

## Studies on Actinomycetes in Rankala Lake of Kolhapur City and their Screening as Potential Antibiotic Producer

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Water samples from different sites in Rankala lake of Kolhapur city, 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 Portyrata and Krichevsky (1992). Isolates other than *Streptomyces* genus were identified using Bergeys manual of systematic bacteriology by Williams *et.,al.*(1989). The actinomycetes species identified are *Streptomyces* (32), *Streptoverticillum* (28), *kineosporia* (23), *Sporichthya* (18), *Streptosporangium* (16), *Micromonospora* (17), *Nocardia* (14), *Microbispora* (11), *Spirillospora* (9), *Microbispora* (7), *Dactylosporangium* (6), *Actinoplanes* (5), *Planomonospora* (3), *Kitasatosporia* (1). Isolates were screened for antibacterial and antifungal activity by Agar overlay technique using two bacterial and four fungal species. Results indicated that the water from Rankala lake is rich in biodiversity of actinomycetes, 3 species showed antifungal activity and 13 showed antibacterial activity. It is the first study on microbiological aspect of Rankala lake. Present study indicated that the actinomycetes in Rankala Lake have a great potential to be an antibiotic producer and can be explored for antibiotic production.

**Key Words:** Rankala lake, Actinomycetes, Agar overlay, Screening, Antibacterial, Antifungal.

Actinomycetes is a diverse group of heterotrophic prokaryotes that occur in natural and man made environment. Kolhapur district is one of the important southern district of Maharashtra state occupying an area of 7,685 sq.kms. Rankala is a famous lake of Kolhapur city, but its microbiological importance is unexplored. The actinomycetes from fresh water habitats have been

studied by Erikson,(1941); Umbreit and McCoy, (1941), Al-Diwany *et.,al.*,(1978), Rowbotham and Cross,(1977). Their studies indicated that the aquatic environments are rich in diverse group of actinomycetes in lakes, and these are found to be good sources of bioactive compounds. They are important producers of antibiotic and other secondary metabolites and therefore have been subject of interest to scientific and industrial community. Besides these they are found to be the good producers of several enzymes of industrial, pharmaceutical and medical importance. Because of wide scale importance of actinomycetes the terrestrial habitats are screened with the hope of getting new actinomycetes with high potential. In view of this background, the present investigation dealt with the studies on actinomycetes in Rankala lake the fresh water reservoir.

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## MATERIALS AND METHODS

Water samples from fifty different sites were collected in sterile conical flasks. From this actinomycetes were isolated on Glycerol asparagine agar, Yeast extract sucrose agar, Sucrose nitrate agar, Bennets agar and coconut milk agar each inoculated with Nystatin 50 ug / ml and were used as suitable media. Total actinomycetes population was determined by standard plate count method as per Collins *et al.*, (1995). Plates were incubated at 28 °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 as per Backer *et al.*, (1965), Staneck and Robert, (1974). And spore morphology by inclined coverslip technique as per Gibbs and Shapten (1968) and other characters were used to identify isolates to species level. The members of Streptomyces genus were identified by using MICRO-IS software<sup>1</sup> and Isolates other than Streptomyces genus were identified using Bergeys manual of systematic bacteriology<sup>11</sup> and as per Williams *et al.*, (1983). All the isolates were screened for antibacterial and antifungal activity by Agar overlay<sup>11</sup> as described by Williams *et al.*, (1989), technique. using two bacterial and four fungal pathogens.

**Table 1.** In all 173 actinomycetes were isolated on different media. Isolates identified belonged to 13 different genera

Genus	Total number of isolates
<i>Streptomyces</i>	32
<i>Streptovorticillium</i>	28
<i>Kineosporia</i>	23
<i>Sporichthya</i>	18
<i>Streptosporangium</i>	16
<i>Nocardia</i>	14
<i>Micromonospora</i>	11
<i>Spirillospora</i>	09
<i>Microbispora</i>	07
<i>Dactylosporangium</i>	06
<i>Actinoplanes</i>	05
<i>Planomonospora</i>	03
<i>Kitasatosporia</i>	01

## RESULTS AND DISCUSSION

Actinomycetes genera isolated from Rankala lake were *Streptomyces*, *Streptovorticillium*, *Kineosporia*, *Sporichthya*, *Streptosporangium*, *Nocardia*, *Micromonospora*, *Spirillospora*, *Microbispora*, *Dactylosporangium*, *Actinoplanes*, *Planomonospora*, *Kitasatosporia*.

Erikson, (1941), Jiang and Xu (1996) reported that *Micromonospora* was predominant in rivers, lakes and streams. The actinomycetes that are found commonly in aquatic habitats are

*Streptomyces*, *Micromonospora*, *Actinoplanes*, *Nocardia*, *Thermoactinomyces*. Silvey and Roach, (1981), Cross and Al Diwany, (1981), reported the common genera that occurs in aquatic habitats. Jiang and Xu, (1996) reported presence of these genera in Yunan lake in China. They also reported that the composition of micro flora was generally the same, except for particular species, which were absent in some water bodies. The difference was the dominance of a particular species.

Present study indicated that the genera *Streptomyces*, is more dominant in Rankala lake followed by *Streptomyces*, *Streptovorticillium*, *Kineosporia*, *Sporichthya*, *Streptosporangium*, *Nocardia*, *Micromonospora*, *Spirillospora*, *Microbispora*, *Dactylosporangium*, *Actinoplanes*, *Planomonospora*, *Kitasatosporia*.

Out of 173 isolates, 32 belonged to genus *Streptomyces* these are, *S. albidoflavus*, *Streptomyces cellulosa*, *Streptomyces luridus*, *Streptomyces peuceticus*, *Streptomyces albus*, *Streptomyces diastaticus*, *Streptomyces olivaceoviridis*, *Streptomyces griseoflavus*, *Streptomyces rimosus*, *Streptomyces microflavus*, *Streptomyces antibioticus*, *Streptomyces torulosus*, *Streptomyces cinnamonesis*, *Streptomyces rameus*, *Streptomyces griseoluteus*, *Streptomyces griseoruber*, *Streptomyces fradie*, *Streptomyces acrimycini*, *Streptomyces flaveolus*, *Streptomyces graminifaciens*, *Streptomyces atratus*, *Streptomyces badius*, *Streptomyces alboflavus*, *Streptomyces fragilis*, *Streptomyces rameus*, *Streptomyces viridiviolaceus*, *Streptomyces erythrogriseus*, *Streptomyces praecox*, *Streptomyces bobili*, *Streptomyces antimycoticus*, *Streptomyces albosporus*, *Streptomyces roseoflavus*.

Out of these *Streptomyces albidoflavus*, *Streptomyces griseoflavus*, *Streptomyces albobiflavus*, *Streptomyces antimycoticus* showed antifungal activity against *Aspergillus niger*, *Fusarium solani*, *Candida albicans*, *Cryptococcus*. And *Streptomyces atratus*, *Streptomyces albosporus*, *Streptomyces exfoliatus*, *Streptomyces viridiviolaceus*, *Streptomyces torulosus*, *Streptomyces olivaceiseleroticus*, *Streptomyces diasticus*, *Streptomyces albidoflavus*, *Streptomyces badius*, *Streptomyces antibioticus* showed antibacterial activity against *Escherichia coli*, *Staphylococcus aureus*,

In present study I report the detail analysis of actinomycetes in Rankala lake of Kolhapur city. This is the first report on Microbiological aspect of Rankala lake. Study indicated that Rankala lake is rich in the biodiversity of actinomycetes and can be used as potential for antibiotic production. Besides already reported genera in aquatic habitats other genera found in Rankala lake are *Dactylosporangium*, *Kitasatosporia*, *Spirillospora*, *Streptosporangium*, *Sporichthya*, *Kineosporia*, *Streptoverticillum*. However *Thermoactinomyces* was found to be absent.

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