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ICC JEJU, KOREA

PROGRAM BOOK

CIGR 2024

DIGITAL AGRICULTURE

MAY 19-23

Day 1, May 20 (Mon.) | Scientific Program

S6-3 Technical Section 6: Bioprocesses

16:30 - 18:00 303 (3F)

Chair(s): SEUNG HYUN LEE (Chungnam National University)

S6-3-01 16:30-16:45

Establishment of CRISPR-Cas-based antiparasitic agents for the swimming crab parasite Mesanophrys sp.

Author XIAOPENG WANG (Ningbo University)

S6-3-02 16:45-17:00

A novel hybrid nanocarrier with dual Stimuli-Responsiveness for enhanced delivery of prochloraz in agriculture

Author MAHESH BHAT PADMALAYA (Chonnam national University)

Corresp. Author KYEONG-HWAN LEE (Department of Convergence Biosystems Engineering, Chonnam National University)

Co-author(s) JAE HO LEE (Agricultural Automation Research Centre, Chonnam National University)
VINAYAK HEGDE (Department of Convergence Biosystems Engineering, Chonnam National University)
KYEONG-HWAN LEE (Agricultural Automation Research Centre, Chonnam National University)

S6-3-03 17:00-17:15

Identification of microbial career promoting anaerobic long-chain fatty acids degradation

Author RIKU SAKURAI (Tohoku University)

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YASUHIRO FUKUDA (Tohoku university)
CHIKA TADA (Tohoku university)
MASAKI KAWAKAMI (Asahi Kasei Home Products corporation)
SATOSHI HASHIMOTO (Asahi Kasei Home Products corporation)

S6-3-04 17:15-17:30

Metabolic engineering of pseudomonas putida for bioconversion of antarctic krill shell waste into medium-chain-length-polyhydroxyalkanoates

Author YUEYUE ZHOU (School of Marine Sciences, Ningbo University)

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S6-3-05 17:30-17:45

Copper-Iron based bimetallic MOF decorated natural diatoms for the delivery of thiabendazole

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S6-3-06 17:45-18:00

Bacterial cellulose based edible scaffolds for cultivated meat application

Author YUNAN TANG (Zhejiang University)

Corresp. Author XIMING ZHANG (Zhejiang University)

Copper-Iron Based Bimetallic MOF Decorated Natural Diatoms for the Delivery of Thiabendazole

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Abstract

Plant fungal diseases are a serious threat to agricultural productivity and plant health. To increase crop yield, it is essential to prevent or treat these diseases effectively. The conventional method of using active ingredients (AIs) has many drawbacks. Nanotechnology can offer a better alternative to delivering AIs, as it can overcome the limitations and improve the cost-efficiency, environmental impact, and efficacy of the AIs, while also fostering innovation and competition in the agricultural sector. This study examined the release efficiency of fungicide thiabendazole (Tbz), from a hybrid nanomaterial composed of low-cost natural diatoms and a bimetallic metal-organic framework (MOF) based on copper and iron (DE-MOF-Tbz). The study also evaluated the performance of a lauric acid-modified hybrid nanomaterial (DE-MOF-Tbz-LA) in releasing Tbz in-vitro under different pH and temperature conditions. The results showed that DE-MOF-Tbz released the highest amount of Tbz (about 45.8%) at pH 7, while DE-MOF-Tbz-LA released the maximum amount of Tbz (32.3%) at pH 5. Lauric acid, which is sensitive to temperature, acted as a gatekeeper, allowing a sustained release of about 97% over 10 days. In addition, in-vitro antifungal tests showed that the nanomaterials completely inhibited the growth of *B. cinerea*, a fungal pathogen, at a concentration of 1 µg/mL. Moreover, in-vivo antifungal experiments using nanomaterials at a concentration of 200 µg/mL showed complete suppression of fungal growth in cherry tomato fruits and leaves after 4 and 7 days of inoculation, respectively. These findings indicate that developed nanomaterials could be potential candidates for the controlled release of fungicides.

Keywords: Hybrid nanocarrier, Lauric acid, Fungal infections, Controlled release.

Acknowledgments

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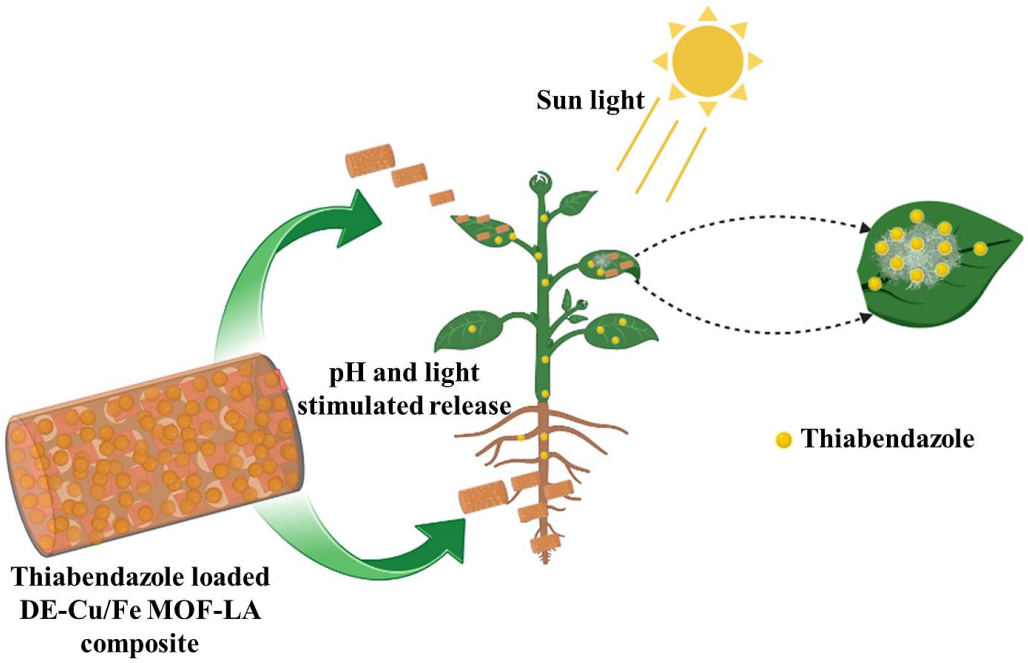

Figure 1. Schematic representation of thiabendazole release from bimetallic hybrid MOF nanocomposite for prevention of fungal disease in plant.