

Modeling and optimization of medium constituents for enhancement of lipase production from niger seed oil cake (*Guizotia abyssinica*) using artificial neural networks and genetic algorithms

Sarat Babu Imandi¹, Sita Kumari Karanam² and Hanumantha Rao Garapati³

¹Department of Biotechnology, GITAM Institute of Technology, GITAM University, India

²M.R.College of Pharmacy, India

³Department of Chemical Engg. & Biotechnology, Anil Neerukonda Institute of Technology and Sciences, Andhra University, India

A hybrid system of Artificial Neural Networks (ANN) and Genetic Algorithm (GA) was used to optimize the medium constituents to enhance the lipase production by *Yarrowia lipolytica* NCIM 3589 in solid state fermentation (SSF) using niger seed oil cake as the substrate. Different microbial metabolism regulating fermentation variables (initial moisture content of the substrate, glucose and urea) were used to construct a '3-5-1' topology of the ANN for identifying the nonlinear relationship between fermentation variables and enzyme yield. ANN predicted values were further optimized for lipase production using GA. The goodness of the neural network prediction (coefficient of R^2) was found to be 0.988. Improved enzyme yield could be achieved by this microbial strain in wide nutrient concentration range and each selected variable concentration depends on rest of the variable concentration. The usage of ANN-GA hybrid methodology has resulted in a significant improvement (25 %) in the lipase yield. The present study helps to optimize enzyme production and its regulation pattern by combinatorial influence of different medium constituents. Further, the information obtained in this study signifies its importance during scale-up studies. MATLAB 7.0 was used for implementing the ANN-GA and the MATLAB program developed for data fitting is included as the appendix.

saratbabuimandi@gmail.com