the treatment. In the case of *A. verrucosa* one of the clones (A622c) differed from the parent (A622) and the other clones (A622a, b and d). Studies on blue-green algae under certain culture conditions sometimes lead to highly complex taxonomic situations.

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1. Adhikari, S. P. and Pattnaik, H., *Curr. Sci.*, 1979, **48**, 23.
2. Anand, N., *Acta Botanica Indica*, 1979, **7**, 22.
3. Allen, M. B. and Arnon, D. I., *Pl. Physiol.*, 1955, **30**, 366.
4. Gerloff, G. C., Fitzgerald, G. P. and Skoog, F., *Am. J. Bot.*, 190, **37**, 216.
5. Wilcox, M., Mitchison, G. J. and Smith, R. J., *Arch. Mikrobiol.*, 1975, **103**, 219.
6. Geitler, L., *Cyanophyceae in Rabenhorsts, Kryptogamenflora Leipzig*, 1932, **14**, 1196.
7. Desikachary, T. V., *Cyanophyta*, Indian Council of Agricultural Research, New Delhi, 1959, p. 686.
8. Jeeji Bai, N., *Arch. Protistenk.*, 1977, **119**, 367.
9. Anand, N. and Rengasamy, R., *Proc. Indian Acad. Sci.*, 1978, **B87**, 75.
10. Anand, N., Gunaseeli, R., *J. Madras Univ.*, 1978, **41**, 138.

FUSARIUM SOLANI (MART.) SACC.—A NEW VASCULAR PARASITE INDUCING WILT IN MUSKMELON

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FUSARIUM wilt of muskmelon induced by one of the *Fusarium* spp., *viz.*, *Fusarium solani* (Mart.) Sacc. is a serious disease causing severe damage to the crop. Extensive work done on the histopathological aspects of other wilt diseases has revealed many interesting findings regarding the host parasite interaction. *Fusarium solani* (Mart.) var. *cvarum* was observed to penetrate through rootlets and tracheid walls of muskmelon plants[1]. Studies on comparison of Fusarium wilts of cucumber and melon, revealed that *F. oxysporum* led a parasitic existence in the wood vessels, whereas *F. solani* primarily attacked the cortex in the root and collar region[2]. Cortical infection of *F. solani* was also emphasised later[3].

The present study revealed that the mycelium of *F. solani* moved inter-and intracellularly throughout the cortex, medullary rays and ultimately towards xylem vessels. Xylem colonization was also found in *F. solani* (figure 1). However, many of the xylem vessels were often found to be blocked with tyloses (figure 2) and a dense material. This occlusion was sometimes partial or sometimes total as regards the individual vessels. Vascular infection of *F. solani* noticed in the

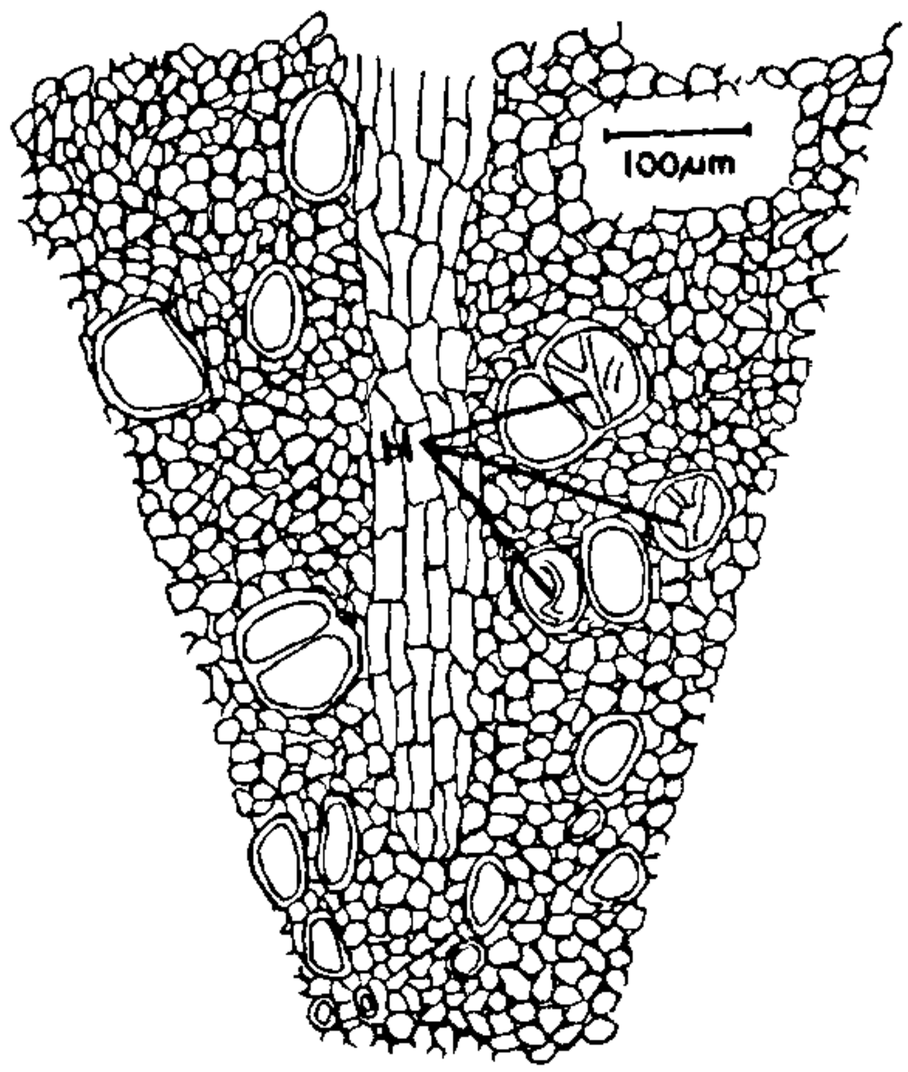

Figure 1. Portion of cross-section of *Fusarium solani* (Mart.) Sacc. infected muskmelon root showing hyphae (H) in xylem vessels.

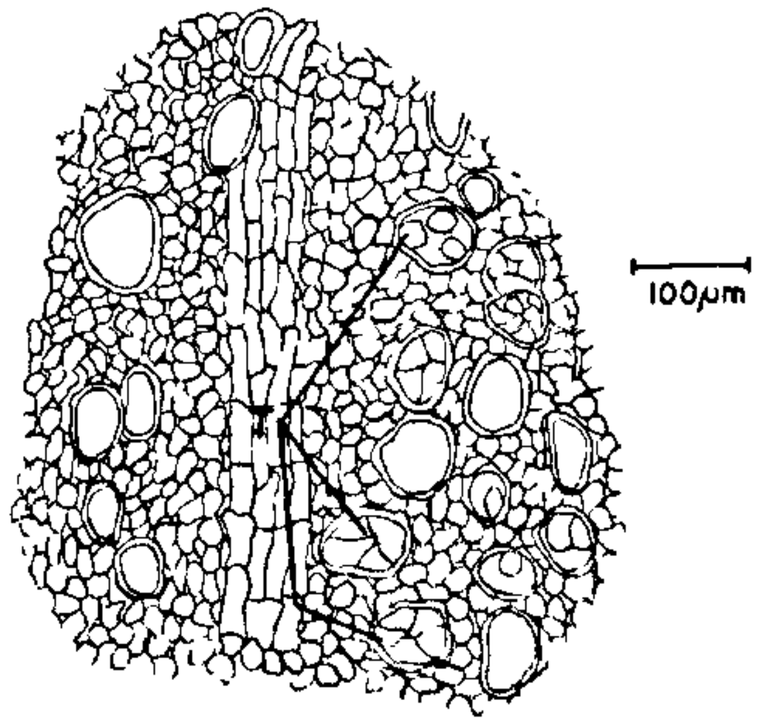

Figure 2. Portion of cross section of *Fusarium solani* (Mart.) Sacc. infected muskmelon root showing tyloses (T) in xylem vessels.

present investigations has thrown light into a new direction by which *F. solani* can also be called a vascular wilt pathogen, a designation which was mainly withheld by the 'Elegans' section among the *Fusaria*. This happens to be the first record of vascular colonization of this species (*F. solani*) in the roots of a

crop plant. It will perhaps be relevant to mention that work on another muskmelon isolate of *F. solani* disclosed complete absence of the usual root rotting in that particular case but the pathogen was never found in the vessels[4].

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1. Dufrenoy, J., *Ann., Epiphytics.*, 1921, 7, 405.
2. Kosswig. W., The symptomatology of the Fusarium wilt of cucumber (*Cucumis sativus* L.) and their relation to wilt disease of other plants. Hamburg and Berlin, Paul Parey., 1975, 148.
3. Christou, T. and Snyder, W. C., *Phytopathology*, 1962, 52, 219.
4. Sen, B. and Palodhi, P. R., *Curr. Sci.*, 1979, 48, 166.

INTERMEDIATE SHOOT APEX OF *PAPAVER* SPECIES

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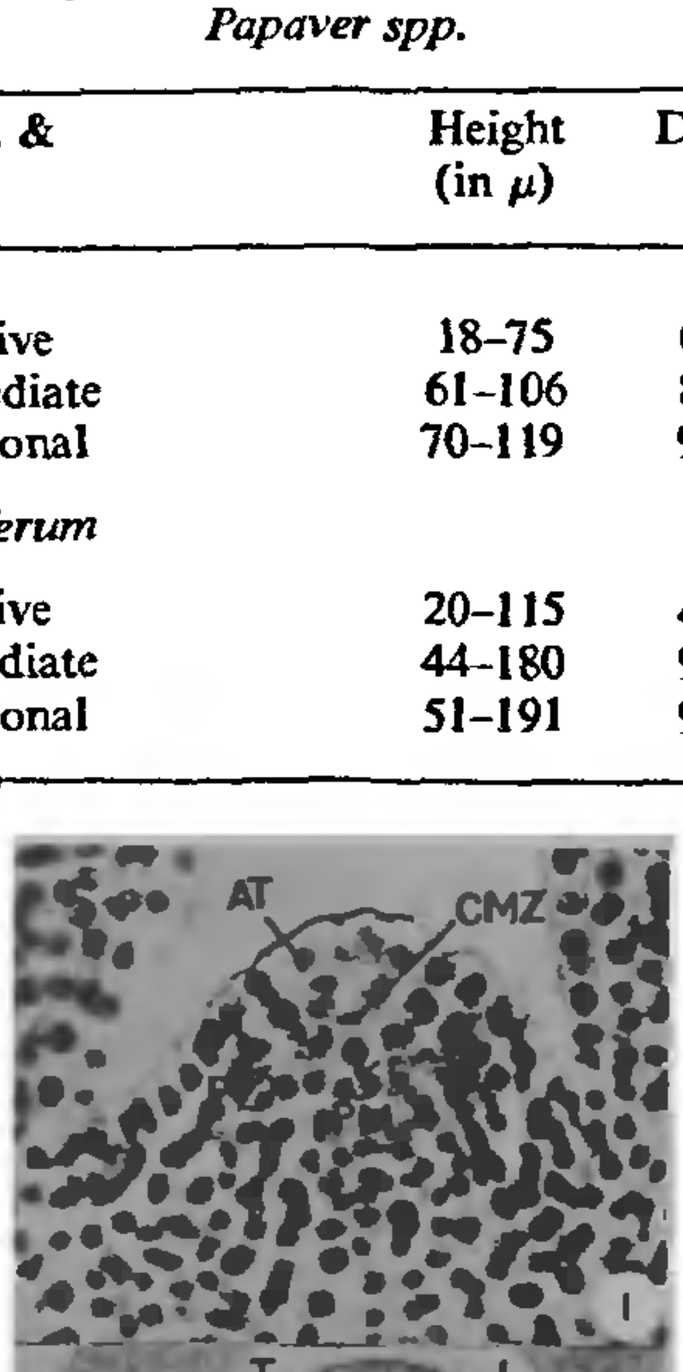
CONSIDERABLE progress has been made in the last few years in anatomical studies of shoot apices as influenced by environmental factors such as photoperiod[1,2]. It was found that meristems of plants held under non-inductive conditions pass from the vegetative stage to an intermediate stage. This condition was described[3,4] as intermediate because the apex continues to initiate new leaves but gradually acquires new characteristics that are partly vegetative and partly transitional. This paper attempts to characterise the vegetative and intermediate apices in *Papaver rhoeas* Linn. and *P. somniferum* Linn. using anatomical techniques.

The vegetative shoot apex is a low to high dome depending on the age and plastochronic stage (table 1) and shows a cytohistological zonation pattern superimposed on a tunica-corpus organisation. A gradual age-related increase in size of the apex is maintained from germination to seven weeks. The tunica in the active vegetative apex is single-layered in *P. rhoeas* and two-layered in *P. somniferum*. At the summit of the apex a few tunica cells are larger and more vacuolated, so the term "axial tunica" is used for these cells (figure 1).

The central mother cell zone (CMZ) at the summit of the apical dome shows a group of large, lightly stained and irregularly arranged cells. Occasional divisions in this zone contribute cells to the peripheral

TABLE 1
Average height and diameter of the shoot apex in Papaver spp.

Plant spp. & stages	Height (in μ)	Diameter (in μ)
P. rhoeas		
Vegetative	18–75	60–140
Intermediate	61–106	80–146
Transitional	70–119	90–164
P. somniferum		
Vegetative	20–115	40–146
Intermediate	44–180	90–160
Transitional	51–191	96–181



Figures 1–3. L. S. of the shoot apex in *Papaver* spp. **1.** *P. rhoeas* showing cytohistological zonation in the vegetative apex (× 500). *2. P. somniferum* showing elongate, less zonate intermediate apex (×300). **3.** *P. rhoeas* showing early mantle-core organisation in transitional apex. Note the lighter staining in the axially located cells (×255). (AT, axial tunica; CMZ, central mother cell zone; CO, core; L. leaf; M. mantle; PM, pith meristem; PZ peripheral zone; T, tunica; darts indicate mitotic figures).