Production, characterization and bioinformatics analysis of l-asparaginase from a new Stenotrophomonas maltophilia EMCC2297 soil isolate

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Abstract

An exhaustive screening program was applied for scoring a promising l-asparaginase producing-isolate. The recov ered isolate was identifed biochemically and molecularly and its l-asparaginase productivity was optimized experi mentally and by Response Surface Methodology. The produced enzyme was characterized experimentally for its cata lytic properties and by bioinformatics analysis for its immunogenicity. The promising l-asparaginase producing-isolate was selected from 722 recovered isolates and identifed as Stenotrophomonas maltophilia and deposited at Microbio logical Resources Centre (Cairo Mircen) under the code EMCC2297. This isolate produces both intracellular (type I) and extracellular (type II) l-asparaginases with about 4.7 fold higher extracellular l-asparaginase productivity. Bioinformat ics analysis revealed clustering of Stenotrophomonas maltophilia l-asparaginase with those of Pseudomonas species and considerable closeness to the two commercially available l-asparaginases of E. coli and Erwinia chrysanthemi.
Fourteen antigenic regions are predicted for Stenotrophomonas maltophilia l-asparaginase versus 16 and 18 antigenic regions for the Erwinia chrysanthemi and E. coli l-asparaginases. Type II l-asparaginase productivity of the test isolate reached 4.7 IU/ml/h and exhibited maximum activity with no metal ion requirement at 37 ÁC, pH 8.6, 40 mM aspara gine concentration and could tolerate NaCl concentration up to 500 mM and retain residual activity of 55% at 70 ÁC after half an hour treatment period. Application both of random mutation by gamma irradiation and Response Sur face Methodology that determined 38.11 ÁC, 6.89 pH, 19.85 h and 179.15 rpm as optimum process parameters could improve the isolate l-asparaginase productivity. Maximum production of about 8 IU/ml/h was obtained with 0.4% dextrose, 0.1% yeast extract and 10 mM magnesium sulphate. In conclusion l-asparaginase of the recovered Steno trophomonas maltophilia EMCC2297 isolate has characters enabling it to be used for medical therapeutic application

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