FOLIAR EPIDERMAL STRUCTURE AND ONTOGENY OF STOMATA IN *OPHIOPOGON INTERMEDIUS* DON (LILIACEAE)

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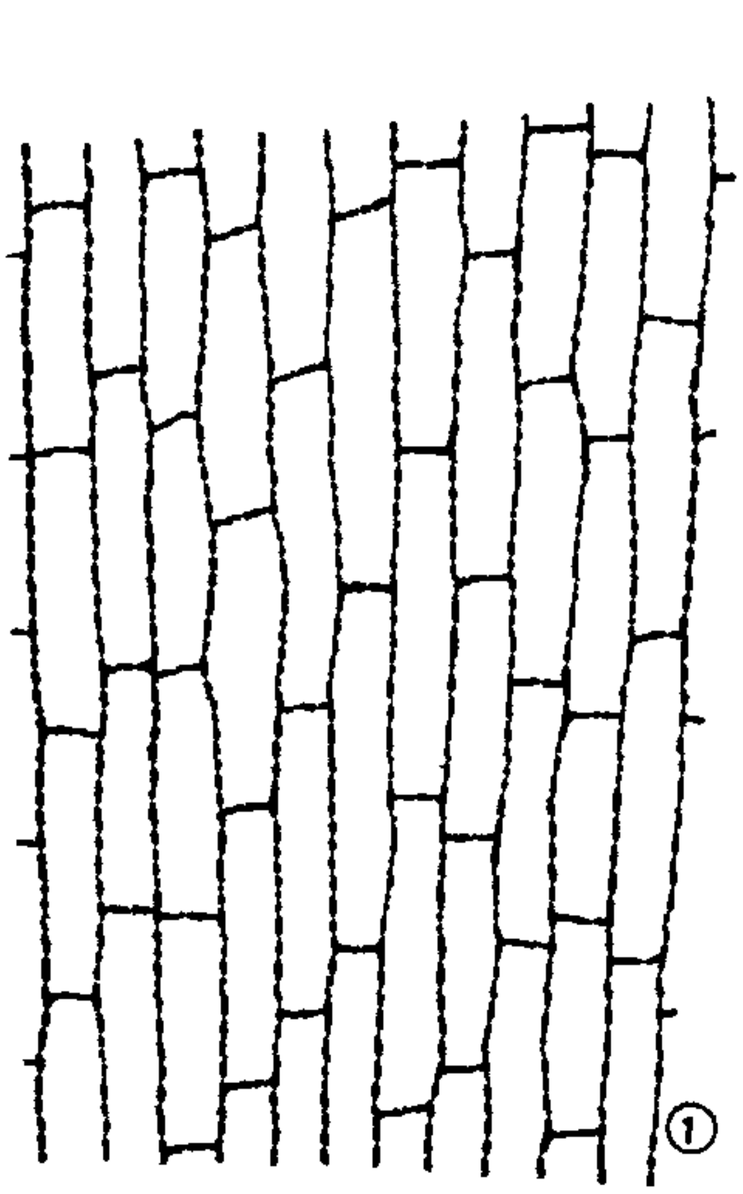
EPIDERMAL characters have of late gained ground as parameters in taxonomic, phylogenetic and pharmacognostic studies. The stomatal structure and development are similarly useful amongst monocotyledons[1]; although Tomlinson[2] doubts it, yet suggests its usefulness in combination with other characters. The present account on *Ophiopogon*, an apparently anomalous genus amongst the lilies, is of interest.

The leaves are grass leaf-like, linear, hypostomatic; though rarely stomata may occur on the upper epidermis. The cells in the adaxial epidermis are elongated and more or less of the same size, the walls being straight and thick with prominent pits (figure 1).

The abaxial surface is ridged and grooved. The epidermis shows distinct costal and intercostal zones (figure 2). The cuticle is rather thin. The cells of the costal region are mostly elongated with straight walls. They also show prominent pits as in the adaxial surface. Stomata are confined to the intercostal zone in the grooves (figures 2-4). The guard cells are ledged along their outer and abaxial walls (figure 4). The cells in the basal meristematic region of the leaf are smaller and mostly polygonal. A stomatal meristemoid is easily distinguished from adjacent cells by its smaller size, prominent nucleus and dense protoplasmic contents (figure 5). A meristemoid functions directly as a guard mother cell, enlarges and divides by a straight wall into a pair of guard cells conforming to the perigenous type.

In the basal meristematic region, the epidermal cells do not develop papillae (figure 5), which develop in the



Figures 1-5. 1-3. Epidermis: **1,** adaxial **2-3,** abaxial **4,** t.s. of leaf, portion showing papillae on lower epidermal cells. **5,** Development of stomata. CZ, costal zone. IZ, Intercostal zone. P, Papillae. P_1, Elongated papillae.

intercostal region only (figures 2–4). These are short, peg-like and appear rotundate, oval or elongated (figures 2,3). The epidermal cells around the stomata invariably develop one or two papillae close to the guard cells apart from a few more. The former often fuse into an elongated structure. The development of such papillae flanking a stoma on all sides may be characteristic of *Ophiopogon*; even the stomatal complex may be tetracytic. However when stomata develop on the upper surface, the epidermal cells behave similarly. Before this character is used taxonomically, further studies in the tribe are called for.

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1. Stebbins, G. L. and Khush, G. S., *Am. J. Bot.*, 1961, **48**, 51.
2. Tomlinson, P. B., *Taxon*, 1974, **23**, 109.

PHYSIOLOGICAL HETEROGENEITY IN STEM EXPLANTS OF PEARL MILLET CULTURED *IN VITRO*

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THE stem explant in pearl millet produced variations under 2,4-D treatment *in vitro*, perhaps due to differences in the concentration of endogenous auxin at different portions of the explant. Physiological heterogeneity is known to exist between plants grown from seed and even from those of a single cultivar. When a high degree of variability is found among replicates, this is accredited to genetic and/or environmental differences[1]. Many workers ignore physiological variability[2] which results in morphological diversity, and is also a fundamental problem in tissue culture research.[1,3,4,5]. In the present communication the variability within a single explant of pearl millet (*Pennisetum americanum*) plant has been reported.

Stem explants were excised from the plants of the same age cultivated in the experimental field. The selected stem portions included the terminal bud and 3 to 4 successive nodal rings away from the apex. They were surface-sterilized with 0.1% $HgCl_2$ for 5 min rinsed thoroughly with sterile distilled water until the sterilant was completely removed, aseptically dried with sterilized blotters and the injured ends were re-cut to eliminate the incorporated $HgCl_2$ traces. Such stem segments were inoculated horizontally on the synthetic nutrient solid culture medium, MS+2, 4-D (5 mg/l) contained in 100 ml capacity Erlenmeyer flasks plugged with non-absorbant cotton wool. The cultures were incubated under diffuse daylight during day and two incandescent lights mounted 1 m away from the culture flasks during night at 21±1° C.

Callus proliferation was observed mainly on the nodal rings and terminal apex although considerable response was seen in some explants at the internodal region. But the callus formed from each segment of the stem axis differed morphologically in that the nodal ring away from the apex produced (figure 1) soft translucent juicy callus which grew faster than the hard nodular callus formed at the apex. The soft type callus lacked morphogenetic capacity and failed to form plantlets when transferred to 2,4-D omitted medium. On the contrary, the hard nodular callus formed at the apex differentiated into normal plants shortly after being transferred to the basal medium. There was also a difference in the rate of growth of callus formed at the successive nodes from the apex.

Figure 1. Stem piece of millet showing different types of callus at different nodal rings.

Thus significant difference was noticed in growth potential and morphology in explants at different levels in the stem. Auxins are important growth regulators among the numerous locally varying chemical substances in plants. It is well-known that the endogenous auxin is localised at the meristematic regions, particularly stem apex. Differences in position of cells and tissues with respect to total system depend on the differences in the chemical concentration and hence the physiological environment of such cells/tissues. The endogenous hormone levels have been shown to vary with distance, in stems, from the terminal bud and particularly in *Nicotiana* pith explants, the growth potential decreases basipetally down the stem.