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TO SCREENING THE PLANT GROWTH PROMOTING STRAINS FROM MANGROVE RHIZOBACTERIA

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ABSTRACT

The woody plants known as mangroves are found in tropical and subtropical scopes where the land meets the water. In the intertidal zone of marine waterfront environments or estuarine edges, mangroves are "a tree, bush, palm or ground greenery, frequently surpassing one half meter in level, and which typically develops above mean ocean level". Except for the way that ground plants are probably going to be viewed as mangrove colleagues instead of genuine mangroves, this arrangement is fitting. As in "mangrove tree" or "mangrove fauna," "mangrove" can likewise be utilized as a descriptor. Flowing timberlands, waterfront forests, and sea tropical jungles are terms that have been utilized to depict mangrove woods.

KEY WORDS: Plant Growth, Strains, Mangrove, Rhizobacteria, Eenvironments

INTRODUCTION

Mangroves are seaside environments that can be tracked down overall in tropical and subtropical regions. Mangroves are tracked down in America, Africa, Asia, and Oceania. They are tracked down in the temporary zones between land, ocean, and streams. Around 25% of the world's shore and 75% of tropical shorelines have mangrove vegetation. Mangrove woodlands and all that lives there are based on top of mangrove dregs. Mangrove daily routine necessities particular transformations to experience in areas that at times flood with ocean water. Since mangroves make up under 1% of the tropical woods and under 0.4% of the world's all out timberland region, they may be considered a slight green line of vegetation that encompasses coasts and estuaries. They cover around 1,52,000 km2 and are situated in 123 countries and domains.

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ADAPTATIONS TO SALINITY

Mangrove backwoods' efficiency and development are affected by saltiness, which is impacted by flowing floods, geology, hydrology, and environment. It can likewise essentially influence how various species rival each other. In many occasions, saltiness slopes are the primary component that makes sense of how different plant species are conveyed inside the mangal. Lower salinities for the most part bring about lusher mangrove vegetation. Notwithstanding, low saltiness connected to delayed flooding speeds up the degeneration of mangroves by lessening cell turgor and breath. Subsequently, the plants should have the option to endure some saline. Albeit genuine mangroves (such Avicenia sp. furthermore, Rhizophora sp.) may deal with more saltiness than non-mangroves, there are contrasts in their defenselessness to saltiness. For example, seedlings of Rhizophora mucronata fill better in salinities of 30 g/L, however R. apiculata fills better in salinities of 15 g/L. While S. lanceolata can deal with salinities of up to 5% seawater, Sonneratia alba can flourish in conditions that are somewhere in the range of 5% and half seawater. Low saltiness is important for mangrove seedlings, yet as they mature, they become more lenient toward salt.

MANGROVES CONTAIN A VARIETY OF MICROORGANISMS.

Mangroves are unmistakable tropical intertidal environments that are home to a wide assortment of sea-going and land animals. This biological system's ideal spot at the progress between the earthly and marine conditions advances the improvement of different microorganisms.

BACTERIA

Debris takes care of numerous bacterial populaces, every one of which helps the mangrove climate another way. In the mangrove biological system, these microscopic organisms do various capabilities, including photosynthesis, nitrogen obsession, methanogenesis, agarolysis, creation of anti-infection agents and proteins (arylsulphatase, L-glutaminase, chitinase.

ACTINOMYCETES

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Actinomycetes that produce anti-toxins can be secluded from the mangrove climate. Also, actinomycetes related with mangroves that have adversarial potential have been inspected.

FUNGI

As to variety of marine parasite in mangroves, a ton of spotlight has been put on the 450 types of commit marine organisms that live on wood, representing the greater part of them. Mangrove woodlands produce a lot of garbage, including leaf litter, woody trash, and inflorescence, causing them an ideal living space for some microbes that to rely upon debris . Therefore, processing of junk includes immense parasitic populaces. There is boundless development of filamentous growth on the outer layer of mangrove woody litters, as per a few distributions. One hundred fifty animal types are just tracked down on the decaying mangrove wood, aeronautical roots, and seedlings. The mangrove-abiding growths have been analyzed and are known as "manglicolous organisms," which have a new report of fossil record from the west shoreline of India.

ENZYMES

Catalysts are biocatalysts those utilization synthetic cycles to change the substrate into items. They give a particular job and enliven the responses by offering substitute, less-vigorous initiation pathways. These are the essential structure blocks of biochemical cycles, and they are utilized in an assortment of food handling areas. Chemicals are intense and particular impetuses that are crucial for life. Under ideal conditions, chemicals are single-chain or multi-chain proteins that capability as natural impetuses and can accelerate a specific biochemical response. From single cells to multicellular people, they are available in essentially all living things. Because of two critical benefits over creature and plant catalysts, microbial chemicals have become exceptionally famous among these assorted sources. Catalysts can first and foremost be produced in tremendous amounts inside the obliged reality for monetary development. Microorganisms are a strong hotspot for the modern blend of many proteins.

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ALKALOPHILES

Especially in association with supplements, metal particles, and temperature, numerous microorganisms exhibit more than one ideal pH for their development. Microorganisms known as alkaliphiles flourish or foster best at pH levels higher than 9.0, as often as possible somewhere in the range of 10.0 and 12.0, yet they can't develop at unbiased pH or beneath 6.0. Alkaliphiles and haloalkaliphiles are the two significant physiological subgroups of microorganisms. For development, alkaliphiles need a basic pH of 9.0 or above, with an optimal pH of around 10.0. Haloalkaliphiles, then again, need both a high saltiness of up to 33 percent NaCl and a basic pH of 9.0. Regular soluble settings incorporate carbonate springs, basic soil, and soft drink lakes, all of which have pH values somewhere in the range of 8.0 and 11.0 because of the great centralization of sodium salts that are delivered by dissipation.

HALOPHILE BIOLOGY

The expression "halophilic microorganisms" (otherwise called "salt-cherishing") alludes to microorganisms that need salt (NaCl) to develop. Halophilic microorganisms incorporate microscopic organisms, archaea, and eukarya. Halophiles live in hypersaline conditions that are normal all through the world's numerous districts, like pungent lakes, salt dish, or salt swamps. Halophiles can be inexactly parted into two gatherings: moderate halophiles and outrageous halophiles, in view of the salt focus expected for ideal development. Extremophiles might endure salt centralizations of 0 to 25 percent (w/v), while moderate halophiles expect 3 to 15 percent (w/v) for development. Various sorts of halophilic microbes can be found in a wide range of phylogenetic subgroups, most of which are individuals from the family Halomonadaceae (Class: Gamma proteobacteria). To stay away from NaCl from the climate diffusing into the cells and make due in the hypersaline climate, halophiles have two primary versatile cycles.

ALKALIPHILE TYPES

Alkaliphiles (otherwise called alkalophiles) and soluble base open minded species are the two essential classifications of antacid adjusted microorganisms. The expression "alkaliphiles" (got from the Arabic words "soluble base," and that implies soft drink debris, and "phile," and

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that means to cherish) is frequently held for microorganisms that truly require antacid circumstances for their ideal improvement rate, which is seen somewhere around two pH units above impartiality.

Microorganisms that are alkaliphilic can flourish in neutrophilic settings and specifically cruel environments found in nature. As per the flow circumstance, alkaliphilic microbes have additionally been found in remote ocean silt taken from the Mariana Channel at profundities of up to 10,898 m.

HALOPHYTIC MICROORGANISMS AND THEIR CLASSIFICATION

Contingent upon how much salt they need to develop, halophilic microorganisms can be separated into four classifications: (i) outrageous halophiles, which need 3.5-5 M NaCl; (ii) moderate halophiles, which can develop at 0.5-3.5 M NaCl; (iii) powerless halophilies, which need 0.3-0.5 M of NaCl; and (iv) halotolerant, which needn't bother with salt to develop yet A class of halophilic microorganisms known as reasonably halophilic microbes can flourish in conditions containing somewhere in the range of 3 and 15 percent sodium chloride. The biology, physiology, natural chemistry, and hereditary qualities of a heterogeneous gathering of microorganisms from a few genera, including Halomonas and Salinivibrio, have been inspected. From over 20% (w/v) to immersion, salt focuses are great for the development of incredibly halophilic microorganisms. For their development and improvement, they can blend an assortment of hydrolytic catalysts, including amylase and lipase.

RESEARCH METHODOLOGY

Isolation of PGPR (Plant Growth Promoting Rhizobacteria) from mangroves

Study area

Three enormous marine worlds—the Indian Ocean, the Arabian Sea, and the Bay of Bengal—join at the research locations in Kanyakumari. The Manakkudi estuary is situated at 8.1160 latitude and 77.4882 longitudes. Rajakkamangalam is situated at 8.0926 latitude and 77.5032 longitudes, which puts it even closer to Kanyakumari.

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The samples for the current experiment were taken from the mangrove plants' rhizosphere soil at the estuaries of Manakkudi and Rajakkamangalam. Rhizosphere soil samples were taken from the halotolerant plants Rhizophora and Avicenia at these two sites.

Screening of bacteria from mangroves

Following sample collection, bacterial strains were tested on several media, including Pikovskoyas agar, chitinase agar, skim milk agar, and carboxyl methyl cellulose agar, for their various enzyme activities, including phosphatase, chitinase, protease, and cellulase, respectively.

RESULTS AND DISCUSSION

Screening of plant growth promoting strains from mangrove rhizobacteria

Ten different types of morphologically distinct colonies were isolated from the soil of the mangrove rhizosphere for this study. The isolated bacteria were tested for characteristics that encourage plant growth, including the synthesis of IAA, siderophores, antimicrobial activity, and cell wall-degrading enzymes (protease, cellulase, and phosphatase) that can be dissolved in the appropriate medium. Ten separate bacterial isolates from the screened bacterial strains were found to be plant growth-promoting rhizobacteria, but only one of these strains was found to promote maximal zone development. This strain was then the focus of additional experimental testing.

Identification of screened bacterial strains

The standard keys of Bergy's Manual of Determinative Bacteriology were used to identify the mangrove rhizobacterial strains based on the appearance of morphological, physiological, and biochemical properties (Tables 1).

16S rRNA gene sequence analysis

Using the 16S rDNA universal primers, the 16S rRNA gene of the mangrove rhizobacterial strains was amplified using PCR, and both strands were sequenced. The 16S rRNA gene sequences found in the RDP database (http://rdp.cme.msu.edu) were compared to the

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sequences of the other genes. Sequence analysis showed that the strains were closely related to the genus of their respective bacterial strains phylogenetically. Bacillus sonorensis BH 3, Bacillus cereus BH 2, Pseudomonas putida BH 4, and Pseudomonas plecoglossicida BH 5 were identified as mangrove rhizobacterial isolates through NCBI. BLAST analysis of the 16S rRNA gene sequence revealed that isolate Bacillus cereus BH 2 has 100 percent sequence similarity (Accession number - KU215676), Bac (Accession number – KX092007) Sequence similarity between Halobacillus trueperi SS. SNC 01 and Oceanobacillus iheyensis SS. SNC 03 is 98 percent (Accession number: MF175362), 97 percent for Halobacillus dabanensis, and 97 percent for Halobacillus trueperi (Accession number – MF192762) SS Cloacibacterium normanense SNC 04 (Accession number: MF322524) and Bacillus flexus SS share 98% of their amino acid sequences. With its related strains, SNC 05 (Accession number: MF347994) showed a higher similarity score with a 97 percent sequence similarity. Despite the isolates' high levels of similarity, the dendrogram created using their phylogenetic relationships showed that each isolate was clearly assigned to a different cluster. Figures 1-9 compare and illustrate the outcomes of the identification (Gene sequence and phylogenetic tree) of the isolates using various techniques.

Table 1: Biochemical characteristics of strains from Manakkudi

Biochemical characters	***Bacillus cereus***	***Bacillus sonorensis***	***eudomonas putida***	***Pseudomonas plecogossicida***	***Bacillus licheniformis***
Indole	Negative	Negative	Negative	Negative	Negative
Methyl Red	Negative	Positive	Negative	Negative	Negative
Voges Proskauer	Positive	Positive	Negative	Negative	Positive
Citrate	Positive	Positive	Positive	Positive	Positive
Motility	Positive	Positive	Positive	Positive	Positive
Glucose	Positive	Positive	Positive	Negative	Positive
Fructose	Negative	Positive	Negative	Negative	Positive
Galactose	Negative	Positive	Negative	Negative	Positive

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Lactose	Negative	Positive	Negative	Negative	Positive
Maltose	Negative	Positive	Negative	Negative	Positive
Sucrose	Positive	Positive	Negative	Negative	Positive
Mannitol	Negative	Positive	Positive	Positive	Negative
Oxidase	Negative	Negative	Positive	Positive	Positive
Urease	Negative	Positive	Negative	Negative	Negative
Gelatin	Negative	Positive	Negative	Negative	Negative
Nitrate Reductase	Variable	Positive	Negative	Positive	Positive

Fig. 1 Phylogenetic tree of *Bacillus cereus*

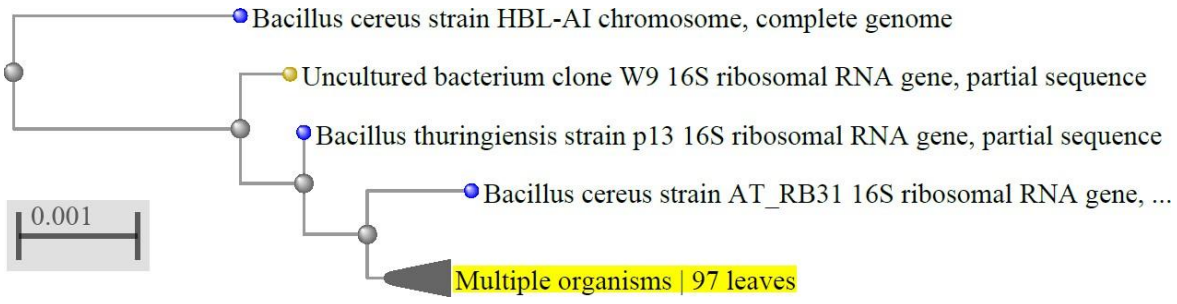

Fig.2 Phylogenetic tree of *Bacillus sonorensis*

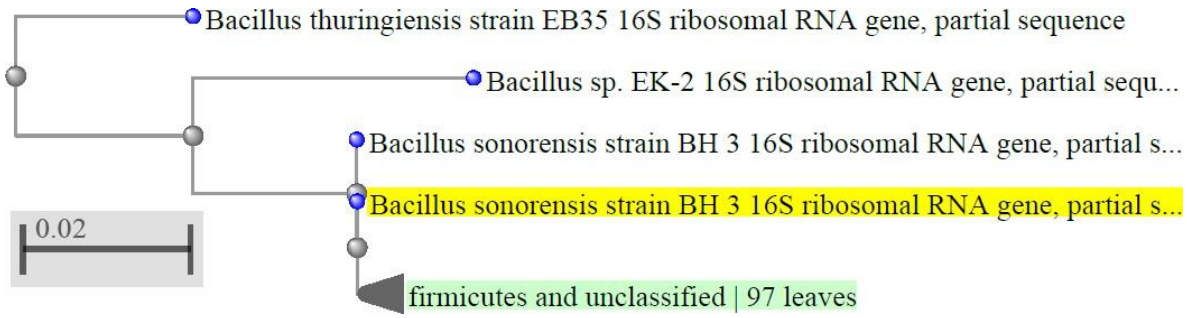

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Fig. 3 Phylogenetic tree of *Pseudomonas putida*

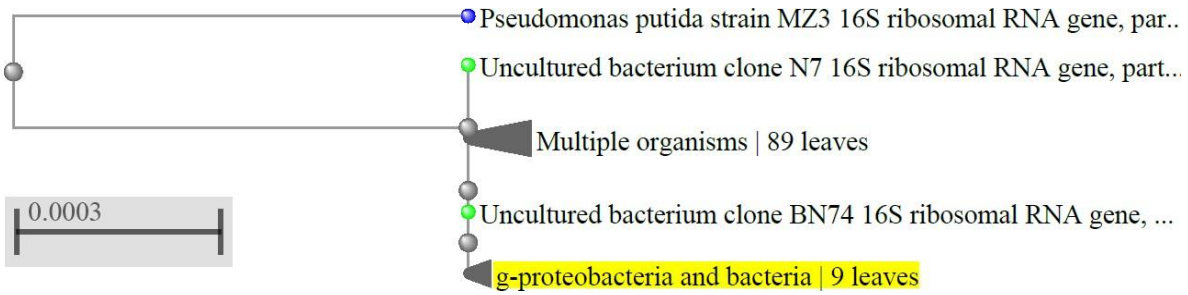

Fig. 4 Phylogenetic tree of *Pseudomonas plecoglossicida*

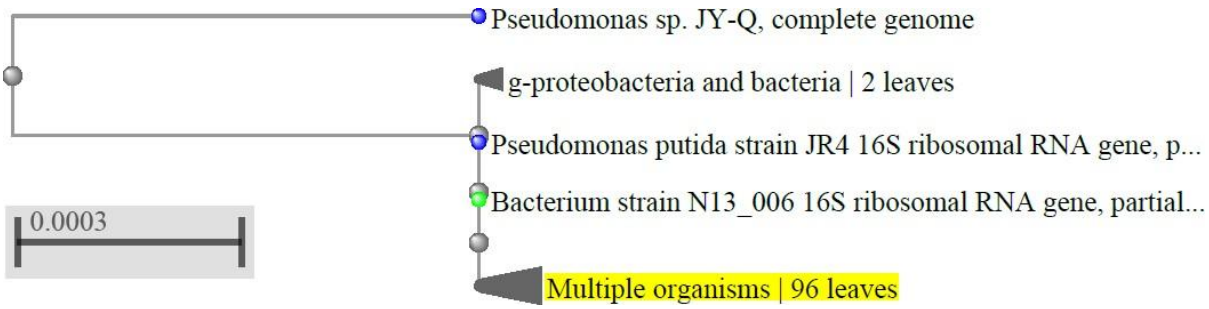

Fig. 5 Phylogenetic tree of *Bacillus licheniformis*

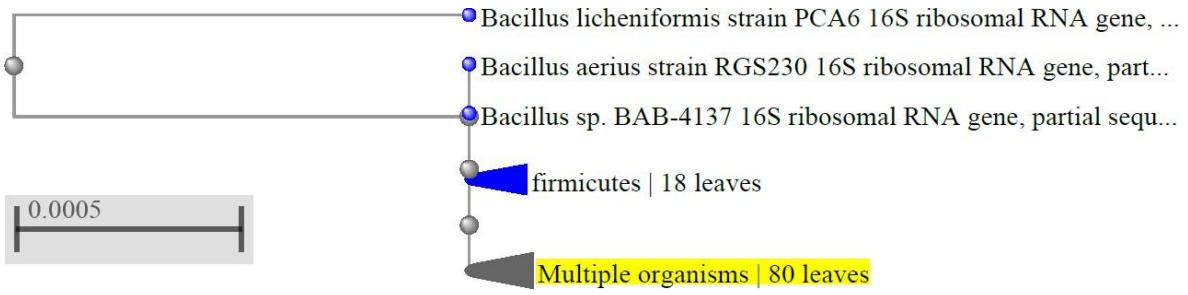

Fig. 6 Phylogenetic tree – *Halobacillus trueperi*

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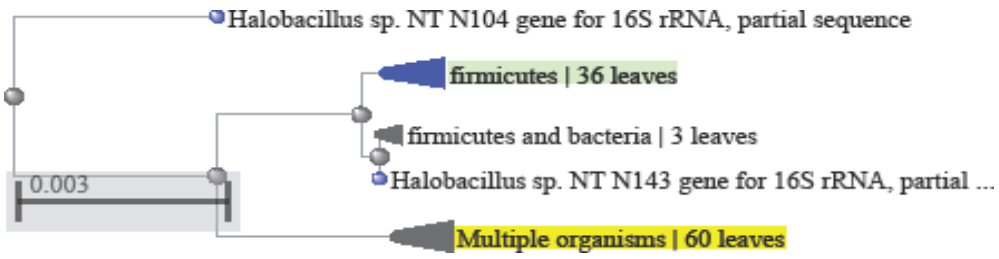

Fig.7 Phylogenetic tree of *Oceanobacillus iheyensis*

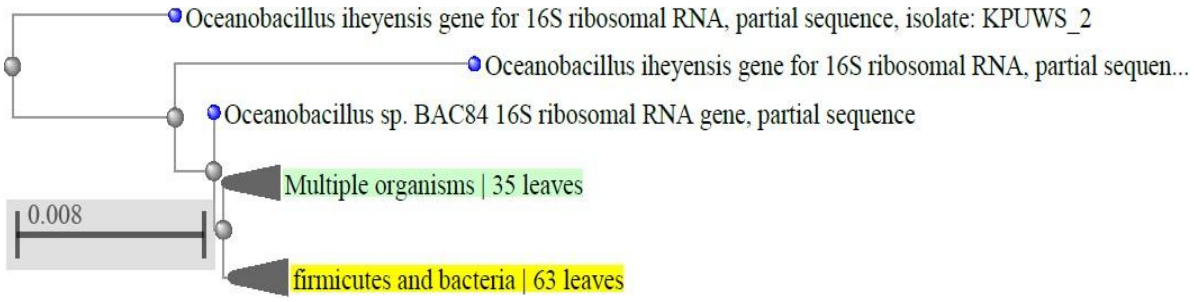

Fig. 8 Phylogenetic tree of *Cloacibacterium normanense*

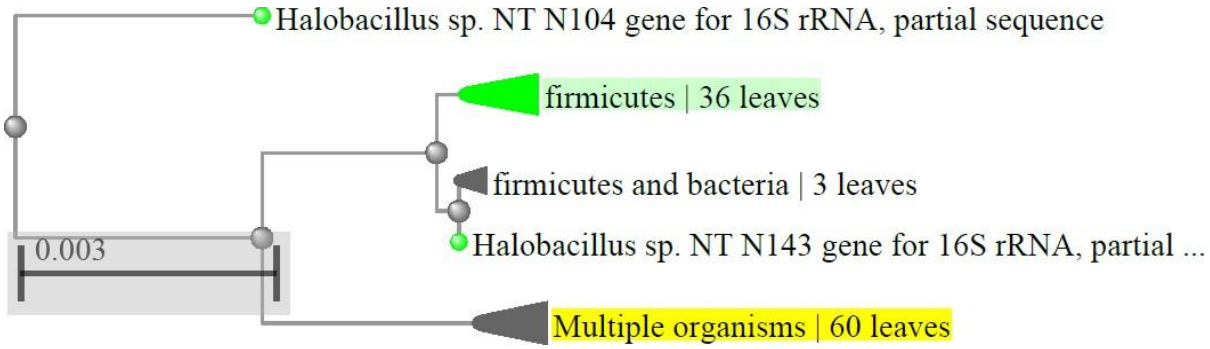

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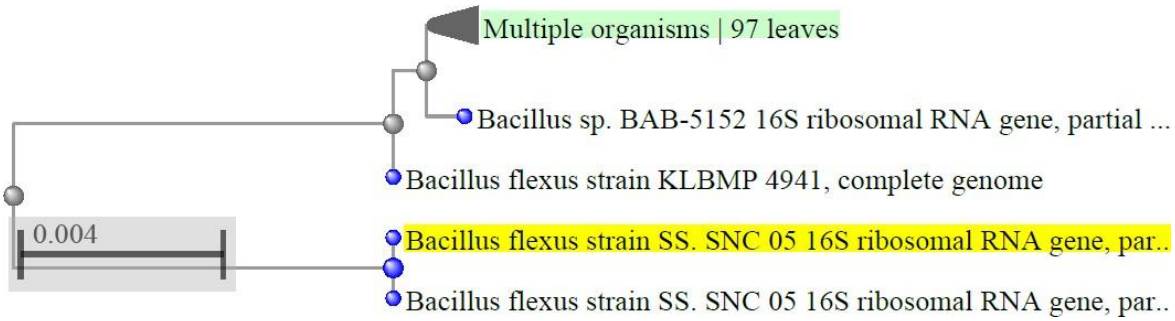
Fig. 9 Phylogenetic tree of *Bacillus flexus*



CONCLUSION

In India, mangroves are a useful biological system that is profoundly helpless to ecological changes. The mangrove environment has extraordinary natural importance and is home to a scope of endophytes that are known to further develop soil's edaphic factor and neutralize its adverse consequences. Endophytic microscopic organisms are a gathering of microorganisms that poor person been adequately concentrated however which comprise a dependable and copious wellspring of bioactive and synthetically special substances with guarantee for use in an extensive variety of modern, horticultural, and clinical fields. To arrive at better conclusions about which higher plants to study and dedicate work to separating microfloral parts from, it is important to understand the strategies by which endophytes live and respond to their current circumstance. This could make the method involved with finding new items more straightforward. To look at the viability of PGP potential, we have extricated different bacterial settlements from the rhizosphere of mangrove plants for the ongoing analysis. who found that the plant rhizosphere tests structure a one of a kind organic specialty with different microflora, including microorganisms, green growth, parasites, and protozoa, upholds the ongoing report. This sort of variety is achieved by means of the interesting PGPR instrument. It is for the most part realized that most of solid plant tissues contain plant bacterial endophytes. Various meanings of this specific host endophyte communication incorporate kindness, commensalism, advantageous interaction, and latency to pathogenicity. Anything that the exact relationship, bacterial colonization of inward plant tissues addresses a critical environmental specialty that is still minimal comprehended.

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