PRODUCTION OF CELLULASES AND XYLANASES BY TRICHODERMA GAMSII

IITM Technology Available for Licensing

Problem Statement

- Increasing urbanization has led to a rising demand for nonrenewable fossil fuels, depleting energy reserves and increasing greenhouse gas emissions.
- **The production of bioethanol from cellulosic materials requires efficient enzyme mixtures, but existing methods often lack the desired effectiveness.**
- Lignin in lignocellulosic biomass hinders the conversion of biomass to fermentable sugars.
- There is a need for a novel strain of Trichoderma, such as M501, to produce cellulases and xylanases efficiently for lignocellulosic biomass hydrolysis.

Intellectual Property

- IITM IDF Ref. **1561**
- **IN 201741023751**
- **NBA Appl. Ref. No.** INBA3202305180

Technology Category/ Market

Category - Biotechnology
Applications - Biofuel Production, Biorefinery, Waste Biomass Valorization
Industry - Renewable Energy and Biofuels

Market- Global biofuel market is estimated to grow at **a CAGR of 9.7%** to reach US$295 Bn in 2028.

TRL (Technology Readiness Level)

TRL - 3 , Technology concept formulated.

Research Lab

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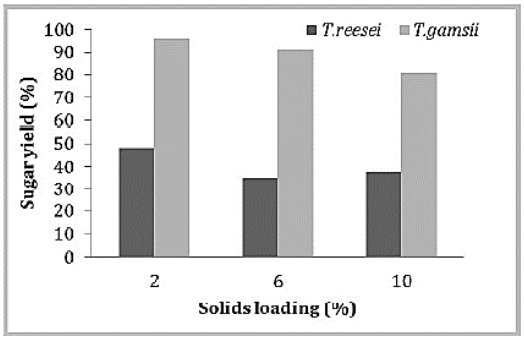

FIG. 1. Shows a comparison of Saccharification of alkali pretreted bagasse using enzyme mixture produced by *T. gamsii* M501 with commercial cellulases of T. reesei (Celluclast 1.5L, Sigma) as a control.

Technology

1. **The invention aims to produce an enzyme mixture consisting of cellulases and xylanases using a novel strain of *Trichoderma gamsii*, referred to as M501, for the efficient hydrolysis of lignocellulosic biomass.**
2. **The strain *T. gamsii* M501 is deposited and accessible at the Institute of Microbial Technology (IMTECH) in Chandigarh, India, with Accession no. MTCC 25104 and GenBank accession no. KT037690.1.**
3. **The production process of the enzyme mixture involves growing *T. gamsii* M501 in a modified Vogel's medium, supplemented with microcrystalline cellulose, to maximize cellulase and xylanase production within 3 days.**
4. **The enzyme mixture produced by *T. gamsii* M501 under specific growth conditions exhibits significant levels of FPase (2.0 U/ml), CMCase (45.3 U/ml), and xylanases (600 U/ml) after 72 hours.**
5. **The invention further presents a process for hydrolyzing lignocellulosic biomass using enzymes produced by *T. gamsii* M501, involving pretreatment of sugarcane bagasse, enzymatic hydrolysis, and the determination of glucose and xylose concentrations in the hydrolysate.**

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Key Features / Value Proposition

1. Enhanced Enzyme Activities: *Trichoderma gamsii* M501 delivers higher activities of cellulases and xylanases, improving the efficiency of lignocellulosic biomass hydrolysis.

2. Simplified Production Process: The use of a modified Vogel's medium and a 3-day incubation period simplifies the enzyme production process.

3. Maximum Enzyme Levels: Achieves significant levels of FPase, CMCase, and xylanases, ensuring effective breakdown of biomass.

4. Sustainable Biomass Hydrolysis: The enzyme mixture is ideal for hydrolyzing alkali-pretreated lignocellulosic biomass, contributing to sustainable biofuel and chemical production.

5. Market Growth Potential: Addresses the increasing demand for efficient enzymatic processes in the biofuel and renewable energy industries.

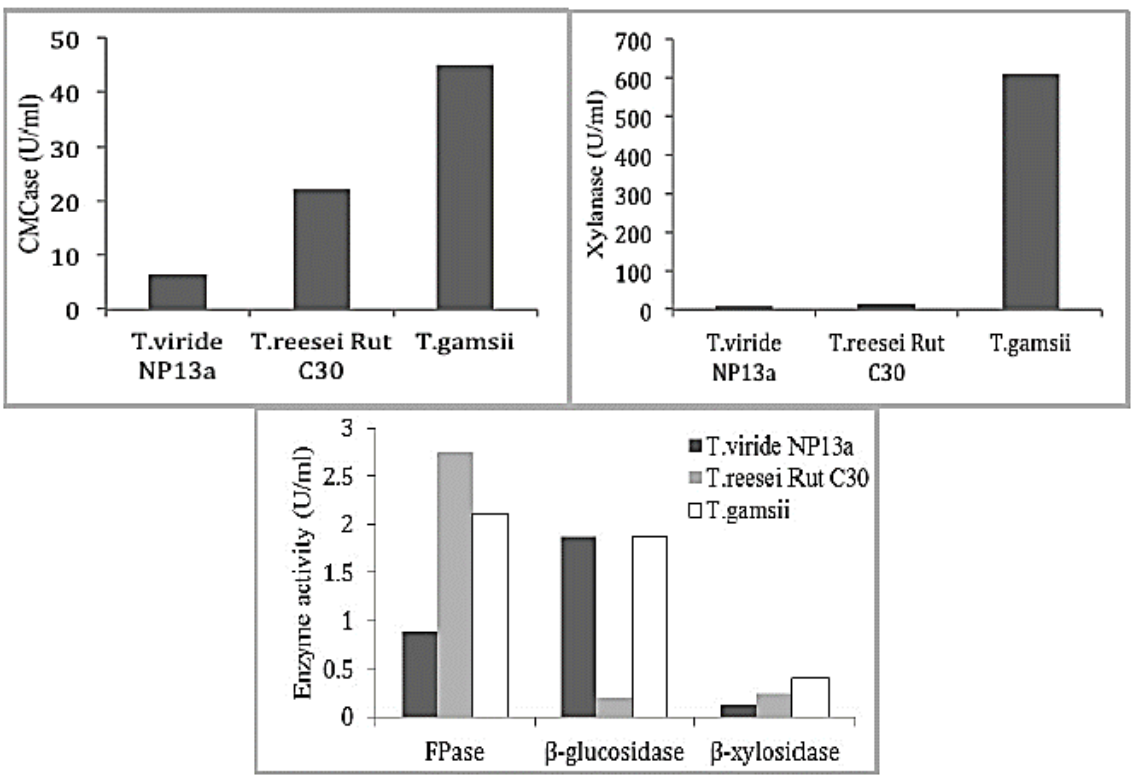

FIG. 2. Shows a comparison of production of cellulases and xylanases by *T. gamsii* M501 with 190 *T. reesei* RUT C30 and *T. viride* NP13a. The values for RUT C30 and NP13a are obtained from reported values (Jiang et al., 2011). The strain RUT C30 is a mutant, obtained from the native strain *T. reesei* QM6a through a three steps procedure (Peterson and Navalainen, 2012).

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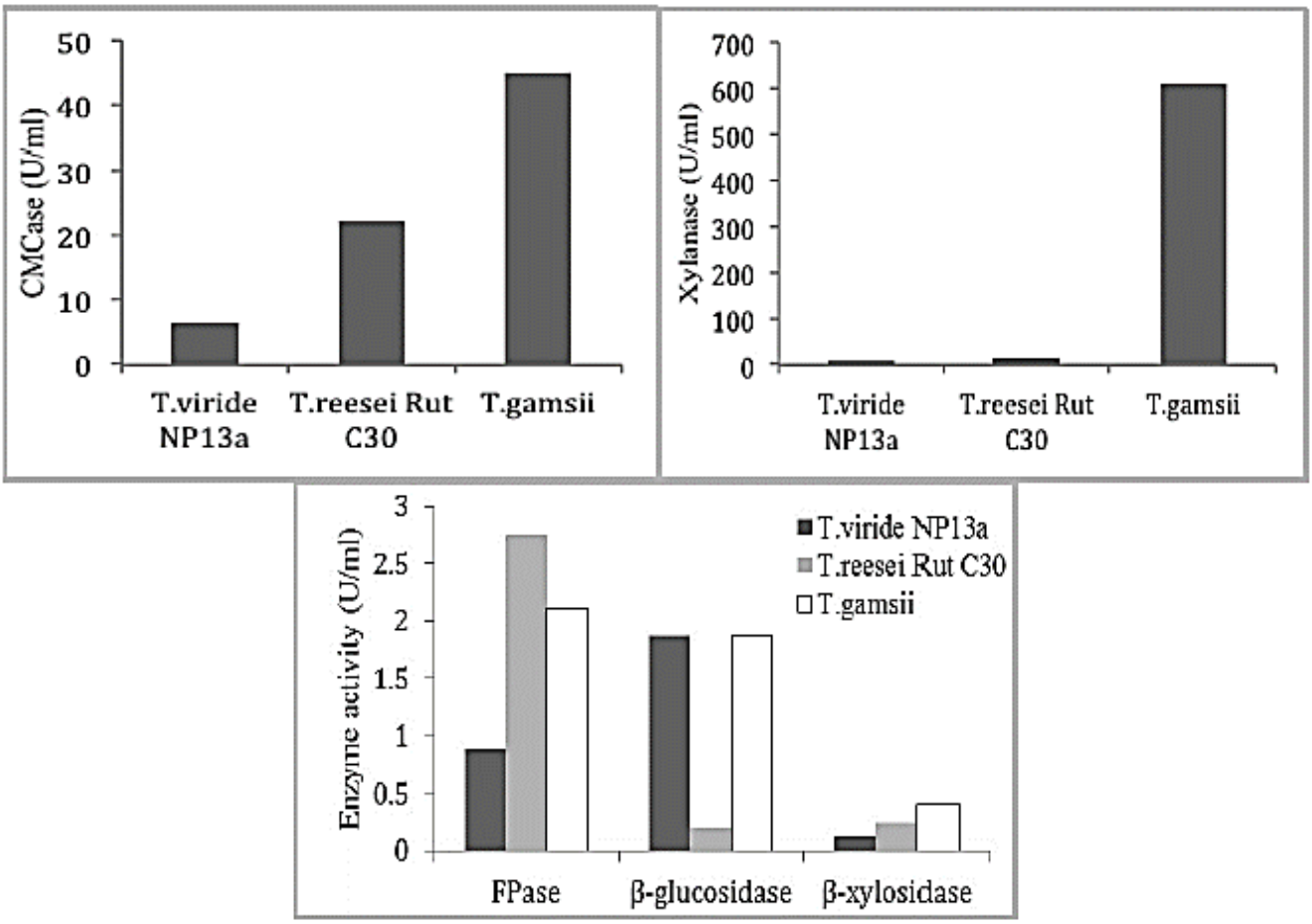

FIG. 3. Shows the time course of production of cellulases and xylanases 195 by *T. gamsii* M501.

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