

A Recent Study of Actinomycetes from different Regions of India

Bhoomi N Patel^{a*}, Priti Patel^a Gayatri Patel^a

^aGanpat University-Mehsana Urban Institute of Sciences, Kherva, Gujarat, India.

Abstract

Actinomycetes are gram positive bacteria of mycelial origin that produce a wide variety of medically and industrially important compounds. They are crucial because they generate a large range of beneficial secondary metabolites. This article includes the study of Actinomycetes from different region of India. Based on the activity of particular species there activity are different and sample site is different so the chances of novel Actinomycetes is high.

Keywords: *Actinomycetes, microorganisms, Streptomyces, Actinobacteria.*

INTRODUCTION:

Actinomycetes are thoroughly dispersed in nature and are identified to produce special secondary metabolites. If we look at the overall genera in nature, Actinomycetes on their own produce 70-80% of the present antibiotics. In that, Streptomyces has been recognized to produce 74% of antibiotics. Several Actinomycetes have potential antibacterial properties that could be used to combat human infections. This has increased the need for fresh pharmaceuticals and chemical substances in the field of pharmacology[1]. Even extreme habitats such as scorching heat, arid deserts, high salinity, hay, seawater, mangrove sediments, caves, etc., also don't pose a threat or challenge for Actinomycetes to flourish. More than half of the naturally occurring antibiotics that have been identified up to this point have come from Streptomyces, which are also regularly recognised as prolific creators of fresh bioactive metabolites. There are several ways to separate desirable uncommon Actinomycete genera from their natural habitats [2]. The current paper is an attempt to present a summary through systematic research carried out on the Actinomycetes genera obtained from different locales and discusses potential use for these organisms as novel bioactive compounds.

RESEARCH ON RARE ACTINOMYCETES IN SOIL

Streptomyces are widespread in natural soil habitats and make up a sizable portion of the Actinomycetes population as a whole. In order to preferentially isolate a rare genus of Actinomycetes, methods are used that either increase the desired Actinomycetes in natural habitat samples (enrichment) or remove the undesirable Streptomyces and other pollutants from the isolation media (pre-treatment). A better chemotactic technique for enrichment was developed by Hayakawa et al. (1991c) as a result of the considerable chemotactic reactivity of Actinomycete zoospores to -collidine, which improves recovery of Actinoplanes spp. and Dactylosporangium spp. from various soil samples [1].

ISOLATING OF ACTINOMYCETES FROM THE SEDIMENTS OF MANGROVE FOREST- PICHAVARAM, SOUTH INDIA.

5 distinct sites in the Pichavaram mangrove forest yielded a total of 13 Actinomycetes, and numerous experiments were carried out to determine their antibacterial effectiveness against 10 bacterial species. These experiments demonstrated that Actinomycetes produce antibacterial substances that are effective against bacterial species that are both Gram-positive and Gram-negative [3]. There are a number of significant chemical

*Corresponding Author
E-mail address: bnp04@ganpatuniversity.ac.in

compounds found in the sediments of the Pichavaram mangroves that have medicinal and antibacterial uses. These antibiotics have the capacity to treat a range of diseases[3].

The findings of this study provide a scientific way to employ the sediment from mangroves as an antibiotic components, which is widely used to numerous microbial infections. It is also possible to use these naturally existing.

RESEARCH ON THE STREPTOMYCES SPECIES FOUND IN DIFFERENT ALTITUDES IN NEPAL

The particular geographical features of Nepal have given soil microbes a strong potential to produce secondary metabolites that are valuable in the clinical setting and are produced by some species, such as Streptomyces. [2].

For the isolation of novel Streptomyces species soil sample is collected by lading in the soil at different area of Nepal. Transfer this soil in laboratory after packed in sterile container. Before isolation allow it to air dry at 45°C to eliminate other contaminate microorganisms[2].

Streptomyces isolate from the Nepalese soil they provide a novel antimicrobial properties and also they are diverse based on molecular phylogeny, it is recognized that more than 7,000 antibiotic produced by Streptomyces [2].

STUDY OF ACTINOBACTERIA FROM NORTH-EAST INDIA

In different region they are different in biodiversity based on climate and altitudinal variations and same type of biodiversity observed in North-East India, resulting in ecological habitats are differ. India flora and founa have a broad spectrum in a region of India- Malayan and Indo-Chinese bio geography so they are reachest source where the chances to isolate novel Actinomycetes.

Among Actinobacteria, they have ability to produce more than one antibiotics for example nystatin, streptomycin, tetracyclin and they are most prominent antibiotic-producing family, "Streptomyces" [3].

In a research paper show that they isolate a 107 actinobacteria among them they find 77 isolates which have an antagonistic activity, when we can apply these bacteria in a large field so there are chances to give adverse effect on plants and crops also so before applying large scale it is mandatory to applied in small scale, change the environment condition if they have not change there activity then we can go for conclusion [3].

RARE ACTINOMYCETES FROM THAI CAVE SOILS

Thailand's Thai Cave region is where soil samples are taken. They find that the selected isolates have anti-

cancer, antibacterial and antifungal activity PNK470 and PT708 they are match with genus Spirillospora and Nonomuraea. Spirillospora have very slow growth compare to other soil microorganism due to this it is difficult to isolate, there are very less work done on these bacteria. For isolation of Actinomycetes pretreatment is mandatory to remove unrequired microorganisms from the medium also give phenol treatment to remove particular type of microorganisms but in some cases when phenol is applied so there are chances your desired bacteria which is sensitive from phenol which have higher capacity to produce product of your interest so we can not able to isolate phenol sensitive bacteria so for these pre-treatment is best option [4].

Based on their morphological characteristics and isomeric forms, a total of 377 Actinomycetes were isolated and divided into two groups (Streptomyces and rare Actinomycetes). Amount of heat-labile Dry heat treatment may result in a reduction in Streptomyces, effectively selecting for rare Actinomycetes that are more heat resistant. Streptomyces constituted the majority (55.44%) of the total isolates, whereas the rare Actinomycete group comprised the remaining isolates (44.56%). [6]

STUDY OF RARE ACTINOMYCETES FROM ALPINE HABITATS ON THE QINGHAI-TIBETAN PLATEAU

For these selected isolate soil sample is collected from the different region of Qinghai-Tibetan plateau, this is a selected sites were we can find the rare Actinomycetes. The study demonstrates the potential opportunities for discovering novel bioactive chemicals that will benefit the medical fields [5].

STUDY OF TERRESTRIAL ACTINOMYCETES FROM DIVERSE LOCATIONS OF UTTARAKHAND, INDIA

According to the history of modern drug discovery techniques, herbal sources have historically been the primary source of new skeletons[8]. The emphasis today is on discovering uncommon and understudied ecosystems[9]. The findings of this investigation clearly support the idea that the quantity of Actinomycetes that could be counted varied dramatically with altitude. Actinomycetes have been found in the highest viable counts in valleys that are surrounded by mid- and high-altitude hills. Actinomycetes species that are distant from lowlands, midhills, and highhills has a significant capacity to create chemicals with particular antibacterial activities.[6].

Co-culture is a useful method for finding natural goods. In liquid culture, a natural pair of Actinomycetes and MACB gathered and displayed metabolic alterations.

It's important to note that after the co-aggregated Actinomycetes and MACBs were once more isolated from the soil, there were no evident morphological differences among colonies of the same strain. The results demonstrate that there is a stochastic likelihood of discovering colonies with aggregated Actinomycetes and MACB, suggesting that the two may live and interact in the soil environment. [7].

CONCLUSION

The current study's findings provide a scientific application for rare Actinomycetes species that have been extracted from diverse understudied ecosystems because they have antibacterial and therapeutic characteristics and are frequently utilised to treat a variety of microbial-based diseases. Rare Actinomycetes is difficult to isolate because they have required more time and they are rare in the environment. So for isolation of these Actinomycetes selected a different environments like rocky place, marine environment, salty environment, based on different types of environmental conditions so they have high chances to isolate a novel rare Actinomycetes and they are also diverse based on molecular bases and their activity. Further, we can conclude that such exploitation may be a means of ensuring the success of natural antimicrobials as a substitute for synthetic antimicrobial drugs.

REFERENCES:

- M. Hayakawa, "Studies on the Isolation and Distribution of Rare Actinomycetes in Soil," *Actinomycetologica*, vol. 22, no. 1, pp. 12–19, 2008, doi: 10.3209/saj.saj220103.
- K. Khadayat et al., "Molecular Identification and Antimicrobial Potential of Streptomyces Species from Nepalese Soil," *Int. J. Microbiol.*, vol. 2020, 2020, doi: 10.1155/2020/8817467.
- P. Sharma and D. Thakur, "Antimicrobial biosynthetic potential and diversity of culturable soil actinobacteria from forest ecosystems of Northeast India," *Sci. Rep.*, vol. 10, no. 1, pp. 1–18, 2020, doi: 10.1038/s41598-020-60968-6.
- N. Nakaew, W. Pathom-aree, and S. Lumyong, "Generic Diversity of Rare Actinomycetes from Thai Cave Soils and Their Possible Use as New Bioactive Compounds," *Actinomycetologica*, vol. 23, no. 2, pp. 21–26, 2009, doi: 10.3209/saj.saj230201.
- A. Ma et al., "Phylogenetic and Physiological Diversity of Cultivable Actinomycetes Isolated From Alpine Habitats on the Qinghai-Tibetan Plateau," *Front. Microbiol.*, vol. 11, no. October, 2020, doi: 10.3389/fmicb.2020.555351.
- "Antibacterial Activity of Actinomycetes Isolated from Foothill Soils of Shivalik Range."
- M. Kato, S. Asamizu, and H. Onaka, "Intimate relationships among actinomycetes and mycolic acid-containing bacteria," *Sci. Rep.*, vol. 12, no. 1, pp. 1–14, 2022, doi: 10.1038/s41598-022-11406-2.

