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ROOT APICAL ORGANISATION IN *SOLANUM MELONGENA* Linn.

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Anatomical as well as histochemical studies have been made on the root apical meristem of *Solanum melongena* Linn. The Korper-Kappe concept seems to be of maximum utility in interpreting the structural organisation. The root apex is of the closed type at all developmental stages. Separate initials are seen for cortex, central cylinder, columella and epidermis-peripheral part of the root cap. Comparison of nuclear/cytoplasmic ratio shows that initials are highly meristematic as compared to their immediate derivatives. Histochemical preparations showed uniform staining in the initials and their immediate derivatives.

Keywords :.*Solanum melongena*; Korper-Kappe; Closed type.

Introduction

Root apical organization in members of some advanc d families like Gentianaceae and Scrophulariaceae was described by Pillai *et al.* (1961, 1965 b). Pillai *et al.* (1965 a, b) reported root apical organization in some primitive families like Ranunculaceae and Proteaceae. The present article deals with the apical organization and localisatlon of several metaboiites in the root apex of *Solanum melongena* Linn. belong to family Solanaceae.

Materials and Methods

Seeds of *Solanum melongena* were soaked in water overnight and the radicular apices from the dissected embryos fixed. Soaked seeds were also germinated in petriplates lined with moist blotting paper and transferred to earthenware posts after one week. One to seven day old apices were collected from the petriplates and old root apices were collected from mature plants grown in the field.

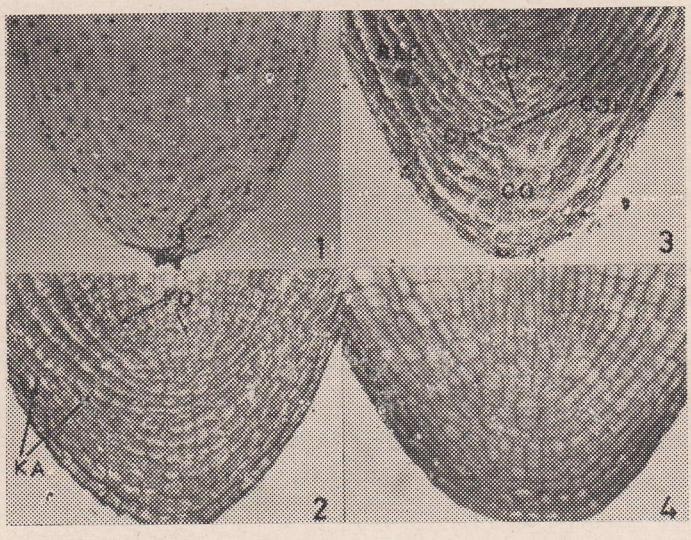
Materials collected were fixed in FAA (Formalin–Aceto–Alcohol) and the standard procedures for dehydra– and embedding followed. The apices were sectioned on a rotary microtome

at 4–5 μm and stained with safranin and light green. The following staining procedures were used for studying histochemical localisation of different metabolites. Feulgen method for DNA (Gomori, 1952), Pyronin Y for RNA (Tepper and Giffo.d, 1962), Mercuric bromophenol blue for total proteins (Mazia *et al.*, 1953), Periodic acid Schiff's reaction for carbohydrates (Hotchkiss, 1948; Mc Manus, 1948).

Observations

The radicular apex shows a closed type of organisation with three superposed tiers of initials at the root pole–one each aligned with the central cylinder, cortex and columella and separate initials for the epidermis peripheral part of the rootcap (Fig. 3).

Rootcap—The rootcap extends only to a distance of 31.7 μm proximally in the radicular apex. Demarcation between the central columella and the peripheral region can be seen more clearly in older roots as compared with the radicular apex. The distinction can be made on the basis of cell orientation. The columella is a 2–3 cells wide column of cells,



Figs. 1–4 Radicular apex stained for DNA, RNA, total proteins and insoluble polysaccharides respectively (X 250).

CI—Cortical initials; CCI—Central cylinder initials; CO—Columella; COI—Columella initials; KA—Kappe divisions; KO—Korper divisions; REC—Rootcap epidermis complex.

flanked by the peripheral part of the cap composed of files of cells which curve from the flanks towards the columella. The epidermis-rootcap initials show repeated *Kappe* divisions and form the peripheral region of the rootcap (Fig. 2).

Cortical initials—A tier of cells situated between initials for the central cylinder and those for the columella form the cortical initials. As seen in L.S. these are 2–4 cells wide, the peripheral cells showing *Korper* divisions and the daughter cells differentiate into the cortex proximally.

Central cylinder initials—Proximally the central cylinder is formed by *Korper* divisions followed by differentiation of the daughter cell (Fig. 2). The closed type of organisation in the radicular apex is retained during further growth. The broad radicular apex becomes progressively thinner in the older roots.

Average Nuclear area/Cytoplasmic area ratio values in the radicle and seedling root were calculated. N/C ratios were found to be as shown in the following table :—

	Central Cylinder		Cortex Columella				Root pole	Proximal region
	Initals (IN)	Derivatives (D)	(IN)	(D)	(IN)	(D)		
Radicle	0.60	0.42	0.66	0.47	0.55	0.30	—	—
Seedling Roots	—	—	—	—	—	—	0 50	0.54

Histochemistry

(i) *RNA*—The cells of the root-body show more pyroninophilia than the rootcap particularly the columella. The initials at the radicular apex are marginally lighter than their derivatives (Fig. 2). Variations in root length failed to show any correlation with the above staining pattern.

(ii) *DNA*—Uniform staining of nuclei was seen in the preparations for localisation of DNA.

(iii) *Total proteins*—Radicular apex shows more or less uniformly stained nitials and derivatives.

(iv) *Insoluble polysaccharides*—The outer 3-5 cell layers of the rootcap are darkly stained in the radicle as well as growing roots. Inner to this, the cell walls of the root body and rootcap region are uniformly stained. A few outer cell layers of the central cylinder show marginally darker staining (Fig. 4).

Discussion

The type of apical organisation observed at the root apex studied here is referred to as "the most precise organisation of the meristem in the dicotyledons" by Esau (1953,

1965). The Korper Kappe concept of Schuepp (1926) seems to be of maximum utility in interpreting the structural organisation at the root apex. In addition to the *Korper* and *Kappe* which exhibit two different growth patterns, the columella seems to be a third growth pattern—the ribmeristem type. In the species reported upon here the columella has a separate group of initials which can be designated as the "columellogen". Structurally and ontogenetically the columella differs from the peripheral region of the rootcap. This suggestion is in agreement which earlier reports (Zirkle, 1932 and Pillai, 1964).

Comparison of the nuclear-cytoplasmic ratios in different regions of the root apex brought forth interesting results. In the radicular apex the values denote that the initials are highly meristematic as compared to their immediate derivatives.

Histochemical localisetion of DNA, total patients and insoluble polysaccharides in the radicular apex evinces a more or less uniform distribution in the initials and their immediate derivatives. In preparations of RNA, the initials were found to have less pyroninophilia than the derivatives. Variation in root length or age failed to show any change from the above staining pattern.

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