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## ABBREVIATIONS

## APPENDIX-A

EB: Endophytic bacteria

SS: surface sterilisation

NA: Nutrient agar

NB: Nutrient broth

LB: Luria Bertani broth

LA: Luria Bertani agar

TSA: tryptic soy agar

WA: Water agar

IAA: Indole-3-acetic acid

NaCl: Sodium chloride

SEM: Scanning Electron Microscope

MR: Methyl red

VP: Voges-proskauer

MHA: Muller Hinton Agar

BLAST: Basic Local Alignment Search Tool (BLAST)

SI: Solubilization index

AMP: Ampicilin

GEN: Gentamicin

CIP: Ciprofloxacin

P: Penicillin

CTX: Cefotaxime

R: Resistant

I: Intermediate

S: Susceptible

## **INSTRUMENTS USED**

## **APPENDIX-B**

1. Weighing balance
2. pH meter (Elico pH meter LI617)
3. Micropipette (Eppendorf)
4. Milli Q system (Ellix)
5. Microwave oven (Godrej)
6. Autoclave (Optics technology)
7. Hot air oven (Optics technology)
8. Magnetic stirrer (Optics technology)
9. Laminar air flow (Optics technology)
10. Incubator (Optics technology)
11. Refrigerator (Godrej)
12. Deep freezer -80°C (Blue star, CRESCENT)
13. Olympus Cx43 Trinocular microscope
14. Scanning Electron Microscope (ZEISS)
15. Lyophilizer (Telstar lyoquest freeze dryer)
16. Water bath shaker (Remi Model No. KWBS-2)
17. Centrifuge (RV/FM, super spin, plastocraft, India)
18. Microcentrifuge (SPINWIN MC-01)
19. Thermal cycler (Applied Biosystem)
20. Electrophoresis
21. E-Gel Imager (life technologies)
22. Qubit 4 Fluorometer (Thermo Fisher Scientific)



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RESEARCH ARTICLE

## Isolation and characterisation of endophytic bacteria present in the leaves of *Glycosmis pentaphylla* (Retz.) Correa

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### Abstract

Endophytes are an endosymbiotic group of microorganisms that dwell in plant tissues and are reservoirs of bioactive compounds. However, the researches on this area are limited. The present investigation was undertaken to isolate and characterise endophytic bacteria from the leaves of *Glycosmis pentaphylla* (Retz.) Correa. An effective surface sterilisation procedure was developed from the experiment to isolate endophytic bacteria from the leaves of the candidate species. There was no bacterial growth observed in



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Characterization of endophytic bacteria, *Solibacillus silvestris* DDBU6 and *Kocuriaassamensis* DDBU9 isolated from the leaves of a medicinal plant, *Phlogacanthusthysiformis*  
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## Characterization of endophytic bacteria, *Solibacillus silvestris* DDBU6 and *Kocuriaassamensis* DDBU9 isolated from the leaves of a medicinal plant, *Phlogacanthusthysiformis*

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<sup>1</sup>Department of Biotechnology, Bodoland University, Kokrajhar, 783370, India  
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### KEYWORDS

Endophytic bacteria;  
*Phlogacanthusthysiformis*;  
plant growth promotion activity;  
salt stress.

### ABSTRACT

Endophyte's symbiotic association with host plants can be immensely valuable to agriculture because it promotes plants growth and development. Endophytic bacteria present in medicinal plants play a highly essential role in the fields of pharmacology as well as agriculture, since therapeutic plants themselves are reservoirs for a variety of significant bioactive substances. However, the study of the endophytic bacteria presents in the medicinal plant, *Phlogacanthusthysiformis*, remains unknown. The primary goal of this research is to isolate, characterize, and molecular identification of endophytic bacteria present in the leaves of *P. thysiformis*. Two endophytic bacteria were isolated from theleaves: *Solibacillus silvestris*DDBU6 (PTL-1) and *Kocuriaassamensis*DDBU9 (PTL-2). In this study, *K. assamensis* was identified as an endophytic bacterium for the first time. Gram staining revealed that both leaf isolates were Gram-positive. In biochemical tests, both isolates tested negative for indole production but positive for citrate utilization and catalase activity PTL-1 and PTL-2 tested negative for oxidase test. *S. silvestris* and *K. assamensis*were able to tolerate 5% NaCl. These bacteria, under conditions of salt stress, hold potential to support plant growth. Moreover, in plant growth promotion assays, both the isolates exhibited positive results for ammonia production, negative for phosphate solubilization. For IAA production ability, highest production was shown by PTL-1 ( $81 \pm 1.24 \mu\text{g/ml}$ ) followed by PTL-2 ( $45 \pm 0.47 \mu\text{g/ml}$ ). All isolates showed promise as a viable endophytic bacterium for application in agriculture, possibly helping to produce ecologically friendly biofertilizers due to its positive results for some plant growth promotion activities and its tolerance of high salt concentrations.

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REVIEW ARTICLE

## A study on the potential of endophytic bacteria to promote plant growth: Uses in agriculture and future directions

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### Abstract

The increasing demand for chemical-free fertilizers in agriculture arises from the adverse effects of chemical fertilizers on both human and animal health as well as environmental pollution. To address these issues, plant-based microorganisms offers a promising solution for developing environmentally sustainable biofertilizers. Among these microorganisms, endophytic bacteria, living within plant tissues without harming the host plant, shows exceptional qualities that promote plant growth. Notably, these bac-

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## Certificate

*This is to certify that*

DEBAJANI DAS

*of*

*Department of Biotechnology, Bodoland University Has presented a research paper entitled  
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This is to certify that Prof./Dr./Mr./Mrs./Ms. *Dehajani Das*.....  
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authored by *Dehajani Das, Tikendrajit Baro and Prof. Sandeep Das*.....  
in ORAL/POSTER mode during ICESD 2022 at NEHU, Tura Campus, Meghalaya, India  
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As Paper Presenter

This is to certify that Debjani Das  
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Glycosmis pentaphylla  
(Author(s): Debjani Das, Raju Ali, Sandeep Das) in  
the National Seminar organized by the Centre for Bodo  
Studies, Bodoland University held on 10<sup>th</sup> December,  
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