CYTOTAXONOMIC NOTES ON AFRICAN PAPILIONACEAE*

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SUMMARY

Diploid chromosome numbers are reported in species of the Papilionaceous genera *Gamwellia*, *Bolusia*, *Argyrolobium*, *Adenocarpus*, *Trifolium*, *Rhynchosia*, and *Eriosema*, all of them, except one, originating from the African continent. Some notes are added discussing the taxonomic significance of these numbers.

1. INTRODUCTION

These notes concern chromosome studies on material either collected by the author or received from experiment stations and botanical institutes mentioned in *table 1*. Herbarium vouchers confirming the naming of the taxa have been stored in the herbaria at Wageningen, Netherlands and, eventually, at Kew. If merely seeds were available, plants were raised in the hothouses of the Department of Tropical Crops, Wageningen and herbarium therefrom was verified by Kew Herbarium specialists.

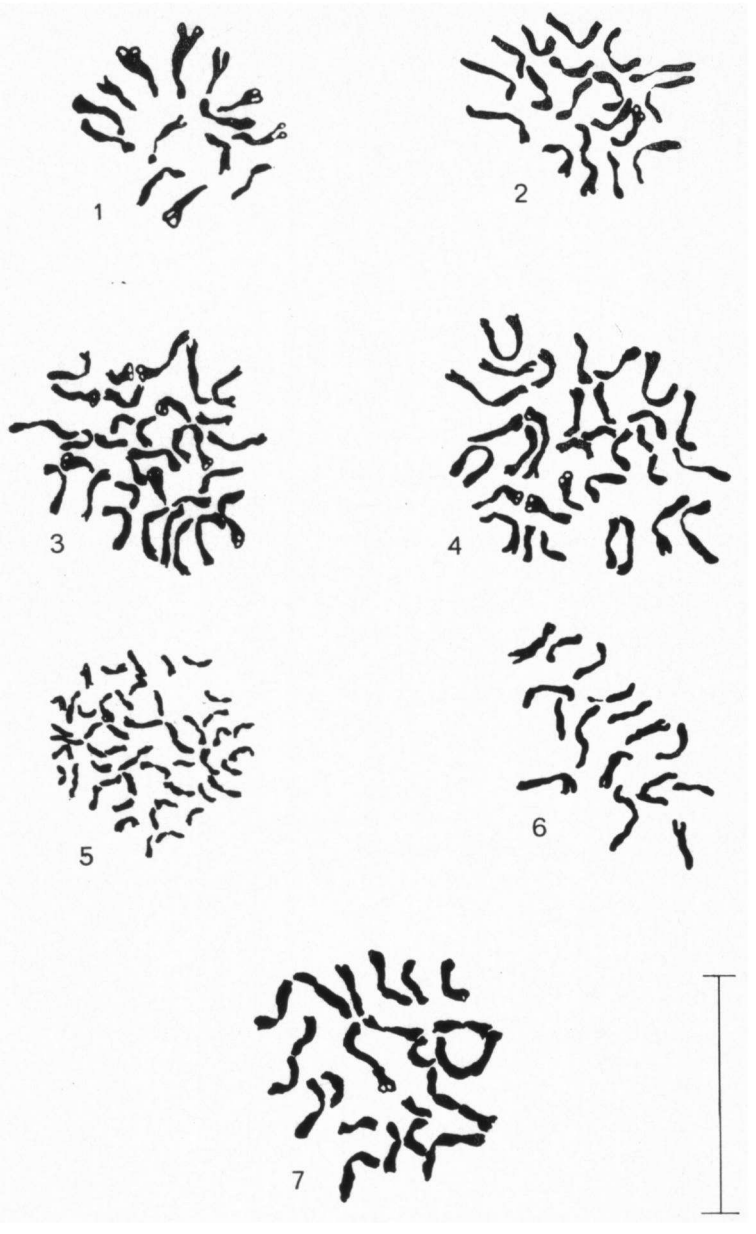
2. METHODS

Seedling roottips were fixed in Navashin, embedded in paraffin, sectioned and the sections subsequently stained with Newton's crystal violet. Camera lucida drawings were made at a magnification of 2000 times. The unit of scale added to the figures is 10 μ.

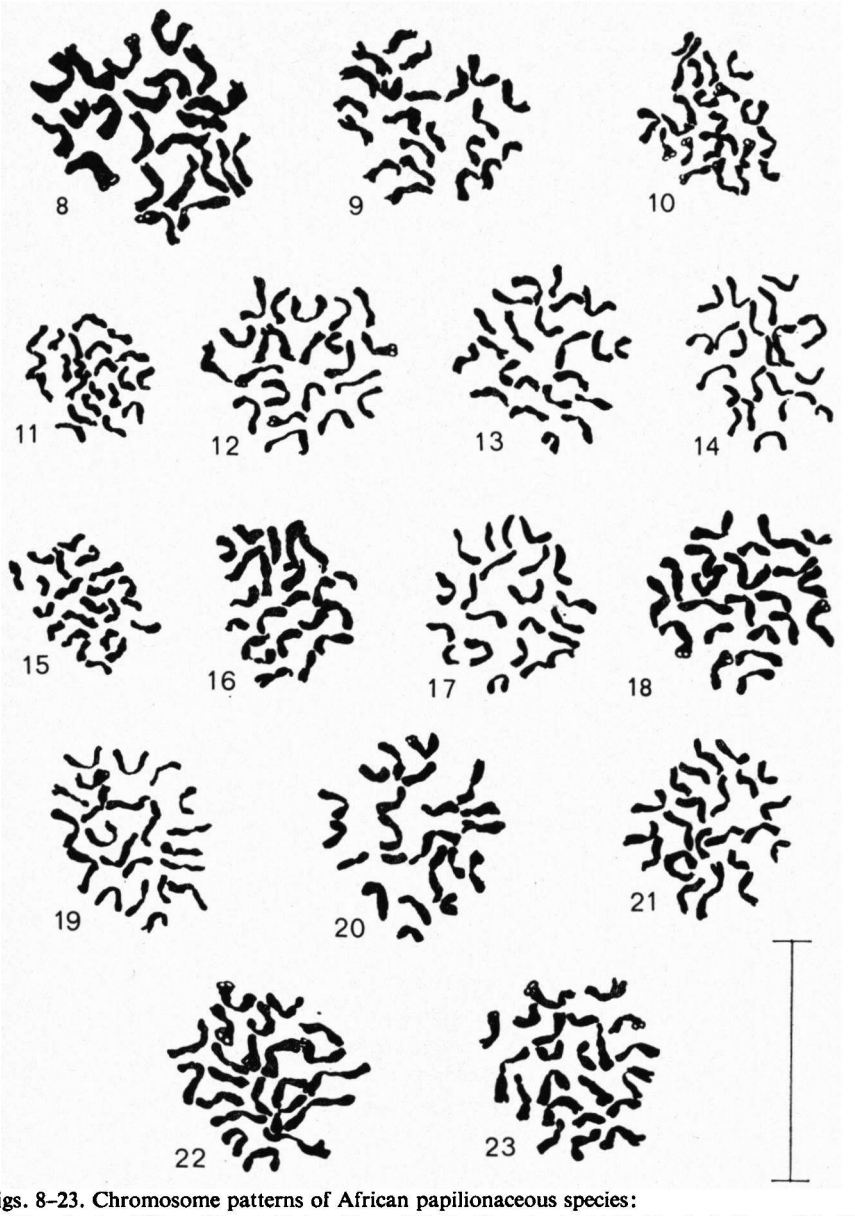
3. OBSERVATIONS AND DISCUSSION

In 1966, Mr. Polhill at Kew enclosed a batch of viable seeds of *Gamwellia flava* Bak.f. when sending a number of *Crotalaria* species. According to Polhill, this monospecific genus should be considered as being taxonomically closely related to *Crotalaria*. Both chromosome number and dimensions tally rather well with those in the subgenus *Incanae* of *Crotalaria* L. Whereas in all other subgenera of *Crotalaria* the base number hitherto found is n = 8, the *Incanae* up till now studied have n = 7 and the chromosomes are much larger than in the other subgenera (FRAHM-LELIVELD, to be published). Simultaneously, seeds were received from a member of the genus *Bolusia* Benth. As to the chromosomes in this small southern African genus as yet nothing has been reported. *Bolusia rhodesiana* Corb., now, has a diploid number of 18 and as such it obviously

* Dedicated to Professor Dr. Th. J. Stomps.



Figs. 1–7. Chromosome patterns of African papilionaceous species:
1. *Gamwellia flava* Bak. f. (2n = 14); 2. *Bolusia rhodesiana* Corb. (2n = 18); 3. *Argyrolobium andrewsianum* (E. Mey.) Steud. (2n = 32); 4. *Argyrolobium leucophyllum* Bak. (2n = 32); 5. *Adenocarpus mannii* Hook. f. (2n = 48); 6. *Trifolium acaule* Steud. ex. A. Rich. (2n = 16); 7. *Bowringia mildbraedii* Harms (2n = 22).



Figs. 8–23. Chromosome patterns of African papilionaceous species:
8. *Rhynchosia albiflora* (Sims.) Alston (2n = 22); 9. *Rhynchosia debilis* Hook. f. (2n = 22); 10. *Rhynchosia memnonia* (Del.) DC. (2n = 22); 11. *Rhynchosia memnonia* (Del.) DC. (2n = 22); 12. *Rhynchosia memnonia* (Del.) DC. (2n = 22); 13. *Rhynchosia sennarensis* Hochst. ex Schweinf. (2n = 22); 14. *Rhynchosia* spec. (2n = 22); 15. *Rhynchosia sublobata* (Schum. & Thonn.) Meikle (2n = 22); 16. *Rhynchosia viscosa* (Roth) DC. (2n = 22); 17. *Rhynchosia viscosa* (Roth.) DC. (2n = 22); 18. *Eriosema cajanoides* Hook. f. (2n = 22); 19. *Eriosema glomeratum* Hook. f. (2n = 22); 21. *Eriosema glomeratum* Hook. f. (2n = 22); 22. *Eriosema griseum* Bak. (2n = 22); 23. *Eriosema montanum* Bak. f. (2n = 22).

Table 1. Species investigated, with the collection number, reference to origin and accession, diploid chromosome number (2n), and the number of the figures.

Coll. no.	Species	Fig.	Herbarium
Genisteae			
65026	*Gamwellia flava* Bak. f.	1	K
65027	*Bolusia rhodesiana* Corb.	2	K
59001	*Argyrolobium andrewsianum* (E. Mey.) Steud.	3	–
62287	*A. leucophyllum* Bak.	4	Kit.
62009	*Adenocarpus mannii* Hook. f.	5	Wag.
Trifolieae			
62371	*Trifolium acaule* Steud. ex A. Rich.	6	Wag., K
Sophoreae			
62020	*Bowringia mildbraedii* Harms	7	Wag.
Phaseoleae			
63020	*Rhynchosia albiflora* (Sims.) Alston	8	Wag.
54075	*R. debilis* Hook. f.	9	Wag.
62131	*R. memnonia* (Del.) DC.	10	Wag.
63011	*R. memnonia*	11	–
63021	*R. memnonia*	12	–
62267	*R. sennarensis* Hochst. ex Schweinf.	13	Wag.
62266	*R.* spec. (not matched at Kew)	14	Wag., K
63028	*R. sublobata* (Schum. & Thonn.) Meikle	15	Wag.
63019	*R. viscosa* (Roth) DC.	16	–
63027	*R. viscosa*	17	Wag.
–	*Eriosema cajanoides* Hook. f.	18	Wag.
54045	*E. glomeratum* Hook. f.	19	Wag.
57117	*E. glomeratum*	20	Wag.
57170	*E. glomeratum*	21	Wag.
57008	*E. griseum* Bak.	22	Wag.
62183	*E. lejeunei* Stainer & D. Crane		Wag., K
62136	*E. montanum* Bak. f.	23	Wag., K

comes near to the genus *Lotononis* Eckl. & Zeyh. where BYTH (1964) reports for *L. angolensis* Welw. 2n = 18 and for *L. bainesii* Bak. 2n = 36. The again closely related *Listia heterophylla* E. Mey. (personal communication of Cameron to Byth) has 2n = 18. On morphological grounds, however, BRENAN (1965) considers *Gamwellia* to be related to *Lotononis*, and *Bolusia* is thought to be near to *Crotalaria*. Whether this situation may point to polyphyletic origins within this part of the *Genisteae* may be suggested, but as yet must remain an open question.

Argyrolobium andrewsianum (E. Mey.) Steud. was received from the Botanical Gardens at Delft, Netherlands, but the exact origin is unknown. It is entered here on account of earlier reports by LARSEN (1956) and GILOT (1965) who give the diploid number as 30. Both this species and *A. leucophyllum* Bak., however, at present studied by the author, appear to have 2n = 32. The base number 16 (8?) was found also in *A. linnaeanum* Walp., the only European representative of the genus, when both LORENZO-ANDREU (1951) and LARSEN (1956) reported 2n = 48. Gilot supports the view of BRIQUET (1894) who suggested another taxonomic classification of the *Argyrolobium* species, but recently the

Origin	2n
Richards 15211, Abercorn, N. Rhodesia	14
Robinson 5424, Mongu, Zambia	18
Bot. Gardens, Delft, Netherlands 1959	32
AB 5518, Bogdan K 52235, Grassl. Exp. Sta., Kitale, Kenya	32
Breteler, Mt. Cameroun, 2850 m,. 1962	48
Frahm-Leliveld, Entoto Hills, Addis Abeba, Ethiopia, 1963	16
Breteler, Cameroun 2770, 1962	22
Sisal Exp. Sta., Mlingano, Tanzania, L. 20, 1963	22
Frahm-Leliveld, Assakra, Ivory Coast, 1954	22
Frahm-Leliveld, Rift Wall Estate, Manyara, Tanzania, 1962	22
Sisal Exp. Sta., Mlingano, Tanzania, L. 74, 1963	22
Sisal Exp. Sta., Mlingano, L 15, 1963	22
Bogdan, Mongola (Mbulu), Tanzania, K55103, Grassl. Exp. Sta., Kitale, Kenya, 1962	22
Bogdan, Sth. Nyanza, Kenya, K54336, Grassl. Exp. Sta., Kitale 1962	22
Sisal Exp. Sta., Mlingano, Tanzania, L 8, 1963	22
Sisal Exp. Sta., Mlingano, Tanzania, L 14, 1963	22
Sisal Exp. Sta., Mlingano, Tanzania, L 117, 1963	22
BBPP, Bogor, Indonesia, 1951	22
Frahm-Leliveld, Mopoyem, Ivory Coast, 1954	22
Frahm-Leliveld, Ketou, Dahomey, 1957	22
Frahm-Leliveld, Moossou, Ivory Coast, 1957	22
Frahm-Leliveld, Jos, Nigeria, 1957	22
Frahm-Leliveld, Ruiru, Kenya, 1962	ca. 22
Frahm-Leliveld, Old Moshi, Tanzania, 1962	22

following fact has come to light. An even more manifest deviation of the base number n = 16 is reported in *A. flaccidum* Jaub. & Spach. by BIR & SIDDHU (1966), *viz.* n = 13. In the subtribe *Genisteae* a few species with 2n = 52 (base number 13 or 26?) are known in other genera, *e.g.* ir *Lupinus*, *Spartium*, *Genista Petteria*, *Adenocarpus*, *Cytisus*, and *Echinosparton* (DARLINGTON & WHYLIE 1955 and Index Plant Chrom. No.s 1955–1966). Although a good deal of work in these genera has been done, a more extensive investigation on the chromosomes in this part of the *Genisteae* might have its reward with a view to taxonomic problems.

Adenocarpus mannii Hook. f., widely spread in the mountain regions of tropical Africa, is the only representative of this genus on the continent of Africa. BRENAN (1965) reports the main distribution of the genus to be in Europe and Western Asia. LEMS (1958) discriminates 5 taxa (species and varieties) in the Canary Islands, all of them growing at higher altitudes. Earlier, cytological investigations had been reported on *A. viscosus* Webb. & Berth., n = ca. 23, 24, by LARSEN (1958, 1960) who obtained his material from Tenerife at 1800 m alt.

Another report is that of GILOT (1965) who studied *A. complicatus* A. Gay: he mentions 2n = 52 for this mediterranian species.

The Entoto Hills (ca. 2800 m alt.) immediately north of Addis Ababa, Ethiopia, contain numerous gullies, originally covered with *Podocarpus* and *Juniperus* woods, remnants of which are still existing, but at present widely reafforrestated with *Eucalyptus globulus*. Locally, the undergrowth is still in its original state and there the soil may be densely covered with *Trifolium acaule* Steud. ex A. Rich. Curiously enough, this *Trifolium* species has escaped the attention of BRITTEN (1963) and the Australian workers (PRITCHARD *c.s.* 1962, 1964, 1967) who, with a view to the eventual introduction of African *Trifolium* as grassland plants in Australia, made a very extensive chromosome survey of the East African mountain species of this genus. The diploid number 2n = 16 reported here is by far the most common number in the African species hitherto studied.

Bowringia mildbraedii Harms, belonging to a monospecific genus of the subtribe *Sophoreae*, appears to have 2n = 22 and thus fits in the neighbourhood of the genera *Baphia* Lodd. and *Baphiastrum* Harms where also 2n = 22 occurs. In the genus *Baphia* a few species are recorded with 44 (46) chromosomes, apparently cases of polyploidy (MANGENOT & MANGENOT 1957, 1958; RILEY 1960).

According to Dr. Verdcourt (personal communication), the genera *Rhynchosia* Lour, and *Eriosema* Desv. are considered as being closely related. Both have a pantropical distribution, and several reports on chromosome numbers are available, almost uniformly stating 2n = 22 (cf. for *Rhynchosia:* SENN 1938, TURNER 1956, AHUJA & NATARAJAN 1957, FRAHM-LELIVELD 1957, THOMBRE 1959, TURNER & FEARING 1960, MIÈGE 1960, and for *Eriosema:* FRAHM-LELIVELD 1953, 1957, TURNER & FEARING 1959). The only exception, thusfar, has been reported by MIÈGE: *Rh. pycnostachya* (DC.) Meikle with 2n = 24. A considerable difference in chromosome dimensions, however, is present between the various species of *Rhynchosia*, much more so than in the *Eriosema* species studied. The material available of *E. lejeunei* Stainer & D. Crane allowed the counting of only one plate, but a camera lucida drawing was impossible. The much greater variability of chromosome dimensions in *Rhynchosia* might give rise to the suggestion, that of these two genera *Rhynchosia* is the older one.

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