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Full Length Research Paper

Statistical optimization of cultural conditions by response surface methodology for phenol degradation by a novel *Aspergillus flavus* isolate

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Phenol is a hydrocarbon compound that highly pollutes the environment. *Aspergillus flavus* having high ability to degrade phenol was isolated. The fungus fully degraded phenol concentration of 100 mgl^{-1} in 72 h, 300 mgl^{-1} in 96 h, 500 mgl^{-1} in 120 h, 700 mgl^{-1} in 240 h, while 900 and 1000 mgl^{-1} needed more than 240 h. On the other hand, 2000 and 3000 mgl^{-1} was lethal to the fungal growth. Statistical designs of the multi-factorial experiment consisting of two serial designs (Plackett-Burman and Box-Behnken) were applied to optimize medium components and growth conditions to raise the fungus potency for phenol degradation and to reduce required time. The fungus achieved 100% (of 500 mgl^{-1}) phenol degradation in 99 h, after application of Plackett-Burman design. The design reduced required time for phenol degradation from 120 to 99 h. And after application of Box-Behnken design, the required time to complete phenol degradation became 97 h instead of 99 h. So the statistical programs raised the fungus efficiency by 20% and reduced required time to complete phenol degradation from 120 to 97 h. These results were applied for the bioremediation of the crude sewage containing phenol concentration of 0.7 mgl^{-1}, which was obtained from the main track of Makkah sewage, where *A. flavus* completed phenol degradation with optimized conditions in four hours. This efficiency proved the ability of this fungus to remove the phenolic compounds from pollution.

Key words: Statistical design, phenol degradation, *Aspergillus flavus*.