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SOME ANEUPLOIDS IN INDIAN CHAROPHYTA

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SUMMARY

Aneuploid chromosome numbers have been found in Indian material of *Chara zeylanica* var. *zeylanica* f. *elegans* (A.Br. & T.F.A.) Gr. & J.Gr. (n = 48) and *Nitella acuminata* var. *acuminata* f. *belangari* (A. Br.) R.D.W. (n = 29). The cytotaxonomy of the *C. zeylanica* complex has been discussed with reference to the antheridial scutae number. On karyotypic grounds *N. acuminata* f. *belangari* has been given the status of 'variety'.

1. INTRODUCTION

The occurrence of aneuploidy in Charophyta from India is quite unusual compared with forms from Europe and America. Up to now *Chara gymnopitys* var. *duriuscula* with n = 37 (CHEENNAVEIRAIAH & BHARTI 1974) from Mysore state and *C. fibrosa* var. *hydropitys* f. *hydropitys* with n = 8 (NOOR & MUKHERJEE 1975) from Bihar state are the only aneuploids recorded from India.

The present paper reports cytotaxonomic investigations of two new aneuploids, *viz. Chara zeylanica* var. *zeylanica* f. *elegans* (n = 48) and *Nitella acuminata* var. *acuminata* f. *belangari* (n = 29) from Rohilkand Division, U.P., India.

2. MATERIALS AND METHODS

Plants were collected during November–December 1976 and 1978. *C. zeylanica* was found at a depth of 15 cm, temperature 27 °C, pH 7.4, *Nitella belangari* at a depth of 60 cm, temperature 28 °C, pH 9. They were found in association with *Nitella mirabilis, N. furcata, C. corallina, C. braunii, C. brachypus,* and *C. hydropitys.* Smears were stained with Feulgen stain and the TBA-euparal schedule was used for making the slides permanent.

3. OBSERVATIONS

3.1. Chara zeylanica f. elegans (A. Br. & T.F.A.) Gr. & J.Gr.

Plants monoecious, 20–32 cm high. Axes 382–410 μm in diameter. Internodes twice as long as the branchlets. Stem triplostichous. Spine cells well developed. Branchlets 8–9, segments 8–9. lowermost segment ecorticated, fertile. Gametangia conjoined. Bracts 2. Oogonia solitary, 437–588 μm long, 150–232 μm wide.

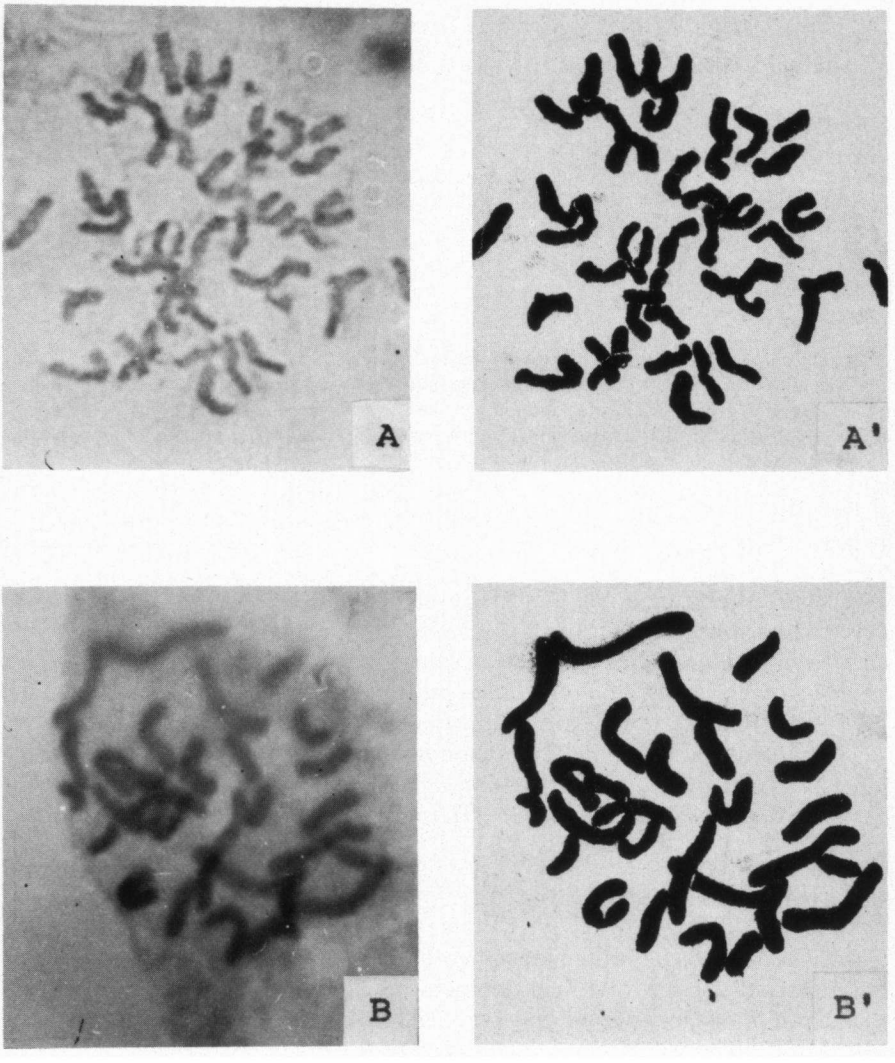

Fig. 1. Metaphase plates showing mitotic chromosomes in two aneuploid forms: A. *Chara zeylanica* f. *elegans* (n = 48); A'. Camera lucida drawing of the same; B. *Nitella acuminata* f. *belangari* (n = 29), B'. Camera lucida drawing of the same.

Oospore black, 328–409 μm long, 123–178 μm wide, convolutions 9–10. Antheridia tetrascutate, 219–246 μm in diameter. Interphase nucleus 9.58–14.9 μm in diameter. Nucleolus 1 (–2),),7 μm in diameter. Chromocenter not seen. Chromosome number n = 48 (*fig. 1A, A'*). Chromosomes short to medium in size, 1.3–4.0 μm long, 0.4–1.0 μm thick; 11 chromosomes metacentric, 30 submetacentric, 4 subtelocentric and 3 telocentric at metaphase (*fig. 2A*).

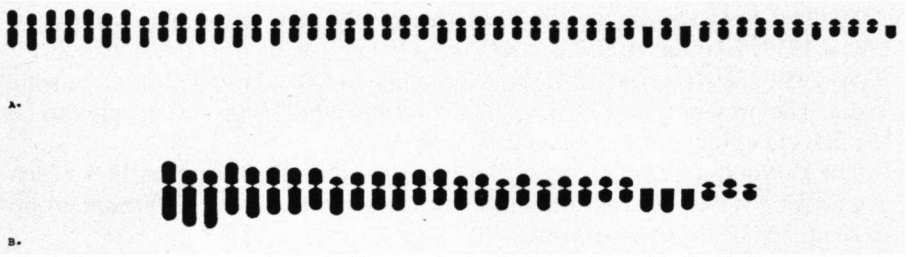

Fig. 2. Karyotypic organisations: A. *Chara zeylanica* f. *elegans* (n = 48), B. *Nitella acuminata* f. *belangari* (n = 29).

3.2. Nitella acuminata var. acuminata f. belangari (A. Br.) R.D.W.
Plants monoecious, 6–18 cm high. Axes 460–650 μm in diameter. Branchlets 4–8, 2(–3) furcate. Dactyls 3(–5), acuminate, 1-celled. Gametangia together forming condensed fertile heads. Oogonia solitary, 250–316 μm long, 176–230 μm wide. Oospores blanck, 116–200 μm long, 100–150 μm wide. Convolutions 6–8. Antheridia 135–200 μm in diameter. Chromocentres one. Chromosome number n = 29 (*fig. 1B, B'*). Chromosomes short to medium in size, 1.3–4.5 μm long, 0.4–0.7 μm thick; 3 chromosomes metacentric, 22 submetacentric, 1 subtelocentric and 3 telocentric (*fig. 2B*).

4. DISCUSSION

In the genus *Chara* many aneuploid chromosome numbers have been recorded outside India: n = 12 (CORILLION et al. 1959), 16 (OEHLKERS 1916), 18 (LINDENBEIN 1927), 24 (LINDENBEIN 1927; GUERLESQUIN 1967; GILLET 1959), 26 (GEITLER 1949), c. 20 (GEITLER 1949), 32 (GILLET 1959; GUERLESQUIN 1967; CORILLION & GUERLESQUIN 1972), and +40 (KARLING 1928). For India only two aneuploids have been reported earlier in the genus *Chara*, viz. *C. gymnopitys* var. *duriuscula* (n = 37, GHEENNAVEERAIAH & BHARTI 1974) and *C. fibrosa* var. *hydropitys* (n = 8, NOOR & MUKERJEE 1975).

During a broad survey of Rohilkhand division the author came across tetrascutate forms of *Chara zeylanica* f. *elegans* with n = 48, which is the first recorded aneuploid in the *Chara zeylanica* complex.

GRIFFIN & PROCTOR (1964) were of the opinion that 4-plated *C. zeylanica* forms possess 28 chromosomes, whereas the 8-plated forms have 42 or more chromosomes; according to SUNDARALINGAM (1946), SARMA & KHAN (1965), KHAN & SARMA (1967), RAMJEE (1969), and RAMJEE & SARMA (1971) on the other hand, no relation exists between the chromosome number and the number of antheridial plates. The present report of n = 48 in 4-plated *C. zeylanica* forms supports the latter view. A series of n = 28, 42, 48, or 56 may be found in any form irrespective of the number of antheridial plates. In second instance PROCTOR (in: RAMJEE 1969) abandoned the above-mentioned position because of the existence of a very complex arrangement of polyploid races within the *C. zeylanica* complex.

Unlike *Chara*, the genus *Nitella* has shown only a few aneuploids, viz. n = 14 (SATO 1959; IMAHORI & KATO 1961), 16 (GILLET 1959), 17 (LINDENBEIN 1927; SATO 1959). 28 (IMAHORI & KATO 1961), and 34 (KARLING 1926), all outside India. The present report of n = 29 in *N. acuminata* f. *belangari* appears to be the first aneuploid in the genus *Nitella* from India.

The karyotypic organisation of this taxon exhibits advancing features which argues for a varietal status rather than the forma in the *Nitella acuminata* group as suggested by WOOD & IMAHORI (1965).

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REFERENCES

BHATNAGAR, S. K. (1981): *Cytotaxonomy of Charophytes of Rohilkhand division and effect of different chemicals on selected taxa.* Ph. D. Thesis (Rohilkhand University), Bareilly.

CHEENNAVEERAIAH, M. S. & S. G. BHARI (1974): Morphological and cytological observations on Chara gymnopitys A. Br. *Cytologia* **39** (3): 443–451.

CORILLION, R. & M. GUERLESQUIN (1972): Recherches sur les Charophycées d' Afrique occidentale, *Travaux et Memoirs* **25**: 1–169.

—, CL. GILLET & M. GUERLESQUIN (1959): Critères cytologiques anatomiques et écologiques en faveur du maintaien d'un genre Charopsis chez les Charophycees. *Bull Soc. Sc. Bretagne* **34**: 65–73.

GEITLER, L. (1949): Über die Teilungsrhythmen in den spermatogenen Faden der Characeen, *Osterr. Bot. Zeitschr.* **95**: 147–163.

GEILLET, CL. (1959): Nombres chromosomiques de plusieurs espèces de Charophycées (genres Nitella et Chara). *Rev. Cytol. Biol. vég.* **20**: 229–234.

GODWARD, M. B. E. (1948): The iron-alum acetocarmine method for algae. *Nature* **161**: 203.

GRIFFIN, D. G. & V. W. PROCTOR (1964): A population study of Chara zeylanica in Texas, Oklahoma and New Mexico. *Amer. J. Bot.* **51**: 120–124.

GUERLESQUIN, M. (1967): *Recherces caryotypiques et cytotaxonomiques chez les Charophycées.* Thesis, Angers, France.

IMAHORI, K. & T. KATO (1961): Notes on chromosome numbers of Charophytes in Fukui Prefecture, Japan (1). *Sci. Rep., Osaka Univ.* **10**: 39–48.

KARLING, J. S. (1926): Nuclear and Cell division in Nitella and Chara. *Bull. Torrey Bot. Club* **23**: 319–379.

— (1928): Nuclear and cell division in antheridial filaments of Characeae. *Bull. Torrey Bot. Club* **55**: 11–39.

KHAN, M. & Y. S. R. K. SARMA (1967): Studies on cytotaxonomy of Indian Charophyta. 1. Chara. *Phykos* **6** (1 & 2): 36–47.

LINDENBEIN, W. (1927): Beitrag zur Zytologie der Charales. *Planta* **4**(4): 436–466.

NOOR, N. N. & S. MUKHERJEE (1975): On the aneuploid chromosome numbers in *Chara hydropitys* from India. *Cytologia* **4**(4): 804–807.

OEHLKERS, F. (1916): Beitrag zur Kenntnis der Kernteilungen bei den Charazeen. *Ber. Deutsch Bot. Ges.* **34**: 223–227.

RAMJEE (1969): *Contributions to the systematics, cytology and cytotaxonomy of Indian Charophyta.* Ph. D. Thesis, B.H.U., Varanasi.

— & Y. S. R. K. SARMA (1971): Some observations on the morphology and cytology of Indian Charophyta. *Hydrobiologia.* 37(2): 367–382.

SARMA, Y. S. R. K. & M. KHAN (1965): Some new observations on the karyology of Chara zeylanica Klein ex Willd. *Curr. Sci.* 34(9): 293–294.

SATO, D. (1959): The prokaryototype and phylogeny in plants. *Sci. Pap. Coll. Gen. Edu. Univ., Tokyo* 9: 316.

SUNDARALINGAM, V. S. (1946): The cytology and spermatogenesis in Chara zeylanica Willd. *Jour. Ind. Bot. Soc., M.O.P. Iyanger Commemoration Vol.* 289–303.

WOOD, R. D. & K. IMAHORI (1965): *A revision of the Characeae, Monograph and Iconograph.* Verlag J. Cramer, W. Germany.