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Two Different Chromosome Numbers of *Cymbidium cyperifolium* Lindl.

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Cymbidium cyperifolium Lindl. に見出された二つの染色体数

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Detailed karyotype studies has been carried out on five different diploid individuals of *Cymbidium cyperifolium* (Orchidaceae). In one of the individuals (cytotype A), the chromosome number is found to be 2n=36 and the rest of the four individuals (cytotype B) reveal 2n=40. The fundamental arms of the chromosome numbers in both the cytotypes is estimated at 68. It is evident that chromosome fusion or fission has played a major role in the chromosomal evolution of the species in *C. cyperifolium*.

It is emphasized that cytological information is imperative to solve the breeding procedure and for improvement of desired varieties through hybridization. The study shows a detailed account to evaluate genomic composition of having two chromosome numbers x=18 and x=20 within the five individuals of *Cymbidium cyperifolium* Lindl.

Materials and Methods

Materials for the present study were collected from the living specimen at Royal Botanical Garden, Godawari. Root tips were pretreated in 0.002 M solution of 8-hydroxyquinoline for 4 hours at 15°C, fixed in 1:3 acetic alcohol and stained in 2% aceto-orcein. The stained roots were then squashed in 2% aceto-orcein. Photomicrographs were taken at ×1050 from the permanent slides which were made by using *n*-butyl series and mounted in euperol. For the karyotype analysis, chromosomes were drawn with Olympus drawing tube.

Results

Morphological and cytological observations have been carried out on five individuals of *Cymbidium cyperifolium*.

Cymbidium cyperifolium is distributed in central Nepal at an altitudinal range 1675–2440m (Banerji and Pradhan 1984). It is a terrestrial species with pseudostem thin, short; leaves linear 20–70 cm long and about 5mm broad, accuminate, sheathing base; inflorescence racemose, arising from the base of pseudostem, erect; 4 to 7, fragrant greenish yellow, flowers with 3-lobed lip with purple patches on a greenish yellow background.

Striking difference on morphological characters were not observed within the five individuals. Of the five individuals examined, chromosome number 2n=36 (cytotype A) is observed in one of the individuals. In the rest of the four individuals 2n=40 (cytotype B) is determined.

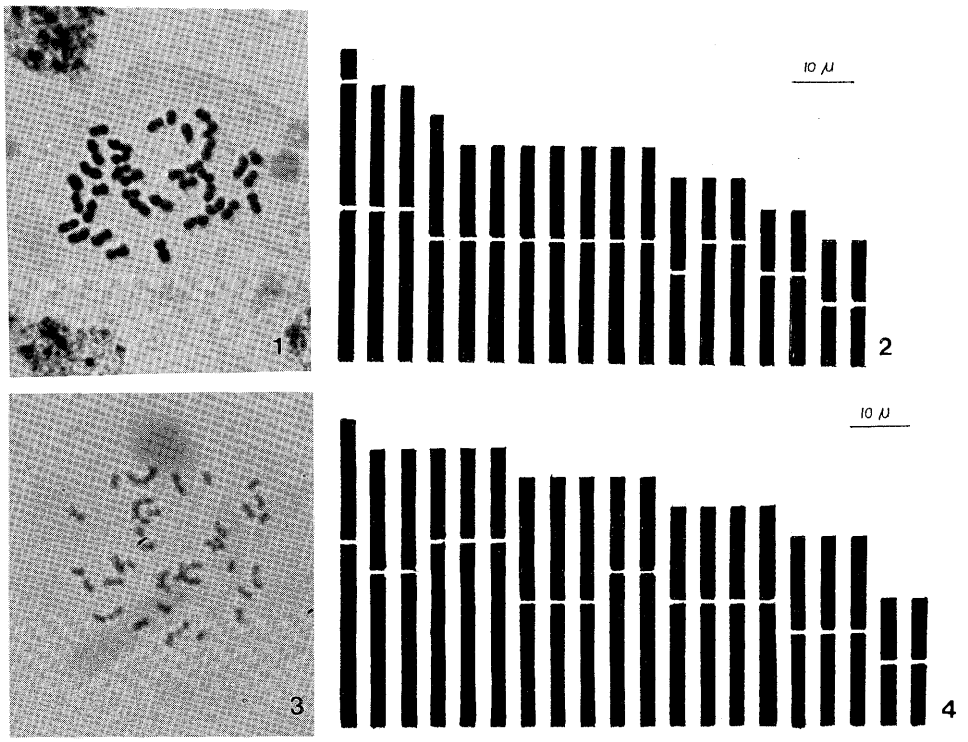
Cytotype A: The somatic chromosome number of this cytotype is 2n=36 (Fig. 1). The karyotype is composed of four pairs metacentric, twelve pairs submetacentric and two pairs acrocentric chromosomes (Fig. 2). Secondary constrictions have been observed in one pair of submetacentric chromosome. Karyotype formula is 8M + 24SM + 4A.

Cytotype B: The somatic chromosome number count of this cytotype is found to be 2n=40 (Fig. 3). The karyotype comprises eight pairs metacentric, six pairs submetacentric and six pairs acrocentric chromosomes (Fig. 4). Karyotype formula is 16M + 12SM + 12A.

Discussion

Previous authors (Mehra and Seghal 1978) have determined the chromosome number of this species, 2n=40. Present study has provided a new information of two different chromosome sets i.e. 2n=36 and 40.

By scoring the meta or submetacentrics as biarmed and the chromosome with acrocentric as uniarmed (Gold and Gall 1975), the arm numbers in all 5 individuals is estimated to be 68 in which the number of large chromosome arms is maintained. On the basis of chromosome morphology, a Robertsonian relationship appears to exist between x=18 and x=20 sets and this emphasizes that two of the former is represented by four acrocentrics in the latter, and that the



Figs. 1–4. Photomicrographs of metaphase plates and idiograms of the two cytotypes (A and B) of *Cymbidium cyperifolium*. 1. Cytotype A, 2n=36. 2. Idiogram of cytotype A. 3. Cytotype B, 2n=40. 4. Idiogram of cytotype B.

two basic number were differentiated originally by a simple structural change. This structural change is similar to that of the case in *Gibasis linearis* and its allies (Jones, Bhattarai and Hunt 1981) and in *Gibasis schiedeana* (Jones 1974). It is evident that in these cases, centric fusion of acrocentrics has taken place.

It is an established fact that centric fusion between acrocentric or telocentric chromosomes results in increased number of metacentric thereby leading to reduction in the chromosome number.

The explanation for the four chromosome difference in the diploid number between the two cytotypes (A and B) is the past occurrence of two independent centric fusions (or dissociations) involving different pairs of non-homologous acrocentric (or metacentric) chromosomes; with the fusion (or dissociations) subsequently becoming homozygous. This would account for the differences in chromosome number without changing the fundamental arm number. In the cytotype A having 2n=36, two pairs of chromosomes with meta or submetacentric are not readily apparent in the cytotype B with 2n=40. These two pairs could represent the products of two fusion that is, union of long arms of four acrocentrics to a common centromere. This situation agrees with Gold et al. (1975). This mutation has long been recognized as a common and important mechanism of chromosome evolution in animals but has not been regarded as being of the same significance in plants (Jones 1983).

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要 旨

ネパールに産する *Cymbidium cyperifolium* Lindl. の染色体を5個体について調べた．その結果，未報告の 2n＝36 をもつ1個体と，既知の 2n＝40 をもつ4個体がみいだされた．核型を分析した結果，前者はロバートソン型転座によって生じたと考えられた．