

## Karyomorphological Studies of Two Morphotypes of *Lasia spinosa* (Lour.) Thwaites Available in Assam, India

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**Abstract:** *Lasia spinosa* belongs to the Araceae family is one of the important medicinal plants, extensively used in rheumatic pain, stomach ache, cholic etc. It also has anticestodal and antinematodal effects. There are two morphotypes available in Assam, which can be easily distinguished by their colour of inflorescences and leaves types. Karyotypic analysis has been carried out to find out any differences in chromosomal level between these two morphotypes of *Lasia spinosa* from Assam region. The chromosome number of *L. spinosa* (mixed form) was found to be  $2n = 26$  in the somatic cells. The chromosome length varied from  $2.31\mu\text{m}$  -  $4.08\mu\text{m}$  while their volumes ranged from  $0.034\mu\text{m}^3$ - $3.70\mu\text{m}^3$ . The chromosome number of lamina-dissected form was found to be  $2n=24$  in the somatic cells. The chromosome length varied from  $1.09\mu\text{m}$  -  $4.42\mu\text{m}$  while their volumes ranged from  $0.015\mu\text{m}^3$ - $0.40\mu\text{m}^3$ . Our finding is different from the previous cytological report, which might be due to ecological adaptation.

**Key Words:** Karyomorphology, *Lasia spinosa*, Morphotypes, Ecological adaptation, Medicinal plant

### Introduction

The genus *Lasia* comprises of two species which is native in Asia. Three morphological forms of *L. spinosa* has been reported, of these two morphological forms are found in Assam. The plant *Lasia spinosa* is found along marshy places, muddy streams and swampy ground in tropics. It is a stout prickly herbs of 60-120 cm high with thick creeping rhizome. One morphotype bears smoky green inflorescence with two types of leaves is known as mixed form and other bears red/purple inflorescence with lamina-dissected leaves is known as lamina-dissected form.

Young tender leaves are used as vegetable (1). In India the plant is used for cholic, intestinal diseases and stomach ache (1,2). It is used in the treatment of haemorrhoids amongst the Malays. It is also used as antihelminthics, anticestodal, antinematodal and antioxidant (3-7). Karyomorphological analysis gives the morphology of chromosome viz, chromosome number, size, length etc. Cytological information can solve taxonomic problems and gives evidence of the relatedness at the generic and species level.

In the present investigation karyomorphological character of two morphological form of *L. spinosa* has been studied which are available in Assam, India. The two forms are mixed forms, one having both lamina dissected and sagittate leaves and the other having the lamina-dissected leaf only. The two forms more or less similar with each other except the inflorescence colour and leaf form. Hossain and Sharif (1984) suggested that this may be due to ecophenic variations (8).

Our study has been carried out in order to observe if there are any karyomorphological variations in the alike forms.

### Material and Methods

For the present investigation, two morphotypes of *Lasia spinosa* were collected from two different places, the mixed form from Botanical Garden, Gauhati University and lamina-dissected form from 50 km away (Rangiya), Assam. The collected plant species were maintained in the departmental garden of Gauhati University (Fig. 1A and 1B).

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**Figure 1:** Morphology of two forms of *L. Spinosa*, A: mixed form and B: lamina-dissected form

For detail karyotypic studies, karyotypes were prepared from the somatic chromosomes. Root tips were collected between 7.00- 7.30 am. Fresh and healthy root apical meristems were pretreated in saturated solution of PDB (paradichlorobenzene) for 4 hours at 20°C with an initial temperature at 0°C for 5 min, followed by fixation in glacial acetic acid and ethanol (1: 3) overnight. The root tips were then hydrolyzed in a mixture of 1N HCl and 45% acetic acid (2: 1) at 60°C for 1-2 min, then warmed for a few seconds in a mixture of 2% aceto-orcein, kept for 3-4 hours (9-12).

For Chromosomal analysis, a well scattered metaphase stages were selected and observed under a compound microscope at a magnification of 10×, 45× and 100× (using oil immersion). The following parameters were considered for the analysis:

(i) Total chromosome length; (ii) Arm ratio = Length of long arm / Length of short arm; (iii) Volume of the chromosome ( $\pi r^2 h$ ); (iv) Relative length of the chromosome = (Length of the individual chromosome / Total chromatin length of the diploid set)  $\times$  100; (v) F% = (Length of the short arm / Total length of individual chromosome)  $\times$  100 and (vi) Total form percent or TF % = (Total sum of short arm length / Total sum of chromosome length)  $\times$  100.

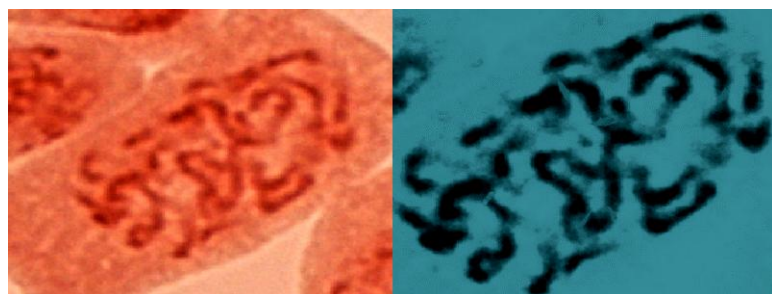
On the basis of the centromeric position, the chromosomes were classified into metacentric, sub-metacentric, sub-telocentric, and telocentric (13). Chromosomes were grouped into different categories depending upon their length.

These were Type A = 4.00 $\mu$ m and above, Type B = 3.00 $\mu$ m – 3.99 $\mu$ m, Type C = 2.00 $\mu$ m – 2.99 $\mu$ m, Type D = 1.00 $\mu$ m – 1.99 $\mu$ m, Type E = 0 $\mu$ m – 0.99 $\mu$ m.

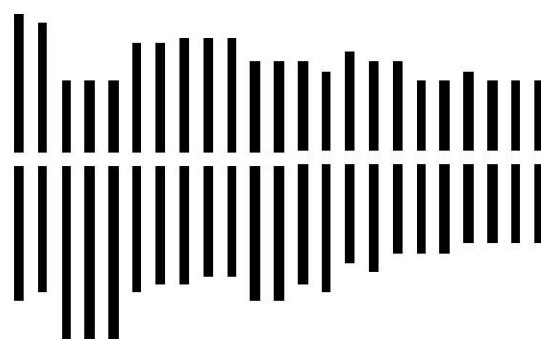
## Results

The detail karyomorphological analysis of *Lasia spinosa* (mixed form) has been given below:

The chromosome no. of *Lasia spinosa* was found to be  $2n=26$  in the somatic cells. The chromosome length varied from 2.31 $\mu$ m - 4.08 $\mu$ m while their volumes ranged from 0.034  $\mu$ m<sup>3</sup> - 0.370  $\mu$ m<sup>3</sup>. The relative length of the chromosomes varied from 2.74  $\mu$ m to 4.80  $\mu$ m. On the basis of the length, the chromosomes were classified into Type A, Type B, Type C, Type D, and Type E (Table-1, Fig. 2A & 2B). The total genomic chromosome length was found to be 84.38  $\mu$ m. The different types of chromosomes categorized on the basis of the length are represented as



**Figure 2A:** Morphology of chromosomes in metaphase stage of *L. spinosa* ( $2n=26$ ) (mixed form)



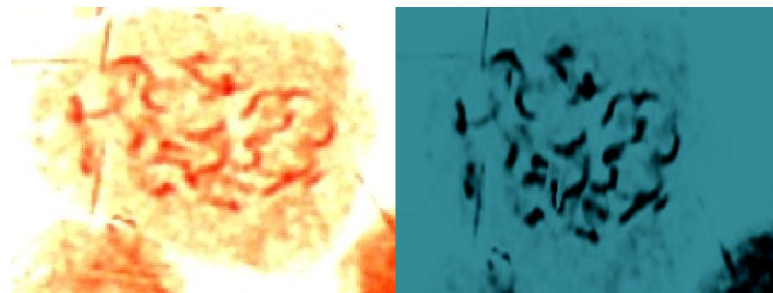
**Figure 2B:** Idiogram of *Lasia spinosa* (mixed form)

**Table 1:** Chromosome characters of *Lasia spinosa* (Lour.) Thwaites (mixed form)

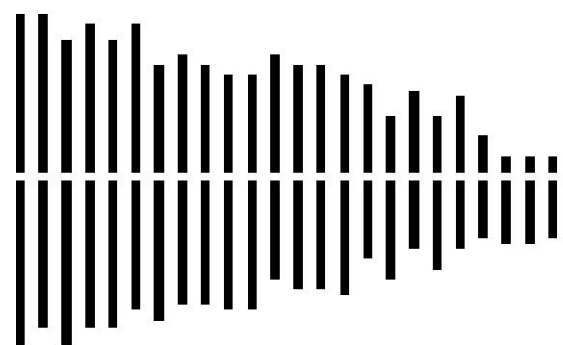
Chr. Type	Chr. No.	Chromosome Length		Total Length (l+s) $\mu\text{m}$	Relative Chr. Length ( $\mu\text{m}$ )	Arm Ratio (l/s)	Chromosome		Centromeric Index (F%)	Position of centromere	Nomenclature of Chromosome
		Long Arm (l) $\mu\text{m}$	Short Arm (s) $\mu\text{m}$				Radius (r) $\mu\text{m}$	Vol. ( $\pi r^2 h$ ) $\mu\text{m}^3$			
A	1	2.72	1.36	4.08	4.80	2	0.17	0.370	33.33	sm	Submetacentric
A	2	2.72	1.36	4.08	4.80	2	0.17	0.370	33.33	sm	Submetacentric
A	3	2.38	1.7	4.08	4.80	1.4	0.17	0.370	41.66	m	Metacentric
A	4	2.04	2.04	4.08	4.80	1	0.17	0.370	50	M	Median
B	5	1.90	1.90	3.80	4.50	1	0.17	0.345	50	M	Median
B	6	2.58	1.09	3.67	4.35	2.37	0.14	0.226	29.7	sm	Submetacentric
B	7	2.58	1.09	3.67	4.35	2.37	0.14	0.226	29.7	sm	Submetacentric
B	8	2.58	1.09	3.67	4.35	2.37	0.14	0.226	29.7	sm	Submetacentric
B	9	1.90	1.63	3.53	4.18	1.17	0.14	0.217	46.18	m	Metacentric
B	10	1.80	1.63	3.43	4.06	1.10	0.14	0.211	47.52	m	Metacentric
B	11	1.80	1.7	3.43	4.06	1.10	0.14	0.211	47.52	m	Metacentric
B	12	1.7	1.7	3.4	4.02	1	0.10	0.106	50	M	Median
B	13	1.7	1.7	3.4	4.02	1	0.10	0.106	50	M	Median
B	14	2.04	1.36	3.4	4.02	1.5	0.10	0.106	40	m	Metacentric
B	15	2.04	1.36	3.4	4.02	1.5	0.10	0.106	40	m	Metacentric
B	16	1.80	1.36	3.16	3.74	1.32	0.10	0.099	43.04	m	Metacentric
B	17	1.90	1.22	3.12	3.70	1.56	0.10	0.098	39.10	m	Metacentric
B	18	1.50	1.50	3.00	3.69	1	0.10	0.094	50	M	Median
C	19	1.63	1.36	2.99	3.54	1.20	0.10	0.094	45.49	m	Metacentric
C	20	1.36	1.36	2.72	3.22	1	0.068	0.039	50	M	Median
C	21	1.36	1.09	2.45	2.90	1.25	0.068	0.036	44.49	m	Metacentric
C	22	1.36	1.09	2.45	2.90	1.25	0.068	0.036	44.49	m	Metacentric
C	23	1.22	1.22	2.44	2.89	1	0.068	0.035	50	M	Median
C	24	1.22	1.09	2.31	2.74	1.12	0.068	0.034	47.19	m	Metacentric
C	25	1.22	1.09	2.31	2.74	1.12	0.068	0.034	47.19	m	Metacentric
C	26	1.22	1.09	2.31	2.74	1.12	0.068	0.034	47.19	m	Metacentric

$A_4 + B_{14} + C_8 = 2n = 26$ . These 26 somatic chromosomes comprised of 7 median chromosomes, 14 metacentric chromosomes and 5 submetacentric chromosomes. The karyotypic formula for *Lasia spinosa* is represented as:  $M_7 + m_{14} + sm_5 + t_0 = 2n = 26$ .

The detail karyomorphological analysis of *Lasia spinosa* (lamina-dissected form) revealed the chromosome no.  $2n=24$  in the somatic cells. The chromosome length varied from  $1.09\mu\text{m}$  to  $4.42\mu\text{m}$  while their volumes ranged from  $0.015\mu\text{m}^3$  to  $0.401\mu\text{m}^3$ . The relative length of the chromosomes varied from  $1.60\mu\text{m}$  to  $6.51\mu\text{m}$ . On the basis of the length, the chromosomes were classified into Type A-E (Table 2; Fig. 3A and 3B). The total genomic chromosome length was found to be  $67.83\mu\text{m}$ . The different types of chromosomes categorized on the basis of the length are represented as  $A_4 + B_8 + C_8 + D_4 = 2n = 24$ . These 24 somatic chromosomes comprised of 4 median chromosomes, 14 metacentric chromosomes and 3 submetacentric, 1 subtelocentric and 2 telocentric chromosome. The karyotypic formula for this morphotype of *Lasia spinosa* is represented as:  $M_4 + m_{14} + sm_3 + st_1 + t_2 = 2n = 24$ .



**Figure 3A:** Morphology of chromosomes in metaphase stage of *L. spinosa* ( $2n=24$ ) (lamina-dissected form)



**Figure 3B:** Idiogram of *Lasia spinosa* (lamina-dissected form)

**Table 2:** Chromosome characters of *Lasia spinosa* (Lour.) Thwaites (lamina-dissected form)

Chr. Type	Chr. No.	Chromosome Length		Total Length (l+s) $\mu\text{m}$	Relative Chr. Length ( $\mu\text{m}$ )	Arm Ratio (l/s)	Chromosome		Centromeric Index (F%)	Position of centromere	Nomenclature of Chromosome
		Long Arm (l) $\mu\text{m}$	Short Arm (s) $\mu\text{m}$				Radius (r) $\mu\text{m}$	Vol. ( $\text{nr}^2\text{h}$ ) $\mu\text{m}^3$			
A	1	2.38	2.04	4.42	6.51	1.16	0.17	0.401	46.15	m	Metacentric
A	2	2.12	2.04	4.16	6.13	1.03	0.17	0.377	49.03	M	Median
A	3	2.38	1.7	4.08	6.01	1.4	0.17	0.370	41.66	m	Metacentric
A	4	2.12	1.9	4.02	5.92	1.11	0.17	0.364	47.26	m	Metacentric
B	5	2.12	1.7	3.82	5.63	1.24	0.14	0.235	44.50	m	Metacentric
B	6	1.90	1.90	3.8	5.60	1.00	0.14	0.233	50.00	M	Median
B	7	2.04	1.36	3.4	5.01	1.5	0.14	0.209	40.00	m	Metacentric
B	8	1.84	1.5	3.34	4.92	0.55	0.14	0.205	44.91	m	Metacentric
B	9	1.84	1.36	3.2	4.71	1.35	0.14	0.196	42.50	m	Metacentric
B	10	1.90	1.22	3.12	4.59	1.55	0.14	0.192	39.10	m	Metacentric
B	11	1.9	1.22	3.12	4.59	1.55	0.10	0.097	39.10	m	Metacentric
B	12	1.5	1.5	3.0	4.42	1	0.10	0.094	50.00	M	Median
C	13	1.63	1.36	2.99	4.40	1.19	0.10	0.093	45.48	m	Metacentric
C	14	1.63	1.36	2.99	4.40	1.19	0.10	0.093	45.58	m	Metacentric
C	15	1.7	1.22	2.92	4.30	1.19	0.10	0.091	41.78	m	Metacentric
C	16	1.22	1.09	2.31	3.40	1.19	0.10	0.072	47.18	m	Metacentric
C	17	1.5	0.68	2.18	3.21	2.20	0.10	0.068	31.19	Sm	Submetacentric
C	18	1.09	1.02	2.11	3.11	1.06	0.10	0.066	48.34	M	Median
C	19	1.36	0.68	2.04	3.00	2	0.068	0.029	33.33	Sm	Submetacentric
C	20	1.09	0.95	2.04	3.00	1.14	0.068	0.029	46.56	M	Metacentric
D	21	0.95	0.41	1.36	2.00	0.69	0.068	0.019	30.14	Sm	Submetacentric
D	22	1.02	0.14	1.16	1.71	7.28	0.068	0.016	12.06	t	Telocentric
D	23	1.02	0.14	1.16	1.71	7.28	0.068	0.016	12.06	T	Telocentric
D	24	0.95	0.14	1.09	1.60	6.78	0.068	0.015	12.84	St	Subtelocentric

### Discussion

Karyotype analysis provides the species to correct taxonomic status. It is the basic tool to provide taxonomic character. Karyomorphological studies traces the phylogenetic relationships among the flowering plant (14).

Karmorphological study of *L. spinosa* (mixed form) reveals that it has diploid no. of chromosome  $2n=26$  and centromeric formula is  $7M+14m+5sm=26$ , which is unlike the earlier report  $14m+11sm+1t=26$  (15). According to earlier report there are 5 satellite chromosome in mixed form but in our report satellite chromosome was not observed under microscopic observation. Further, it was reported that the mixed form is intermediate between metacentric and sub-metacentric chromosome but we found median chromosomes are present.

The chromosome number in lamina dissected form was found to be diploid  $2n=24$  unlike the earlier findings where the number was  $2n=26$ . There was variation in the centromeric formula too  $4M+14m+3sm+1st+2t=24$ . In the earlier studies two sat-chromosome was recorded but no sat- chromosome was observed in this study.

Our data bring to light that the two form of *L. Spinosa* collected from Assam, India vary in their chromosome number and both the form has symmetric karyotype. The variation in the two findings might be due to the habitat distribution and climatic effect.

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**Conflict of interest:** None Declared