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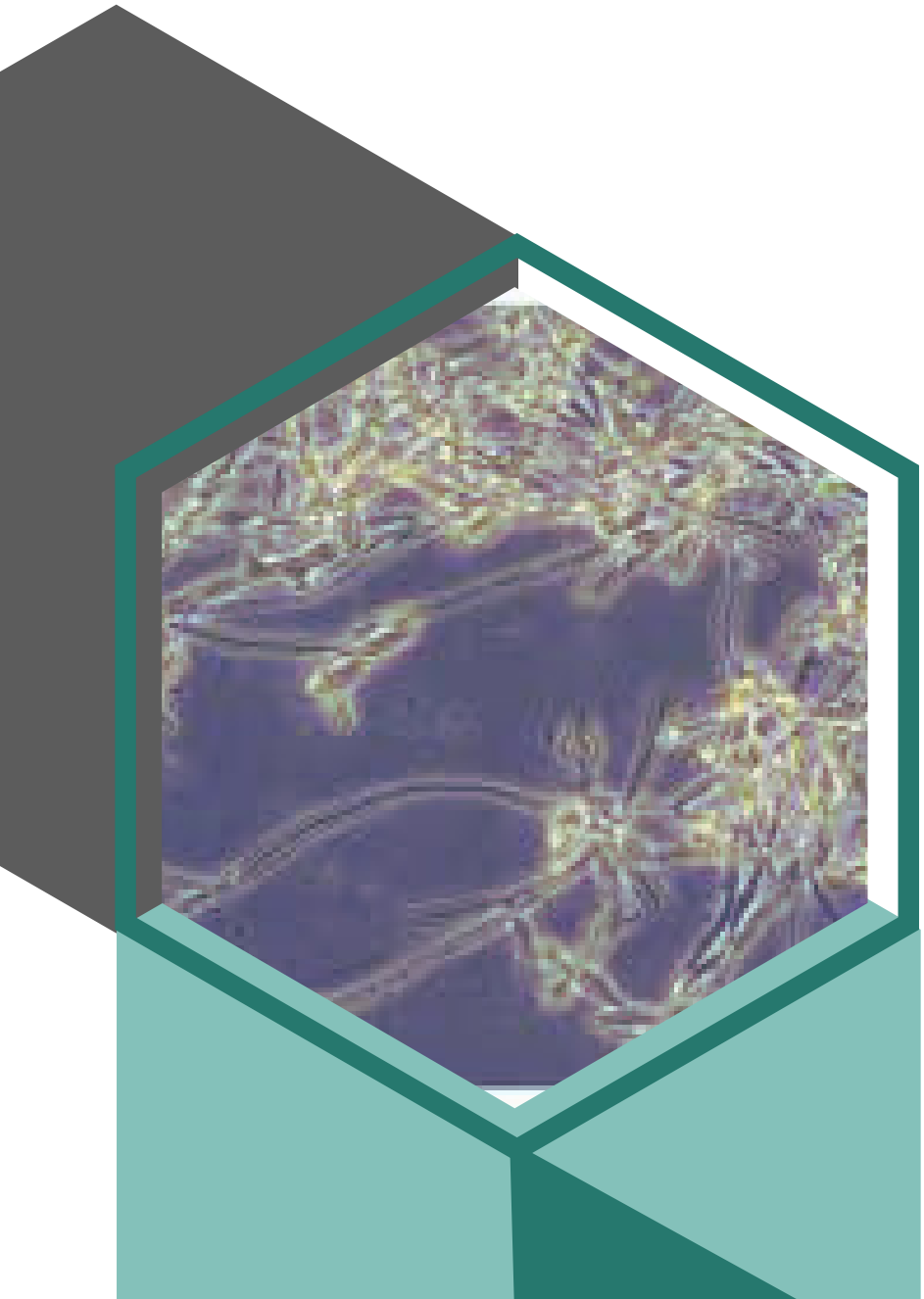
Call for Bio-prospecting on *Trichoderma reesei* for Industrial Application through Ethiopia's Access and Benefit Sharing (ABS) Scheme

Genetic Resource Access and Benefit Sharing Research LE



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1. Introduction

The Ethiopian Access and Benefit-Sharing (ABS) laws play a crucial role in bio-prospecting by ensuring the protection of genetic resources and promoting equitable sharing of benefits derived from their utilization. These laws are essential for safeguarding the rights of local communities, ensuring that they receive fair compensation for the use of their biological resources and traditional knowledge.

Trichoderma reesei is a filamentous fungus renowned for its ability to produce cellulolytic enzymes, which are critical for various biotechnological applications, especially in the processing of lignocellulosic biomass (Bischof *et al.*, 2016). It is predominantly found in soil and decaying plant material, making it widely utilized in the biotechnology industry for enzyme production, particularly cellulases. These enzymes are essential for converting plant biomass into fermentable sugars for biofuel production and other applications (Keshavarz and Khalesi, 2016)

This document aims to encourage the bio-prospecting of Trichoderma reesei in Ethiopia by emphasizing its distribution, possible industrial uses, and the importance of leveraging this organism within the country's Access and Benefit Sharing (ABS) framework. By participating in bio-prospecting efforts focused on this organism, we can harness its potential advantages for humanity and multiple industries.

2. Biology of the Organism

Taxonomy and Classification

- **Scientific Name**: *Trichoderma reesei*
- **Classification**:
    - Kingdom: Fungi
    - Phylum: Ascomycota
    - Class: Sordariomycetes
    - Order: Hypocreales
    - Family: Hypocreaceae
    - Genus: Trichoderma

- Species: *reesei* (Cai *et al.*, 2022)

Morphological Characteristics

Trichoderma reesei has mycelial structure composed of branched, septate hyphae. It produces conidia that are greenish in color, which aids in its identification (Gorai *et al*., 2020)

Physiological Traits

Trichoderma reesei thrives in a range of conditions, with optimal growth at temperatures between 28-30°C and a pH of around 4.5-6.0. It can metabolize various carbohydrates, including cellulose and hemicellulose, enabling efficient growth on lignocellulosic substrates (Singh *et al*., 2014).

Genetic Characteristics

Research on *Trichoderma reesei* has identified important genes involved in the biosynthesis of cellulolytic enzymes, enhancing its capabilities for enzyme production (Bischof *et al.,* 2016). Understanding its genetic makeup is crucial for optimizing fermentation processes and improving enzyme yields for industrial applications.

3. Distribution of the Organism

Trichoderma reesei is predominantly found in soil and decaying plant material (Yao *et al*., 2022; Keshavarz and Khalesi, 2016). It is commonly found in various regions of Ethiopia, particularly in areas rich in organic matter, such as forests and agricultural lands. It is typically isolated from soil, decaying plant materials, and compost heaps, thriving in environments with high carbon content (Mulatu *et al*., 2022; Mulaw *et al*., 2010)

4. Industrial Application

Overview of Applications

Trichoderma reesei has several industrial applications, particularly in biotechnology:

- **Food Industry**: The enzymes produced by *Trichoderma reesei* can be used in food processing, such as in the production of fruit juices and the clarification of beverages (Fischer *et al*., 2021).

- **Pharmaceuticals**: The organism's enzymes may also have potential applications in the pharmaceutical industry for drug formulation and production (Fischer *et al*., 2021).
- **Biotechnology**: *Trichoderma reesei* is widely used in enzyme production, particularly cellulases, which are essential for the bioconversion of lignocellulosic biomass into fermentable sugars for biofuel production (Bischof *et al*., 2016).
- **Agriculture**: The fungus can enhance soil health and promote plant growth by improving nutrient availability and suppressing soil-borne pathogens (Manoharachary *et al*., 2020).

5. Potential or Known Negative Impacts or Side Effects

While *Trichoderma reesei* offers numerous benefits, it is essential to consider potential negative impacts. The introduction of this fungus in non-native environments may disrupt local ecosystems and affect indigenous species. Additionally, excessive use in agriculture could lead to monocultures and reduced biodiversity (Pozo *et al.*, 2024). Thorough assessments are crucial to mitigate these risks and ensure sustainable practices.

6. Conclusion

This call for bio-prospecting highlights the significance of *Trichoderma reesei* as a valuable organism with diverse applications in biotechnology, food, and pharmaceuticals. Its potential to contribute to sustainable development and biofuel production is noteworthy. We encourage stakeholders including industries, manufacturers, researchers, and policymakers to engage in bio-prospecting initiatives centered on *Trichoderma reesei*. By utilizing this organism through the Ethiopian ABS scheme, we can promote sustainable development while respecting local communities and biodiversity.

7. References

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