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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)

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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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KYEONG-HWAN LEE (Chonnam national University)

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)

A Novel Hybrid Nanocarrier with Dual Stimuli-Responsiveness for Enhanced Delivery of Prochloraz in Agriculture

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Abstract

Pesticides are essential for protecting crops from pests and diseases, but they also pose risks to human health and the environment. Most of the applied pesticides do not reach their target and drift away, causing pollution and resistance. To overcome this challenge, stimuli-responsive nanomaterials have emerged as a novel approach for delivering pesticides on demand. In this work, we developed a dual stimuli-responsive nanoplatform based on diatoms (DE) and titanium metal-organic frameworks (Ti-MOFs) for controlling *Botrytis cinerea*, a common fungal pathogen in South Korea that causes gray mold in many plants. Our nanoplatform combines the advantages of natural DE and Ti, which are environmentally friendly and suitable for agricultural applications. We loaded fungicide prochloraz onto the DE-Ti-MOF nanocomposite, which had a high surface area of 731 m^2/g and a high loading capacity for Pro of 39%. We also coated the nanoplatform with biopolymers pectin and alginate, to achieve enzyme-responsive and pH-responsive release of Prochloraz. When the plants are infected by *B. cinerea*, they secrete pectinase and lower the pH, which triggers the degradation of the pectin and alginate layers, respectively. This leads to the sustained release of prochloraz, which kills the fungus. We tested the nanoplatform on tomato plants and found that it effectively prevented the gray mold infection on fruits and leaves at a concentration of 200 µg/mL. In contrast, the conventional method requires a higher dosage. Therefore, we believe that our nanoplatform offers a potential solution for replacing conventional pesticides and reducing their environmental impact.

Keywords: Nanocarrier, stimuli-responsive release, sustainable agriculture, Agrochemical delivery, metal-organic framework, fungicide.

Acknowledgments

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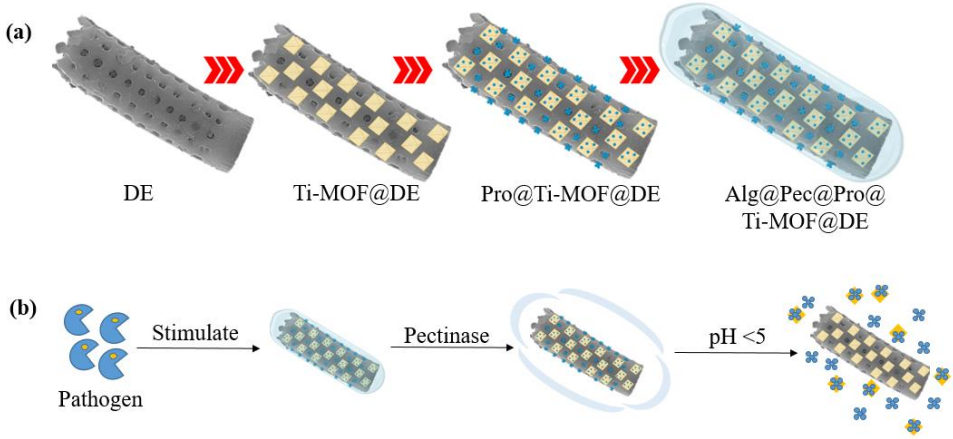

Figure: Graphical illustration of (a) synthesis of nanocarrier, (b) stimuli-responsive release of prochloraz (Pro) from nanocarrier.