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Speaker for the May 15 MSSF Meeting

Roberto Garibay Orijel

Fifty Years of Ethnomycology

Roberto Garibay Orijel has been studying traditional knowledge of fungi in rural Mexico for the past nine years, having earned his B.A. degree in Biology and Ph.D. in Biological Sciences from the National Autonomous University of Mexico (UNAM). In his dissertation, he

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MycoDigest: Mycorrhizal Sulfur Tufts?

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What sets a mycorrhizal species apart from a species with a saprotrophic lifestyle? Is it truly an "either/or" situation, or are some or all species capable of doing both? Could it be that species that get their carbs (sugar components) from a tree on whose roots they form mycorrhizae are also able to break down wood and litter?

When ectomycorrhizal species gained the ability to grow with trees, did they lose the capability to use wood and other dead plant material as their energy source? The jump from an exclusively saprotrophic existence to a mycorrhizal way of life has been made repeatedly in evolutionary time, by all kinds of mushroom groups: *Boletus*, *Russula*, *Cortinarius*, and *Amanita*, to name a few, which have close non-mycorrhizal relatives. Did they all abandon their former lifestyle?

***Hypholoma fasiculare*, the sulphur tuft mushroom.**
Photo courtesy of Ron Pastorino

In fact, ectomycorrhizal species do make some of the enzymes involved in the break-down of lignin. One example is the class of enzymes known as laccases, which are secreted outside the fungal cell. But, laccases have other functions too, so their presence does not by itself prove that the species is able to break down lignin. A second class of enzymes, lignin peroxydases, is, as far as we know, not present in ectomycorrhizal fungi (though there is a paper claiming to find genes for these enzymes in a broad range of fungi; unfortunately, or fortunately, the data on which this conclusion was based are not to be trusted). The third class of lignin-decomposing enzymes, manganese peroxydases, have been found in all kinds of mushroom-producing fungi. In other words there seems to be evidence that, to some degree, ectomycorrhizal fungi have lost the ability to degrade lignin.

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MycoDigest is a section of *Mycena News* dedicated to the scientific review of mycological information.

Cultivation continued

that the notorious relationship between morels and burn zones may indicate that the sclerotia of morels are stimulated, along with moisture and warmth, to sprout when they detect smoke from fires. It may be that the morels are always producing sclerotia in the forest and these periodically sprout with the spring warmth and moisture to produce "natural" morels. But, when the forest is burned off, releasing smoke extract into the ashy soil, perhaps the sclerotia "know" that there are lots of nutrients suddenly available. Yes, lots of explanations are possible but this is one that could be tested.

If you would like to try some mycorrhizal experiments, two of the most likely host trees are apples and dogwoods. There is a lot of lore about finding morels in old apple orchards. It could be that they like all the extra unharvested fruit that falls to the ground, or that they have developed a symbiotic relationship with the trees, or both. When you go to the Sierras looking for burn morels, the flowering dogwoods are usually indicators that morel fruiting has arrived. It is also believed that these and other trees could be mycorrhizal with morels, and that when the fire destroys them the morels come out and fruit. Often you can find young dogwoods uprooted around logging roads in the burn zones, which are available for rescue and transplanting to your planting tub or back yard. You can mulch your trees deeply with saprobic materials, inoculate them with your spawn bag full of burn morel bases, and see what happens.

These and other mushroom cultivation experiments are open to you in our Mushroom Cultivation class at the Merritt Community College Landscape and Horticulture Department in Oakland, Sundays from 10am to 2pm. The class starts again in the fall semester, August 26 to December 16. The course number is LH45A, the class code is M0951, and participants may elect to receive credit. That's $42 for about 15 Sundays. Come

MycoDigest continued

These questions were also approached from the saprophytic side of the divide by a group of researchers who found wood-decay fungi growing in or on the roots of perfectly happy seedlings. In a study of around 15,000 root tips, three were colonized by mushroom species that were supposed to grow on dead wood only, namely sulfur tufts (*Hypholoma fasciculare*), and two crusts: *Phlebiopsis gigantea* and *Phlebia centrifuga*. To figure out what these three wood decayers were doing on the roots, this symbiosis was synthesized from scratch with seedlings of *Picea abies* and the local pine, *Pinus sylvestris*. Only one combination (*Picea abies* with *Phlebiopsis gigantea*) really produced the same structure as an ectomycorrhizal fungus, with a fungal mantle around the root tip, and the hyphae of the fungus inside the root. Although they didn't produce mantles, the other two fungi were also found within the roots. In all cases, the seedlings looked healthy after growing for half a year with these fungi. They were not parasitized, as you might expect. This is the first time that wood-decay fungi have been found on live, healthy tree roots, however another example has been reported. The earth tongue, *Geoglossum nigritum*, a litter decomposer, has been found in roots of tanbark oak in Humboldt County. What saprotrophic fungi are doing in living roots is the next question, and it has still to be answered. Whether this is a widespread phenomenon among saprotrophic species is also under investigation.

An interesting piece of information to ponder is that foresters in boreal forests spread *Phlebiopsis* spores on dead stumps to prevent the growth of root pathogens. If this species can colonize the roots of the trees, what are the implications for the ectomycorrhizal community and the health of the forest in general?

The complete story can be found at:

Vasiliauskas, R., A. Menkis, R.D. Finlay & J. Stenlid, 2007. *Wood-decay Fungi in Fine Living Roots of Conifer Seedlings*. New Phytologist 174: 441-446.

Speaker continued

explored the taxonomy, ecology, and ethnomycology of edible mushrooms from the north Oaxacan mountain ridge. He has also studied the collection and sale of wild edible mushrooms in Mexico, and founded the Group for Ethnomycology Development in Mexico (GIDEM), with whom he has organized and participated in several fungus fairs and workshops on traditional mycological knowledge. He now pursues postdoctoral studies on the molecular ecology of mycorrhizic mushrooms of Michoacan at UC Berkeley's Bruns Labratory. As this year marks the fiftieth anniversary of the founding of ethnomycology by Robert Gordon Wasson, Orijel's lecture will focus on the early history of this discipline and its current state around the world.