

## A NEW FORM OF ECTOTROPHIC MYCORRHIZA.

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Mycorrhizas have many different forms and characteristics but certain types are limited to certain genera of trees. Mycorrhizas of coniferous trees have characteristic forms that differ from those of deciduous trees though there are many variations in both cases.

The ectotrophic mycorrhizas commonly found on deciduous trees have four parts. They are: (a) the fungus mantle, (b) a layer of cells that are elongated on one side of the root and irregular in shape on the other side, (c) about three rows of ordinary cortical cells and (d) the central cylinder. It is the area containing the radially elongated and irregular cells that is characteristic of deciduous trees. The fungus filaments penetrate between the cells in this region and enter the area of ordinary cortical cells. Usually, however, they penetrate only a very short distance into this area and sometimes not at all.

Mycorrhizas found on coniferous trees have only three parts. These are: (a) the fungus mantle, (b) several rows of ordinary cortical cells and (c) the central cylinder. The fungus mantle is often not very well developed. The fungus penetrates between the cortical cells sometimes clear to the central cylinder.

The new form described in this paper was found on *Quercus bicolor* (see Fig. 1). Four regions could be distinctly seen in this form, namely: (a) the fungus mantle, (b) about five or six rows of ordinary cortical cells filled with a substance of some kind, (c) several rows of ordinary cortical cells not filled with the substance and (d) the central cylinder. This form of mycorrhiza has characteristics of mycorrhizas of both coniferous and deciduous trees. The fungus mantle is very well developed, unlike the mycorrhizas of coniferous trees but similar to those of deciduous trees. However, the fungus filaments are not able, under any conditions, to penetrate the cells of the cortex. A close examination with the oil emersion microscope proved that the fungus did not gain entrance in a single case. Apparently the deposit in the outside area of cortical cells served

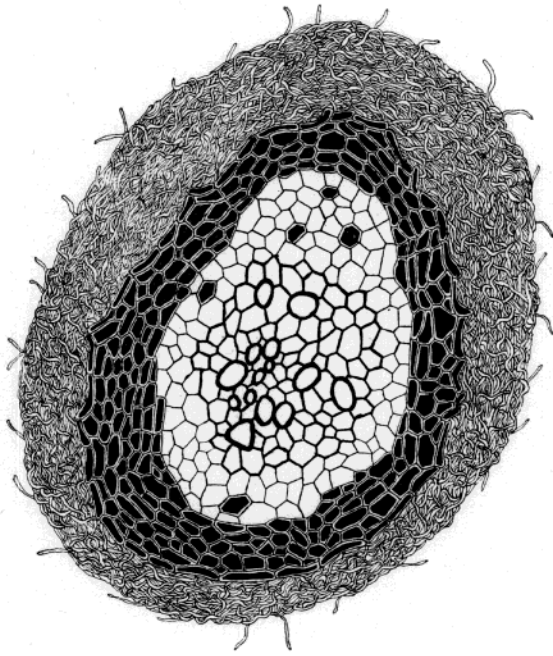


Fig. 1. Cross section of mycorhiza of *Quercus bicolor*

as a barrier that would not permit the fungus to enter. The central cylinder and the ordinary row of several cortical cells are the same as is usually found in other forms of mycorrhizas.

It is necessary for the fungus to obtain nourishment from some source and the question confronts us as to where it has received enough nourishment to produce such a well developed mantle. It is rather doubtful that enough nourishment could be obtained from the outer row of cells of the root. There is a possibility that the fungus penetrated the younger portion of the root nearer the tip, and the mantle then grew back over the older portion of the root but was unable to enter the tissues. Whatever the case may be, it is quite evident that the fungus was unable to enter the root at that particular place from which the section was taken, and this seems to have been due to the unusually large amount of secreted substance in the cells. It is common to find this substance (probably resin or tannin) in a few cells of a mycorrhizal root but not in such large amounts.

This phenomenon adds evidence in favor of the contention of McDougall<sup>1</sup> and some other workers that the symbiosis represented by ectrotrophic mycorrhizas is antagonistic in nature. It is apparent that the fungus is parasitic on the tree but there is no evidence that the tree is parasitic on the fungus. On the other hand, such evidence as we have points to an attempt on the part of the seed plant to exclude the fungus. Mycorrhizas have not previously been collected from *Quercus bicolor* and much more work needs to be done before definite conclusions can be drawn but the evidence from this one collection indicates that this species of oak is apparently able to "throw up a barrier" to prevent the penetration of a mycorrhizal fungus and this may be a clue to the reason why some seeds plants form mycorrhizas and others do not, that is, some may be more efficient than others in protecting themselves from the mycorrhizal fungi.

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<sup>1</sup>McDougall, W. B., Mycorrhizas of Coniferous Trees. Jour. Forestry 20:255-260. 1922.