IIT MADRAS
Indian Institute of Technology Madras

Technology Transfer Office
TTO - IPM Cell

Industrial Consultancy & Sponsored Research (IC&SR)

BIOPROCESS TECHNIQUE FOR PRODUCTION OF SECONDARY METABOLITES FROM PLANT CELLS USING TEXTILE DYE EFFLUENTS

IITM Technology Available for Licensing

Problem Statement

- Leveraging the potential of phytoremediation to enhance the sustainability and eco-friendliness of secondary metabolite production.
- Meeting the growing demand for tocopherols and phytosterols in the cosmetic industry, where these compounds are valued for their benefits.
- Developing a reliable and scalable process to ensure a consistent supply of these secondary metabolites.
- **Overcoming existing limitations in secondary metabolite production methods to contribute to advancements in cosmetics, pharmaceuticals**, and other sectors that rely on these compounds.

Intellectual Property

- IITM IDF Ref. **1611**
- **IN 201841001881**
- **NBA Appl. No. INBA3202204201**

Technology Category/ Market

Category- Bioprocess Engineering
Applications- Phytoremediation of textile dyes.
Industry- Bioremediation

Market- Global Phytoremediation Market reached **USD 6.2 Bn in 2023** and is projected to exhibit a **CAGR of 5.1%** from 2023 to 2030.

Research Lab

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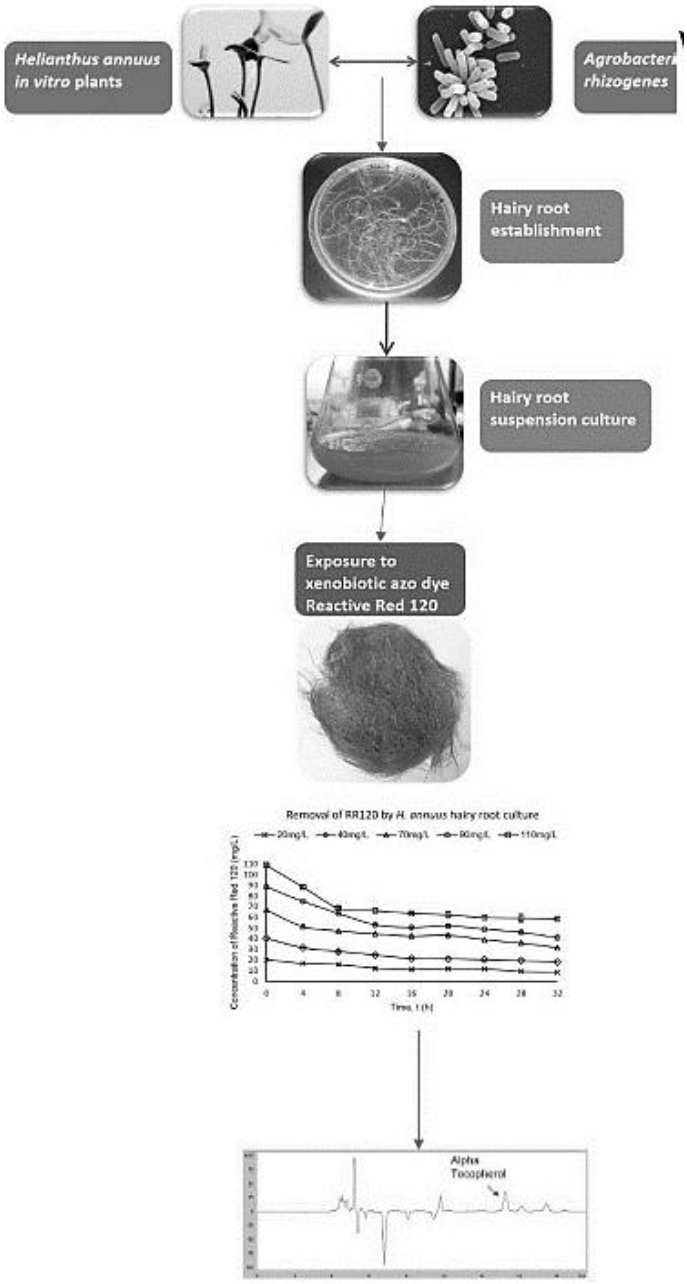

FIG. 1. illustrates a process flow diagram illustrating steps for production of secondary metabolites-tocopherols and phytosterols from suspension cells of *Helianthus annuus*.

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Key Features / Value Proposition

- Utilizes plant cell and hairy root cultures to produce valuable secondary metabolites, tocopherols, and phytosterols.

Sustainable Secondary Metabolite Production

- Offers a bioprocess for phytoremediation of textile dyes, addressing environmental concerns.

Eco-Friendly Textile Dye Remediation

- Optimized growth conditions lead to increased production of tocopherols and phytosterols.

Enhanced Yield and Consistency

- Utilizes in vitro cultures of Helianthus annuus for a cost-effective and reliable approach.

Cost-Efficient Production

- Standard operating protocols can be customized for industrial applications, meeting growing demand in cosmetics, pharmaceuticals, and more.

Adaptability for Industry

- Aligns with the sustainability goals of eco-conscious industries by offering a green solution for both secondary metabolite production and textile dye remediation.

Value for Sustainability

Technology

- The present invention is related to the **production of secondary metabolites such as tocopherols and phytosterols from *Helianthus annuus.***
- The bioprocess involves generating *Helianthus annuus* (*H. annuus*) in vitro plants and transforming them using *Agrobacterium tumefaciens*, enhancing the expression of certain enzymes related to secondary metabolite production.
- Transformed *H. annuus* cell lines are grown under optimized conditions, including specific temperature, light, and culture parameters, to maximize the production of secondary metabolites, particularly alpha-tocopherol.
- **The process demonstrates the ability to remove xenobiotic azo dye** (Reactive Red 120) from a solution using 10-day old *H. annuus* suspension cultures, showcasing a potential eco-friendly application.
- Additionally, **the technique includes the transformation of *H. annuus* hairy roots**, offering an alternative approach to achieve enhanced dye removal and secondary metabolite production.
- The physico-chemical parameters are further **optimized to improve dye removal**, utilizing specific conditions such as hairy root concentration, temperature, and light exposure.

TRL (Technology Readiness Level)

TRL - 4: Technology validated in lab scale.

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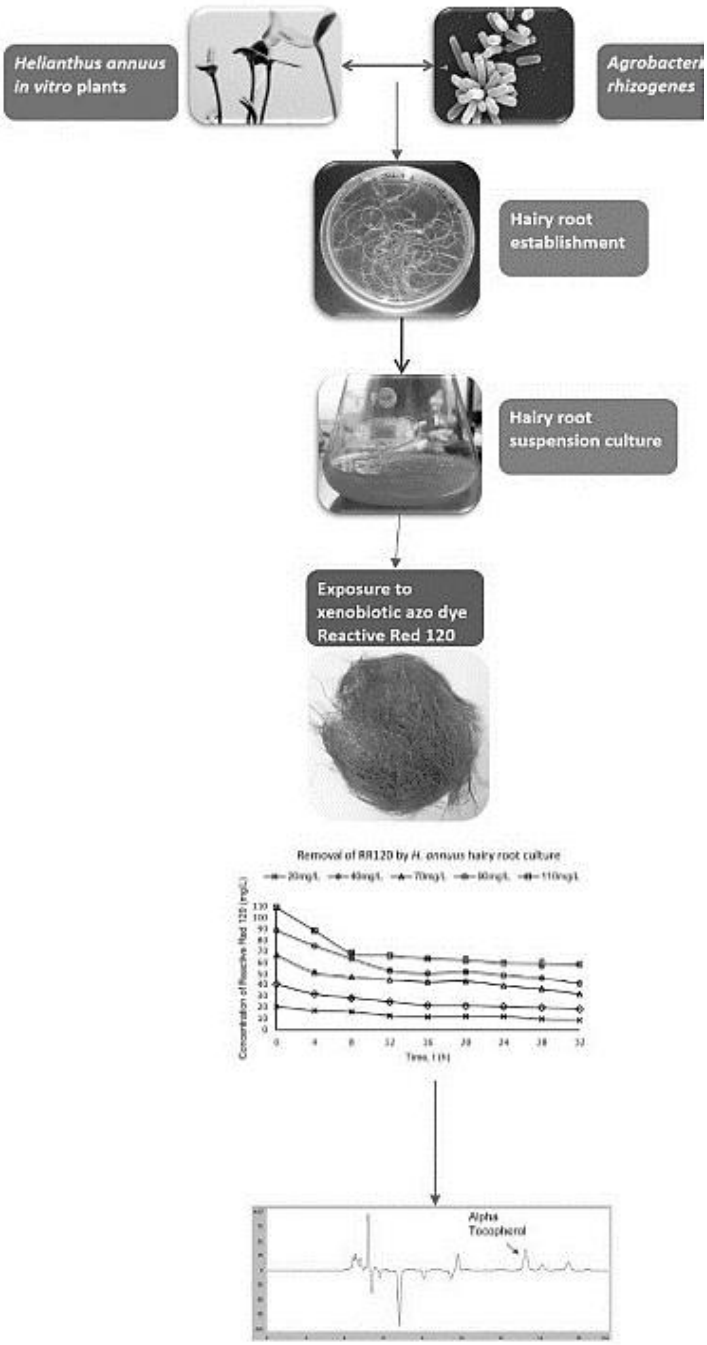

FIG. 2. illustrates a process flow diagram illustrating steps for production of secondary metabolites-tocopherols and phytosterols from hairy roots of *Helianthus annuus*.

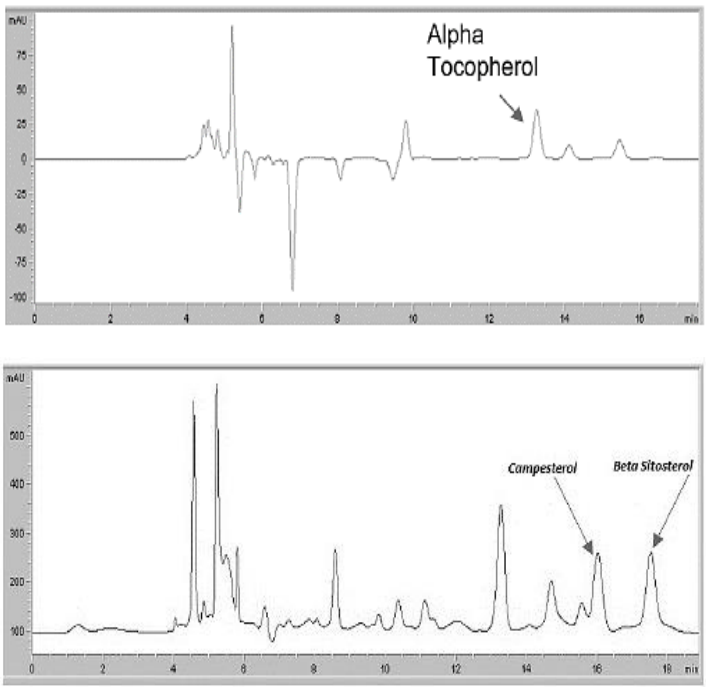

FIG.3. illustrates a graphical representation of HPLC chromatogram indicating peaks corresponding to Alpha-tocopherol and phytosterols.

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