TECH OFFER

Eco-Friendly 3D Substrates From Recycled Raw Materials

KEY INFORMATION

TECHNOLOGY CATEGORY:
Materials - Composites
Materials - Bio Materials
Chemicals - Agrochemicals
Waste Management & Recycling - Food & Agriculture Waste Management
Sustainability - Circular Economy

TECHNOLOGY READINESS LEVEL (TRL): TRL5
COUNTRY: ITALY
ID NUMBER: TO174391

OVERVIEW

The choice of substrate for agricultural applications is crucial to ensure optimal growth of the crops. For instance, peat has traditionally used as a growing medium to produce crops due to its fertility and ability to provide the necessary conditions to support growth. However, peatlands are running out and unable to cope with the global demand for increased food, hence there is a need to seek for sustainable alternative substrates.

The technology is a three-dimensional (3D) dry but wettable substrate formed through the chemical reaction between natural substances such as clay, humus, and polysaccharides to form a matrix and incorporated with cellulosic fibers. The cellulose fibers can be derived from several waste streams including wood, coconut, straw, and bamboo to name a few. The 3D substrates can

be customisable according to the type of crop and is biodegradable and compostable, releasing beneficial substances for soil and microflora at the end-of-life cycle. It has been successfully tested as a growing medium for fungi (Lentinula spp), lettuce, corn, and wheat. This technology is cost-effective and suitable for the vertical farming sector. It may also be extended to bioremediation applications.

The technology owner is interested in co-development, test-bedding and licensing collaborations in Singapore.

TECHNOLOGY FEATURES & SPECIFICATIONS

This technology comprises of natural substances (clay, humus and polysaccharides) as the matrix and cellulosic fibres obtained from agricultural wastes e.g, cellulose pulp, wood pulp, coconut residues, straw, rice husk, bamboo, vegetable fibers, jute, linen, cotton, etc.

Features of these 3D substrates include:

- Biodegradable and compostable
- Formulation and shape may be modulated to suit the intended type of crop to be grown in
- Achieves a spongy consistency when infused with water
- Bulk density can reach a minimum value of 0.08 g/cm3 (approximately)
- Manufacturing process includes sterilization steps that reduce pathogenic microbiota
- Type of fibre used will determine the characteristics of the final substrate i.e., degree of swelling, degradation rate etc
- Contains humic substances, which are very useful for supporting seedlings, and can be easily enriched with extra nutrients
- Upon degradation, the matrix loses its rigidity before converting to CO2, mineral elements and humus

The technology has been successfully tested with seeds of lettuce, corn, wheat, and fungi (Lentinula spp). Optimisation of the substrates for other types of crops will be required.

POTENTIAL APPLICATIONS

Potential applications include (but not limited to):

- Vertical farming
- Bioremediation
- Biofertilization
- As a porous/filter compound that is burnable and compostable after use

MARKET TRENDS & OPPORTUNITIES

The vertical farming market is expected to reach $ 7.3 billion by 2025 with an annual growth rate of 20.2%. As the common peat needs to be replaced, companies operating in this sector are looking for renewable substrates, with alternatives now being tested extensively and preformed substrates are gaining traction.

BENEFITS

- Disengages from peat supply
- Able to offer a simplified process of mechanization and cleaning in vertical farms
- Less dusty and more wettable compared to peat
- Enables a circular economy
- Has residual fertility that can be used to regenerate new substrates and / or compost.