appearance to the plants. Severely infected plants show yellowing of tips of young leaves, which gradually spread downwards to the leaf blade. Ultimately the entire plant turns yellow and collapses due to rotting of the basal portion.

The above two root-rot diseases of fenugreek and coriander are new records for India.

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DIMORPHIC SEEDS IN A CAPITULUM AND DISPERSAL STRATEGIES IN *OLIGOCHAETA RAMOSA* (ROXB.) WAGENITZ

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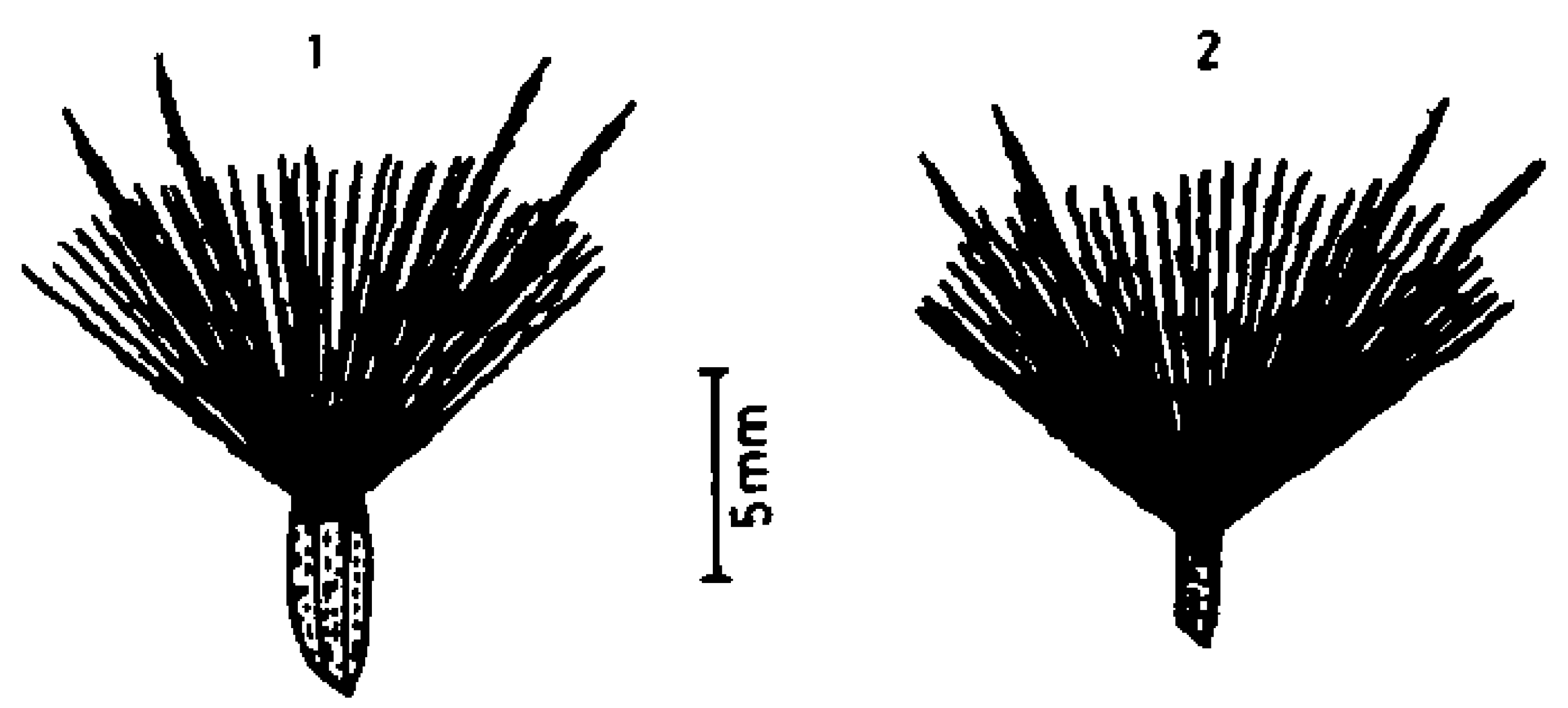
OLIGOCHAETA ramosa is a perennial plant which becomes more conspicuous in Indian desert in late winter and spring when most of other rainy season ephemerals disappear. New seedlings appear after winter rains but old perennating rootstocks sprout just after monsoon rains, and the new aerial branches start bearing flowers early[1,2]. The adaptive values of seed shape, size and weight may vary to such an extent that reproductive efficiency in a particular habitat would depend upon a compromise among these conflicting demands. Seed shape involves a compromise between the forms most efficient for packing, dispersal and landing while seed size represents a compromise with seed number[3]. The importance of seed size, in relation to survival of seedlings in various environments, was first realised by Salisbury[4]. His studies have been amplified and made more precise by a number of workers[5-8]. Seed colours are generally adaptive in orienting seed predators[9]. Seed outline and weight are adaptive in respect of dispersal mechanism. Heavy seeds with smooth outline are difficult for dispersal, while lighter seeds with conspicuous awns, hairs or projections are easily dispersed[10].

All aspects of dispersal, including dehiscence and structural and physiological devices, are important during migration, succession and evolution. The transformation of calyx to pappus is an adaptive feature in the plants of compositae. The role of involucral bracts, present on the capitulum, and behaviour of pappus during seed dispersal have been studied[11]. Dispersal strategies in plants of Indian arid zone have also been reported[12].

In the present investigation, dimorphic seeds were found in a capitulum of *O. ramosa*. The peripheral and central seeds were collected from the plants growing in cultivated fields. The shape and the colour of the seeds and different types of pappus were observed under dissecting microscope. The number of pappus in each row was noted. Results presented here are the average of 100 observations. For dispersal strategies, two different aspects were emphasized, *viz.*, actual dispersal in the field, and the structural modifications needed to attain this dispersal.



Figures 1-2. **1.** Peripheral and **2.** Central seeds of *Oligochaeta ramosa.*

Seeds from the the periphery (figure 1) and centre (figure 2) of a capitulum showed dimorphism. The lengths of the peripheral and central seeds were 5 and 3 mm, respectively. The width of the peripheral seeds was 2 mm at the top and middle and 1 mm at the base, while the central seeds were 1 mm in width from top to base. The weights of peripheral and central seeds were 0.240 and 0.094 g, respectively. The peripheral seeds were somewhat swollen having ridges and furrows (five each) while the central ones had ridges and furrows only (two each). The peripheral seeds were dark yellowish-brown; while the central ones were pale yellowish-brown in colour. Ridges were darker than furrows in peripheral as well as in central seeds. Two rows of pappus were present on the top of both types of seeds. Four pappus, 11 mm long, were noted in the centre; and outer to this a row of 115 pappus, 4–8mm long, was noted. The lower portion of the inner pappus was yellowish, while the remaining portion was colourless. The pappus of outer row were colourless.

In this species, each branch terminates in an inflorescence which is a head. The involucral bracts are multiseriate, the innermost being longest and gradually become shorter outwards. Spiny tips of the outer bracts are bent at right angle to the head, but tips of the inner bracts are very compact. Through a small opening at the top of capitulum some parts of pappus come out. After seed maturation, involucral bracts dry and spread to form a cup-like structure, as a result the pappus get completely exposed. The achenes detach from the torus and the central seeds reach just at the top of the capitulum due to their light weight; while peripheral ones go slightly upwards due to their heavy weight. During the fast currents of wind, the seeds float in the air with the help of pappus and are dispersed to long distances. The central seeds go 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

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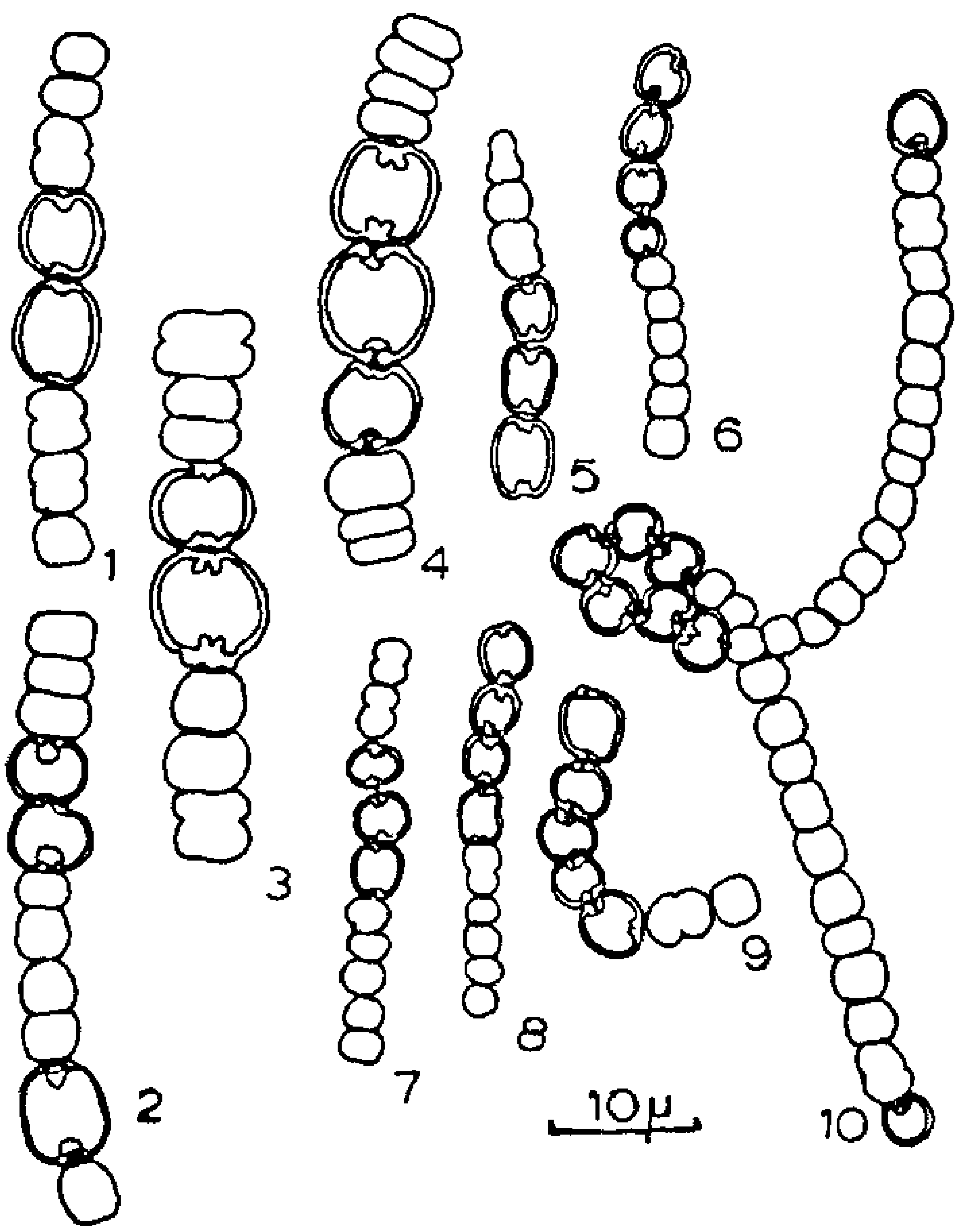
STUDIES on the effect of growth promoting substances on blue green alage have been concerned mostly on physiological aspects[1]. In the present attempt cultures of 19 species of *Anabaena*[2] were grown in Allen and Arnon medium amended with IBA (indole-3-butyric acid) in the following concentrations: 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 fiom 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.