NOTES

Endoascosporic cells in three pyrenocarpous lichen genera

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Hyaline, smooth-walled, endoascosporic cells are reported in the lichen genera *Anthracothecium* Hampe, *Pyrenula* Ach. em. Massal., and *Trypethelium* Spreng.

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L'auteur rapporte des cellules endoascosporales hyalines à paroi unie chez les genres de lichens suivants: *Anthracothecium* Hampe, *Pyrenula* Ach. em. Massal. et *Trypethelium* Spreng.
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Introduction

A number of pyrenocarpous lichen genera possess what look, at first glance, to be very thick-walled ascospores with reduced cell lumina. They bear a similar morphological appearance to the conidia of certain Fungi Imperfecti, especially *Helminthosporium* Link ex Fr. A detailed examination of the ascospores in the genera *Anthracothecium*, *Pyrenula* and *Trypethelium* has, however, shown them to have a brittle outer wall or epispore enclosing globose to subglobose cells, each of which is surrounded by an individual wall. The epispore of *Anthracothecium* and *Pyrenula* is light brown in color, that of *Trypethelium* is hyaline. The endoascosporic cells are smooth-walled, guttulate and hyaline. Those of *Pyrenula* become very minutely roughened with age. They can be seen extruding from the epispore when the ascospores are crushed.

Descriptive Part

Anthracothecium libricolum (Fée) Müll.-Arg. (Fig. 1D) possesses pale brown to yellowish brown, smooth-walled, ovoid, ascospores. There are usually six to eight transverse septa in each ascospore and each of the segments, except those at the extreme ends, are subdivided by one or two longitudinal septa. The longitudinal septa are not always easily observed and the transverse septa do not always seem to extend to the periclinal wall. In young ascospores the transverse septa can be seen to be continuous with the periclinal wall, however. The outer wall of the ascospore is brittle and is easily ruptured when crushed by the application of pressure to the cover slip in a slide preparation. This results in the extrusion of globose, smooth-walled, hyaline, fully differentiated, guttulate cells. Sections through the ascospores reveal that the walls of the endoascosporic cells are differentiated *de novo*, independently of the epispore. The protoplast within each compartment rounds off and becomes surrounded and enclosed by a newly laid down wall. Similar endoascosporic cells have been observed in *Anthracothecium ochraceoflavum* (Nyl.) Müll.-Arg.

The ascospores of *Pyrenula nitida* (Weig.) Ach. (Fig. 1A) resemble in structure those of *Anthracothecium*. They differ in having no longitudinal septa. The endoascosporic cells, four per ascospore, are lens-shaped, but become globose after release. They are hyaline, guttulate, at first smooth-walled, but eventually become minutely roughened. Identical endoascosporic cells have been observed in *Pyrenula subconfluens* Vainio. Janex-Favre (1970) described the ascospores of *P. nitida*. A number of layers in the ascospore wall were recognized and referred to as perispore, épispore, mésospore, and endospore. However, the discrete nature of the endospores was not determined, and individual, released endoasco-

sporic cells were neither described nor illustrated.

In *Trypethelium virens* Tuck. (Fig. 1C) each ascospore is divided into a number of units by transverse septa. In addition, the protoplast of each division is enclosed by a wall which is distinct from the outer wall. *Trypthelium eleuteriae* Spreng. (Fig. 1B) has similarly shaped ascospores to those of *T. virens*, but in this species there are no true septa. The contents of each ascospore cleaves into a number of units, each of these becoming enclosed by a new wall. In the early stages of maturation the ascospores have the appearance of possessing true septa, the endoascosporic cells being tightly compressed. Upon release they assume a globose shape.

Discussion

The ascospores described above resemble the conidia of species of the hyphomycete genus

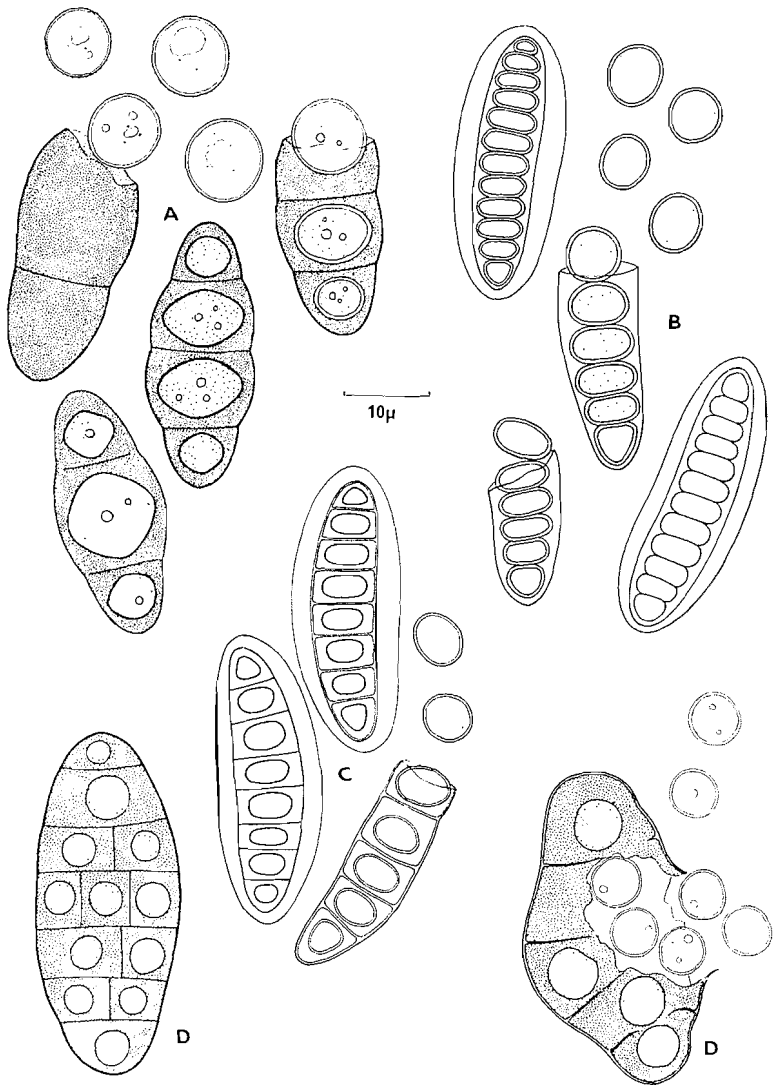

FIG. 1. Ascospores with extruded endoascosporic cells. A, *Pyrenula nitida*; B, *Trypethelium eleuteriae*; C, *Trypethelium virens*; D, *Anthracothecium libricolum*.

Helminthosporium and the coelomycete genus *Camarosporium* Schulz., in that they have hyaline endosporic cells. Luttrell (1963) illustrated hyaline cells extruding from a ruptured epispore in *Helminthosporium sorokinianum* Sacc., and Dickinson and Morgan-Jones (1966) found similar cells in *Camarosporium obiones* Jaap.

Luttrell (1963) found that all the cells of the conidia of *Helminthosporium avenaceum* Curt. ex Cooke were capable of producing germ tubes although only the end cells produced them in the other species of *Helminthosporium* studied. In the lichen genera considered here it seems possible that each of the endoascosporic cells might be capable of germination. In nature, the brittle epispore of the ascospore might well disintegrate, thus releasing the cells. The number of potential propagules would thereby be greatly increased. Cultural experiments are, however, necessary before this hypothesis can be proven.

Collections Examined

Anthracothecium libricolum, on bark, Sikkim, East Himalayas, D.D. Awasthi, May 1947, H.

Anthracothecium ochraceoflavum, Charles Island, Galapagos, A.W.C.T. Herre, Krypt. exs. ed. a Mus. Hist. Nat. Vindobon No. 3142, H.

Pyrenula nitida, on branches of *Fraxinus*, Artro Valley, Llanbedr, Merioneth, Wales, G. Morgan-Jones, 5 June 1966, IMI 119407.

Pyrenula subconfluens, Sangre Grande, Trinidad, West Indian Cryptogams No. 26, R. Thaxter, 1912–13, FH.

Trypethelium eleuteriae, on sour orange, Mayaguez, Puerto Rico, B. Fink, 18 Dec. 1915, CAN.

Trypethelium virens, on *Ilex opaca*, Avalon, Cape May Co., New Jersey, U.S.A., I.M. Brodo, 26 July 1962, CAN.

Acknowledgments

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DICKINSON, C. H., and G. MORGAN-JONES. 1966. The mycoflora associated with *Halimione portulacoides*. IV. Observations on some species of Sphaeropsidales. Trans. Br. Mycol. Soc. **49**: 43–55.

JANEX-FAVRE, M. C. 1970. Recherches sur l'ontogénie, l'organisation et les asques de quelques Pyrenolichens. Rev. Bryol. Lichenol. **37**: 421–650.

LUTTRELL, E. S. 1963. Taxonomic criteria in *Helminthosporium*. Mycologia, **55**: 643–674.

Glycoprotein II in developing and germinating bean seeds[1]

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RACUSEN, D., and M. FOOTE. 1973. Glycoprotein II in developing and germinating bean seeds. Can. J. Bot. **51**: 495–497.

Glycoprotein II increased most rapidly as growing bean seeds became grey and neared their maximal length and fresh weight. During germination this protein decreased most rapidly between 7 and 10 days.

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La glycoprotéine II a augmenté le plus rapidement dans les graines de fève en croissance au moment où celles-ci devenaient grises et s'approchaient de leur longueur et de leur poids frais maximaux. Durant la germination, cette protéine a diminué le plus rapidement entre le septième et le dixième jour.

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The major glycoprotein of bean seed, glycoprotein II, was first characterized by Pusztai and Watt (4). It has a molecular weight of 140 000 at neutral or alkaline pH and contains 4.46% neutral sugars (chiefly mannose) and 0.99% 2-glucosamine. Our laboratory has confirmed these criteria and studied the fate of glycopro-

[1]University of Vermont Agricultural Experiment Station, Journal Article No. 296.