



### Short Communication

## Biodiversity of Actinomycetes in Hypersaline soils of Kolhapur district and their screening as potential antibiotic producer, India

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### Abstract

Hyper saline Soil samples from different sites in Kolhapur district of Maharashtra were analysed over a period of one year for actinomycetes population. Microscopic, cultural, biochemical characters, pigmentation, cell wall analysis and spore morphology and other criteria were used to identify the Actinomycetes isolates. Members of genus *Streptomyces* were identified by MICRO-IS software<sup>1</sup>. Isolates other than *Streptomyces* genus were identified using Bergeys manual of systematic bacteriology<sup>2</sup>. The actinomycetes species identified are *Streptomyces* (37), *Streptoverticillum* (20), *Micromonospora* (15), *Nocardia* (13), *Microbispora* (08), *Actinoplanes* (5), *Planomonospora* (04), *Kitasatosporia* (3). Isolates were screened for antibacterial and antifungal activity by Agar overlay technique using two bacterial and four fungal species. Results indicated that the hyper saline soils are rich in biodiversity of actinomycetes, 4 species showed antifungal activity and 10 showed antibacterial activity. Present study indicated that the halophilic actinomycetes have a great potential to be an antibiotic producer and can be explored for antibiotic production.

**Keywords:** Hyper saline soil, actinomycetes, agar overlay, screening, antibacterial, antifungal, biodiversity.

### Introduction

Hyper saline habitats are typical extreme environments that include saline lakes, salterns, saline soils, hyper saline soils. Hyper saline soils are the soils for which the conductivity of the saturation extract is more than 18 mmhos/cm at 25<sup>o</sup> C<sup>1</sup>. As these soils contains 9 to 23 percent salts, these soils are reach in moderate halophiles<sup>2,3,4</sup>. Kolhapur district is one of the important southern district of Maharashtra states occupying an area of 7,685 sq.kms. Geographically Kolhapur district is divided in to twelve taluka regions, of which Shirol taluka is worstly affected by salinity.

It occupies 44,794 hectares of land, out of which 2021 hectares is hyper saline. Few researchers have carried out number of studies on soils derived from disused salterns, but saline deserts are unexplored<sup>5,6,7</sup>. In present study we analysed these soils for actinomycetes biodiversity and were screened for their potential as antibiotic producers.

### Material and Methods

Forty soil samples from 10 to 15 cm area were collected in plastic bags from hyper saline soils. From this 500 gm was used for physicochemical analysis and remaining 500 gm used for isolation of Actinomycetes. For the isolation Glycerol asparagine agar, Yeast extract sucrose agar, Sucrose nitrate agar, Bennets agar and coconut milk agar each inoculated with Nystatin 50 mg / ml and 15 % NaCl were used as suitable media. Total Actinomycetes population was determined by standard plate count method<sup>8</sup>. Plates were incubated at 28<sup>o</sup>C for 7 to 21 days.

Representative actinomycetes isolates were selected from different media. Selection was done on the basis of cultural and morphological characters without repetition of same Actinomycetes isolates. Biochemical characters, pigmentation, cell wall analysis<sup>9,10,11</sup>. Spore morphology by inclined coverslip technique<sup>11</sup>. Other characters were used to identify isolates to species level. The members of *Streptomyces* genus were identified by using MICRO-IS software<sup>12</sup> and Isolates other than *Streptomyces* genus was identified using Bergeys manual of systematic bacteriology<sup>13</sup>. All the isolates were screened for antibacterial and antifungal activity by Agar overlay technique<sup>13</sup>. Using two bacterial and four fungal pathogens.

### Results and Discussion

In all 105 actinomycetes were isolated on different media. Isolates identified belonged to eight different genera.

Table-1

Genus	Total number of isolates
<i>Streptomyces</i>	37
<i>Streptoverticillum</i>	20
<i>Micromonospora</i>	15
<i>Nocardia</i>	13
<i>Microbispora</i>	8
<i>Actinoplanes</i>	5
<i>Planomonospora</i>	4
<i>Kitasatosporia</i>	3

Actinomycetes genera isolated from hypersaline soils were Streptomyces, Streptoverticillium, Micromonospora, Nocardia, Microbispora, Actinoplanes, Planomonospora, Kitasatosporia.

Some researchers reported that Micromonospora was predominant in rivers, lakes and streams<sup>14,15</sup>. The actinomycetes that are found commonly in aquatic habitats are Streptomyces, Micromonospora, Actinoplanes, Nocardia, Thermoactinomyces. It was also reported that there was a wide range of organisms which grows in wide range of salt<sup>3,16,17</sup> Concentrations.

The composition of micro flora was generally the same in saline and non saline soils, except for particular species, which were absent from saline soils. The difference was the dominance of a particular species<sup>18</sup>. Most of the isolates appeared to be moderate halophiles with growth between 5 to 15 percent salt<sup>5</sup>.

Present study indicated that the genera Streptomyces, is more dominant in hypersaline soil followed by Streptoverticillium, Micromonospora, Nocardia, Microbispora, Actinoplanes, Planomonospora, Kitasatosporia.

Out of 105 isolates, 37 belonged to genus Streptomyces these are, Streptomyces albidoflavus, Streptomyces exfoliates, Streptomyces violaceus, Streptomyces rochei, Streptomyces albus, Streptomyces diastaticus, Streptomyces olivaceoviridis, Streptomyces griseoflavus, Streptomyces rimosus, Streptomyces microflavus, Streptomyces antibioticus, Streptomyces californicus, Streptomyces flaveolus, Streptomyces luridus, Streptomyces griseoluteus, Streptomyces xanthochromogenes, Streptomyces fradie, Streptomyces atroolivaceus, Streptomyces canus, Streptomyces graminifaciens, Streptomyces gelaticus, Streptomyces badius, Streptomyces alboflavus, Streptomyces fragilis, Streptomyces rameus, Streptomyces globosus, Streptomyces atratus, Streptomyces albopinus, Streptomyces bobili, Streptomyces Rangoon, Streptomyces albosporus, Streptomyces roseoflavus, Streptomyces cinnamomensis, Streptomyces tricolor, Streptomyces noursei, Streptomyces olivaceiseleroticus, Streptomyces fimbriatus.

Out of these Streptomyces albidoflavus, Streptomyces griseoflavus, Streptomyces alboflavus, Streptomyces rimosus showed antifungal activity against Aspergillus niger, Fusarium solani, Candida albicans, Cryptococcus. And Streptomyces rameus, Streptomyces albus, Streptomyces exfoliates, Streptomyces violaceus, Streptomyces fragilis, Streptomyces olivaceiseleroticus, Streptomyces diasticus, Streptomyces albidoflavus, Streptomyces graminifaciens, Streptomyces antibioticus showed antibacterial activity against Escherichia coli, Staphylococcus aureus.

## Conclusion

In present study i report the detail analysis of Actinomycetes in hyper saline soils. This indicated that hyper saline soils are rich in the biodiversity of actinomycetes and can be used as potential for antibiotic production.

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