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 mg l\(^{-1}\) in 72 h, 300 mg l\(^{-1}\) in 96 h, 500 mg l\(^{-1}\) in 120 h, 700 mg l\(^{-1}\) in 240 h, while 900 and 1000 mg l\(^{-1}\) needed more than 240 h. On the other hand, 2000 and 3000 mg l\(^{-1}\) 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 mg l\(^{-1}\)) 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 mg l\(^{-1}\), 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*. 