Isolation and Morphological Characterization of Glyphosate Utilizing Fungi from Contaminated Sites in Sri Lanka

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The use of synthetic pesticides has become an indispensable tool in Sri Lankan agriculture. The extreme usage of glyphosate herbicide over the past years in the country has led to a serious environmental pollution. Thus, bioremediation is the most environmentally sound technology for clean-up. This study was aimed at isolation and morphological characterization of the fungal species that could potentially utilize glyphosate as their sole source of carbon and energy. Soil samples were obtained from the selected agricultural lands in Dambulla and Rathnapura area, which were chronically contaminated over ten years with numerous pesticides including glyphosate. The enrichment culture technique was used to isolate fungi from the collected soil samples by providing glyphosate at the concentration of 50 ppm in the Mineral Salts Medium (MSM) under the incubation temperature of 30 ^{o}C for two weeks. After 5 enrichment cycles, single fungal species (D1FW) was isolated that could potentially biodegrade glyphosate. D1FW isolate was characterized by culturing on both Potato Dextrose Agar medium and on MSM agar enriched with glyphosate (50 ppm). It was observed that the colony morphology of the fungus grown on the two different media is different. Further, Lacto Phenol Cotton Blue staining conducted under the sticky tape method showed that the DIFW is possessed with small round shaped spores and branched non septate mycelia. Further, the glyphosate utilization patterns based on their growth kinetics over a 7 day period of incubation of the isolated fungus was also assessed. The results revealed more or less a continuous growth in the MSM. In conclusion, the isolated fungal species has the capacity to utilize glyphosate as the sole carbon and energy source and might be used in bioremediation of glyphosate-contaminated environments. However, molecular characterization would be needed for the precise identification of the isolate.

Keywords: Bioremediation, fungi, glyphosate, herbicide