

Karyomorphological Analysis of *Lepidagathis lutea* (Acanthaceae): An Endemic Species from Western Ghats, India

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Summary *Lepidagathis lutea* Dalzell is an endemic species to the northern Western Ghats, of which cytology has not been reported until present. In this investigation, basic chromosome count is reported to be eight for the first time for the genus *Lepidagathis* Willd. The study reveals its closeness to the genus *Barleria* L. which is shown to have basic chromosome counts 8, 9 and 10. Karyotype and somatic chromosome counts ($2n=16$) for *L. lutea* are reported here for the first time. According to Stebbins classification, karyotype is of 4B asymmetric category and the karyotypic formula was observed to be $2n=16=10m+6sm$.

Key words Somatic chromosome count, Karyotype, *Lepidagathis*, Endemic.

The *Lepidagathis* Willd. (Acanthaceae) is distributed in tropical and warm regions of the world represented by 100 species (Mabberley 1997, Kameyama 2008). *Lepidagathis* is divided into two sections on the basis of two-seeded and four-seeded fruit and fruit opening (Clarke 1885). The genus is represented by 22 species and one variety in the Western Ghats. Out of these, 16 species are endemic to India (Nayar *et al.* 2014).

Lepidagathis lutea Dalzell is endemic to the northern-Western Ghats (Mishra & Singh 2001). It grows on baren lateritic plateaus in open places with woody rootstock. It is closely allied to *L. rupestris* Nees but differs in having conspicuous bracts and bracteoles and fluorescent yellow flowers. In this paper, somatic chromosome count and karyomorphology are reported for the first time for the species.

Materials and methods

The material for the present investigation was collected from the Goa University campus in Goa. The voucher specimen is deposited in the Herbarium of Department of Botany, Goa University, Goa, India.

Root tips from seeds germinated in glass petriplates were studied for mitosis. Pretreatment of root tips (6–10 mm) were carried out for 3–4 h at $9\pm 3^\circ\text{C}$ in saturated aqueous solution of para-dichlorobenzene. Staining was done using 2% propionic orcein. LEICA DME compound microscope with attached LEICA EC3 camera

at $\times 1000$ magnification was used for photographs of freshly prepared slides. The karyotype analysis method of studying ten plates of well-separated somatic chromosomes was utilized following Levan *et al.* (1964). As the secondary constrictions were not clear they were not taken into account. The degree of karyotype asymmetry has been determined using A1 and A2 indices (Romero 1986) and the categories of Stebbins (1971).

Results

The eight chromosome pairs of *L. lutea* can be classified into four different classes on the basis of chromosome morphology (Table 1). Class 'A' includes only one chromosome pair with the longest length ($2.62\ \mu\text{m}$) and with submedian type. Class 'B' includes three long chromosome pairs that ranged between 2.27 to $1.81\ \mu\text{m}$ in length with submedian to median types. Class 'C' includes three short chromosome pairs ranging between 1.66 to $1.43\ \mu\text{m}$ in length with median and submedian types. Class 'D' includes only one chromosome pair with the shortest length ($1.26\ \mu\text{m}$) and with median types.

Somatic chromosome count in *L. lutea* was observed as $2n=16$ (Fig. 1b). The karyotypic formula was observed as $2n=16=10m+6sm$ and 4B asymmetric category (Stebbins 1971). The karyotype analyses are shown in Table 1 and different karyotypic parameters are given in Table 2.

Discussion

Different chromosome counts ($n=10, 11, 42$) have

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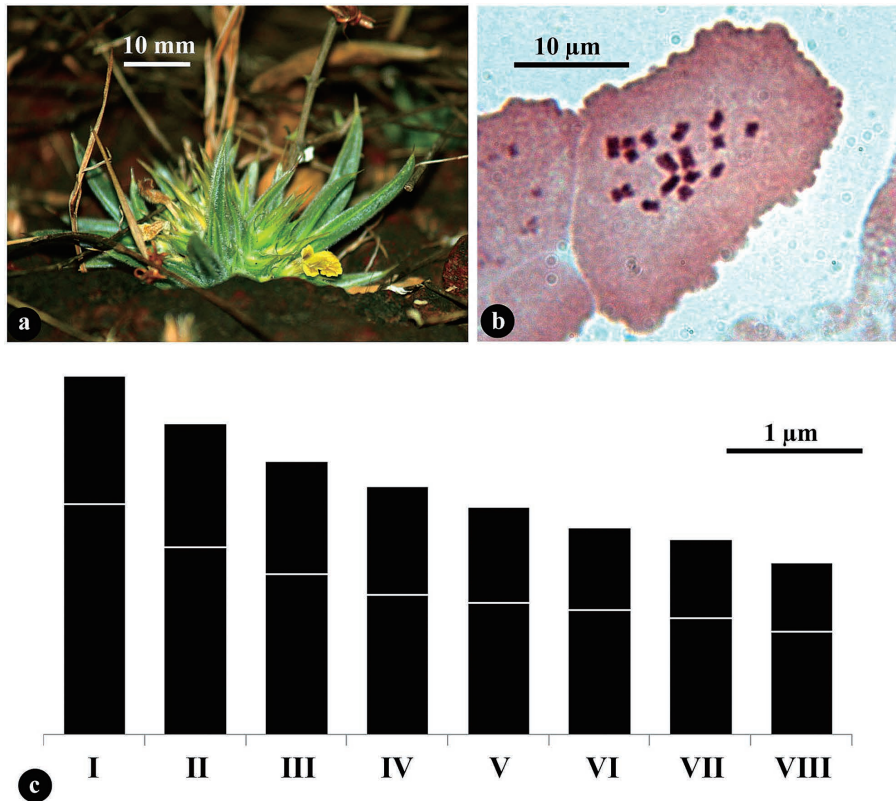


Fig. 1. *Lepidagathis lutea* Dalzell: a. habit; b. somatic chromosome plate; c. idiograph.

Table 1. Karyotype analysis of *L. lutea*.

Chromosome pair	Long arm (l) (μm)	Short arm (s) (μm)	Total length C=1+s (μm)	'd' value (μm)	'r' value (μm)	'l/s' value ×100	Centromeric position	Type
I	1.68±0.43	0.93±0.15	2.62±0.58	1.25	1.80	35.71	SM	A
II	1.36±0.25	0.90±0.14	2.27±0.39	1.11	1.51	39.85	SM	B
III	1.17±0.16	0.82±0.11	1.99±0.27	1.01	1.42	41.31	M	B
IV	1.02±0.07	0.79±0.11	1.81±0.18	0.95	1.29	43.57	M	B
V	0.96±0.07	0.70±0.08	1.66±0.14	0.89	1.37	42.12	M	C
VI	0.91±0.13	0.60±0.05	1.51±0.19	0.78	1.51	39.85	SM	C
VII	0.85±0.11	0.57±0.07	1.43±0.18	0.75	1.49	40.24	M	C
VIII	0.75±0.09	0.51±0.08	1.26±0.17	0.66	1.48	40.27	M	D

Table 2. Different karyomorphological parameters of *L. lutea*.

Sr. no.	Parameters	<i>L. lutea</i>
1	TF%	40.10315
2	SI	66.95369
3	GI	48.00174
4	R	2.083258
5	CVel	25.11089
6	Cvci	5.65884
7	Ai	1.420985
8	A1	0.544537
9	A2	0.251109
10	THCL	17.99
11	Classification (Stebbins, 1971)	4B
12	Karyotype formula	2n=16=10m+6sm

Table 3. Chromosome numbers of *Lepidagathis* species.

Sr. no.	Species name	Chrom. no. (n/2n)	Reference
1	<i>L. cuspidata</i> Nees	n=11	Bir & Saggoo, 1981
		n=11	Sareen & Sanjogta, 1976
		n=11	Vasudevan, 1976
2	<i>L. felicitis</i> Benoist	n=10	Saggoo, 1983
3	<i>L. incurva</i> Buch. -Ham. ex D. Don	n=42	Sareen & Sanjogta, 1976
4	<i>L. lutea</i> Dalzell	n=8	Present communication
5	<i>L. purpuricaulis</i> Nees	n=11	Sareen & Sanjogta, 1976
		n=42	Mehra & Vasudevan, 1972
6	<i>L. royenii</i> Bremek.	2n=21, c.21	Daniel, 2000

already been reported for the genus *Lepidagathis* (Table 3). Lindau (1895) included *Lepidagathis* in the tribe Barlerieae, near the genus *Barleria*. Bremekamp (1965) seg-

regated it into a distinct but close tribe of *Barleria* (i.e. Lepidagathideae). *Lepidagathis* and *Barleria* showed affinity through predominant basic chromosome num-

Table 4. Chromosome numbers of *Barleria* species.

Sr. no.	Species name	Chrom. no. (n; 2n)	Reference
1	<i>B. acanthoides</i> Vahl	n=20	Khattoon & Ali, 1993
2	<i>B. buxifolia</i> L.	2n=40	Krishnappa & Basavaraj, 1982
3	<i>B. courtallica</i> Nees	n=20 2n=40	Saggo & Bir, 1982 Devi & Mathew, 1991
4	<i>B. cristata</i> L.	n=20 2n=40	Saggo & Bir, 1986 Devi & Mathew, 1991
5	<i>B. cuspidata</i> Heyne ex Nees	n=16; 2n=32 n=20; 2n=40	Datta & Maiti, 1970 Devi & Mathew, 1991
6	<i>B. gibsonii</i> Dalzell	n=20 2n=40	Mehra & Vasudevan, 1972 Krishnappa & Basavaraj, 1982
7	<i>B. involucrata</i> Nees	2n=40	Govindarajan & Subramanian, 1985
8	<i>B. longiflora</i> L.	2n=40	Govindarajan & Subramanian, 1985
9	<i>B. prinoites</i> L.	n=20; 2n=40 n=16; 2n=32	Sarkar <i>et al.</i> , 1980 Datta & Maiti, 1970
10	<i>B. repens</i> Nees	n=20	Daniel & Chuang, 1998
11	<i>B. strigosa</i> Willd.	2n=40	Krishnappa & Basavaraj, 1982
12	<i>B. tomentosa</i> Roth	n=20; 2n=40	Devi & Mathew, 1991

ber *i.e.*, $x=11$ (Federov 1969, Gosavi *et al.* 2010). In the present paper, a new basic chromosome number ($x=8$) is reported. Indian *Barlerias* are predominated by somatic chromosome counts $2n=40$ ($4x$ or $5x$) (Table 4). The present new basic count ($x=8$) also suggest the closeness of *Lepidagathis* to *Barleria*. The present study supports the phylogenetic relationship reported by McDade and Moody (1999).

Chromosome counts $2n=16$ and karyomorphology of *L. lutea* are reported for the first time in this paper. The new base chromosome number ($x=8$) of *L. lutea* shows a close relationship with the genus *Barleria*.

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