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# Characterization of Indigenous Bacteria Isolated From Soil around Kakrapar Atomic Power Station, Surat

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## Abstract

Studies by various atomic energy regulatory organizations have corroborated the presence of radionuclides in soils around atomic power stations. Several microorganisms have been reported to grow in presence of radionuclides and even extreme gamma-radiation, where *Deinococcusradiodurans* serves as the model bacterium. In the present study, soil sample was collected from the outer periphery of Kakrapar Atomic Power Station (KAPS), Surat, and characterized physico-chemically. The indigenous microbial load was determined on nutrient agar medium. The isolates obtained were then evaluated for their biochemical potential and ability to produce exopolysaccharides (EPS). These parameters served as the basis for the screening of the isolates. Out of 33 isolates, 6 were screened-in while 27were eliminated from further evaluation. EPS has been known to remediate radionuclides as well as heavy metals from the contaminated environments. Production of EPS on EPS agar medium by strain AM7, a gram-positive bacillus, was observed to be significant with respect to the amount of EPS produced in 48 h, as compared to other isolates. Further characterization and optimization is required for a potential application of the isolate in bioremediation of radionuclide containing waste.

## Introduction

Several bacteria have been reported to grow in presence of naturally occurring radionuclides (NOR) in soil, such as: U, Th, K, Ra, Pu, Tc, Cs, Sr and Ca[1]. The objective of this study was to cultivate and characterize the indigenous bacteria present in soil sample collected from the outer periphery of Kakrapar Atomic Power Station, Surat. The study also evaluated the ability of the isolates to produce exopolysaccharides (EPS).

## Materials and Methods

Indigenous bacterial load cultivation and growth characters were observed on nutrient medium. Of the 33 isolates obtained, 8 were screened-out owing to their slow growing ability. Biochemical characterization of remaining 25 isolates was carried out for evaluating the utilization of various

sugars, carbon and nitrogenous compounds. EPS production was determined on semi-syntheticmedium[2] containing (%w/v): sucrose (4.0), $NaNO_3$ (0.10), $MgCl_2 \cdot 7H_2O$ (0.02), $K_2HPO_4$ (0.05), $CaCl_2 \cdot 2H_2O$ (0.01), $NaMoO_4$ (0.005) and yeast extract (0.10). The extraction of EPS was in compliance with standard 1:3 (v/v) EPS broth:acetone method, with overnight incubation at 4±2°C.

## Results and Discussion

Bacterial load was evaluated on nutrient medium, 33 isolates were cultivated and subject to biochemical characterization for utilization of organic acids, nitrogenous compounds, qualitative production of amylases, lipases and proteases. Six most versatile organisms in terms of a wide range of biochemical potential were selected (**table 1**). These six isolates were investigated qualitatively for production of exopolysaccharides (EPS). Three isolates; AM1, AM3 and AM7 were found to be EPS producers from which AM7 demonstrated significant production within 48 h of incubation. Further characterization and optimization is required for a potent biotechnological application of the screened isolates, AM1 and AM7.

| CHARACTERISTIC | AM1 | AM3 | AM7 | AM12 | AM13 | AM19 |
|---|---|---|---|---|---|---|
| SIZE | Small | Large | Large | Large | Small | Large |
| SHAPE | Round | Round | Round | Round | Round | Round |
| MARGIN | Entire | Entire | Entire | Undulate | Entire | Undulate |
| ELEVATION | Flat | Flat | Umbilicate | Flat | Flat | Flat |
| SURFACE | Smooth | Smooth | Rough | Contoured | Contoured | Smooth |
| OPACITY | Semi-transparent | Translucent | Opaque | Semi-transparent | Opaque | Opaque |
| PIGMENTATION | Peach | Pale yellow | Nil | Nil | Lemon yellow | Orange |
| CONSISTENCY | Moist | Butyrous | Moist | Moist | Moist | Moist |
| GRAM'S REACTION | Gram-positive | Gram-positive | Gram-positive | Gram-positive | Gram-positive | Gram-positive |
| SHAPE | Round | Round | Rod | Rod | Round | Round |
| ARRANGEMENT | Single, diploid | Single, diploid | Chain | Single, chain | Single | Single, tetrad, cluster |
| EPS PRODUCTION* | ++ | + | ++ | - | - | - |

**Table 1: Growth and morphological characteristics of selected isolates**

*where; ++ excellent, + good, - no EPS

## References

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