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Exploring the Biotechnological Potential of Bacterial Endophytes from the Lathyrus Genus: Isolation, Screening, and Characterization for Agricultural Applications

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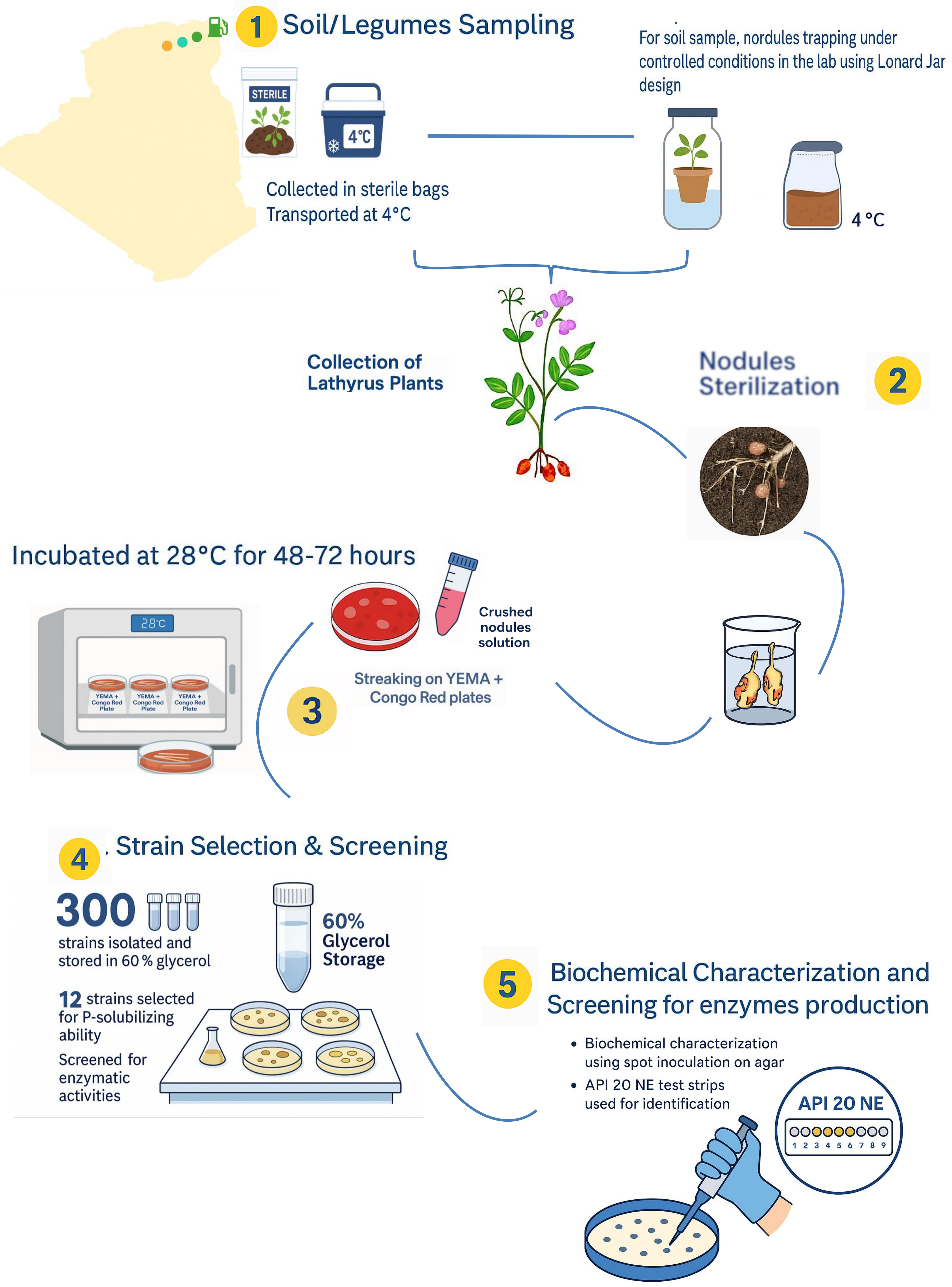
INTRODUCTION & AIM

New methods need to be developed to offset the excessive use of synthetic fertilizers and curb their global impact on health and the world economy (Brunelle et al., 2015). Sustainable agriculture is a production system that combines ecological and economic production elements (Pretty, 2008). The use of microorganisms remains a promising avenue for sustainable agricultural strategies (Vessey, 2003). Indeed, using Rhizobium inoculants has been shown to improve crop yields and quality, increasing their value as a food source (Zahran, 1999). This initiative can help improve crop productivity while limiting the damage caused by excessive fertilizer use (Bashan & de-Bashan, 2010).

Like most of the Leguminosae (Fabaceae) family which counts over 18,000 species, species of the Lathyrus genus can establish effective symbiosis with diverse bacterial populations which gives this legume the ability to grow in diverse environments where other legumes may fail to survive (Wojciechowski, Lavin, & Sanderson, 2004). Legume endophytic bacteria play a significant role in the provision of agricultural ecosystem services due to their ability to form symbiotic associations with a wide range of leguminous plants that result in biological nitrogen fixation (Orrell & Bennett, 2013). This process of biological nitrogen fixation has great potential in sustainable agriculture production because of the input of atmospheric nitrogen in the soil (Giller, 2001).

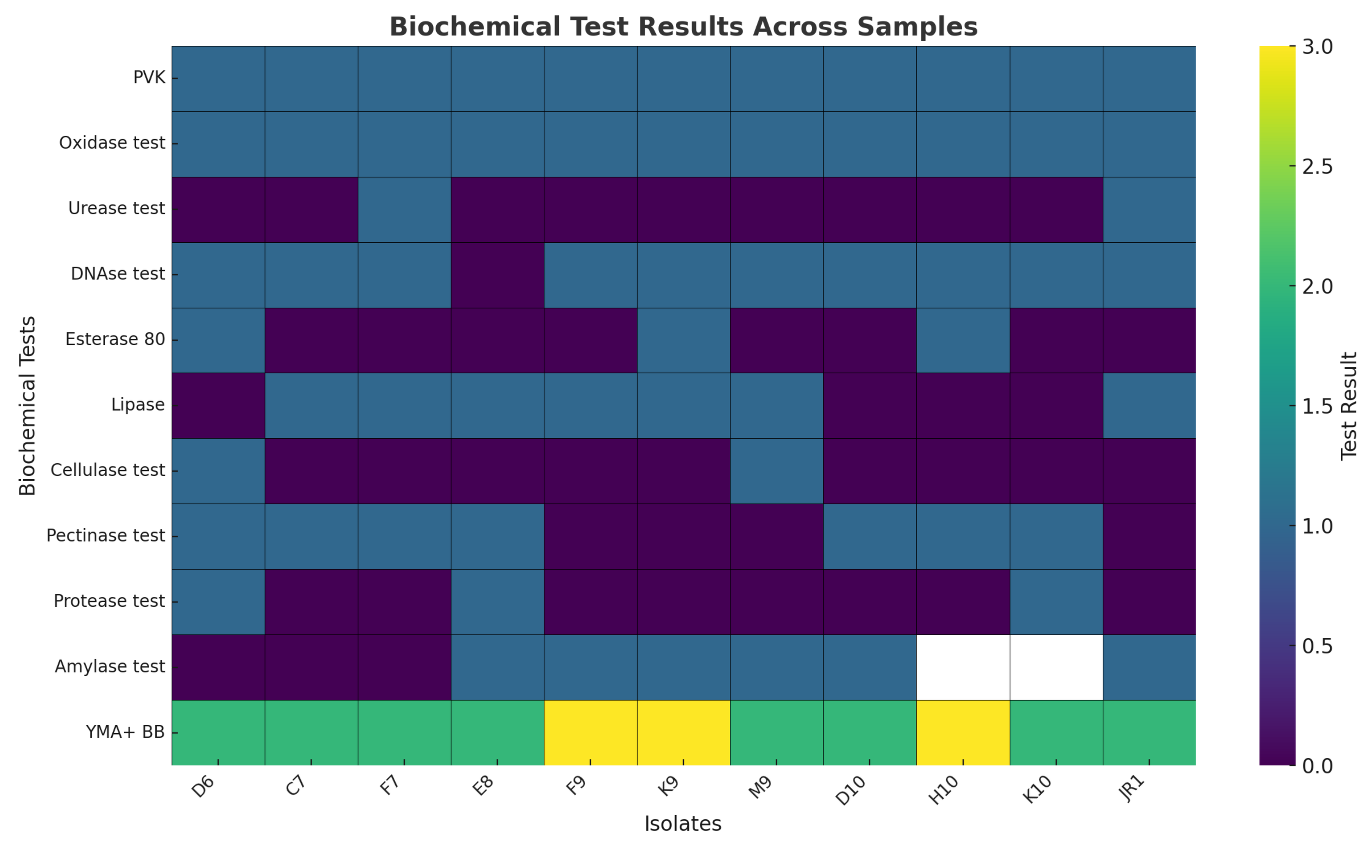
This study aimed to investigate the agricultural potential of indigenous Lathyrus-nodulating endophytic bacteria by screening for the production of key agricultural enzymes, such as phosphatase, pectinase, and others, which play crucial roles in soil health and crop productivity.

METHOD

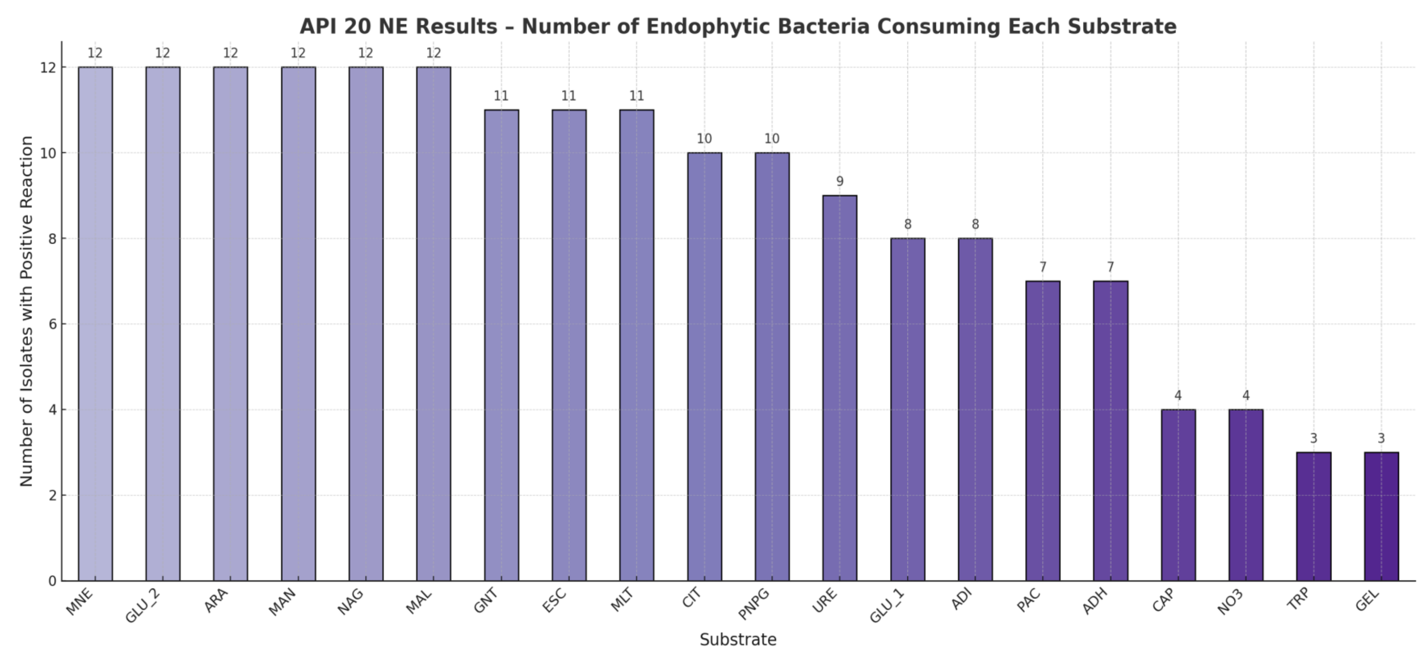


RESULTS & DISCUSSION

Isolates show strong metabolic consistency in core reactions such as **PVK solubilization** and **oxidase activity**, with positive results. However, reactions like **urease**, **lipase**, and **cellulase** exhibit high variability, suggesting metabolic specialization among isolates. This variability is crucial when selecting strains for agricultural or industrial applications as candidates for **plant growth promotion** or **biocontrol** inoculums.



Substrates like **N-acetyl-glucosamine (NAG)**, **Maltose (MAL)**, and **Arabinose (ARA)** were consumed by nearly all isolates, highlighting a **shared core metabolic profile** likely tied to common endophytic niches. These sugars are abundant in plant tissues, aligning with the ecological origin of the isolates. In contrast, **caprate (CAP)** and **gelatine (GEL)** had low consumption rates.



CONCLUSION

Through meticulous isolation, screening, and characterization, several endophytic strains demonstrated promising traits such as plant growth promotion, biocontrol capabilities, and stress tolerance enhancement. These findings underscore the importance of endophytes as a sustainable alternative to chemical fertilizers and pesticides, contributing to eco-friendly agricultural practices. Future research should focus on field trials and the development of endophyte-based bioformulations to fully harness their potential in improving crop productivity and resilience.

FUTURE WORK / REFERENCES

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