EXPLORATION OF POTENTIAL ENDOPHYTIC ACTINOMYCETES DERIVED FROM MANGROVE ECOSYSTEM AND HARNESSING THE EFFICACY AS PLANT GROWTH PROMOTING AND BIO-CONTROL AGENT TO CONTROL DISEASE IN PEARL MILLET.

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Mangrove, Actinomycets, Biocontrol, Antagonism, PGPR, Pearl millet, *Fusarium monaliform*

Introduction

Mangrove ecosystems are prevalent across numerous tropical, sub-tropical, and warm temperate regions worldwide, embodying a distinctive botanical community characterized by various unique growth forms [Khoon, G. W. (1987)]. Mangrove ecosystems hold significant ecological and economic value, serving essential functions at the interface of land and sea. They offer crucial habitats, serving as breeding grounds, nursery sites, and food sources for diverse terrestrial and marine organisms. Additionally, mangroves contribute to human sustainability and livelihoods by providing resources such as food, timber, fuel, and medicinal plants. Moreover, they serve as natural barriers, mitigating the impact of catastrophic events like tsunamis, tropical cyclones, and tidal bores, while also helping to minimize shoreline erosion. In recent years, mangrove biodiversity has garnered significant attention due to heightened research efforts aimed at comprehending the values, functions, and attributes of mangrove ecosystems. Mangrove forests are a unique type of vegetation that are found along estuaries' mouths and in areas where the sea and land meet. These forests are home to a variety of mangrove. Endophytes are microorganism which shows a symbiotic relationship with the plant tissues, which will colonizes and benefit plants in multiple ways.

Objectives

- Isolating endophytic bacteria and actinomycetes from the mangrove ecosystem.
- Conducting the in vitro qualitative assessments of plant growth promoting and biocontrol trait.
- Selecting the most efficient strains and utilizing 16S rRNA microbial phylogeny to identify them.

- Evaluvating the antibacterial and antagonistic efficacy of the selected strains on *Pseudomonas syringea* and *Fusarium moniliform* which cause brown spot dieseas and Pokkah Boeng disease in pearl millet.
- Development of formulations with the potential strains either as a foliar spray or as carrier-based using inert cheaply available substrates like talc, lignite, coir pith or peat.

Methodology:

Study area: Thanjavur , Thrissur, Ernakulam, Kannur

*Isolation:

Soil: From the collected sample perform serial dilution upto 10^{-8} and plated on various media.

Leaf: Imprint method and macerated samples are used to isolate the endophytic bacteria and actinomycetes.

Surface sterilization was performed and plated on various media.

Root: Imprint method and macerated samples are used to isolate the endophytic bacteria and actinomycetes.

Surface sterilization was performed and plated on various media.

* Staining and biochemical characterisation of isolates.

*Screening of extracellular activity / Biocontrol agents:

1. Amylase production
2. Protease production
3. Phosphate production
4. Chitinase production
5. Pectinase production
6. Cellulase production
7. Ammonia production
8. IAA production

* PGPR:

- Selection of bacterial and actinomycetes starin for study
- Plant material , innoculum preparation and seed bacterization treatment
- Efficiency of starin for plant growth promotion under laboratory condition.
- Pot trail & Formulation studies.

Result and Conclusion:

Endophytes have been found in common land plants, but there has been limited research into their presence in mangroves as Plant Growth-Promoting Rhizobacteria (PGPR). Because of their close relationship with plants, endophytes have garnered significant attention for their potential in promoting sustainable agriculture. These endophytes exhibit certain biocontrol characteristics that aid in PGPR. Table 1 illustrates the biocontrol traits of these isolates.

Table 1 : Biocontrol traits of the isolates

SL NO	ORG	AMMONIA	AMYLASE	PROTEASE	PHOSPHATE	HCN	IAA	PECTIN	CHITIN	CMC	L-ASPARGINASE	SIDEROPHORE
1.	MAST -1	+	-	-	-	-	+	+	+	+	+	+
2.	MAST -4	++	+	+	-	-	+	-	+	-	+	-
3.	MAST -5	+	+	-	+	-	+	-	-	-	+	-
4.	MARTr - 1	-	-	+	-	-	+	+	-	-	+	+
5.	MARTr - 2	+	+	-	-	+	+	-	-	+	+	+
6.	MARTr - 3	+	+	-	-	-	+	-	-	-	+	+
7.	MARTr - 4	+	-	+	-	-	+	+	-	-	+	+
8.	MALTr - 1	++	+	+	-	-	+	+	+	+	+	-
9.	MART -1	+	+	-	-	+	+	-	-	+	+	+
10.	MALK – 1	++	-	-	-	+	+	-	-	-	+	+
11.	MALK - 3	+	-	-	+	-	-	-	+	+	+	+
12.	MASK -1	+	-	+	+	-	+	-	-	+	+	-
13.	MASK- 2	+	+	-	+	+	+	-	+	-	+	+

Fusarium moniliforme is a fungal pathogen which cause disease in pearl millets. The endophytic isolates are tested against the pathogen and results are obtained and depicted in table 2.

SL NO	ORG	ANTAGONISM
1	MAST -1	-
2	MAST -4	-
3	MAST -5	-
4	MARTr -1	-
5	MARTr -2	-
6	MARTr -3	+
7	MARTr - 4	-
8	MALTr -1	+
9	MART -1	+
10	MALK –1	+
11	MALK - 3	-
12	MASK -1	+
13	MASK- 2	+

Innovation in the project

Mangroves are relatively unexplored ecosystems, offering potential for various actinomycetes to be used as Plant Growth-Promoting Rhizobacteria (PGPR). Biofertilizers, derived from these actinomycetes, can serve as an alternative to chemical fertilizers in agriculture. Mangrove isolates exhibit several biocontrol traits, making them suitable for PGPR applications, and some isolates also show antagonistic properties against *Fusarium moniliforme*..

Future work scope

Mangrove actinomycetes are a group of organisms with significant applications in agriculture, medicine, and industry. These actinomycetes have various agricultural uses, including product formation. Given their importance and the need for their protection, discovering multiple applications for these species can help achieve a sustainable balance in the ecosystem. The future aspects of the research can be like disease management, sustainable agriculture, ecosystem balance, biotechnological innovation and futher more

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