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Morphophenology and karyotype study of *Patidoi* (*Schumannianthus dichotomus* (Roxb.) Gagnep. synonym *Clinogyne dichotoma* Salisb.) – a traditional plant of Assam

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***Patidoi* (*Schumannianthus dichotomus* (Roxb.) Gagnep. synonym *Clinogyne dichotoma* Salisb., family Marantaceae) is a perennial shrub. Leaves are petiolated, distichous and sheathing. Flowering occurs during May–June, with 9–18 panicles (inflorescence) in each culm. Anthesis begins around 3.30 h and continues up to 10.00 h. Ovary is villous and three-celled. Fruits are indehiscent, subglobose and take 25–35 days for maturity. Karyotypic study revealed that the species is diploid with $2n = 20$ (where $n = x = 10$). The total haploid genome length is 12.7 μm . The length of chromosome is found to vary from 0.8 to 2.2 μm , with predominance of meta-centric (M) and submetacentric (SM) behaviour.**

Keywords: *Clinogyne dichotoma*, diploid, karyotype, morphophenology, Sital pati.

THE genus *Schumannianthus* consists of two species in the Indo-Malayan region¹. *Patidoi* is a major component of the rural cottage industry of the Northeastern states. The bark of the matured culm is used as raw material for making ‘Pati or Sital pati’ (a type of decorated, durable and biodegradable mat) and many other domestic articles like handbag, hat, seat, hand-held fans, etc. The pith is used as raw material for preparing indigenous detergent solution, paper and in some cases as firewood in the countryside. Leaves and flowers are also used for cooking purposes. The plant is found to have wide adaptability under water-logged conditions². In the years to come, it could become an agriculturally important plant for the landless poor farmers of the region, provided effective agro-techniques are developed. In the last two to three decades, the population of this plant in its natural habitat has been decreasing at an alarming rate due to over-exploitation, destructive harvesting, large-scale deforestation and lack of awareness. Information on the plant with respect to its morphophenology is scanty. As far as karyotype is concerned, no reports were found elsewhere. Different authors studied karyotype of genera other than *Schumannianthus* (synonym *Clinogyne*) under the family Marantaceae and reported the chromosome numbers^{3–6}. However, the objectives of the present communication are to provide morphological and cytological data for future utilization of *Patidoi*.

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Sample plants was collected from a natural habitat of Tezpur (Dollabari and Amolapam) and planted in the Medicinal Plants Park, Tezpur University, Napam, Assam, India. Voucher specimen was deposited in the TU herbarium (accession number – TU/MBBT/S1-5; name of the collector – D. Chowdhury).

For morphophenological study, two populations (P_1 and P_2) of the plant near the university campus were selected. Population P_1 (Dollabari village) covers an area of about 8.0 m² with 1 hill/m², each hill containing 50–80 tillers (culms). Population P_2 (Amolapam village) covers an area of about 9.0 m² with 1 hill/m², having 50–60 tillers/hill. From each population, ten plants were selected randomly for morphological and cytological investigation.

Standard techniques of karyotype study were followed⁷. Slides of root tips were examined under a light microscope (Leica ATC 2000 Model). For studying the details of chromosomes, 20 cells were marked randomly at the well-spread metaphase stage. A standardized method⁸ was followed to determine the position of the centromere and

other related parameters. Photographs were taken using a digital camera (C-5060 Wide Zoom Digital Camera) attached to an Olympus-Bx 41 microscope at 10 x 100 magnification. The drawing of chromosomes was made with the help of camera Lucida apparatus. Idiograms were then constructed on tracing paper.

The morphological characters of the plant are presented in Table 1. The culm of the plant is glossy, green in colour, erect, round and smooth², with the first node appearing at 1.5–2.5 m height. The base of the culm is encircled by 1 or 2 green, leafless sheaths with acuminate tip. The first node usually bears 2–3 primary branches from which secondary branches, leaves, flowers and fruits develop. The average height of the plant is found to be 3.0–4.0 m. A leaf sheath measuring 7.0–12.0 cm in length is found encircled at the base of each node. Primary branches come out from each node and each of them is encircled by 2–3 leafless sheaths having acuminate tip. Leaves are petiolated, distichous, sheathing with distinct hairy ligule. Petiole is stalked and there is a joint-like appendage at the junction of the petiole and leaf blade. Leaf blade is green in colour, glabrous, ovate to elliptic; the veins spread from the mid-rib being pinnate and closely parallel. Rhizome is highly fibrous, tough and strong; black in colour with circumference 5.0–8.0 cm. New shoots appear from the rhizome twice a year, i.e. in April–May and October–November. Roots are tough, strong and fibrous; they penetrate up to a depth of 40–60 cm below the soil surface. Circumference of the root varies from 1.2 to 2.5 cm. The plant starts flowering from the first week of May with the appearance of buds and full blooming occurs by the first week of June, with the opening of 50% florets of 50% panicles. Flowering continues till the end of June. The duration from flower-bud initiation to full bloom is 28–35 days. Anthesis of flowers takes place at around 3.30 h in the early morning and peaks between 4.30 and 5.30 h (38%), which continues up to 10.00 h. The floral characters of the plant are presented in Table 2 and photographs of panicle, florets, the different parts, fruit and flowering plant are shown in Figure 1. The inflorescence is a panicle and branched, bearing flowers in pairs². During initial period of flowering, the panicle is surrounded by a spathaceous bract, which is green and lanceolated. The panicle comes out of the spathaceous bract completely during full bloom. The first floret of the pair appears on the peduncle and the second floret appears ca. 0.2 cm above the first one. Flowers are bisexual, irregular and white in colour, having three-sepal calyx and irregularly three-lobed corolla. Sepals are lanceolated and white in colour. Corolla is basally tubular and white in colour. Ovary is villous and three-celled. Fruits are indehiscent, subglobose, ca. 1.0 cm in length. Seeds are subglobose, brown in colour, dorsal face faintly grooved.

The somatic chromosome number of *Patidoi* is shown in Figure 2 and a detailed karyotype is presented in Table 3. Camera Lucida drawings and ideograms are presented in

Table 1. Morphological characters of *Schumannianthus dichotomus*

Morphological character	Average data \pm SE	Range
Stem height (cm)	201.3 \pm 10.77	150–250
Stem diameter (cm) at the base	7.3 \pm 0.41	5.0–9.0
At the end of 1st internode	2.7 \pm 0.16	2.0–3.5
Length of sheath (cm)	12.1 \pm 0.46	10.0–15.0
No. of leaves/culm	122.2 \pm 3.05	105–140
Leaf length (cm)	16.4 \pm 0.71	12.0–20.0
Leaf breadth (cm)	4.8 \pm 0.35	3.3–6.3
Length of petiole (cm)	0.6 \pm 0.02	0.5–0.7
Length of ligule (cm)	0.1 \pm 0	0.1

Table 2. Characteristics of *S. dichotomus* inflorescence (panicle) and its different parts

Floral characteristics	Average panicle characters \pm SE	Range (cm)
No. of panicles/culm	12.4 \pm 0.84	9–18
Panicle length (cm)	17.0 \pm 1.5	8.0–23.0
Bract length (cm)	9.2 \pm 0.17	9.0–10.0
Bract breadth (cm)	1.5 \pm 0	1.5
Pairs of floret/panicle	9.7 \pm 1.0	5–14
Flowering bract length (cm)	3.6 \pm 0.03	3.5–3.8
Flowering bract breadth (cm)	0.9 \pm 0.02	0.8–1.0
Bracteole length (cm)	1.6 \pm 0.02	1.5–1.7
Bracteole breadth (cm)	0.4 \pm 0	0.4
Peduncle length (cm)	1.9 \pm 0.03	1.8–2.1
Pedicle length (cm)	0.3 \pm 0.01	0.3–0.4
Floret length (cm)	4.7 \pm 0.07	4.5–5.2
Sepal length (cm)	2.5 \pm 0.05	2.4–2.8
Sepal breadth (cm)	1.7 \pm 0	1.7
Corolla tube length (cm)	1.5 \pm 0.1	1.0–2.0
Staminal tube length (cm)	0.2 \pm 0	0.2
Staminodes length (cm)	0.1 \pm 0	0.1

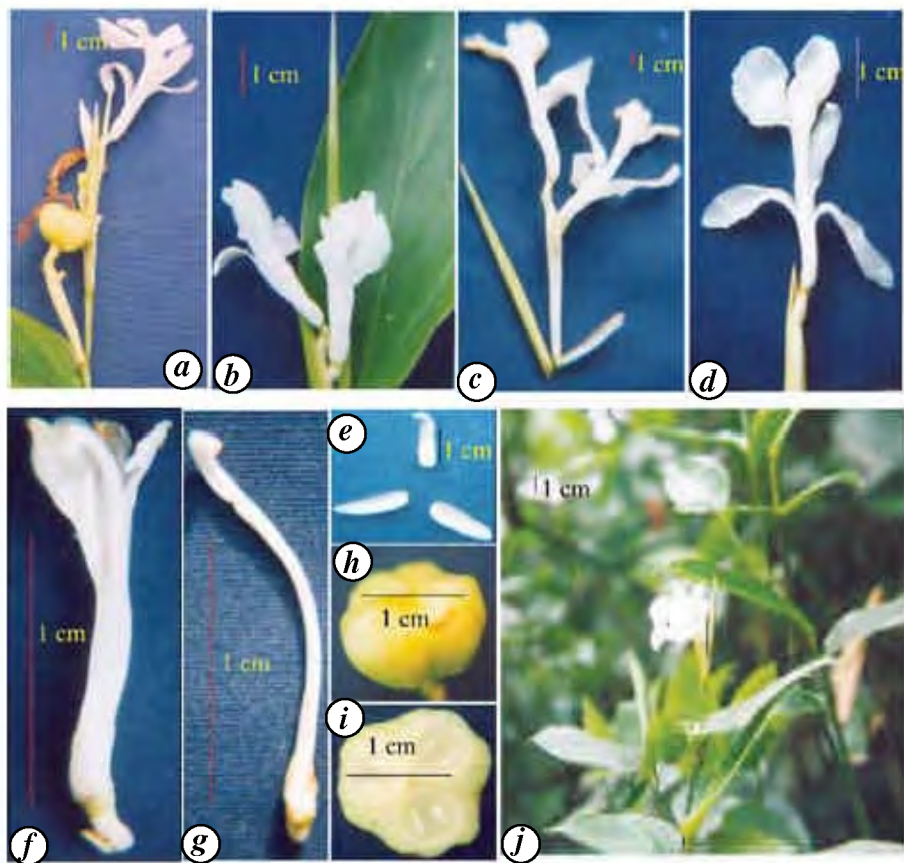


Figure 1. Plant, panicle, florets and fruit of *Schumannianthus dichotomus*. *a, b*, Panicle; *c, d*, Florets; *e*, Sepals; *f*, Corolla tube; *g*, Gynoecium; *h*, Fruit; *i*, Transverse section of fruit; *j*, Flowering plant.

Table 3. Morphological details of chromosomes of *S. dichotomus*

Chromosome pair	Long arm (µm)	Short arm (µm)	Total length (µm)	Relative length*	Arm ratio $r = l/s$	Centromeric index $F\% = 100XS/C$	Centromeric position	Group
I	1.1	1.1	2.2	17	1.0	50	M	I
II	0.8	0.8	1.6	13	1.0	50	M	I
III	0.7	0.7	1.4	11	1.0	50	M	I
IV	1.1	0.2	1.3	10	5.5	15	SM	II
V	0.6	0.6	1.2	9	1.0	50	M	I
VI	0.8	0.3	1.1	9	2.7	27	SM	II
VII	0.9	0.2	1.1	9	4.5	18	SM	II
VIII	0.9	0.1	1.0	8	9.0	10	SM	II
IX	0.8	0.2	1.0	8	4.0	20	SM	II
X	0.4	0.4	0.8	6	1.0	50	M	I

*Relative length = percentage length of individual chromosomes; M, Median; SM, Submedian; No. of cells scored = 20.

Figure 3. A study of 20 randomly distributed cells undergoing metaphase stage revealed that the species is diploid, having somatic chromosome number $2n = 20$, where $n = x = 10$. Karyotype study revealed that the total length of haploid (monoploid) chromosome is $12.7 \mu\text{m}$. The length of chromosomes varies from 2.2 to $0.8 \mu\text{m}$. On the basis of arm ratio and centromeric index ($F\%$), the position of the centromere on each chromosome was determined. Based on the position of the centromere, the chromosomes

were divided into two groups. Group I consists of five chromosome pairs (chromosome I–III, V and X) with median centromere and Group II consists of five chromosome pairs (chromosome IV, VI–IX) with submedian centromere.

Chromosome numbers of different genera under the family Marantaceae have been reported, viz. *Calathea* ($x = 9$ and 11)⁵, *Ctenanthe* ($x = 10$)⁵, *Ischnosiphon* ($x = 21$)³, *Maranta* ($x = 12$ and 13)³, *Marantochloa* ($x = 31$)⁵,

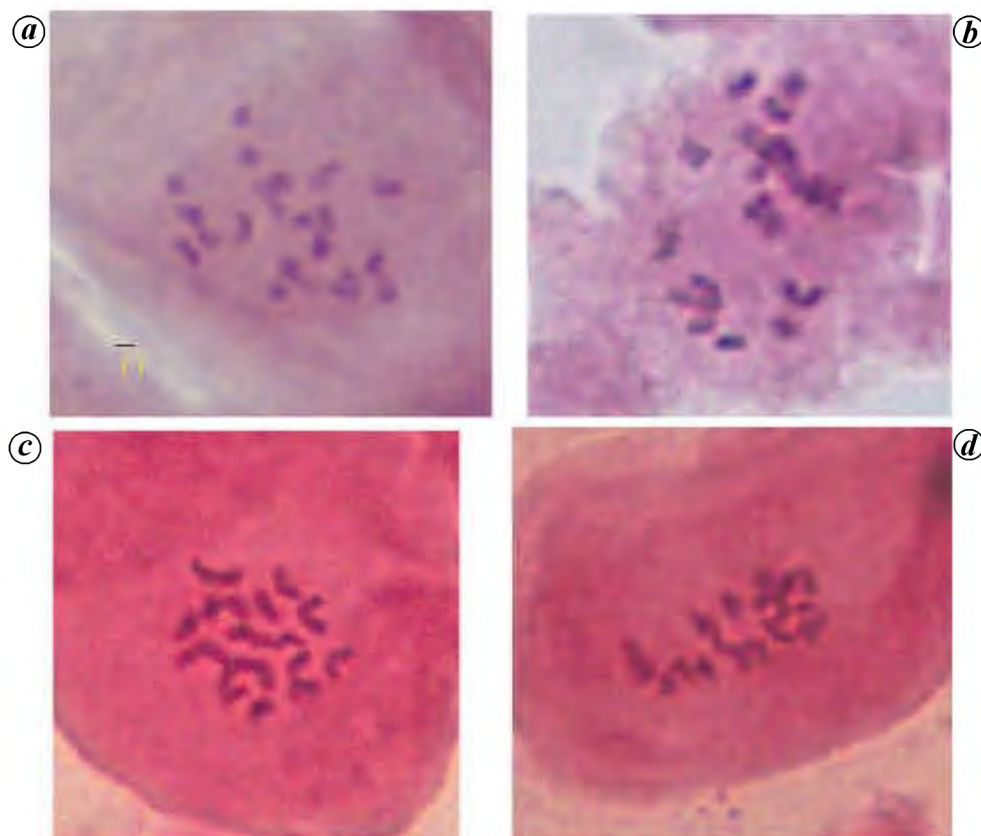


Figure 2. Mitotic chromosome ($2n$) of *S. dichotomus*. *a-c*, Prophase; *d*, Metaphase.

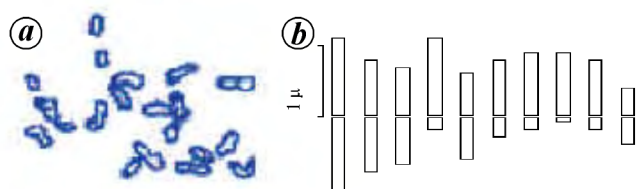


Figure 3. *a*, Camera Lucida diagram; *b*, Chromosome ideogram of *S. dichotomus*.

Monostogma ($x = 9$)⁴, *Phrynium* ($x = 9$)⁶, *Stromanthe* ($x = 9$ and 11)⁴ and *Thalia* ($x = 13$)⁵. However, to the best of our knowledge, there have been no reports on chromosome number and karyotype study of *Patidoi*. Our report provides detailed morphological characters of the plant belonging to the species *S. dichotomus*. Our findings would provide a basis for systematic study of the plant.

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