farther than the peripheral ones. After the dispersal of seeds a cup-like structure, made up of multiseriate dry involucral bracts remains.

The present investigation shows that dimorphic seeds were observed in a capitulum of *O. ramosa*, as evolutionary success of any angiospermic weed depends upon the production of variable seeds. In Indian arid zone, seeds have developed various types of adaptive mechanisms for their continuous perpetuation, the dispersal being one of them which occurs by parachute-like pappus in this plant. Thus, this plant is more advanced in ecological races among the members of the family compositae.

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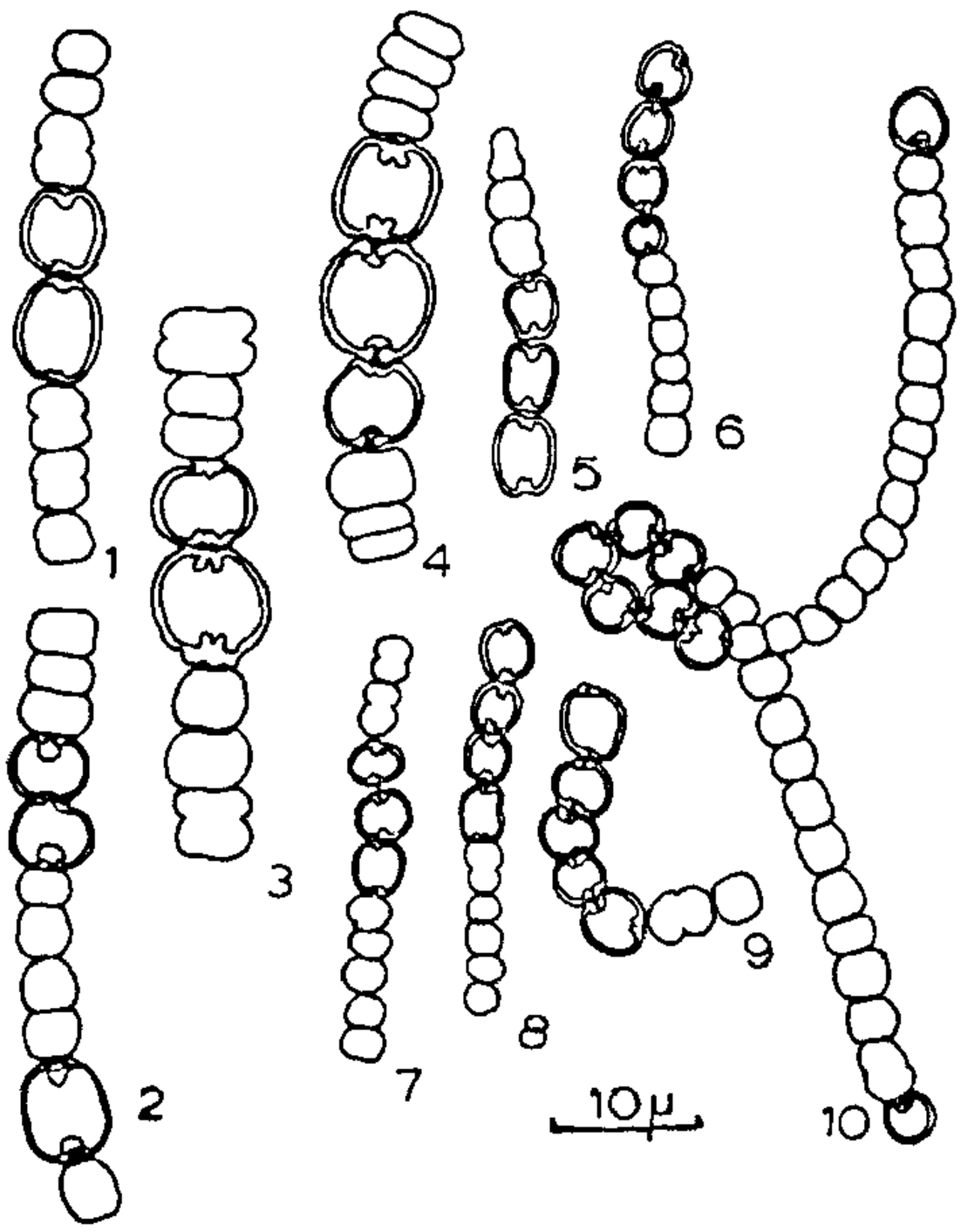
RESPONSES OF SOME *ANABAENA* SPECIES TO IBA

N. ANAND
Centre for Advanced Study in Botany,
University of Madras, Madras 600005, India

STUDIES on the effect of growth promoting substances on blue green alage have been concerned mostly on physiological aspects[1]. In the present attempt cultures of 19 species of *Anabaena*[2] were grown in Allen and Arnon medium amended with IBA (indole-3-butyric acid) in the following concentrations: 10^{-8}; 10^{-6}; 10^{-5}, 10^{-4}, 10^{-3} M. All the cultures grew up to 10^{-4} M concentration and were examined for their morphological characteristics. The cultures of *Anabaena* species showed induction of sporulation, production of heterocysts in chains and significant increase in cell dimensions namely cell length and cell width (table 1).

Sporulation has been found to be enhanced in as many as 12 species of 19 studied. However, cultures of two species, *Anabaena oscillarioides* and *A. catenula* did not sporulate in the basal medium (modified Chu 10 medium)[4] as well as IBA amended medium.

Addition of IBA to the medium resulted in the production of heterocysts in a contiguous, chained arrangement. The number of heterocysts in a chain varied from a pair up to 6. (figures 1-10). However, cultures of three species *A. ambigua*, *A. augstumalis*



Figures 1-10. Heterocysts in pairs and chains. **1.** *A. catenula* (A101), **2.** *A. variabilis* (A486) and **3.** *A. fertilissima* (A524) all showing paired heterocysts; **4.** *A. fertilissima* (A524) and **5.** *A. torulosa* (A525) showing 3 heterocysts together; **6.** *A. subtropica* (A618) having a 4-heterocyst chain; **7, 8, 9, & 10.** *A. oryzae* (A618) showing heterocysts-chain having 3, 4, 5 and 6 heterocysts in a row respectively.

TABLE I

Effect of IBA on cultures of Anabaena species

S.No.	Name	Induction of sporulation	Production of heterocysts chains	Significant increase in	
				cell length	cell width
1.	*Anabaena aequalis*	A488, A906	A488	—	—
2.	*A. ambigua*	A100	—	—	—
3.	*A. anomala*	A75	A75	A75	A75
4.	*A. augstumalis*	A802, A831	—	—	—
5.	*A. catenula*	*	A101, A482	A482	A482
6.	*A. cylindrica*	A621, A516	A483, a, bc,d A517, A621, A516	A483, b A621, A516	A483b, A621
7.	*A. fertilissima*	A572, A524	A52, A388, A524, A549	A572, A524	A572, A524
8.	*A. flosaquae*	—	A513	—	A513
9.	*A. inaequalis*	A487, A 905	A905	A487, A905	A487, A905
10.	*A. minutissima*	—	A619	—	A619
11.	*A. oryzae*	—	A570, A604	A570, A604	A570, A604
12.	*A. oscillarioides*	*	A804	—	A801
13.	*A. randhawae*	—	A903	A903	—
14.	*A. sphaerica*	A623, A904	A904	A904	—
15.	*A. subtropica*	—	A618	—	A618
16.	*A. torulosa*	A527	A525, A800, A527	A525, A800	A525, A800
17.	*A. vaginicola*	A951, A952	A950, A951, A952	A950, A951, A952	A950, A951, A952
18.	*A. variabilis*	A597, A472, A528 A574, A833, A920 A923, A921	A486, a,b,c,d, A514, A472, A528, A830, A832, A833, A484, A920, A923	A486, a, d, A521, A830, A832, A833, A484, A920, A923.	A486, a, d, A521, A574, A830, A833, A484, A895, A920
19.	*A. verrucosa*	A622,a,d	—	A622 c	A622 c

*non-sporulating

and *A. verrucosa* did not produce such a condition. The occurrence of heterocysts in such a chained condition is known only in the case of certain mutant strains of *Anabaena* species[5]. Presence of paired heterocysts in *Anabaena* species may superficially question the validity of the allied genus *Anabaenopsis* which is differentiated from *Anabaena* by its possession of paired heterocysts. However, the ontogeny of such paired heterocysts is more important in *Anabaenopsis* rather than a mere occurrence of paired heterocysts.

Changes in cell dimensions: Cell dimensions are the important criteria on which the species distinction of many blue-greens is based[6,7]. This character has been shown to be highly variable when certain blue-green algae were grown even in basic minimal media[8-10]. In the presence of IBA cell enlargement and elongation have been induced and the increase in cell width and cell length exhibited by the *Anabaena* species has been found to be statistically significant too. Under such condition one may find it difficult to identify a taxon. However, it may be pointed out that cultures of *A aequalis* and *A. ambigua* did not show any significant changes in cell dimensions.

The behaviour of some of the parent cultures and their clones in the presence of IBA appears interesting. The parents and all the clones of *A. cylindrica* (A483/483a-d) and *A. variabilis* (A486/486a-d) produced heterocysts in chain but sporulation was not induced in these. A clone of *A cylindrica* (A483b) exhibited cell elongation and enlargement, but the parent (A483) showed only cell elongation and the other clones (A483a, c and d) were unaffected. Cell enlargement in *A. variabilis* was exhibited in the clones (468a-d) only. Clones of *A. inaequalis* (A487a-d) were unaffected while the parent (A487) reacted to

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

P. RADHAKRISHNAN AND BINEETA SEN
Indian Agricultural Research Institute,
New Delhi 110012, India

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

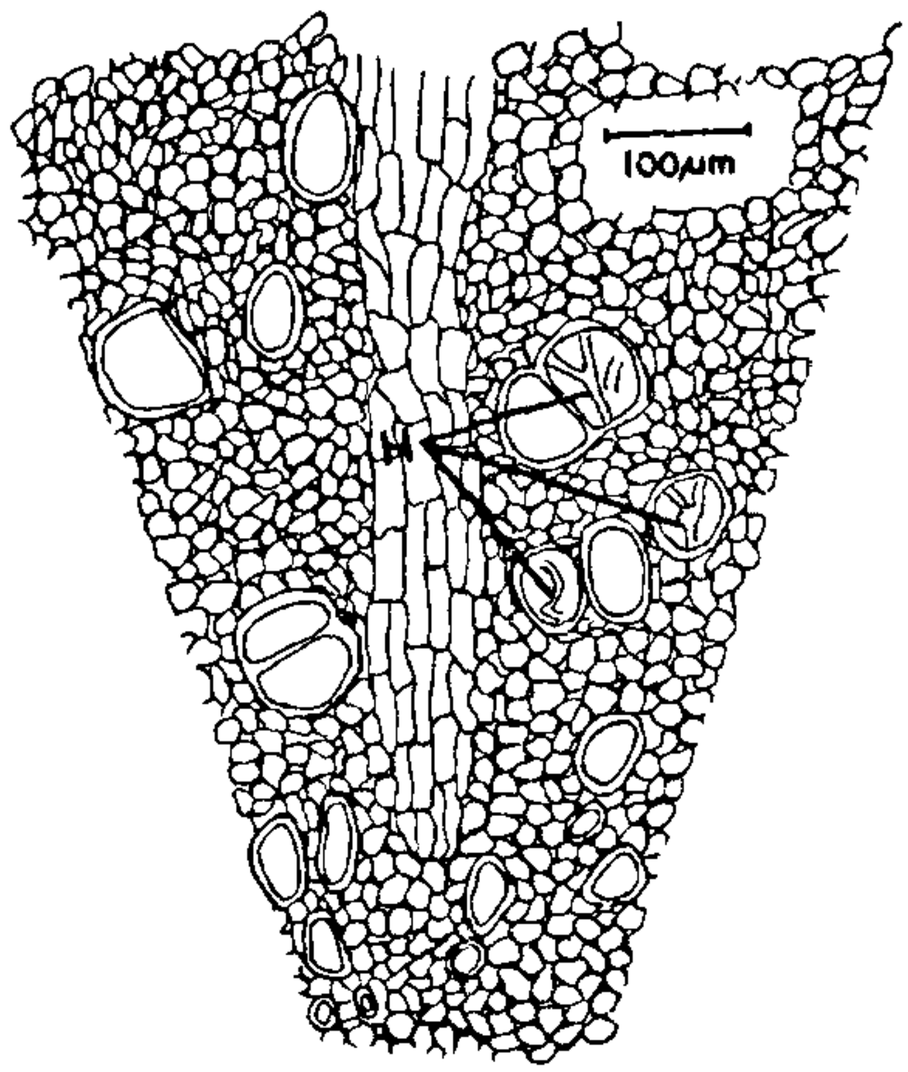

Figure 1. Portion of cross-section of *Fusarium solani* (Mart.) Sacc. infected muskmelon root showing hyphae (H) in xylem vessels.

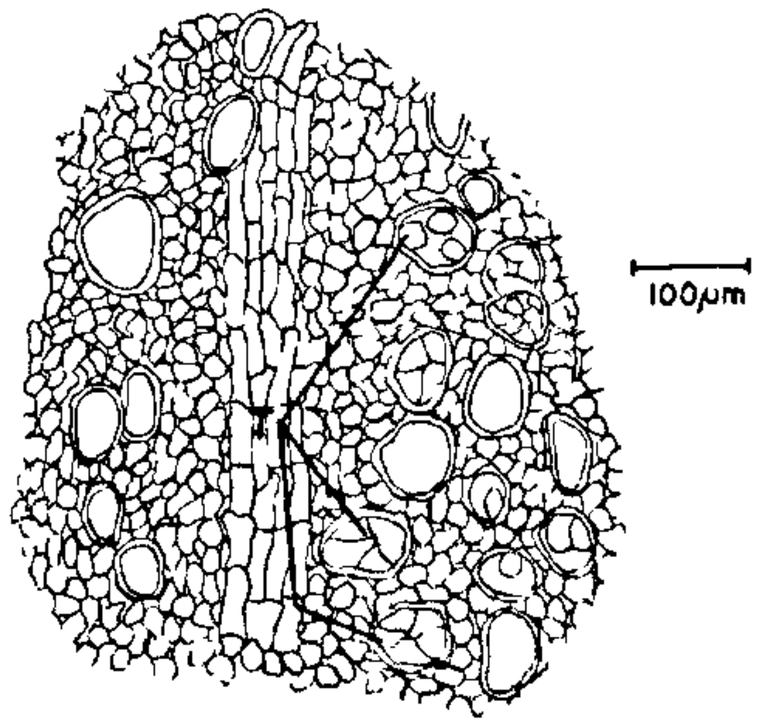

Figure 2. Portion of cross section of *Fusarium solani* (Mart.) Sacc. infected muskmelon root showing tyloses (T) in xylem vessels.

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