Improving Aquilaria crassna callus Sesquiterpenoid Production Using MOFs

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Specialty metabolites used in food, medicine, pesticides, and fragrances are valuable in virtue of their unique properties, but they face challenges in production due to high costs associated with long farming times, large cultivation areas, and high biomass requirements. To overcome this, researchers have explored the applicability of nanospheres to increase metabolite production, however their non-selectivity limits their efficiency to an average of 6 times increase. In this study, Metal-Organic Frameworks (MOFs), known for their selective absorption properties, were employed in Aquilaria crassna callus growth systems to enhance sesquiterpenoid, a specialty metabolite's, production. Remarkable increases, up to 157 times, in the production of cedranone, a target sesquiterpenoid, were achieved. The success of this approach can be attributed to the selective adsorption properties of MOFs, as their pore matched the size of cedranone, and the incorporation of stress-inducing heavy metals. This resulted in a novel cost-effective, space-efficient, and scalable production process, with potential implications for revolutionizing metabolite cultivation. The findings of this study offer new insights into the use of MOFs for targeted metabolite production and highlights their potential as a promising nanomaterial for improving bioactive compound production. Further research in this area could open up new avenues for sustainable and economically viable production of specialty metabolites for various applications.

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