

EXTREMOPHILE BACTERIA UTILIZING NITRILE AS SOLE CARBON AND NITROGEN SOURCES

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Abstract

Nitriles are aliphatic and cyanide containing compounds R-CN. Nitriles are widespread in the environment as a result of biological and industrial activities. Naturally occurring nitriles are found in higher plants, bone oils, and insect. It been proven that microorganisms have the capacity to synthesize naturally occurring nitriles. Synthetic nitriles, have been used in the manufacture of herbicides such as 2,6-dichlorobenzonitrile and 3,5-dibromo-4-hydroxybenzonitrile and the synthesis of polymers, plastics, and organic solvents. The hydrolysis of nitrile involves two stepwise pathways with enzymes like nitrilases, amidases and nitrile hydratase. Very little information is available on the ecological impact of organic nitriles and their derivatives. It is highly conceivable that the direct discharge of wastewater containing some of these nitrile compounds could cause severe health hazards, since most of them are highly toxic and some are mutagenic and carcinogenic. Only a few microorganisms are able to metabolize nitrile compounds and their derivatives. The aim of this research is to assess extremophiles bacteria utilizing nitrile as the sole carbon and nitrogen by enzymatic reaction and to achieve this aim there was different activities such as screening and exploring diversity of extremophile bacteria from soil of soda lakes of Rift Valley on media enriched with butyronitrile and isobutyronitrile and identification by morphology and biochemical test. The reason why soda lake soils are used is because; a lot horticultural farming activities, is done around them so it is assumed that these bacteria that degrade nitriles was present there also due to less competition in extremophiles environment. Collected samples was serial diluted on 2.5ml isobutyronitrile and 2.5ml butyronitrile media both containing 2 μ l vitamin B 12 and 250ml lake water. Spread plating and sub culturing was done on both media and incubated at 40°C for 7 days. Sixty pure isolates were obtained, characterized morphologically and biochemically 30 isolate were gram positive cocci.4 gram positive rod, one Gram negative and 25 were gram positive with spiral shape and were classified as actinomycetes. Seven isolates utilized CMC, ten utilized cellulose, sixteen utilized chitin, forty three utilized starch, nine utilized Xanthan, twenty three utilized skimmed milk, three utilized lignin and twenty seven utilized tween 20. Most isolates were small white or cream in color with regular shape but there were also yellow color with irregular shape or filamentous. One isolate (BN02) utilized seven substrates. The aim of the study was achieved because novel enzymes which can be used as biocatalytic were found. Lipases enzyme can be produced to be used in the degradation of oil in water.