A Hybrid of Harmony Search and Minimization of Metabolic Adjustment for Optimization of Succinic Acid Production

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ABSTRACT
Succinic acid has been favored by researchers due to its industrial multi-uses. However, the production of succinic acid is far below cell theoretical maximum. The goal of this research is to identify the optimal set of gene knockouts for obtaining high production of succinic acid in microorganisms. Gene knockout is a widely used genetic engineering technique. Hence, a hybrid of Harmony Search (HS) and Minimization of Metabolic Adjustment (MOMA) is proposed. The dataset applied is a core *Escherichia coli* metabolic network model. Harmony Search is a meta-heuristic algorithm inspired by musicians' improvisation process. Minimization of Metabolic Adjustment is used to calculate fitness closest to the wild-type, after mutant gene knockout. The result obtained from the proposed hybrid technique are knockout genes list and production rate after the deletion. This proposed technique is possible to be applied in wet laboratory experiment to increase the production of succinic acid in *E. coli*.