Identifying Metabolites in Aspergillus heteromorphus and Magnaporthe grisea and the Overproduction of Cytochalasins

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Almost 10 million cancer-related deaths occur every year, with costs totaling $208.9 billion. Chemotherapy, the currently accepted treatment for cancer, causes significant economic losses, as the cost of cancer treatment exceeds the monthly economic output of developing countries by 313%, and causes further damage to patients' psychosocial well-being. Fungi provide a less expensive and more effective treatment than current chemotherapy by producing cytochalasins, a secondary metabolite that has been proven to specifically target malignant cancerous cells while maintaining minimal effects on healthy immune cells. The biosynthetic potential of unexplored fungi strains was investigated using genome mining to determine which strains would most likely produce cytochalasins. The results identified 4 strains as potential cytochalasin producers and indicated 15-20 biosynthetic gene clusters in each of these fungi, meaning that hundreds of metabolites should be produced but have not yet been reported. As a test system, samples of each fungus were grown and HPLC and LCMS tests were run. The weights of the metabolites reported by the LCMS graphs were investigated with Natural Product Atlas. Cytochalasins and other potential metabolites were found that exhibit cytotoxic properties and can be used in treatments for diseases like tuberculosis and liver disease. PCR and gel electrophoresis was performed on the genes in the cytochalasin biosynthetic pathway to induce the overproduction of cytochalasins. Further experimentation in vector transformation and purification of metabolites needs to be conducted to overexpress the metabolites that can be adapted to lower the cost and increase the effectiveness of cancer treatments.

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