Acta Scientific AGRICULTURE (ISSN: 2581-365X)

Volume 5 Issue 5 May 2021

Perspective

Mycoremediation by Oyster Mushroom

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Received: March 15, 2021

Published: April 16, 2021

Oyster mushroom is the *Pleurotus* species, which is a well-known fungus that can be used in bioremediation of the soil contaminated by pesticides and heavy metals in ecosystem. Cultivation of this mushroom is an age-old practice. Though the biological remediation properties were known from a very long time, as long as the period of world war one, but only a little was done to commercialize it or incorporate it in our daily lives. The absorption potential of *Pleurotus* species is still to be known to the fullest extent.

Mycoremediation is a method of clarifying heavy metals by fungal biomass, using processes such as degradation, absorption, accumulation and conversion through biological means. The microorganisms accumulate high amounts of heavy metals inside them when grown in an area contaminated with these metals. oyster mushroom breaks down a broad spectrum of organopollutants that are not easily decomposed by any other biological agents. This ability makes them promising organisms for use in various bioremediation projects. Thus, white rot fungus are currently being used for soil remediation purposes utilizing techniques such as land farming or composting technologies. They normally colonize plant material (lignocellulosic), where their ability to degrade lignin, cellulose, and hemicellulose makes them more antagonistic compared with other microorganisms. Apart from it, as they produce extensive network of secondary mycelia covering a large area, they have high bio-sorption potential within them. The *Pleurotus* genus can accumulate high concentration of heavy metals. Most of the *Pleurotus* help in accumulation of toxic substances through regulation of laccase isozyme activity and peroxidase activity.

Mushrooms growing is proximity to smelters and industries have been reported to have higher levels of concentration of nickel. When *P. ostreatus* is grown in sites having iron and metal scrape parts, it is found that different species have different accumulation capacity for various metals like copper, zinc, molybdenum, manganese and iron. When *Pleurotus sajor-caju* is grown on duckweed which is rich in metals elements, it is found that there is accumulation of cadmium ions above the permissible limits. Concentration of mercury and cadmium is found to be high in basidium of *P. ostreatus* when grown in polluted areas. The uptake of copper and cadmium ions is higher as compared to cobalt and mercuric ions by *P. sajor-caju*. Decomposition rate of DDVP in the soil was high in the presence of *Pleurotus pulmonarius*. *P. ostreatus* can be used to degrade 2,4-dichlorophenol. *Pleurotus tuberregium* and *P. ostreatus* can be used to biodegrade organophosphate pesticides which form a major percentage of pesticides used in our country.

After the onset of green revolution, there has been an indiscriminate use of pesticides and other fertilizers in order to improve the yield. But what the farmers fail to take into consideration, is the toxicological effects of the residue which will eventually be ingested by us and thus, entering the food chain. This would prove fatal in a long run and cause disturbances at cellular level in human body. Therefore, it is very important to clarify the effluents before the final release, which would otherwise get incorporated into different segments of the environment. Also, due to the increasing population, there is going to be shortage of agricultural land in the near future. Hence, the land in proximity to industries which contain soil contaminated with effluents can be cleared and used for agriculture. Several methods can be used for remediation of the soil contaminated with heavy metals and pesticides i.e. surface capping, encapsulation, soil flushing, electro-kinetic extraction, pyrometallurgical separation, vitrification, stabilization etc. but phytoremediation and biological techniques turned out to be best

solution for elimination of metal(loid) s from the soil, especially in-situ. Some of these have limitations such as cost, time consumption, logistical problems, mechanical involvedness and exposure to toxic metals. Biosorption capacity of different species has been quantified by comparing them. *Pleurotus* is a very promising species on which, even though lot of work has been carried out, more can be done to use it and exploit it to the fullest. Different species of mushrooms can tolerate different concentrations of heavy metals. The spent mushroom substrate which is generated from the mushroom farms periodically needs disposal. In such cases, disposal of SMS faces problems regarding discarding it. Oxygenation, specific infrastructure and substrate addition might be required in some cases, but cost benefit ratio is high. It is environment friendly, self-maintainable, recyclable, cost effective, needs low energy expenditure, and can be used to remediate soil and water. However, remediation properties of this fungi with respect to air is yet to be known.