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The Fine Structure of the Sex Chromatin Bodies in *Rumex acetosa* L.

Ultrastruktura pohlavního chromatinu u *Rumex acetosa* L.

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VÁŇA V.[1]) et T. KALINA[2]) (1972): The fine structure of the sex chromatin bodies in *Rumex acetosa* L. — Preslia, Praha, 44 : 213—214. — In nondividing nuclei of male plant of *Rumex acetosa* the heterochromatin of two Y chromosomes produces the sex chromatin bodies of various size and shape, often closely associated to the nuclear envelope. At the beginning of prophase these bodies undergo the „dispersion" stage during which they are despiralized and it is not possible to differentiate them from other chromatin structures inside the nucleus. — [1]) *Department of Genetics, Microbiology and Biophysics, Caroline University of Prague, Viničná 5, Praha 2, Czechoslovakia.* [2]) *Department of Botany, Caroline University of Prague, Benátská 2, Praha 2, Czechoslovakia.*

The first studies on sexual dimorphism of interphase nuclei in Angiosperms were performed by SHIMIZU (1961) and PAZOURKOVÁ (1964) on *Rumex acetosa* L. A more detailed study showed that the sex chromatin of this species is formed by heterochromatin of two Y chromosomes present in the diploid set of chromosomes of the male plant, and various morphological types of the sex chromatin bodies (i.e. chromocentres, persisting chromosomes and transitional forms between these two types) were described in the nuclei of both differentiated and meristematic tissues of the male plant (VÁŇA 1972a, b).

The present electron microscopic study was performed on samples of parenchyma of young leaves of male plant. Small blocks of the tissue were fixed for 2 hours in 5% glutaraldehyde in Sorenson phosphate buffer at pH 7.1 with sucrose and post-fixed for 2 hours in 1% osmium tetroxide in the same buffer. The tissue was then dehydrated and embedded in Epon 812. Fixation and dehydration were made at 4°C. Sections were cut on Tesla BS 490 microtome using glass knives; mounted on carbon coated Formvar and stained with uranyl acetate followed by lead citrate. Stained sections were examined using Tesla BS 613 electron microscope at 80 kV.

In the ultrathin sections of non-dividing nuclei numerous irregular and conspicuous dense chromatin bodies of various size were observed. One or two of these are larger and often closely associated to the nuclear envelope; others are distinctly smaller and scattered inside the nucleus (Pl. X : 1, 2; Pl. XI : 1). Two morphological types of large chromatin bodies can be distiguished:

a) bodies closely adjacent to the nuclear envelope; no "cavities" are seen between the body and the nuclear envelope (Pl. X : 1);

b) bodies with some "cavities" on the side adjoining the nuclear envelope. On micrographs, these "cavities" are seen as spaces filled with material of the same density as the nucleoplasm. The "cavities" may be small (Pl. XI : 1) or large so that the chromatin body is connected with the nuclear envelope by a few thick chromatin strands (Pl. X : 2).

Large chromatin bodies often have a club- or a ribbon-shaped protrusion inward the nucleus. The protrusion is always thinner than the chromatin body itself (Pl. X : 1; Pl. XI : 1).

At the beginning of prophase large chromatin bodies disappear; the nucleus appears as a network of chromatin strands of approximately equal diameter (Pl. XI : 2).

The assumption that the chromosomal region which becomes despiralized

during late telophase and early G_1 is the euchromatic region of the chromosome has been recently confirmed also by means of electron microscopic autoradiography (KUROIWA et TANAKA 1971). Therefore the chromatin bodies described above may be interpreted as the heterochromatic segments of the chromosomes. In view of the fact that the most prominent chromocentres observed in the non-dividing nuclei of *R. acetosa* with light microscope are those formed by the heterochromatin of two Y chromosomes (i.e. sex chromatin) (VÁŇA 1972b), we assume large chromatin bodies observed in the nuclei to be the sex chromatin bodies. The observation that in the interphase nucleus the heterochromatic segments are often located at the nuclear envelope was one of the most striking arguments for the hypothesis of the nonrandom arrangement of chromatin in the interphase nucleus (rev. in COMINGS 1968). SPARVOLI et al. (1965) observed that prometaphase chromosomes are connected with the nuclear envelope in a manner very similar to that described for some of the large chromatin bodies in this paper ("b-type", see above). The preferential position of the sex chromatin bodies against the inner membrane of the nuclear envelope has also been observed with electron microscope in the nuclei of mammals (rev. in WOLSTENHOLME 1965).

The dispersion stage of heterochromatin in early prophase has recently been extensively studied by NAGL (1968, 1970). This phenomenon seems to be a common feature of both mitotic and endomitotic nuclear cycles in seed plants. NAGL (1970) concludes that it occurs after DNA replication and he assumes it to be connected with the chromatid separation, i.e. the chromosommal reduplication on the chromatin level. In *R. acetosa*, we also observed this stage with light microscope in orcein stained preparations of the meristematic zone of the root (VÁŇA, unpublished observation).

Souhrn

V nedělících se jádrech samčích rostlin *Rumex acetosa* tvoří heterochromatin dvou Y chromozómů tělíska pohlavního chromatinu, různého tvaru a velikosti, spojená s jadernou membránou. Na počátku profáze dochází k disperzi heterochromatinu. V této fázi jsou tělíska pohlavního chromatinu despiralizována, a proto je nelze odlišit od ostatních chromatinových struktur v jádře.

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See also plates X.—XI. in the appendix.

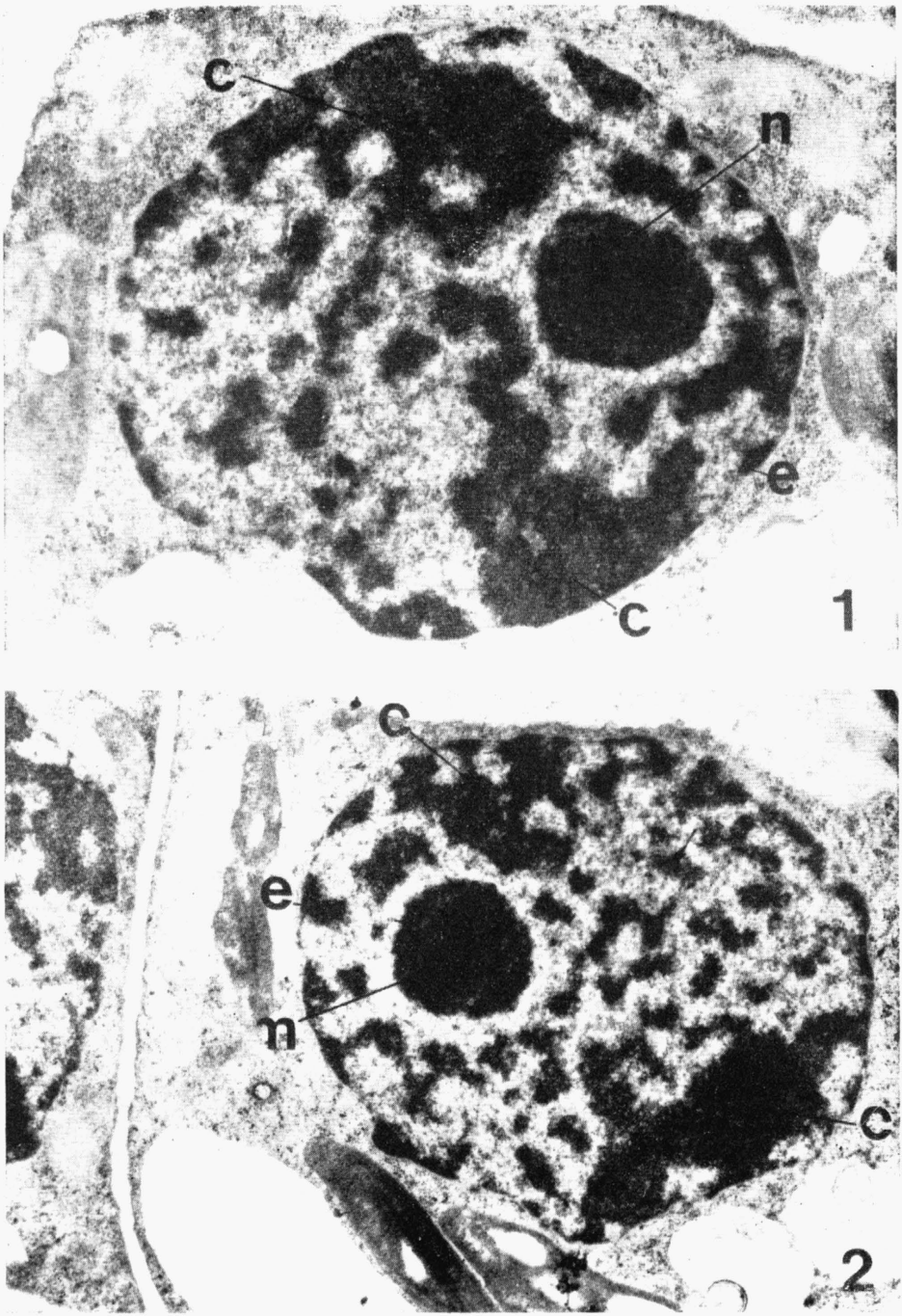
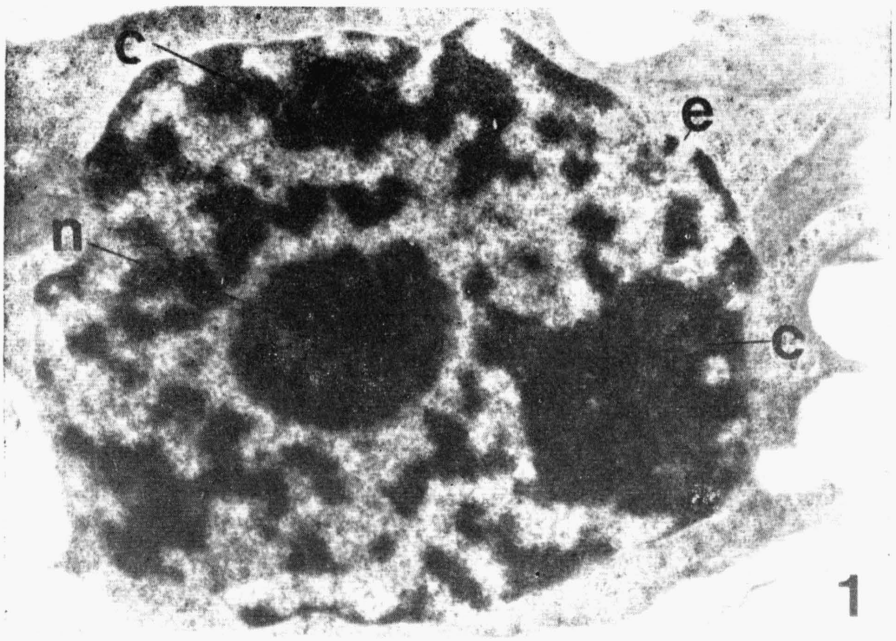


Plate X. — Fig. 1, 2. — Non-dividing nuclei from the leaf parenchyma of male plant of *Rumex acetosa* L. Showing differences in the fine structure of large chromatin bodies: the bodies are closely adjacent to the nuclear envelope (Fig. 1) or connected with the nuclear envelope by a few chromatin strands (Fig. 2). Plate magnification × 10 050, enlargement × 1.5 (Fig. 1) and × 4 500, enlargement × 2,8 (Fig. 2); — *c* — large chromatin body, *n* — nucleolus, *e* — nuclear envelope.



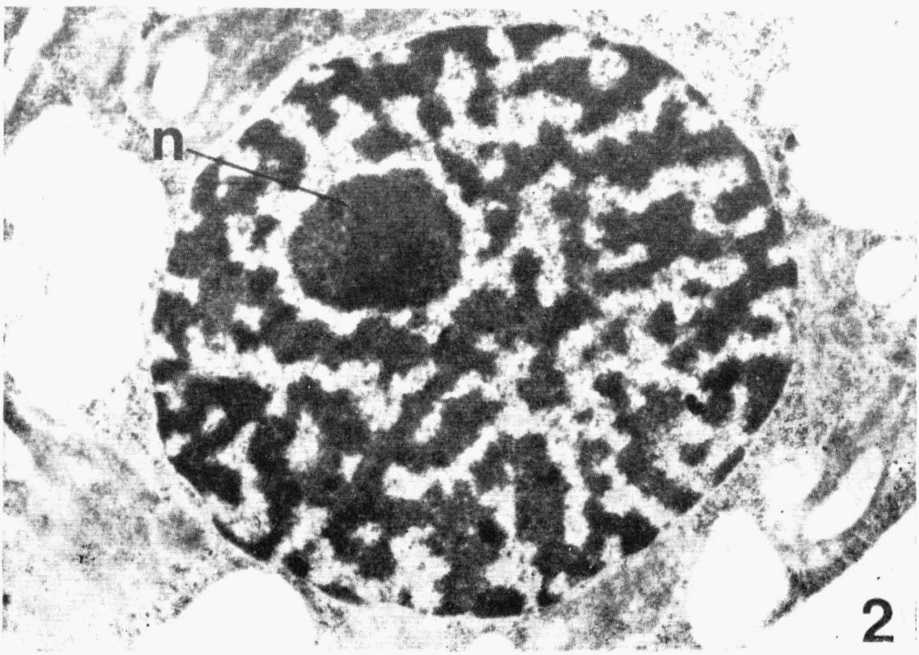


Plate XI. Fig. 1. — Non-dividing nucleus from the leaf parenchyma of male plant of *Rumex acetosa* L. Note the protrusion extending from the chromatin body inward the nucleus. Plate magnification × 10 050, enlargement × 1,5. — Fig. 2. — Early prophase nucleus from the leaf parenchyma of male plant of *Rumex acetosa* L. The nucleus contains no large chromatin bodies; only chromatin strands of approximately equal diameter are seen. Plate magnification × 4 500, enlargement × 3; *c* large chromatin body, *n* — nucleolus, *e* — nuclear envelope.