The Largest and Oldest Living Organism

Ramesh Maheshwari

A fungus hidden beneath the soil surface in forest, estimated to be 1500-2400 years old, is the largest and oldest living organism.

If asked which is the largest and the oldest living organism, the California redwood tree, scientifically named *Sequoia sempervirens*, comes to mind. This tree grows to heights of 300 feet or even more (as a comparison the Qutab Minar in Delhi is 238 feet high). The oldest redwood tree is 2,200 years of age. Some might say that it is the blue whale, *Balaenoptera musculus*, which has an average length and life span are 23 feet and 110 years, respectively. In 1992, a fungus, *Armillaria bulbosa* (synonym *Armillaria gallica*) was discovered in the forests of Michigan in North America which was stated to be the largest and oldest living organism. Subsequently, another species, *Armillaria ostoyae*, was discovered in Oregon, USA, with a spread of approximately 890 hectares, and 2400 years old! These findings were startling because fungi generally are microscopic organisms, the exceptions being the fleshy mushrooms often seen in lawns and pastures, or the leathery bracket fungi growing on fallen trees and decaying timber.

The Fungi

Fungi lack chlorophyll and are therefore non-photosynthetic. The discovery of a giant fungus is therefore a testimony of the success of fungi, whose vegetative body is composed of thread-like filaments called hyphae, which secrete digestive enzymes and breakdown the complex polymeric constituents of living or dead plant remains. A part of these compounds is absorbed by the fungus for its own growth, whereas the major portion is made available for growth of plants and other microorganisms. The fungi play a vital role in sustaining the carbon cycle in the...
biosphere. An American mycologist, B O Dodge (1872-1960), who discovered *Neurospora crassa* (a fungus used by George W Beadle and Edward L Tatum for their experiments which led to the formulation of the one gene-one enzyme concept for which they were awarded the Nobel Prize) summed up his view of fungi as: "The fungi...are progressive, ever changing and evolving rapidly in their own way, so that they are capable of becoming readily adapted to every condition of life. We may be rest assured that as green plants and animals disappear one by one from the face of the globe, some of the fungi will always be present to dispose of the last remains." The fungi are the ultimate winners.

The hyphae generally have a diameter of 2-10 μm (Figure 1), and are concealed in the substratum, such as soil or a dead tree. How then was this fungus discovered, its age and mass estimated?

**Discovery**

In the 1990s aerial survey at the boundary of Michigan (USA) and Canada showed yellowing, wilting of leaves and killing of mature forest trees [1]. The culprit was a fungus that infected the roots and extended into the trunk of mature, killed trees. The fungus, scientifically named as *Armillaria bulbosa*, is commonly called the 'honey fungus' because it forms honey-coloured, edible, mushroom-like fruit bodies (basidiocarps) at the base of the killed tree (Figure 2). It is classified in the Phylum Basidiomycetes (or Basidiomycotina) of Kingdom Fungi (Eumycota).

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**Figure 1.** Hypha of a fungus is divided by transverse walls into multinucleate compartments (cells). The septa have a pore through which protoplasmic movement occurs.

**Figure 2.** A postage stamp showing the mushroom-like, spore-bearing fruiting bodies (basidiocarps) of *Armillaria mellea*. 