocarpus cribbians (Corynocarpaceae), 2n=40 in Drypetes cf. bordenii (Putranjivaceae), 2n=28 in Eriandra fragrans (Polygalaceae), 2n=48 in Euroschinus papuana (Anacardiaceae), 2n=30 in Holochlamys beccarii (Araceae), 2n=48 in Lamiodendron magnificum (Bignoniacaeae), 2n=26 in Nothofagus grandis (Nothofagaceae), 2n=30 in Sericolea sp. (Elaeocarpacaeae), 2n=44 in Stemonures cf. annul (Icacinaceae), and 2n=16 in Trimenia papuana (Trimeniacaeae).

Key words: chromosome number, cytology, Papua New Guinea, plant, taxonomy

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During field work in Papua New Guinea we collected young leaves and root tips of some plants for cytological study. The systematic positions of those plants are too diverse to be included in a single taxonomic unit, but it seems worthwhile to publish the chromosome information about them as a contribution to our knowledge of the cytology of angiosperms. Indeed most of our results represent the first cytological information for the species and genera examined.

Materials and Methods

The cytology of 12 species of angiosperms, mostly native to Papua New Guinea, belonging to the Anacardiaceae, Araceae, Bignoniacaeae, Carpodetaceae, Corynocarpaceae, Dipterocarpaceae, Elaeocarpaceae, Fagaceae, Icacinaceae, Polygalaceae, Putranjivaceae, and Trimeniacaeae (Table 1), were examined in this study. The somatic chromosomes were examined in the meristematic cells of young leaves of all species except Drypetes cf. bordenii, where root tips were used. The methods of pretreatment, fixation, maceration, and staining for cytological study are
TABLE 1. Species studied, and their collections and chromosome numbers

<table>
<thead>
<tr>
<th>Species</th>
<th>Collections*</th>
<th>Chromosome number</th>
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<tbody>
<tr>
<td><em>Anisoptera thurifera</em> Blume</td>
<td>PAPUA NEW GUINEA. Morobe Prov., Oomisis. <em>Kiapranis et al.</em> 69600.</td>
<td>2n=22</td>
</tr>
<tr>
<td><em>Carpodetus arbores</em> Schltr.</td>
<td>PAPUA NEW GUINEA. Morobe Prov., Bulolo Distr. <em>Kiapranis et al.</em> 69609.</td>
<td>2n=30</td>
</tr>
<tr>
<td><em>Corynocarpus cribbianus</em> Bailey &amp; L. S. Sm.</td>
<td>PAPUA NEW GUINEA. West New Britain, Kimbe to Amio. <em>Kiapranis et al.</em> 69613.</td>
<td>2n=44</td>
</tr>
<tr>
<td><em>Drypetes cf. bordenii</em> Pax &amp; K. Hoffm.</td>
<td>PAPUA NEW GUINEA. West New Britain, Amio. <em>Kiapranis et al.</em> 69610.</td>
<td>2n=40</td>
</tr>
<tr>
<td><em>Eriandra fragrans</em> Royen &amp; Steenis</td>
<td>PAPUA NEW GUINEA. West New Britain, Amio. <em>Kiapranis et al.</em> 69639.</td>
<td>2n=28</td>
</tr>
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<td><em>Euroschinus papuanaus</em> Merr. &amp; Perry</td>
<td>PAPUA NEW GUINEA. Morobe Prov., Oomisis. <em>Kiapranis et al.</em> 69638.</td>
<td>2n=48</td>
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<tr>
<td><em>Holochlamys beccarii</em> Engl.</td>
<td>PAPUA NEW GUINEA. West New Britain, Kimbe to Amio. <em>Kiapranis et al.</em> 69612.</td>
<td>2n=30</td>
</tr>
<tr>
<td><em>Lamiodendron magnificum</em> Steenis</td>
<td>PAPUA NEW GUINEA. Morobe Prov., Oomisis. <em>Kiapranis et al.</em> 69640.</td>
<td>2n=48</td>
</tr>
<tr>
<td><em>Nothofagus grandis</em> Steenis</td>
<td>PAPUA NEW GUINEA. Morobe Prov., Bulolo Distr. <em>Kiapranis et al.</em> 69605.</td>
<td>2n=26</td>
</tr>
<tr>
<td><em>Sericolea</em> sp.</td>
<td>PAPUA NEW GUINEA. Morobe Prov., Bulolo Distr. <em>Kiapranis et al.</em> 69605.</td>
<td>2n=30</td>
</tr>
<tr>
<td><em>Stemonurus cf. ammi</em> (Kaneh.) Sleumer</td>
<td>PAPUA NEW GUINEA. West New Britain, Amio. <em>Kiapranis et al.</em> 69611.</td>
<td>2n=44</td>
</tr>
<tr>
<td><em>Trimenia papuana</em> Ridley</td>
<td>PAPUA NEW GUINEA. Morobe Prov., Bulolo Distr. <em>Kiapranis et al.</em> 69606.</td>
<td>2n=16</td>
</tr>
</tbody>
</table>

*All the collections are deposited in LAE.

according to Oginuma and Nakata (1988) and Oginuma et al. (1992). The categories of chromosomes described on the basis of the position of a centromere follow Levan et al. (1964).

Results and Discussion

*Anisoptera thurifera* Blume (Dipterocarpaceae).

Chromosomes at metaphase are 2n=22. Of 22 chromosomes the longest pair is about 1.5–1.4\(\mu\)m long; the remainder are about 0.8–1.1\(\mu\)m long. The longest pair has centromeres at the median position. In the remaining 20 chromosomes, 18 chromosomes have centromeres in a median position and two have them in a submedian position (Figs. 1, 2). Satellite chromosomes were not observed.

*Anisoptera* comprises 11 species distributed from India to New Guinea (Mabberley, 1997). By adding the results of this study to earlier information and unpublished data, chromosome information of five species of *Anisoptera* is now available: 2n=20 in *A. cochinchnensis* and *A. glabra* (Tixier, 1953, 1960), and 2n=22 in *A. laevis* (Jong and Lethbridge, 1967),...
A. megistocarpa (Oginuma, pers. obs.) and A. thurifera (present study). Anisoptera, like the closely related Vatica, which has \(x=11\), is very likely to be \(x=11\), but reconfirmation of the chromosome number in A. cochinchinensis and A. glabra seems necessary.

**Carpodetus arboreus** Schltr. (Carpodetaceae).
Chromosomes at metaphase are \(2n=30\). The variation in chromosome length is gradual; the longest chromosomes are about 1.4\(\mu\)m long, and the shortest about 0.8\(\mu\)m long. Twenty-four of 30 chromosomes have centromeres in a median position. Of the six remaining chromosomes, four have centromeres in a submedian position, and two at a subterminal position (Figs. 3, 4). Satellite chromosomes were not observed.

**Carpodetus** comprises ten species distributed in New Guinea and New Zealand (Mabberley, 1997). Recent molecular evidence suggests that Carpodetus should be placed together with *Abrophyllum* and *Cutsia* in the Carpodetaceae (Gustafsson and Bremer, 1997). Our previous knowledge of chromosomes of *Carpodetus* was restricted to two reports: *C. serratus* (Hair and Beuzenberg, 1960) with \(2n=30\) and *C. sp.* (Borgmann, 1964) with \(2n=28\). Our additional report of \(2n=30\) in *Carpodetus arboreus* implies that the base number of *Carpodetus* is likely to be \(x=15\). However, a more extensive study in *Carpodetus* is needed. Likewise, *Abrophyllum* and *Cutsia*, for which chromosome data are lacking, ought to be studied cytologically for comparison with *Carpodetus*.

**Corynocarpus cribbianus** Bailey & L. S. Sm. (Corynocarpaceae).
Chromosomes at metaphase are \(2n=44\). The variation in chromosome length is gradual; the longest chromosomes are about 1.3\(\mu\)m long, and the shortest 0.6\(\mu\)m long. Some of the chromosomes have centromeres in a median or submedian positions, but in others the exact position of the centromeres is uncertain (Figs. 5, 6). Satellite chromosomes were not observed.

**Corynocarpus** comprises six species distributed in New Guinea, northeastern Australia, New Caledonia, Vanuatu and New Zealand (Mabberley, 1997). The report of \(2n=44\) chromosomes in *C. cribbianus* is the first for the genus.

Chromosomes at metaphase are \(2n=40\). Variation in chromosome length is gradual; the longest chromosomes are about 1.6\(\mu\)m long, and the shortest 0.6\(\mu\)m long. Thirty-two of 40 chromosomes have centromeres in a median position. Of the remaining eight chromosomes, two have centromeres in a submedian position, and six have them in a subterminal position (Figs. 7, 8). Satellite chromosomes were not observed.

**Drypetes** comprises about 200 species distributed from East Asia to South Africa (Mabberley, 1997). Chromosome numbers have been reported in five other species: \(n=20\) in *D. roxburghii* and \(2n=40\) in *D. aylmeri*, *D. chevalieri*, *D. ivorensis* and *D. mottikoro* (Fedorov, 1974;
Goldblatt, 1981, 1985, 1988). This is the first report on chromosomes in D. cf. bordenii, and the finding of $2n=40$ supports a generic base number of $x=20$.

Eriandra fragrans Royen & Steenis (Polygalaceae).

The metaphase chromosome number in E. fragrans is $2n=28$, but chromosomes morphology and karyotype were not examined in detail. Eriandra is a monotypic genus of New Guinea and the Solomon Islands (Mabberley, 1997). The count of $2n=28$ is the first report on the chromosome number of the genus.

Euroschinus papuanus Merr. & Perry (Anacardiaceae).

The metaphase chromosome number in Euroschinus papuanus is $2n=48$. The variation in chromosome length is gradual; the longest chromosomes are about $2.7 \mu m$ long, and the shortest $0.8 \mu m$ long. Forty of the 48 chromosomes have centromeres in a median position, and eight have centromeres in a submedian position (Figs. 9, 10). Among the eight chromosomes with centromeres at the submedian position, two of the smaller chromosomes have satellites in the distal region of their short arms.

Euroschinus comprises six species distributed from Malaysia to Australia and New Caledonia (Mabberley, 1997). The $2n=48$ in Euroschinus papuanus is the first report of a chromosome number for the genus.

Holochlamys beccarii Engl. (Araceae).

The chromosome number at metaphase is $2n=30$. The variation in chromosome length is gradual; the longest chromosomes are about $3.8 \mu m$ long, and the shortest $2.3 \mu m$ long. Twenty-six of 30 chromosomes have centromeres in a median position, and the remaining four have centromeres in a submedian position (Figs. 11, 12). Satellite chromosomes were not observed.

Holochlamys is a monotypic genus comprising only H. beccarii, endemic to New Guinea (Mabberley, 1997). Petersen (1989) already reported $2n=60$ for this species. The present report suggests that polyploidy exists, with $2n=30$ diploid individuals and $2n=60$ tetraploid individuals. The base chromosome number is $x=15$.

Lamiodendron magnificum Steenis (Bignoniaceae).

The chromosome number of Lamiodendron magnificum at metaphase is $2n=48$. Chromosome length varies gradually from about $0.4 \mu m$ long to about $1.0 \mu m$ long. Some of the chromosomes appear to have centromeres in median or submedian positions, but others the exact position of the centromeres (Figs. 5, 6) was uncertain. Satellite chromosomes were not observed.

Lamiodendron is a monotypic genus comprising only L. magnificum, which is endemic to New Guinea (Mabberley, 1997). This is the first report of the chromosome number of the genus.
**Nothofagus grandis** Steenis (Nothofagaceae).

The chromosome number of *Nothofagus grandis* at metaphase is $2n=26$, but the detailed morphology and karyotype could not be examined. *Nothofagus* comprises 35 species distributed from New Guinea, New Caledonia and New Zealand to temperate Australia and South America (Mabberley, 1997). The chromosome number has been

reported for six other species; N. discoidea, N. fucscia, N. menziesii and N. solandri, n=13; and N. alpina and N. pumilio, 2n=26 (Fedorov, 1974; Goldblatt, 1985, 1988; Goldblatt and Johnson, 1990). This is the first report of the chromosome number of N. grandis. Our observations support a base number for Nothofagus of x=13.

Sericolea sp. (Elaeocarpaceae).

The chromosomes number at metaphase of Sericolea sp. is 2n=30. The variation in chromosome length is gradual; the longest chromosomes are about 1.0 μm long, and the shortest about 0.5 μm long. Of the 30 chromosomes, some chromosomes have centromeres in a median or submedian position, but the position of the centromere in the others is uncertain (Figs. 15, 16). Satellite chromosome were not observed.

Sericolea, a genus endemic to New Guinea, comprises 16 species (Mabberley, 1997). The count of 2n=30 in Sericolea sp. is the first report of the chromosome number in the genus.

Stemonurus cf. ammui (Kaneh.) Sleumer (Icacinaceae).

The chromosome number of Stemonurus cf. ammui at metaphase is 2n=44, but the details of their morphology and karyotype were not examined. Stemonurus comprises about 30 species distributed from India to New Guinea (Mabberley, 1997). This is the first report of the chromosome number for the genus.

Trimenia papuana Ridley (Trimeniaceae).

The chromosome number of Trimenia papuana at metaphase is 2n=16. Variation in chromosome length is gradual; the longest chromosomes are about 4.4 μm long and the shortest are about 2.8 μm long. Four of 16 chromosomes have centromeres in a median position. Of the remaining 12 chromosomes, six chromosomes have the centromere in a submedian or subterminal position (Figs. 17, 18). Satellite chromosomes were not observed.

Trimenia, the only genus of the Trimeniaceae, comprises five species distributed from Malaysia to the Marquesas and Samoa (Mabberley, 1997). The count of 2n=16 from our collection of T. papuana agrees with earlier reports on the same species (Goldblatt, 1974; Morawetz, 1986). Concerning the other species of Trimenia, 2n=16 has been reported by Goldblatt and Briggs (1979) and Morawetz (1986) for Trimenia moorei (Oliver) Philipson (=Piptocalyx moorei Oliver). Our report supports a base chromosome number of x=8 in Trimenia, but our observations of the metaphase karyotype does not agree with the report by Morawetz (1986). Morawetz (1986) described the chromosomes as having centromeres in a submedian position, a karyotype clearly different from the one we report above.

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References


摘要

猟沼一男1・R. Kiapranis2・K. Damas2・戸部 博3：パプアニューギニア産植物数種の染色体

パプアニューギニアにそのほとんどが自生する被子植物12科12属12種について、若い葉及び根端細胞を用いて調べた体細胞染色体の数と核型を報告する。このうち4属
Holochlamys, Lamiodendron, Sericolea, Eriandra)は固有属であり，調べた12種のうち10種については初めての報告である。染色体数は以下の通りである。Anisoptera thurifera (フタバガキ科)は2n=22, Carpodetus arboreus (カルポデツス科)は2n=30, Corynocarpus cribbianus (コリノカルプス科)は2n=44, Drypetes cf. bordenii (ハツバキ科)は2n=40, Eriandra fragrans (ヒメハギ科)は2n=28, Euroshinus papuanus (ウルシ科)は2n=48, Holochlamys beccarii (サトイモ科)は2n=30, Lamiodendron magnificum (ノウゼンカズラ科)は2n=48, Nothofagus grandis (ナンキョクブナ科)は2n=26, Sericolea sp. (ホルトノキ科)は2n=30, Stemonurus cf. ammui (クロタキカズラ科)は2n=44, Trimenia papuana (トリメニア科)は2n=16の染色体数をもつことが明らかにされた。

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