



## CYTOLOGICAL STUDIES ON SOME COMMERCIAL ORCHIDS

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### Abstract

Cytological studies have been made in 6 species namely, *Aerides crispum*, *Cattleya hybrida*, *Dendrobium aqueum*, *Dendrobium densiflorum*, *Liparis viridiflora* and *Spathoglottis plicata*. Deviant reports as against the previous records of chromosome numbers have been made in *Aerides crispum*, *Dendrobium aqueum* and *Spathoglottis plicata*. In all the other species studied the present report of chromosome numbers are in correlation with those of earlier reports. Most of the species of *Cattleya hybrida* are having  $2n = 20$ , *Dendrobium densiflorum*  $2n = 16$  and *Liparis viridiflora*  $2n = 36$  chromosome should have been originated by aneuploidy. The study of karyotype analyses show that each and every species has a distinct karyotype. Therefore, karyotype alterations of chromosomes may also play important role in speciation along with aneuploidy.

**Key words :** Chromosome, aneuploidy, euploidy.

### Introduction

Orchidaceae form one of the most natural families of the plant kingdom. The family Orchidaceae includes 20,000 species belonging to 735 genera (Willis, 1966). Fyson (1977) in his Flora of South Indian Hill Station has dealt with about 60 species in 25 genera. Hooker (1890) in his "Flora of British India" dealt with 5000 species in 340 genera.

Orchidaceae mostly inhabit tropical forest: where their numerous species generally grow on the trunks of trees, to which they attach themselves by their long adventitious roots but they are terrestrial in the temperate regions of the northern hemisphere.

The hybrid Orchid flowers have an international recognition for their beauty. The number of hybrid orchids are increasing more swiftly than that of wild orchid species. Most of the wild orchids have beautiful, fragrant and everlasting flowers. Some of the orchids are medicinally supernatant while certain others are used for the extraction of various chemical compounds. Some orchids are used for the oil. Some of the economically important orchids are fastly disappearing from our earth due to disturbances in natural environmental conditions. The family is of little economic value. Most of the plants are grown for their beautiful flowers, of which some possess medicinal value and some yield scent.

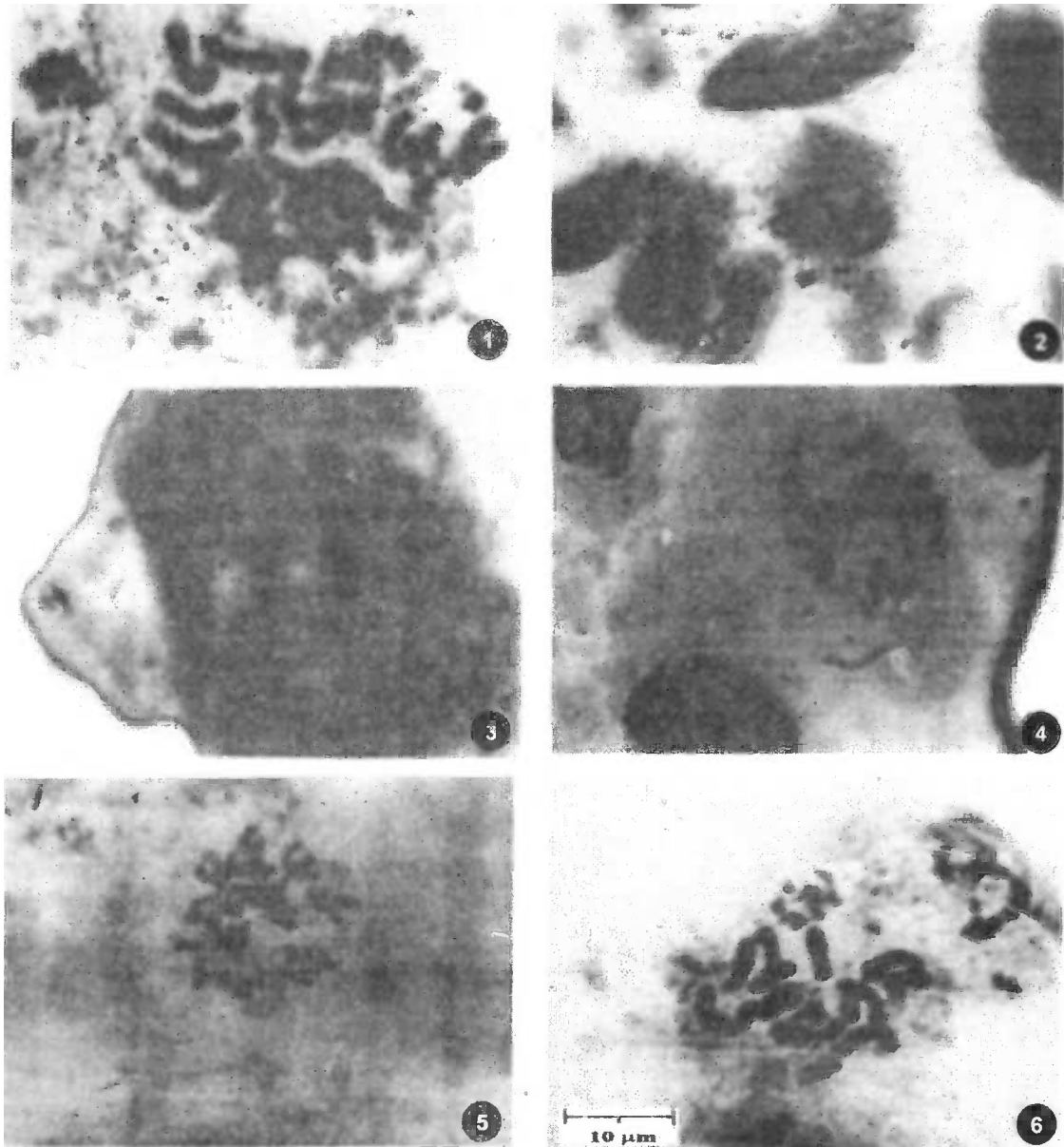
### Materials and Methods

The plants for the present study were collected from hill stations like, Kolli hills, Yercaud, Auroville and Ooty. All these species were grown under identical conditions in clay pots under requisite day light period.

The roots tips were collected and thoroughly washed in water. Then they were pretreated in 0.002 M hydroxyquinoline at 4°C for 3 hours. Then the root tips were thoroughly washed and fixed following iron alum and haematoxylin squash schedule described by Marimuthu and Subramaniam (1960). Squashes were made with 1 or 2 root tips per slide and sealed. Ten plates were considered for karyotype analysis in each species in the present investigation. The measurements of chromosomes were made with ocular micrometer.

### Results and Discussion

The particulars regarding the species studied,  $2n$  chromosomes number, the present report of chromosome numbers and the previous chromosomes reports, authors and year are furnished in table 1. The chromosome of the members of Orchids are generally short sized followed by medium size (plates 1 and 2). Based on the length, the chromosomes are grouped into short I, short II, short III, medium and long types and under each of these groups the following categories of chromosomes have been recognized.

Plate - 1 : Mitosis Microphotographs  $\times 1250$ 

**Figs. 1-6 :** 1. *Aerides crispum* Lindl.,  $2n=26$ ; 2. *Cattleya hybrida* Lindl.,  $2n=20$ ; 3. *Dendrobium aqueum* Lindl.,  $2n=24$ ; 4. *Dendrobium densiflorum* Bailey.,  $2n=16$ ; 5. *Liparis viridiflora* Lindl.,  $2n=36$ ; 6. *Spathoglottis plicata* Blume.,  $2n=16$ .

**Long chromosome (more than  $5.0 \mu\text{m}$ )**

Type S = Chromosome with a sub-medium or median primary and secondary construction and satellite on the long arm or short arm.

**Medium sized chromosomes ( $3.0 \mu\text{m}$  to  $4.9 \mu\text{m}$ )**

Type J = Chromosome with a sub-medium construction.

**Short chromosomes ( $1.0 \mu\text{m}$  to  $2.9 \mu\text{m}$ )**

Type V = Chromosome with a medium construction.

**Very short chromosomes (less than  $1.0 \mu\text{m}$ )**

Type I = Chromosome with a sub-terminal

construction.

First record of somatic chromosome number has been made in 3 species in the present investigation (table 1). Deviant reports as against the previous records of chromosome numbers have been made in 3 species namely, *Aerides crispum*, *Dendrobium aqueum* and *Spathoglottis plicata*. In all other species studied the present report of chromosome numbers are in correlation with those of earlier reports (table 1).

The chromosome of all the species studied are medium sized and short sized the species may be considered cytological evolved. The chromosomes of all

**Table 1 :** Place of collection and species.

S. no.	Species	Present study	Previous study	Place of collection
1.	<i>Aerides crispum</i> Lindl.	2n = 26	2n = 28 Chardard (1963)	Kolli hills
2.	<i>Cattleya hybrida</i> Lindl.	2n = 20	New record	Yercaud
3.	<i>Dendrobium aqueum</i> Lindl.	2n = 24	2n = 38 Jones (1963)	Yercaud
4.	<i>Dendrobium densiflorum</i> Bailey.	2n = 16	New record	Auroville
5.	<i>Liparis viridiflora</i> Lindl.	2n = 36	New record	Ooty
6.	<i>Spathoglottis plicata</i> Blume.	2n = 16	n = 20 Abraham and Vatsala (1981) 2n = 40 Vijayakumar (1986) 2n = 40 Ranganathan (1994)	Auroville

**Table 2 :** Summarised karyomorphological features of the various species studied.

S. no.	Name of the plant	2n	Range and size of the chromosome in $\mu\text{m}$	Type of chromosome				Total chromosome length in $\mu\text{m}$	Absolute chromosome length in $\mu\text{m}$	Average chromosome length in $\mu\text{m}$
				S	J	V	I			
1.	<i>Aerides crispum</i> Lindl.	2n=26	3.0 - 6.4	2	4	10	10	105.6	52.5	4.06
2.	<i>Cattleya hybrida</i> Lindl.	2n=20	1.2 - 1.8	-	-	10	10	29.2	14.6	1.46
3.	<i>Dendrobium aqueum</i> Lindl.	2n=24	1.6 - 3.0	-	-	14	10	55.2	27.6	2.3
4.	<i>Dendrobium densiflorum</i> Bailey.	2n=16	3.0 - 5.2	2	4	4	6	59.6	29.8	3.72
5.	<i>Liparis viridiflora</i> Lindl.	2n=36	2.2 - 4.6	-	4	22	10	120.8	60.4	3.35
6.	<i>Spathoglottis plicata</i> Blume.	2n=16	3.0 - 4.6	-	2	10	4	58	29.0	3.62

the species studied possess asymmetrical karyotypes. Most of the chromosomes in all the species studied have sub-medium, sub-terminal and terminal centromeres. This is another cytologically evolved, character as per the above guidelines described.

There is a range of chromosome numbers from  $2n = 16$  to  $2n = 36$ , of the diploid chromosome number,  $2n = 16$  represented the highest frequency among the species of the genus so far studied. Therefore  $2n = 16$  may be the actual diploid chromosome number. Therefore, most of the species of Orchid with  $2n = 16$  chromosome may be a cytologically primitive character.

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