

ENTOMOLOGY AND PLANT PATHOLOGY

MYCOLOGY 505: RESPONSE PAPER

TITLE

SIX WAYS MUSHROOMS CAN SAVE THE WORLD

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Ways that mushrooms can save the world

Paul Stamets, a mycologist, gives a presentation on six ways in which mushrooms can save the world. In the presentation, he lays out ways in which he believes and can demonstrate, fungi with a particular reference to mushroom can save our planet from the supposedly threats of extinction it faces. His enthusiasm, passion and love for the topic is clear right from the start of the talk which he begins by telling a joke of how organisms would probably vote humans out of the planet earth if given a chance. On that light note, he then delves into explaining the ubiquitous and extensive nature of mycelium, the role mycelium plays in holding the soils together, and generating humus leading to the natural and rich landscapes of most forests and land masses. He innovatively explains the extensive networks and role of mycelium on the earth's surface by equating it to the internet which he calls "the earth's natural internet". He also points out to the important fact that Fungi were one of the first and oldest organisms to colonize the earth and have been very beneficial in the co-evolution and survival of many other organisms including plants and animals.

Having established the unquestionable importance of fungi/mycelium on the earth surface, he then elaborately gets into explaining the different aspects and areas in which mycelium can be advantageously utilized. He starts by showing how fungi can be used in reclamation and remediation of contaminated habitats (myco-remediation), and then goes into the use of fungi in human medicine, fungi in control of insect pests, to the development of an innovative idea of promoting the green world movement and finally the possibility of using fungi in solving the world energy crisis. By the end of the presentation, it is clear that fungi have the untapped potential of positively impacting the world.

Fungi have been known to have various beneficial uses from ancient times which are still in use today. From being a source of food, major ingredients to various food and drink products like bread and beer, to having medicinal properties. In reality however very few people are aware that mushrooms can be used for anything else besides as food and the fact that picking mushrooms can many a times be fatal. Stamets in his very creative and maybe outlandish way brings to light the fact that mushrooms do have other untapped uses. The fact that mycelium can be used in

habitat rehabilitation is very clear from experiments he and other scientists have done. One of these experiments was done in Washington on sites saturated with diesel and other petroleum wastes. Four methods of waste remediation were tested to include the use of fungi mycelium, the results of which outdid their expectation. After six weeks the site with mycelium was covered with hundreds of pounds of oyster mushrooms. This as explained by Stamets was because the mycelium absorbs the oil producing enzymes like peroxidases that break carbon-hydrogen bonds and in turn uses it for its own nutrition. Not only was that site filled with mushrooms but with time sporulated attracting various insects, then birds which spread the spores and with time the pile, using Stamets term, was turned into “an oasis of life”. This was very unlike the other set of piles which were dry, unsightly and stinky. From this, Stamets comes up with the noble idea of using the technology used in mushroom production of spawning to make what he called burlap sacks “bunker spawn”. This would then be put downstream farms that were producing E. coli, or other wastes, or a factory with chemical toxins, which would then lead to habitat restoration. This he points out has been a great success story.

The use of fungi in medicine with a particular reference to antibiotics is well known. Stamets exploits the use of mushrooms in the treatment of viruses. In collaboration with the U.S. defence department of Bioshield program, they discover several strains of Agaricon mushrooms highly active against pox viruses. They don't stop at this but get into looking at the probability of getting any that might be active against flu viruses, which they successfully do. Once again, they get three strains active against flu viruses which have been tested on different strains of flu viruses and even go further to make a combined blend of the extracts which were active against one of the higher strains of flu viruses. From the control of human diseases, Stamets then gets into the field of insect control by the use of fungi, known as entomopathogenic fungi. Once again, he goes against the norm. Instead of trying to control carpenter ants by the use of sporulating spores, he was able to develop a system of using non-sporulating spores. That way, the insects would not be able to detect the spores and avoid them, but would instead be attracted to the mycelium, starting a cycle where the insects would consume the mycelium, die, mummify and then mushrooms would pop out from them which would then sporulate and repel any other ants. From this experiments in his own house, Stamets is able to come up with a very good

control against carpenter ants, termites, fire ants and other insect pests from which he gets not only one, but two patents.

Finally, Stamets ends the talk with his idea of developing a delivery kit of mycelium spores, together with mycorrhizial fungi and endophytic fungi which he calls “the life box” in the form of cardboard boxes. The focus being a method to quickly spread these around the world as an easy way of growing tree seeds and also several other food crops like corn, beans etc. This project then gives him the idea of possibilities of generating ethanol with fungi as an intermediary. This he bases on the fact that fungi are able to convert the cellulose into fungal sugars.

Stamets demonstrates the power of thinking out of the box or going against the norm. his conviction in the potential of mycelium combined with his dedication are very clear from the presentation. Nevertheless, I would say that saving the world, if that were really possible, is really a daunting task. It is a task that cannot be achieved just individually or by any one field or area of technology. It would take the concerted effort and integration of ideas of different technological key players. Stamets shows that this can be possible if applied to other sectors. His innovations are not necessarily based on completely new knowledge; he simply takes what is already known and looks for new leeway into getting improved methods and solutions. He does not stop at that but follows through with ideas on how to practically apply that into his main focus area; making solutions to existing problems that are long lasting. In the end, in his area of research, he does clearly demonstrate that fungi indeed do have the untapped potential of positively impacting the world.