systematics of the Indian Dill plant has long been a controversy and the author[1,2] has recently described it under *Anethum graveolens* sub sp. *sowa* (Roxb. ex Flem.) Gupta. Pharmaceutically, the Indian type Dill fruits are regarded as inferior to its European counterpart because of low percentage of *carvone* and large quantity of *dillapiole* present in its etherial oil.[7] The exotic Dill, therefore, has been introduced under cultivation in farms of Jammu and Kashmir[5] and later at CIMPO Farm, Haldwani, in Tarai region of Uttar Pradesh[3]; the oil distilled from these crops were found to conform with pharmacopoeial standard. A lower (fruit) yield and higher rate of seed shattering during ripening has been the main drawbacks of the crop in comparison to the Sowa crop for large-scale cultivation in India though the collection of full-grown green fruits has been recommended to reducing such losses.[6] A high-yielding cultivar, therefore, has long been desired.

PLATE. I. European Dill : (Haldwani selection).

The author obtained 20 commercial cultivars of the exotic and indigenous type Dill from 15 major Dill-growing countries of the world and performance trial, as a winter annual, was laid at CIMPO Farm, Haldwani (Nainital). The experimental plots were laid out at a distance of 30 m from each other, in a homogeneous, loam soil, rich in humus and nutrients. The range of variations in growth, branching and seeding including size and weight of the umbels, umbellules and fruits were recorded and has been reported partly elsewhere.[4] A number of single plant selections were made and a promising cultivar was thus isolated which on further randomized replicated trials gave significantly (statistically) higher yields than the parent stock. This selection is dwarf in size (average height 96 cm), bearing fewer comp. umbels (average 23·50 cm), each of which is larger in size (peduncle 22 cm in length) and bigger (dia. 29·00 cm) in spread (*see* Plate I); these in turn bear over 1,600 mature fruits in a terminal umbel and over 1,000 fruits in the axillary ones. The mature, full-grown fruits are conspicuously bigger in size and heavier in weight such that a single plant yield comes to 38·25 gm (average fresh weight) fruits in comparison to 27·23 gm from the much-grown English stock. The dimension of peduncle, pedunculii and pedicel too are conspicuous and the stouter nature of the pedicel, in the opinion of the author, contribute to the development of about 90% of the flowers into mature fruits. This selection is called as 'Dill : Haldwani Selection' and is under further approbation trial.

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1. Gupta. Rajendra, *Indian Oil & Soap J.*, 1969, **35** 6, 129.
2. —. *Dissertation* Agra. Univ., 1970; *Abst. CSIR News*, 1970 20. 18, 143.
3. — and Baslas, K. K., *Indian Perf.*, 1967, 9, **2**, 22
4. —. Dhan. S. P. S. and Mehrotra. A. P., *Proc Indian Sci. Cong.*, 1969, **56** (*Bot.*) *Abst.* 136 329.
5. Handa. K. L., Kapoor. L. D. and Channa O. N., *Indian J Agric. Sci.* 1953, 28 Part II, 6, 147.
6. Kapoor, L. D. and Abrol, B. K., *J. Sci. Industr. Res.*, 1961, 20 C, 2, 54.
7. Malviya. B K. and Butt S., *Proc. Ind. Acad. Sci*, 1940, 12 A. 25.
8. *Annual Report* : *CSIR* 1969. *CIMPO*, Selection of cultivars of Dill, 81 (Council of Scientific and Industrial Research, New Delhi); *Abstr. CSIR News*, 1970. 20, 16, 123.

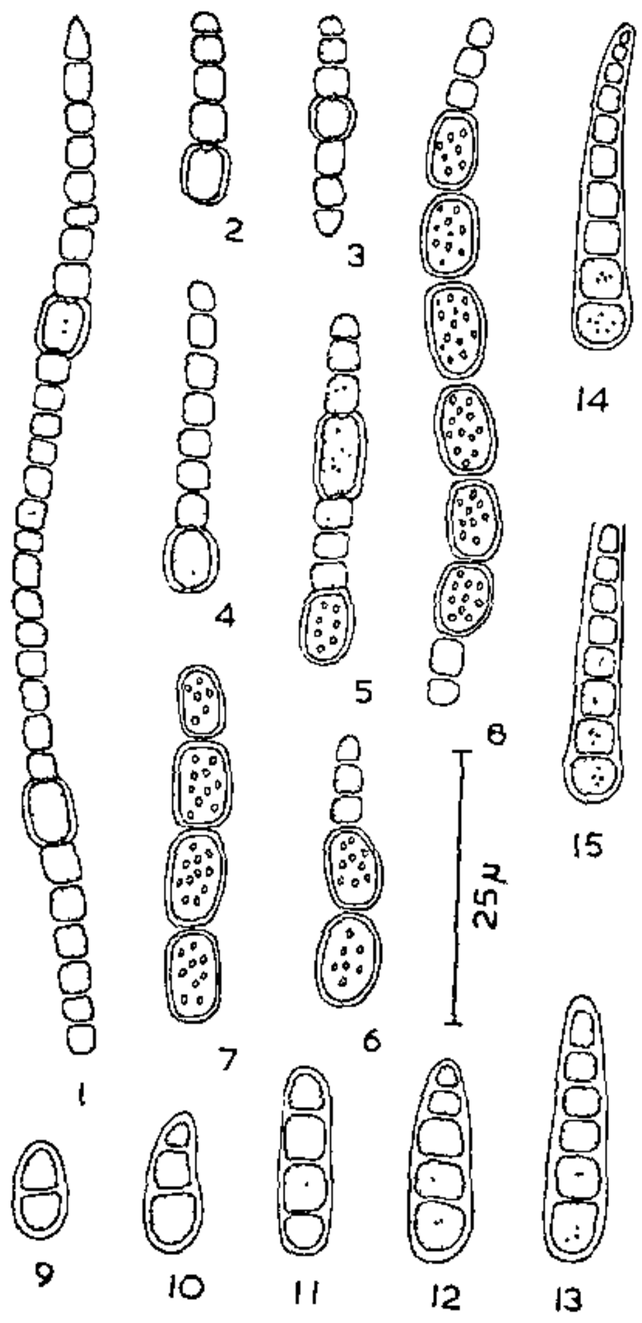
ON THE STRUCTURE AND MODE OF GERMINATION OF AKINETE OF *ANABAENA VARIABILIS* KUTZ VAR. *KASHIENSIS* (BHARADWAJA) FRITSCH

DURING study of the sewage algae of Lucknow, we came across *Anabaena variabilis* var-*kashiensis* in the month of September 1969. It was thought desirable to study the structure and

life-history of this species of *Anabaena*. The description is based on material preserved in 4% formalin. The alga was found growing in sewage along with *Navicula*, *Phormidium*, *Oscillatoria* and *Myxosarcina*.

The thallus is soft and mucilaginous and forms deep green patches on the side of the nala along with other algae. The trichomes are irregularly curved and more or less entangled with each other. A trichomes are devoid of mucilaginous sheath.

The cells are barrel-shaped, 4·2 μ broad and 2·8 μ to 4·2 μ long. The contents of the vegetative cells are coarsely granular. The cells are slightly constricted at the joints. The end cell is pointed (Fig. 1).



FIGS. 1–15. Fig. 1. End Cell pointed. Figs 2–4. Varying shapes of heterocyst. Fig 5. Cylindrical heterocyst in relation to akinete. Fig. 6–8. Chains of akinetes. Figs. 9–14. Germination stages of Akinete (two to ten-celled germling). Fig. 15. Point at which exospore dissolved.

The heterocysts are usually single, intercalary wider than the vegetative cells and occur at regular intervals throughout the length of the trichome. In the young filaments the heterocysts exhibit difference in size and shape. Obviously, one is older than the other (Figs. 2, 3, 4). They are 5·6 μ broad and 5·6 μ to 7·0 μ long, cylindrical or barrel-shaped.

The akinetes are formed in long or short chain of two to six (Figs. 6, 7, 8) and are remote from the heterocysts (Fig. 5). They are usually barrel-shaped with flattened ends, 8·4 μ to 9·8 μ long, 5·6 μ to 7·0 μ broad with thick firm exospore and delicate endospore.

Various stages of akinete germination has been observed in nature. When young, the akinetes are barrel-shaped but later become ovate or oblong and the colour changes from blue-green to pale-green and finally to brownish. In the germination of akinetes at first a two-celled germling is formed (Fig. 9) which undergoes further division and forms a three- to few-celled germling (Figs. 10, 11, 12, 13, 14). During germination the exospore from one side dissolves (Fig. 15) and the germling comes out from the exospore. As a result of further division, the germling grows into a new filament. The germination of akinete in *A. variabilis* Kutz var. *ellipsospora* differs from the present form. In the former, during the germination, the part of exospore becomes dissolved and the contents escape along with the endospore. At this stage, division takes place and develop into a new filament.

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1. Fritsch, F. E., *J. Indian bot. Soc.*, 1949, **28** (3). 136,
2. Venkataraman, G S., *Proc. Nat. Inst. Sci. India.* 1958, **24** (5) 229.
3. *A kashiea is* Bharadwaja, *Proc Indian Acad. Sci.*, 1935 **2 B.** 105, Fig 6 C-G.
4. Gonzalves E A. and Kamat, N. D., *Hydrobiologia*, 1959. **13**. 236

TOLERANCE OF BLUE-GREEN ALGAE TO PESTICIDES

THE use of high-yielding, fertilizer responsive dwarf rice varieties together with the use of powerful pesticides, some of which are applied to irrigation water makes it relevant to consider whether algal cultures could still be used under these conditions. The positive influence of algalization on the high-yielding rice varieties under high levels of fertilization has been