

Cytotaxonomical study of west Bengal Charophyta: a new chromosome number count of *Nitella stuartii* and its karyotype

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SUMMARY

Nitella stuartii A.Br. (Characeae), a heteroclemous taxon collected from Santiniketan, West Bengal, India, was found to have a chromosome count of $n = 18$ in both vegetative and antheridial filament cells which differed from a previous count of $n = 15$. Using a pre-treatment schedule, karyotype analysis revealed that the present material consisted of four chromosomes with subterminal, nine with sub-median, and five with median constrictions.

Key-words: cytotaxonomy, karyotype, *Nitella*.

INTRODUCTION

Nitella stuartii A.Br. (Section-*Palia* of Wood & Imahori 1965) is an interesting heteroclemous taxon, characterized by: a two-furcate branchlet; conjoined sex organs at fertile branchlet nodes, reticulate ornamentations of the oospore membrane (Pal *et al.* 1962). The previous chromosome count for this taxon was $n = 15$ (Khan & Sarma 1967b), based on material from Varanasi U.P., India. The number ($n = 15$) is very unusual for a species of *Nitella* and, hence, it was considered worthwhile to determine the chromosome number of this taxon from West Bengal, India, and to ascertain its karyotype with the methodology developed in our laboratory (Ray & Chatterjee 1983, 1986).

MATERIALS AND METHODS

Living specimens of *Nitella stuartii* were collected from Santiniketan, West Bengal, India, and a clonal culture was established in the laboratory. Cytological preparations for chromosome study were made from both young vegetative shoot apices and antheridial filaments of young globules. The cytological technique followed was essentially the same as that reported by Ray & Chatterjee (1983, 1986). The method consisted of pretreating the vegetative apices in a chilled (1:1) mixture of 0.1 M sucrose and 0.1% aqueous colchicine solution to which was added a 0.002 M aqueous solution of 8-hydroxyquinoline at the ratio of one drop per millilitre of mixture. A karyogram was derived, based on the mean value of chromosome lengths from five well-scattered metaphase plates in the fast growing cells of vegetative apices. Chromosome morphology was designated after Levan *et al.* (1964) and Total Form per cent (TF%) was calculated following Huziwara (1962). Chromosomes were categorized according to their length after Khan & Sarma (1967a). From these data a karyotype formula was constructed.

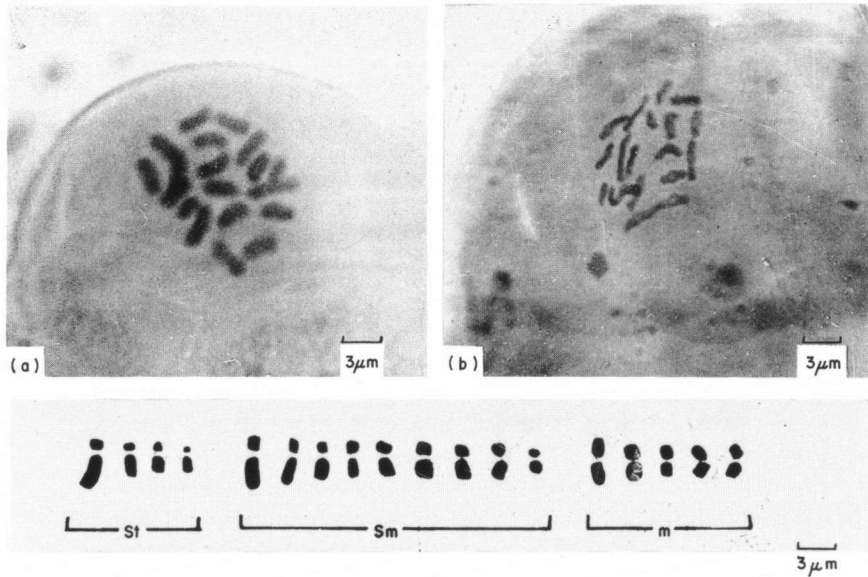


Fig. 1.

OBSERVATIONS

The chromosome lengths of this taxon vary from 1.38 to 3.68 μm and the total chromatin length was found to be 40.4 μm . There are four chromosomes with sub-terminal (St), nine with sub-medial (Sm), and five with medial (m) constrictions. The karyotype formula is as follows: $L(0) + M(\text{Sm}_1 + \text{m}_0 + \text{St}_1) + S(\text{Sm}_8 + \text{m}_5 + \text{St}_2)$ where L, M and S indicate long, medium and short sized chromosomes, and 0 represents the absence of the particular type of chromosome.

DISCUSSION

Nitella stuartii is one of the common heteroclemous representatives of *Nitella* in India, the other one is *N. hyalina*. The chromosome number of this interesting species was first reported by Khan & Sarma (1967b) from Varanasi, U.P., India. The number ($n=15$), though in line with the proposed basic number $x=3$ in an euploid series, as reported by Khan & Sarma (1967b) and Guerlesquin (1984), is very unusual for a species of *Nitella* and so far is unrecorded in any other species studied from India. The present investigation, however, clearly recorded a chromosome number of $n=18$ (Fig. 1a) in vegetative cells. The number ($n=18$) is expected and only in one instance was a variation plate showing 19 chromosomes (Fig. 1b) noted in a dividing vegetative cell, which had possibly arisen due to unequal separation of chromosomes during anaphase; one pole receiving an extra chromosome. It is thus presumed that the number ($n=15$) recorded by previous authors (Sarma 1982) possibly represents an aberrant number which might have arisen due to non-disjunction of chromatids at the end of metaphase. Non-disjunction of chromatids is a frequently encountered natural phenomenon observed in many taxa of Characeae. The chromosome number $n=18$ thus represents the correct number for this taxon and is recorded for the first time. However, in view of the report of $n=15$, further

studies of this taxon from other areas of India should also be made to determine whether this taxon shows polyploid races in nature.

As far as the karyotype is concerned, there are four chromosomes with sub-terminal, nine with sub-median and five with median constrictions (Fig. 1c). Chromosome complements within each of these categories showed a slight gradation in chromosome length. Total Form per cent calculated for this taxon was 37.5. This is a heteroclemous taxon and the value of TF% indicates symmetry of the karyotype, thus confirming its primitive status (Kapoor & Löve, 1970).

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