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QUANTITATIVE CHROMOSOMAL CHANGES IN CULTURED CELLS OF *DIGITALIS LANATA* EHRH.

Digitalis lanata is an important medicinal plant cultivated extensively in Europe and Western Asia since it is the only commercial source of the cardiac glycoside digoxin. The species is diploid with $2n = 56$, and contains digoxin 0·150–0·302% dry weight of the plant. Various inter-specific hybrids of *D. lanata* with *D. purpurea*, *D. lutea* and *D. grandiflora* were raised by different workers[1–3], but all these hybrids contain digoxin within the range found in *D. lanata*. In the present studies, haploid and a series of polyploid and aneuploid numbers have been raised in cultured cells of *D. lanata* through long-term subculturing for evolving the higher digoxin yielding genotypes.

Suspension cultures were initiated from seedling roots of *D. lanata*. The explants were sterilized and placed in liquid Murashige and Skoog's[4] basal medium supplemented with 2 mg/litre 2, 4-dichlorophenoxyacetic acid. First subculturing of the resulting suspension cultures was done after eight days, while the subsequent transfers were made every three or four day intervals upto 30 months. The cultural conditions and cytological technique were the same as reported earlier for *Citrus*[5].

Seedling root apices of *D. lanata* revealed a homogeneous population of diploid cells with $2n = 56$ (Fig. 1). The chromosome constitution of 30 month old subcultured cells of the explants were found to have changed drastically. Only 48·4% cells were diploid, while others were haploid, polyploid and aneuploid, ranging between 28 and 112 chromosomes (Fig. 2). Architectural changes of the chromosomes could not be detected due to their high number and minute size that varied from 1·0 to 2·2 μ.

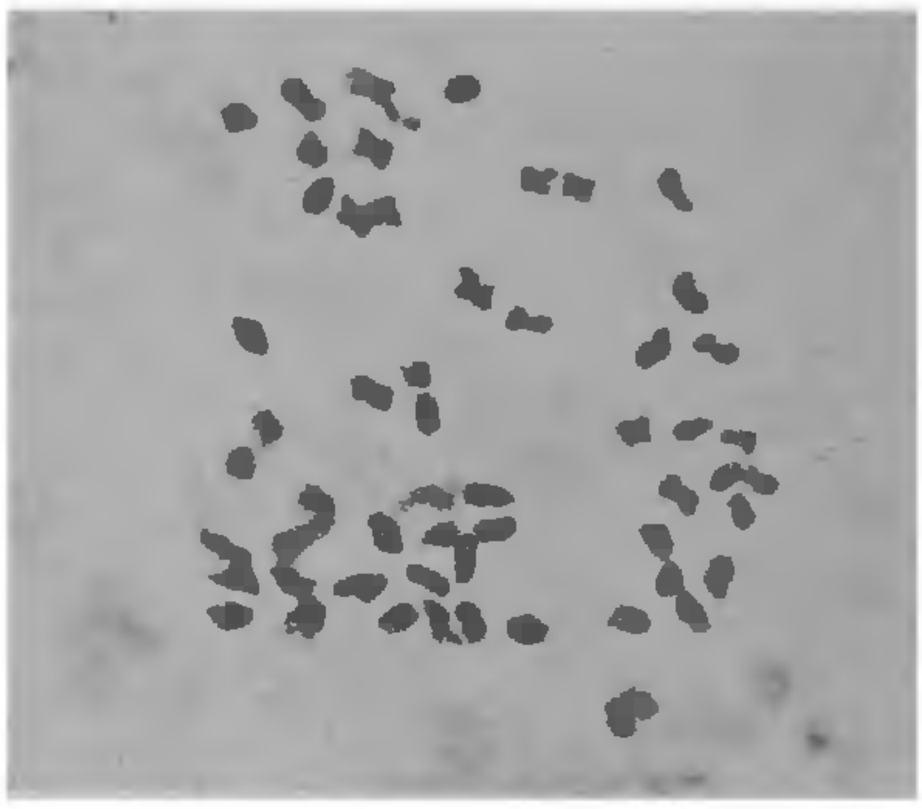

FIG. 1. Metaphase plate showing $2n = 56$ (diploid) in root apex cell of *D. lanata*, × 1,850.

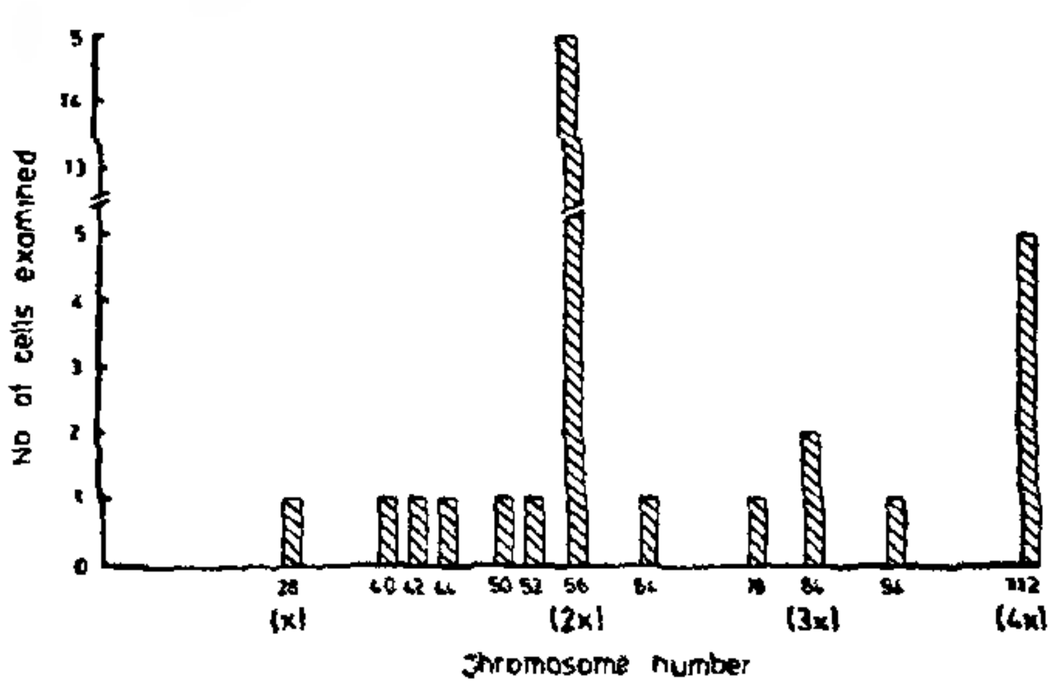

FIG. 2. Chromosome numbers and their frequencies in 30 month old subcultured cells derived from seedling roots of *D. lanata*.

The frequency of numerical variation of chromosomes in suspension culture of *D. lanata* increased with aging. In the 30 month old subcultures, haploid, polyploid and aneuploid cells were predominant. The polyploid numbers probably originated due to either nondisjunction of chromosomes or simply by the failure of cytokinesis with subsequent nuclear fusion[6–7]. For the haploid and aneuploid numbers, the multipolar separations and other segregational irregularities of chromosomes seemed to have been responsible.

Variation of chromosome number within plants obtained through tissue culture has been reported in a number of cases, such as tobacco[8], sugarcane[10–11], rice[12] and scented geraniums[13]. The literature review on these plants suggests a novel approach

to intra-clonal plant improvement, which utilizes the chromosomal variation associated with clonally propagated plants through *in vitro* procedures.

The findings of haploid and a series of polyploid and aneuploid numbers in 30 month old subcultured cells of *Digitalis lanata* would be interesting since it can give rise to new genotypes in the species with varying digoxin contents. Thus, further work in this direction is in progress on selective isolation of the cell lines, which can be propagated to produce genetically upgraded plants containing the higher digoxin.

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DIPTEROCARPOXYLON BOLPURENSE SP. NOV., A FOSSIL WOOD OF DIPTEROCARPACEAE FROM THE TERTIARY OF WEST BENGAL, INDIA

In the present note, a fossil wood resembling the modern genus *Dipterocarpus* Gaertn. f. is described from the Tertiary beds of Santiniketan in the Birbhum District, West Bengal. This is the first record of the occurrence of *Dipterocarpus*-type of wood from the Tertiary of West Bengal. The fossil wood is represented by a small piece of mature secondary xylem measuring 8 cm in length and 5 cm in diameter. The preservation is very good. It shows the following characters :

Wood is diffuse-porous (Fig. 1). *Growth rings* are absent. *Vessels* are medium to large in size, exclusively solitary (Fig. 1); t.d. 86–230 μ, r.d. 143–329 μ; vessels are oval to elliptical in cross-section; vessel-members are short, 300–800 μ in length with truncate ends or abruptly tailed ends; perforation plates are simple; intervessel pits are vestured, alternate with linear to lenticular orifices (Fig. 3); tyloses are present.

Parenchyma are paratracheal and apotracheal; apotracheal parenchyma are associated with gum canals (Fig. 1). *Trachcids* are intermingled with paratracheal parenchyma forming a narrow sheath around the vessels. *Xylem rays* are 3–4 seriate (Fig. 2); 15–52 cells in height and 499 to 1498 μ in length; rays are heterocellular, consisting of procumbent cells and 1–3 marginal rows of upright cells at one or both the ends; sheath cells are occasionally present. *Fibres* are angular, thick-walled, 14 μ–28 μ in diameter, aligned in radial rows between the two consecutive *xylem rays*; non-septate, pits are small, bordered with circular or slit-like aperture (Fig. 4). *Gum canals* are frequently present, vertical, diffuse, mostly in pairs as well as in short tangential rows of 2–4, small, circular in shape, 99 μ–132 μ in diameter (Fig. 1).

The presence of normal vertical gum canals, vasicentric tracheids and vestured intervessel pits in the present fossil wood indicates its affinities with the extant genus *Dipterocarpus* of the family Dipterocarpaceae Bl. It is, therefore, assigned to the form genus *Dipterocarpoxylon* Holden emend. Den Berger, 1927. So far, seventeen species of *Dipterocarpoxylon* have been described from India and abroad (Awasthi[1], Prakash[13]). Among these, unlike the present species, the xylem rays are homocellular in *Dipterocarpoxylon krauseli* Edwards[6], *D. resiniferum* Schweitzer[16], *D. javanicum* Schweitzer[15], and *D. gracile*[15]. Therefore, these species are not considered here for further comparisons with the species described here. The rest of the thirteen species have heterocellular xylem rays (Awasthi[1], Eyde[7], Ghosh[8], Ghosh and Ghosh[9], Kräusel[10-11], Prakash[12-13], Rawat[14], and Schweitzer[15]),