Decoding mushroom's secrets could combat carbon, find better biofuels, safer soils

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Researchers at the University of Warwick are co-ordinating a global effort to sequence the genome of one of the World's most important mushrooms - Agaricus bisporus. The secrets of its genetic make up could assist the creation of biofuels, support the effort to manage global carbon, and help remove heavy metals from contaminated soils.

The Agaricus mushroom family are highly efficient 'secondary decomposers' of plant material such as leaves and litter –breaking down the material that is too tough for other fungi and bacteria to handle.

How exactly it does this, particularly how it degrades tough plant material known as lignin, is not fully understood. By sequencing the full genome of the mushroom, researchers hope to uncover exactly which genes are key to this process. That information will be extremely useful to scientists and engineers looking to maximize the decomposition and transformation of plant material into bio fuels.

The mushroom also forms an important model for carbon cycling studies. Carbon is sequestered in soils as plant organic matter. Between 1–2 giga tons of carbon a year are sequestered in pools on land in the temperate and boreal regions of the earth, which represents 15–30% of annual global emissions of carbon from fossil fuels and industrial activities. Understanding the carbon cycling role of these fungi in the forests and other ecosystems is a vital component of optimizing carbon management.

That however is not the end of the mushrooms talents; several Agaricus species are able to hyper-accumulate toxic metals in soils at a higher level than many other fungi. Understanding how the mushroom does this improves prospects of using such fungi for the bioremediation of contaminated soils.

Agaricus bisporus is one of the most widely cultivated mushrooms and the genome research will also benefit growers and consumers through identification of improved quality traits such as disease resistance. The University of Warwick's horticultural research arm Warwick HRI will co-ordinate provision of genetic materials to the Joint Genome Institute in California for sequencing, will organise analysis of the sequence data and act as curator of the mushroom genome.

Agaricus bisporus has around 35 megabases of genetic information coding for an estimated 11,000 genes. The researchers expect to have a 90% complete genome within 3 years.

Source: University of Warwick