extended to the mature stage of the embryo sac by the organization of the egg apparatus in the end which is now upper, but which was originally the lower or the chalazal end.

I am thankful to Mr. R. K. Bhattacharya, who prepared the slide from the material provided by me.

Dept. of Botany, REAYAT KHAN.
Aligarh Muslim University,
Aligarh, U.P.,
December 21, 1952.

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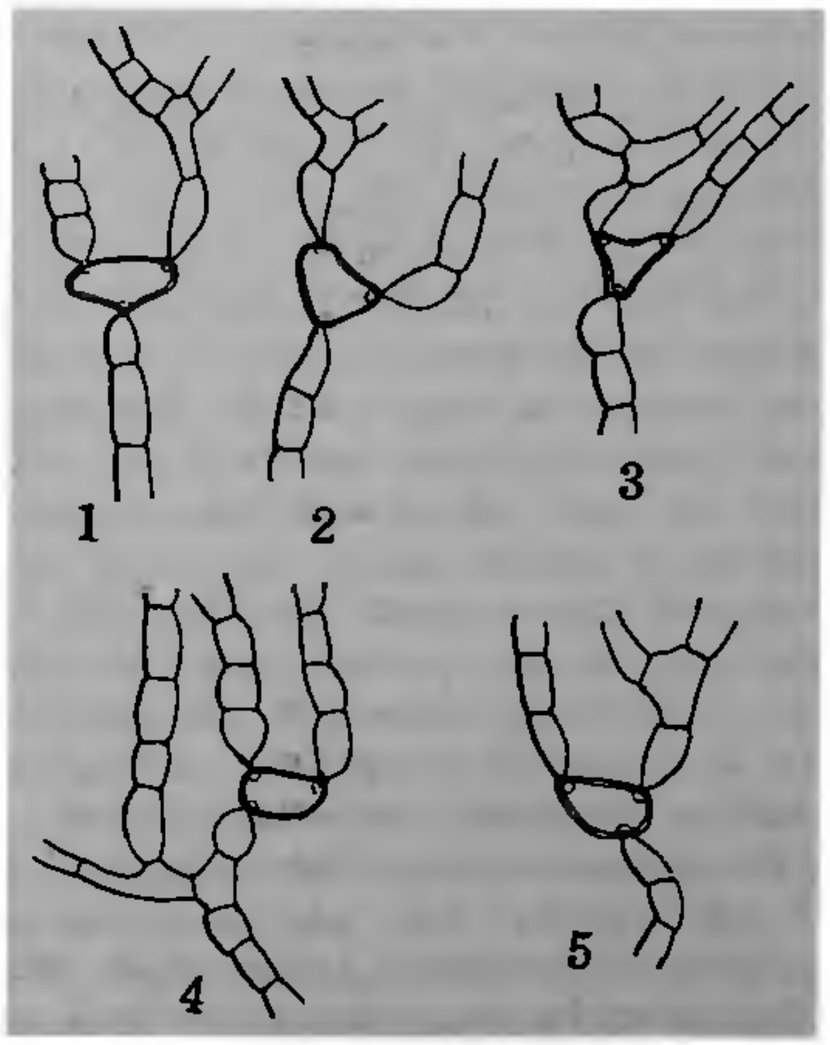
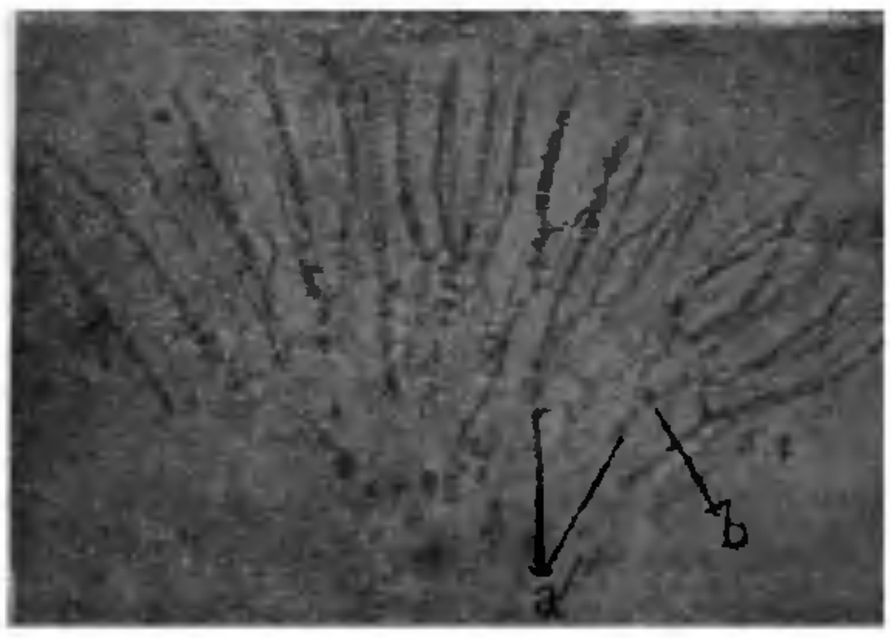
OCCURRENCE OF THREE-PORED HETEROCYSTS IN *BRACHYTRICHIA BALANI* (LLOYD.) BORN. & FLAH.

IN the genus *Brachytrichia* heterocysts are usually intercalary. An ordinary intercalary cell in the trichome gets converted into a heterocyst. Such an intercalary heterocyst develops two pores, one on either side of it, *i.e.*, where the former cell which got converted into a heterocyst was connected with its two adjacent cells of the trichome.

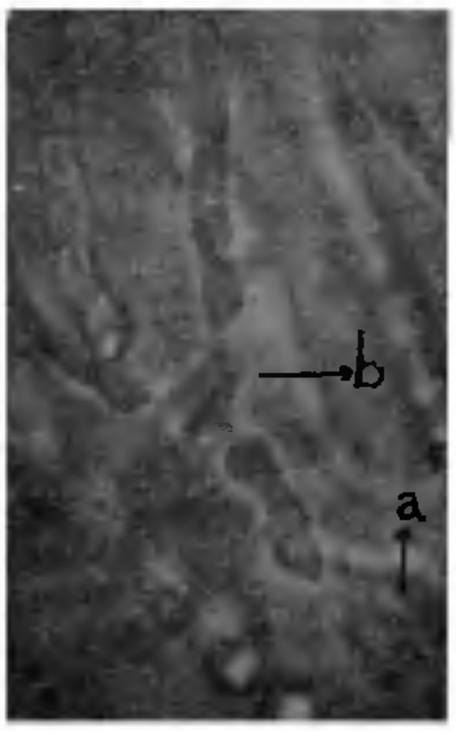


FIGS. 1–5. Filaments of *Brachytrichia Balan* showing three-pored heterocysts (× 640).

In some material of *Brachytrichia Balani* collected from Pamban, sometimes a cell in the main trichome which forms a branch (*branch-bearing cell*) becomes converted into a heterocyst. Since this cell is connected with three adjacent cells, *viz.*, the two adjacent cells in the main trichome and the lowermost cell of the lateral branch, the heterocyst formed by this cell shows three pores one on each side on which it is connected with the three adjacent cells (Figs. 1-5 and Fig. 6). The occurrence of such three-pored heterocysts is very unique and interesting. One-pored and two-pored heterocysts are known among the Blue-green algæ.[1,4] But a three-pored heterocyst does not appear to have been recorded among any of the Blue-green algæ. Several cases of three-pored heterocysts were found in the writers' material. These do not otherwise differ from the normal heterocyst of the alga, and have the same structure and appearance.



6



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8

FIG. 6. Photomicrograph of a part of a thallus showing two-pored (*a*) and three-pored (*b*) heterocysts (×220).

FIGS. 7, 8. Photomicrographs of two-pored (*a*) and three-pored (*b*) heterocysts (× 865).

They have a two-layered wall, the outer being thick and the inner quite thin. The nature of

the contents was normal and did not show any peculiarity. It may be stated here that in view of the fact that any normal vegetative cell can get converted into a heterocyst, there is nothing to prevent a branch-bearing cell of a trichome from developing into a heterocyst and forming three pores one on each of the three sides on which it is connected with its adjacent cells.

In this connection it would be interesting to note that in *Loriella osteophila* Borzi some of the heterocysts are formed at the point of forking (Ref. 2, Pl. VI, Figs. 1-5). This heterocyst would appear from the figures to be in contact with adjacent cells on three sides. But the heterocysts are shown as having only two pores. A re-examination of such heterocysts of the alga from this point is indicated. This alga has so far been recorded only from Papua.[3,5]

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ON THE VERNALIZATION OF TUBERS OF *CYPERUS ROTUNDUS* LINN.

Stout and healthy tubers of nut-grass were dug out and divided into two batches of 24 each, and stored separately in two bottles. 500 ml. of water was maintained in each so as to keep the tubers fully saturated. One of these bottles was kept continuously (in a Kelvinator) at a temperature of 7° C and the other in the shade at the ordinary atmospheric temperature as control.

After four weeks, the tubers were sown separately in four earthen flower pots. The pots were regularly watered to the extent of 1,000 ml. once a week. Hoeing of the pots was, however, regularly effected every Wednesday to maintain an optimum tilth of the soil.

Tubers in both the experimental and control pots germinated quite normally with a bias of earliness to the extent of 2-3 days in favour of the experimental. Subsequent performance of plants raised from the experimental tubers were definitely superior to those of the control *viz.*, they were taller, more vigorous and deeper green with broader leaf-blades. Besides, the plants from the vernalized tubers entered into the reproductive phase 30 to 31 days earlier than the control.

This little experiment, therefore, demonstrates that underground tubers, when subjected to low temperature, could be vernalized like seeds.

I am thankful to Sri. C. Lakshmanan for his help during this experiment.

Dept. of Botany, T. C. N. Singh.
Annamalai University,
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OCCURRENCE OF A NEW SUBSPECIES, *OPALINA JAPONICA DHARWARENSIS*

The Opalina described in this note was found in the rectum of the frog, *Rana limnocharis* from Dharwar and belongs to the beaked group, *Japonica*, since it has an abruptly pointed posterior end. The beak in this Opalina is similar to that found in the type species *Opalina japonica* Sugiyama, but differs from it in the following points.

(1) The nuclei are larger in size and spherical in shape; (2) The individuals are broader in form and more regularly shaped than those described in *O. japonica*; (3) Ranarum-like forms also met with in the same infection suggest the Opalina to be somewhat intermediate; (4) The body dimensions are distinctly larger.

For these points of differences the Opalina has been regarded as a new subspecies of *Opalina japonica* Sugiyama, and it has been named as *Opalina japonica dharwarensis*.

The description given for this new subspecies is based on studies both in its living condition as well as from the observations made from the smears fixed in Bouin's fluid and stained with Delafield's hematoxylin.

The figures have been drawn with the aid of a *Camera lucida*.

Opalina japonica dharwarensis nov. sub. sp.

Body is flat and thin. Anterior end is broadly rounded while the posterior tapers to an abruptly pointed end. The beak thus formed is not bent to one side like in *Opalina coracoidea* Bezz. In some individuals, this beak was found to be very much reduced or even absent. Such forms resembled the Ranarum-like forms. But their nuclei are smaller,