Endophytes – An emerging tool to enrich the soil fertility and plant growth

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Abstract:

The project mainly aims in developing the endophyte based biofertilizer capable of enriching the soil fertility and promoting the plant growth which directly involves in increased crop yield. In agriculture science, the most prime work is maintaining the soil nutrition. Endophytes spend the whole or at least a part of their life cycle colonizing in the healthy living tissue of the host plant, typically causing no obvious symptoms of disease. The *Abelmoschus esculentus* plant part (leaves) was utilized to isolate bacterial endophytes. 20 bacterial colonies with different colony morphology were selected from different plates for differential staining and biochemical tests (MR-VP, starch, oxidase, catalase, citrate, motility, cetrimide test etc.) Around 3 colonies were selected based on their plant growth promoting Activity (PGPA) which includes phosphate solubilization, Ammonia production, IAA production, Gibberellic acid production, Siderophore production, HCN production. From the results obtained through PGPA, a single endophyte was molecular characterized using 16srRNA sequencing. The sequencing confirmed endophyte as *Pseudomonas* sp. The *Pseudomonas* sp. was mixed with saw dust carrier and applied to plants. It was observed that the endophytes treated plants showed increased growth and high yield compared to control plants.

Introduction:

Plant-microbe interaction helps to promote the plant growth and also increases the soil fertility. The synergistic interaction between plant and endophytes called as double-fitness trait is active in the plant endophyte partnership. Endophyte bacteria are almost present in all plants which colonize inside the plant tissue without causing any harmful infections to the host plant. The biofertilizer plays an important role in nitrogen fixation, iron sequestration and phosphate solubilization. So the endophytes are used as inoculants for the preparation of biofertilizers.

Objective:

- To isolate endophytes from the *Abelmoschus esculentus* plant parts.
- Screening of endophytes for the plant growth promoting activities.
- To determine the viability and density of endophytes.
- To prepare biofertilizer by using endophytes.

Methodology:

The okra plant was collected from the Vadaputhupatti field, Theni District. The collected okra plant parts were surface sterilized with sodium hypochlorite, mercuric chloride, ethanol, and finally rinsed with sterile distilled water. The surface sterilized plant parts were

serially diluted using test tubes containing 9 ml of sterilized distilled water. 0.1 ml from the dilution 10^{-4}, 10^{-5}, 10^{-6} was transferred to petriplate containing specific medium. 0.1ml of the last wash water solution was plated and maintained as control. The selected colonies were subjected for Gram's staining, biochemical tests (Citrate Utilization, MR-VP, and Oxidase Test) and screened for plant growth promoting activity. The endophyte DNA was isolated and molecular characterized.

Result and Discussion:

Around 20 random colonies were selected from the plates based on their different morphological characters. The 20 endophyte colonies were subjected to biochemical tests (Gram staining, Citrate Utilization, MR-VP, Oxidase Test). From the results obtained from the biochemical tests, 4 colonies were screened for Plant Growth Promoting Activity (PGPA) tests (IAA production, Gibberellic acid, Siderophore, HCN production). From the results of PGPA tests, single endophyte was selected for molecular characterization. The fresh culture was centrifuged and the DNA isolated was amplified and sequenced by Sanger's di-deoxy method. The sequencing results confirmed the endophyte as *Pseudomonas* sp. The isolated endophyte *Pseudomonas* sp was mixed with the selected carrier material (saw dust), soil and subjected for composting. The composed carrier mixed endophyte was applied to soil that are sown with okra seeds. The plant growth and yield was compared between the endophyte applied and control plants. The rapid plant growth was observed in the endophyte applied plants and crop yield was twice than that of the control plants.

Conclusion:

The Endophyte *Pseudomonas* sp was isolated from *Abelmoschus esculentus* plant leaves. The *Pseudomonas* sp. was mixed with saw dust and applied to plants. It was observed that the okra plants applied with endophyte based biofertilizer showed excellent growth and crop yield compared to the control okra plants.

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