Bioprospecting of marine resources for biopolymer production

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West coast of India can be considered as important area for collecting diverse marine microorganisms with biopolymer producing capacity. In this attempt, 200 marine isolates from west coast of India was obtained, out of which one strain CSMCRI's *Bacillus licheniformis* PL26 was found to be potential for producing ε-polylysine and polyhydroxyalkanoate simultaneously in same fermentation medium. An efficient process was designed for simultaneous production of 0.2 g L^{-1} extracellular ε-polylysine utilizing *Jatropha* biodiesel waste residues as carbon rich source. The PHA produced by *Bacillus licheniformis* was found to be poly-3-hydroxybutyrate (P3HB). Further, in order to improve the ε-polylysine production, the carbon source was replaced with glucose which yielded 1.2 g L^{-1} ε-polylysine as oxygen transfer rate is very low in the medium containing crude glycerol. However, the developed process needs to be statistically optimized further for gaining still better product yield in an efficient manner. Therefore, an advanced modelling and optimization technique was applied to optimize medium parameters for enhanced ε-polylysine production by marine bacterium *Bacillus licheniformis*. The critical nutrients including glucose, yeast extract, magnesium sulphate and ferrous sulphate were incorporated in artificial neural networks (ANN) as input variables and ε-polylysine as the output variable. The ANN topology of 4-10-1 was found to be optimum upon training the model with feed-forward back propagation algorithm and on application of the developed model to particle swarm optimization resulted in 3.56 ± 0.16 g L^{-1} of ε-polylysine under the following optimal conditions: glucose, 34 g L^{-1}; yeast extract, 2.3 g L^{-1}; magnesium sulphate, 0.44 g L^{-1} and ferrous sulphate, 0.08 g L^{-1}. Thus, this optimization technique could significantly improve ε-polylysine by 196.7 %, as compared to un-optimized medium.

Distribution of ε-PL producing bacteria in sea water along west coast of India