Karyomorphological Studies in Some South Indian Convolvulaceae¹

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The family Convolvulaceae consists approximately of 55 genera and 1650 species (van Ooststroom 1953). In South India, the species occur much widespread in the plains as well as in the hills. There is paucity of knowledge regarding the karyology of this family, despite the larger number of species distributed widely. It is of special interest to note that only about 9½% of the total number of species available in this family has so far been cytologically investigated, and even where the chromosome numbers have been determined (cf. Darlington and Wylie 1955, Fedorov 1969), the knowledge concerning the details of karyotype pertaining to chromosome measurements which are vital to the understanding of karyological affinities, is still meagre. It was, therefore, felt that detailed and critical karyological work in this family was desirable. Already there are a few published reports of karyotypes of the members of this family (Sharma and Chatterji 1957, Sharma and Datta 1958, Nakajima 1963, Sampathkumar 1970, Kaul and Bhan 1974). The present paper, which is complementary to the author's previous report (Sampathkumar 1970), deals with the details of chromosome measurements not hitherto reported for twenty-seven taxa of Convolvulaceae from S. India.

Materials and methods

The materials used in this present investigation were collected from different localities of S. Indian plains and hills, the voucher specimens of which have been deposited in the *hortus siccus* of the Botany Department, Annamalai University. For the study of the somatic chromosomes, several squash methods in vogue have been tried, as the chromosomes of most of the Convolvulaceae happen to be rather small. The root tips were fixed in 1:3 acetic alcohol for a period of 24 hours. Pre-treatment with 0.002 M hydroxyquinoline at 20°C for 1-2 hours yielded satisfactory results. Acetocarmine and propiono-orcein were used as stains, following the squash techniques described previously (Rangaswami Ayyangar and Sampathkumar 1967, 1968). From the diagrams drawn with camera lucida at stage level, the chromosome measurements pertaining to short/long arms were made, with a standardized scale improvised for the purpose, the details of which are presented in Table 1 for all the 27 taxa. For the assessment of the morphology

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of the chromosomes, twelve metaphase plates in each species were studied critically for the sake of confirmation.

Observations

The chromosomes of Convolvulaceae are rather small. It is of particular interest to note that the smallest chromosome measured just a micron, while the longest chromosome measures 8.6 microns. Based on the length, the chromosomes have been grouped into Very Long, Long, Medium and Short chromosomes. Under each of these groups, the following categories of chromosomes have been recognized:

Very long (6.5–8.6 μ)

- Type A Chromosomes with median centromere
- Type B Chromosomes with submedian centromere
- Type C Chromosomes with median centromere and satellites
- Type D Chromosomes with submedian centromere and satellites on the short arm.

Long (4.0–5.7 μ)

- Type E Chromosomes with median centromere
- Type F Chromosomes with submedian centromere
- Type G Chromosomes with median centromere and satellites
- Type H Chromosomes with submedian centromere and satellites on the short arm
- Type I Chromosomes with submedian centromere and satellites on the long arm.

Medium (2.0–3.9 μ)

- Type J Chromosomes with median centromere
- Type K Chromosomes with submedian centromere
- Type L Chromosomes with median centromere and satellites
- Type M Chromosomes with submedian centromere and satellites on the short arm
- Type N Chromosomes with submedian centromere and satellites on the long arm
- Type O Chromosomes with median centromere and a secondary constriction in each arm
- Type P Chromosomes with submedian centromere and a secondary constriction in each arm.

Short (1.0–1.9 μ)

- Type Q Chromosomes with median centromere
- Type R Chromosomes with submedian centromere.

The total number of satellited chromosomes and/or secondarily constricted chromosomes has been found to vary from species to species. In certain species, some chromosomes possessing a pair of satellites were seen; and this condition is presumably due to a longitudinal splitting of an originally single satellite, before the remainder of the chromosomes begin to separate. In the following tables (Tables 1 and 2), the details of chromosome measurements are given:

Table 1.

Chromosome		Length in microns					Position of centromere and secondary constriction
Type	No.	Long arm L	Short arm S	Ratio S/L	Total S+L	Relative length	
<i>Argyreia cuneata</i> Ker.-Gawl.							
A	2	3.5	3.5	1.00	7.00	9.66	median
D	2	3.5	3.0	0.86	6.50	8.96	submedian; satellite on the short arm
E	6	2.0	2.0	1.00	4.00	5.51	median
F	6	3.0	2.0	0.67	5.00	6.90	submedian
F	2	2.5	1.5	0.60	4.00	5.51	submedian
G	10	2.5	2.5	1.00	5.00	6.90	median; sat.
K	2	1.9	1.1	0.58	3.00	4.14	submedian
<i>Argyreia hirsuta</i> Arn.							
F	4	2.2	1.8	0.82	4.00	6.75	submedian
H	12	2.3	1.8	0.78	4.10	6.91	submedian; sat. on the short arm
J	2	1.95	1.95	1.00	3.90	6.58	median
L	12	1.9	1.9	1.00	3.80	6.41	median; sat.
<i>Cuscuta chinensis</i> Lamk.							
G	2	2.0	2.0	1.00	4.00	5.13	median; sat.
J	8	1.5	1.5	1.00	3.00	3.85	median
J	8	1.25	1.25	1.00	2.50	3.21	median
J	12	1.0	1.0	1.00	2.00	2.56	median
K	10	2.0	1.0	0.50	3.00	3.85	submedian
K	6	1.5	1.0	0.67	2.50	3.21	submedian
L	10	1.75	1.75	1.00	3.50	4.49	median; sat.
<i>Hewittia sublobata</i> (L.f.) O. Kuntze							
F	2	2.5	1.5	0.60	4.00	9.22	submedian
I	2	2.6	1.4	0.54	4.00	9.22	submedian; sat. on long arm
J	10	1.3	1.3	1.00	2.60	5.99	median
J	4	1.0	1.0	1.00	2.00	4.61	median
K	8	1.8	1.2	0.67	3.00	6.91	submedian
L	4	1.6	1.6	1.00	3.20	7.37	median; sat.
<i>Ipomoea asarifolia</i> (Desr.) Roem. & Sch.							
G	4	2.0	2.0	1.00	4.00	8.35	median; sat.
J	10	1.4	1.4	1.00	2.80	5.85	median
K	4	2.1	1.1	0.52	3.20	6.68	submedian
L	6	1.75	1.75	1.00	3.50	7.31	median; sat.
L	6	1.5	1.5	1.00	3.00	6.26	median; sat.
<i>Ipomoea aquatica</i> Forsk.							
J	2	1.25	1.25	1.00	2.5	6.58	median
J	8	1.05	1.05	1.00	2.1	5.53	median
K	4	1.70	0.80	0.47	2.5	6.58	submedian
L	2	1.65	1.65	1.00	3.3	8.68	median; sat.
M	10	1.70	1.30	0.76	3.0	7.89	submedian; sat. on short arm
R	4	1.20	0.70	0.58	1.9	5.00	submedian

contd.

Table 1 (Contd.)

Chromosome		Length in microns					Position of centromere and secondary constriction
Type	No.	Long arm L	Short arm S	Ratio S/L	Total S+L	Relative length	
<i>Ipomoea cairica</i> (L.) Sweet							
J	4	1.40	1.40	1.00	2.8	6.13	median
J	2	1.05	1.05	1.00	2.1	4.60	median
K	8	1.70	1.30	0.76	3.0	6.56	submedian
K	4	1.50	1.00	0.67	2.5	5.47	submedian
L	12	1.75	1.75	1.00	3.5	7.66	median; sat.
<i>Ipomoea crassicaulis</i> (Benth.) B. L. Robinson							
J	10	1.50	1.50	1.00	3.0	6.73	median
J	8	1.25	1.25	1.00	2.5	5.61	median
K	2	1.80	0.90	0.50	2.7	6.05	submedian
L	6	1.75	1.75	1.00	3.5	7.85	median; sat.
L	4	1.60	1.60	1.00	3.2	7.18	median; sat.
<i>Ipomoea congesta</i> R.Br.							
J	12	1.50	1.50	1.00	3.0	7.14	median
J	6	1.05	1.05	1.00	2.1	5.00	median
K	4	2.10	1.10	0.52	3.2	7.62	submedian
K	4	1.60	0.90	0.56	2.5	5.95	submedian
L	2	1.75	1.75	1.00	3.5	8.33	median; sat.
L	2	1.40	1.40	1.00	2.8	6.67	median; sat.
<i>Ipomoea coptica</i> (Linn.) Roth ex Roem. & Sch.							
J	10	1.40	1.40	1.00	2.8	7.60	median
J	4	1.30	1.30	1.00	2.6	7.06	median
J	2	1.00	1.00	1.00	2.0	5.43	median
K	8	1.50	0.90	0.60	2.4	6.52	submedian
M	4	1.70	1.30	0.76	3.0	8.15	submedian; sat. on short arm
<i>Ipomoea hederifolia</i> Linn.							
G	4	2.00	2.00	1.00	4.0	9.48	median; sat.
K	6	1.70	1.10	0.65	2.8	6.64	submedian
K	4	1.50	1.00	0.67	2.5	5.92	submedian
K	2	1.40	0.80	0.57	2.2	5.21	submedian
L	12	1.55	1.55	1.00	3.1	7.35	median; sat.
<i>Ipomoea tuba</i> (Sch.) Don							
J	6	1.55	1.55	1.00	3.1	6.70	median
J	10	1.25	1.25	1.00	2.5	5.64	median
K	4	1.70	1.10	0.65	2.8	6.32	submedian
L	4	1.75	1.75	1.00	3.5	7.90	median; sat.
L	6	1.65	1.65	1.00	3.3	7.45	median; sat.
<i>Ipomoea maxima</i> (L.f.) Don ex Sweet							
G	4	2.10	2.10	1.00	4.2	9.05	median; sat.
H	6	2.20	1.80	0.82	4.0	8.62	submedian; sat. on short arm
J	8	1.25	1.25	1.00	2.5	5.39	median
K	8	1.80	1.20	0.67	3.0	6.47	submedian
K	4	1.30	0.70	0.54	2.0	4.31	submedian

contd.

Table 1 (Contd.)

Chromosome		Length in microns					Position of centromere and secondary constriction
Type	No.	Long arm L	Short arm S	Ratio S/L	Total S+L	Relative length	
<i>Ipomoea muricata</i> (L.) Jacq.							
F	2	3.00	2.00	0.67	5.0	10.94	submedian
H	2	3.20	2.20	0.69	5.4	11.82	submedian; sat. on short arm
J	6	1.50	1.50	1.00	3.0	6.57	median
J	2	1.25	1.25	1.00	2.5	5.47	median
K	8	1.50	0.70	0.47	2.2	4.81	submedian
L	4	1.50	1.50	1.00	3.0	6.57	median; sat.
M	6	1.70	1.30	0.76	3.0	6.57	submedian; sat. on short arm
<i>Ipomoea nil</i> (L.) Roth							
J	4	1.50	1.50	1.00	3.0	7.01	median
J	8	1.30	1.30	1.00	2.6	6.08	median
K	2	1.80	1.20	0.67	3.0	7.01	submedian
K	8	1.70	0.80	0.47	2.5	5.84	submedian
L	4	1.75	1.75	1.00	3.5	8.18	median; sat.
L	4	1.60	1.60	1.00	3.2	7.48	median; sat.
<i>Ipomoea obscura</i> (L.) Ker.-Gawl.							
J	2	1.50	1.50	1.00	3.0	7.26	median
J	6	1.15	1.15	1.00	2.3	5.57	median
J	4	1.00	1.00	1.00	2.0	4.84	median
K	6	1.90	0.90	0.47	2.8	6.78	submedian
L	4	1.75	1.75	1.00	3.5	8.48	median; sat.
L	8	1.50	1.50	1.00	3.0	7.26	median; sat.
<i>Ipomoea pes-caprae</i> (L.) Sweet							
J	6	1.40	1.40	1.00	2.8	6.72	median
K	4	2.10	1.10	0.52	3.2	7.67	submedian
K	6	1.60	0.90	0.56	2.5	5.995	submedian
K	4	1.40	0.70	0.50	2.1	5.04	submedian
L	2	1.60	1.60	1.00	3.2	7.67	median; sat.
L	8	1.50	1.50	1.00	3.0	7.19	median; sat.
<i>Ipomoea pes-tigridis</i> Linn.—(unlobed leaf variety)							
J	6	1.40	1.40	1.00	2.8	7.98	median
J	4	1.05	1.05	1.00	2.1	5.98	median
K	8	1.40	0.90	0.64	2.3	6.55	submedian
K	4	1.20	0.80	0.67	2.0	5.70	submedian
N	6	1.90	1.20	0.63	3.1	8.83	submedian; sat. on long arm
<i>Ipomoea pes-tigridis</i> Linn.—(lobed leaf variety)							
J	10	1.05	1.05	1.00	2.1	5.87	median
K	6	1.60	0.90	0.56	2.5	6.98	submedian
K	4	1.40	0.60	0.43	2.0	5.59	submedian
L	4	1.50	1.50	1.00	3.0	8.38	median; sat.
N	4	2.40	1.50	0.63	3.9	10.89	submedian; sat. on long arm

contd.

Table 1 (Contd.)

Chromosome		Length in microns					Position of centromere and secondary constriction
Type	No.	Long arm L	Short arm S	Ratio S/L	Total S+L	Relative length	
<i>Ipomoea purpurea</i> (L.) Roth							
J	4	1.00	1.00	1.00	2.0	5.36	median
K	6	1.30	0.90	0.69	2.2	5.90	submedian
L	14	1.25	1.25	1.00	2.5	6.70	median; sat.
P	4	1.80	1.20	0.67	3.0	8.04	submedian; & a constriction in each arm
Q	4	0.80	0.80	1.00	1.6	4.29	median
<i>Ipomoea quamoclit</i> Linn.							
K	4	1.30	0.70	0.54	2.0	4.71	submedian
L	12	1.50	1.50	1.00	3.0	7.06	median; sat.
L	6	1.40	1.40	1.00	2.8	6.59	median; sat.
L	2	1.25	1.25	1.00	2.5	5.88	median; sat.
P	6	1.80	1.40	0.78	3.2	7.53	submedian; & a constriction in each arm
<i>Ipomoea staphylina</i> Roem. & Sch.							
J	11	1.25	1.25	1.00	2.5	5.37	median
K	2	1.90	1.10	0.58	3.0	6.44	submedian
K	2	1.30	0.70	0.54	2.0	4.29	submedian
L	4	1.75	1.75	1.00	3.5	7.51	median; sat.
L	9	1.65	1.65	1.00	3.3	7.08	median; sat.
L	4	1.50	1.50	1.00	3.0	6.44	median; sat.
<i>Jacquemontia pentantha</i> (Jacq.) G. Don							
A	2	3.60	3.60	1.00	7.2	13.24	median
B	2	5.00	3.60	0.72	8.6	15.81	submedian
C	2	3.60	3.60	1.00	7.2	13.24	median; sat
E	2	2.85	2.85	1.00	5.7	10.48	median
F	2	3.00	2.00	0.67	5.0	9.19	submedian
G	6	2.85	2.85	1.00	5.7	10.48	median; sat.
L	2	1.80	1.80	1.00	3.6	6.62	median; sat.
<i>Merremia dissecta</i> (Jacq.) Hall. f.							
J	6	1.25	1.25	1.00	2.5	6.596	median
K	6	1.30	0.90	0.69	2.2	5.81	submedian
L	6	1.50	1.50	1.00	3.0	7.92	median; sat.
L	8	1.40	1.40	1.00	2.8	7.39	median; sat.
Q	6	0.60	0.60	1.00	1.2	3.17	median
<i>Merremia hederacea</i> (Burm. f.) Hall. f.							
J	4	1.25	1.25	1.00	2.5	6.35	median
L	12	1.65	1.65	1.00	3.3	8.38	median; sat.
L	6	1.25	1.25	1.00	2.5	6.35	median; sat.
L	2	1.05	1.05	1.00	2.1	5.33	median; sat.
O	2	1.50	1.50	1.00	3.0	7.61	median; & a constriction in each arm
Q	4	0.50	0.50	1.00	1.0	2.54	median

contd.

Table 1 (Contd.)

Chromosome		Length in microns					Position of centromere and secondary constriction
Type	No.	Long arm L	Short arm S	Ratio S/L	Total S+L	Relative length	
<i>Operculina turpethum</i> (L.) S. Manso							
J	6	1.25	1.25	1.00	2.5	6.78	median
J	4	1.00	1.00	1.00	2.0	5.42	median
K	6	1.30	0.90	0.69	2.2	5.96	submedian
N	10	1.80	1.20	0.67	3.0	8.13	submedian; sat. on long arm
R	4	1.20	0.70	0.58	1.9	5.15	submedian
<i>Rivea hypocrateriformis</i> Choisy							
F	4	2.50	1.50	0.60	4.0	6.77	submedian
G	8	2.25	2.25	1.00	4.5	7.61	median; sat.
H	4	2.90	2.10	0.72	5.0	8.46	submedian; sat. on short arm
J	8	1.75	1.75	1.00	3.5	5.92	median
K	4	1.80	1.00	0.56	2.8	4.74	submedian
M	2	2.00	1.50	0.75	3.5	5.92	submedian; sat. on the short arm

Table 2.

Taxa	Chromo- some	Very long				Long					Medium						Short		
	Types	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
<i>ARGYREIA</i>																			
<i>A. cuneata</i>		2	—	—	2	6	8	10	—	—	—	2	—	—	—	—	—	—	—
<i>A. hirsuta</i>		—	—	—	—	—	4	—	12	—	2	—	12	—	—	—	—	—	—
<i>CUSCUTA</i>																			
<i>C. chinensis</i>		—	—	—	—	—	—	2	—	—	28	16	10	—	—	—	—	—	—
<i>HEWITTIA</i>																			
<i>H. sublobata</i>		—	—	—	—	—	2	—	—	2	14	8	4	—	—	—	—	—	—
<i>IPOMOEA</i>																			
<i>I. asarifolia</i>		—	—	—	—	—	—	4	—	—	10	4	12	—	—	—	—	—	—
<i>I. aquatica</i>		—	—	—	—	—	—	—	—	—	10	4	2	10	—	—	—	—	4
<i>I. cairica</i>		—	—	—	—	—	—	—	—	—	6	12	12	—	—	—	—	—	—
<i>I. crassicaulis</i>		—	—	—	—	—	—	—	—	—	18	2	10	—	—	—	—	—	—
<i>I. congesta</i>		—	—	—	—	—	—	—	—	—	18	8	4	—	—	—	—	—	—
<i>I. coptica</i>		—	—	—	—	—	—	—	—	—	16	8	—	4	—	—	—	—	—
<i>I. hederifolia</i>		—	—	—	—	—	—	4	—	—	—	12	12	—	—	—	—	—	—
<i>I. tuba</i>		—	—	—	—	—	—	—	—	—	16	4	10	—	—	—	—	—	—
<i>I. maxima</i>		—	—	—	—	—	—	4	6	—	8	12	—	—	—	—	—	—	—
<i>I. muricata</i>		—	—	—	—	—	2	—	2	—	8	8	4	6	—	—	—	—	—
<i>I. nil</i>		—	—	—	—	—	—	—	—	—	12	10	8	—	—	—	—	—	—
<i>I. obscura</i>		—	—	—	—	—	—	—	—	—	12	6	12	—	—	—	—	—	—
<i>I. pes-tigridis</i> (unlobed)		—	—	—	—	—	—	—	—	—	10	12	—	—	6	—	—	—	—
<i>I. pes-tigridis</i> (lobed)		—	—	—	—	—	—	—	—	—	10	10	4	—	4	—	—	—	—

contd.

Table 2 (Conted.)

Taxa	Chromo- some	Vely long				Long					Medium								Short	
	Types	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	
<i>I. pescaprae</i>		—	—	—	—	—	—	—	—	—	6	14	10	—	—	—	—	—	—	
<i>I. purpurea</i>		—	—	—	—	—	—	—	—	—	4	6	14	—	—	—	4	4	—	
<i>I. quamoclit</i>		—	—	—	—	—	—	—	—	—	—	4	20	—	—	—	6	—	—	
<i>I. staphylina</i>		—	—	—	—	—	—	—	—	—	11	4	17	—	—	—	—	—	—	
<i>JACQUEMONTIA</i>																				
<i>J. pentantha</i>		2	2	2	—	2	2	6	—	—	—	—	2	—	—	—	—	—	—	
<i>MERREMIA</i>																				
<i>M. dissecta</i>		—	—	—	—	—	—	—	—	—	6	6	14	—	—	—	—	6	—	
<i>M. hederacea</i>		—	—	—	—	—	—	—	—	—	4	—	20	—	—	2	—	4	—	
<i>OPERCULINA</i>																				
<i>O. turpethum</i>		—	—	—	—	—	—	—	—	—	10	6	—	—	10	—	—	—	4	
<i>RIVEA</i>																				
<i>R. hypocrateriformis</i>		—	—	—	—	—	4	8	4	—	8	4	—	2	—	—	—	—	—	

Discussion

Cyto-taxonomical status of the different genera: A critical inquiry into the karyological characteristics of the different taxa of Convolvulaceae has revealed some interesting facts regarding their taxonomical affinities.

The genus *Argyreia* has two sections namely, *Euargyreia* and *Pomifera* (Hooker 1885). Both the species investigated here, namely *A. cuneata* and *A. hirsuta* come under the first section and each of them possesses $2n=30$ chromosomes. The chromosomes of *Argyreia* in general are comparatively of larger size than those of many species of *Ipomoea*. The chromosome numbers of *A. argentea* and *A. campanulata* have been known to be $2n=28$ (Sharma and Chatterji 1957, Vij et al. 1974), while that of *A. nervosa* $2n=30$ (Watanabe 1939). Since both 28 and 30 chromosomes occur in the species of *Argyreia*, it is quite likely that one is derived from the other.

Of the two species of *Rivea* available in India, only *R. hypocrateriformis* has been cytologically investigated (Sampathkumar 1970). Its karyotype bears much resemblance to that of *Argyreia* species. The chromosomes of *Rivea* are large enough to be classed under *Argyreia*-type rather than *Ipomoea*-type and here also the chromosome number is $2n=30$. The absolute and average chromosome lengths also lend additional support to this view (Table 3). Thus the species of *Argyreia* and *Rivea*, with their comparatively long chromosomes and more or less similar karyotypes, may be taken to represent a taxonomical line of evolution. There is a mealy pulp (aril) surrounding the seeds of both the genera. These facts appear to make out a logically clear case for the merger of *Rivea* with *Argyreia*.

In the case of *Cuscuta*, various species have been found to contain different chromosome numbers. Thus, while 7 is the basic number of the genus, some species with haploid chromosomes like 14, 15, 16, 21, 28 and 30 were also reported (Fedorov 1969, Singh and Roy 1970, Bhattacharya 1971, Kaul and Bhan 1974).

Furthermore, reports of varying chromosome numbers exist even for a single species (Finn 1937, Raghavan 1957, Sharma and Chatterji 1957). It is quite likely that these intraspecific polyploid races may lead to the evolution of new species through gene mutations, accompanied by stabilisation and ecological adaptation. Autopolyploidy has also been a potent factor in the speciation in

Table 3. Summarized karyo-morphological features of the taxa investigated here

Taxa	1	2	3	4	5	6	7	8 *
<i>ARGYREIA</i>								
<i>A. cuneata</i>	30	3.0-7.0	18	12	12	4.83	72.5	0.43
<i>A. hirsuta</i>	30	3.8-4.1	14	16	24	3.95	59.3	0.93
<i>CUSCUTA</i>								
<i>C. chinensis</i>	56	2.0-4.0	40	16	12	2.79	78.0	0.50
<i>HEWITTIA</i>								
<i>H. sublobata</i>	30	2.0-4.0	18	12	6	2.89	43.4	0.50
<i>IPOMOEA</i>								
<i>I. asarifolia</i>	30	2.8-4.0	26	4	16	3.19	47.9	0.70
<i>I. aquatica</i>	30	1.9-3.3	12	18	12	2.53	38.0	0.58
<i>I. cairica</i>	30	2.1-3.5	18	12	12	3.05	45.7	0.60
<i>I. crassicaulis</i>	30	2.5-3.5	28	2	10	2.97	44.6	0.71
<i>I. congesta</i>	30	2.1-3.5	22	8	4	2.80	42.0	0.60
<i>I. coptica</i>	28	2.0-3.0	16	12	4	2.63	36.8	0.67
<i>I. hederifolia</i>	28	2.2-4.0	16	12	16	3.01	42.2	0.55
<i>I. tuba</i>	30	2.5-3.5	26	4	10	2.95	44.3	0.71
<i>I. maxima</i>	30	2.0-4.2	12	18	10	3.09	46.4	0.48
<i>I. muricata</i>	30	2.2-5.4	12	18	12	3.05	45.7	0.41
<i>I. nil</i>	30	2.5-3.5	20	10	8	2.85	42.8	0.71
<i>I. obscura</i>	30	2.0-3.5	24	6	12	2.75	41.3	0.57
<i>I. pes-caprae</i>	30	2.1-3.2	16	14	10	2.78	41.7	0.66
<i>I. pes-tigridis</i> (unlobed)	28	2.0-3.1	10	18	6	2.51	35.1	0.65
<i>I. pes-tigridis</i> (lobed)	28	2.0-3.9	14	14	8	2.56	35.8	0.51
<i>I. purpurea</i>	32	1.6-3.0	22	10	18	2.33	37.3	0.53
<i>I. quamoclit</i>	30	2.0-3.2	20	10	26	2.83	42.5	0.63
<i>I. staphylinia</i>	32	2.0-3.5	28	4	17	2.91	46.6	0.71
<i>JACQUEMONTIA</i>								
<i>J. pentantha</i>	18	3.6-8.6	14	4	10	6.04	54.4	0.42
<i>MERREMIA</i>								
<i>M. dissecta</i>	32	1.2-3.0	26	6	14	2.37	37.9	0.40
<i>M. hederacea</i>	30	1.0-3.3	30	—	22	2.62	39.4	0.30
<i>OPERCULINA</i>								
<i>O. turpethum</i>	30	1.9-3.0	10	20	10	2.46	36.9	0.63
<i>RIVEA</i>								
<i>R. hypocrateriformis</i>	30	2.8-5.0	16	14	14	3.94	59.1	0.56

* 1=Chromosome number (2n).

2=Size range in microns.

3=No. of chromosomes with median centromere.

4=No. of chromosomes with submedian centromere.

5=No. of chromosomes with satellites and/or secondary constrictions.

6=Average chromosome length in microns.

7=Absolute chromosome length in microns.

8=Ratio—Shortest chromosome divided by longest chromosome in the complement.

Cuscuta. It has been found that polyploids have smaller chromosomes than their diploid ancestors, suggesting that reduction in size is an adaptation to increase in number (Darlington 1956). In the case of *C. chinensis*, the chromosomes are mostly medium sized. It is quite convincing to note that *Cuscuta*, with its usually long chromosomes (Sharma and Chatterji 1957, Kaul and Bhan 1974) and their large number in different species (as compared with other members of the family even at a polyploid level) seems to stand apart from the rest of the genera in the family. The genus *Cuscuta* is characterized by chromosome numbers which are multiples of 7 and 15. These are the two basic numbers suggested by Darlington and Wylie (1955) for the genus *Cuscuta*. The basic chromosome number in this genus is the lowest so far recorded in the family. Taking into account all these facts, and the data pertaining to cytology of the other genera, *Cuscuta* should be considered to represent the oldest genus in the family. The genus *Cuscuta* may be given a status quite different from the other genera in the family, in view of its unique parasitic habit. Already various authors have suggested that this genus may be segregated and placed under a separate family, Cuscutaceae, on purely morphological basis.

The genus *Jacquemontia*, according to the reports available in the literature, has both $2n=18$ as well as $2n=20$ chromosomes. The chromosomes of *Jacquemontia* are larger than those of the species of *Ipomoea*. The unusual number, namely, $2n=18$ in *Jacquemontia*, with long chromosomes and high absolute chromosome length, suggests a special line of evolution, being a primitive member of the family. It is suggested that $n=10$ is derived from $n=9$, in view of the preponderance of this number ($n=9$).

Hewittia and *Operculina* possess $2n=30$ chromosomes. Of special interest is the fact that there is a general similarity in the karyotypes of the genera like *Merremia*, *Operculina* and *Hewittia*. This probably indicates that these genera represent members of a series derived from the same ancestral stock. A general similarity in the karyotypes of these genera with that of *Ipomoea* may be taken to represent a parallel line of evolution from a common ancestral stock. The species of *Merremia* show a similar sequence of evolution to that of *Ipomoea* species. Here also auto- as well as allo-polyploidy coupled with aneuploidy have contributed to the evolution of its species.

Hooker (1885) recognized six subgenera within *Ipomoea*, a large genus with about 500 species distributed widely. The following are the subgenera of Hooker: 1. *Calonyction*, 2. *Quamoclit*, 3. *Pharbitis*, 4. *Aniseia*, 5. *Batatas* and 6. *Euipomoea*. It is of special interest to note that the subgenus *Euipomoea* includes species of *Merremia* and *Operculina*, in addition to *Ipomoea*. This inclusion is obviously anomalous in view of the fact that in *Merremia* and *Operculina* the pollen grains are smooth whereas in *Ipomoea* they are echinate.

The different species of *Ipomoea* show a marked similarity in their cytology. There is also a corresponding similarity in the external morphology of the different species of *Ipomoea* and these suggest clearly that they form a natural taxonomical assemblage.

While the different species and varieties of *Ipomoea* happen to be more or less

similar in their karyotypes, they differ distinctively from the karyotypes of *Rivea*, *Argyreia*, *Jacquemontia* and *Cuscuta*. However, even within the genus *Ipomoea* there exist subtle differences in the matter of secondary constriction and satellites. Thus, for example, in the two patent varieties of *I. pes-tigridis* (namely, unlobed and lobed) the number of chromosomes with secondary constrictions or satellites vary; the former has six and the latter eight such chromosomes. Thus there is close correlation between karyotypes and taxonomic categories.

Summary

Karyomorphological details pertaining to chromosome measurements in 27 taxa of South Indian Convolvulaceae have been described. The systematic status of the different genera like *Cuscuta*, *Rivea*, *Argyreia*, *Jacquemontia*, *Merremia*, *Operculina*, *Hewittia* and *Ipomoea* have been discussed.

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