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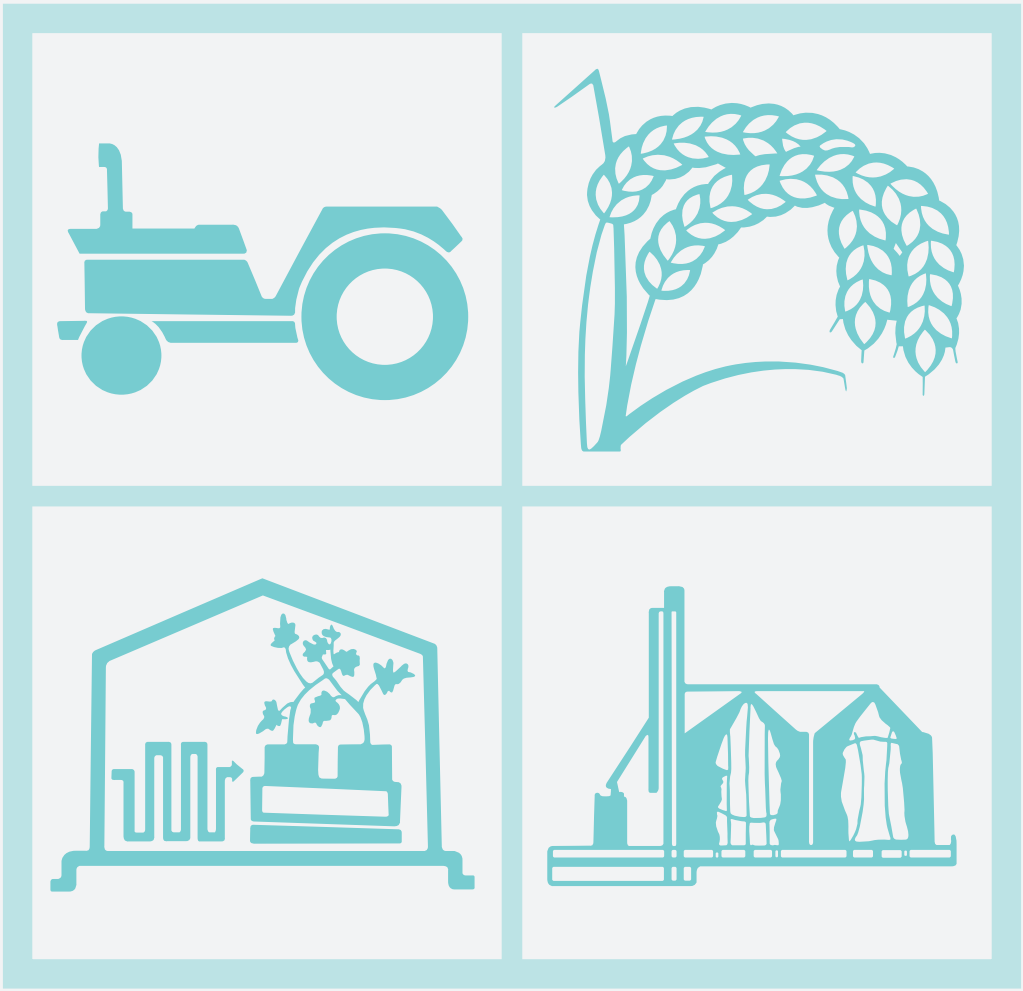

주최

(사) 한국농업기계학회
KSAM Korean Society for Agricultural Machinery

스마트팜 연구센터
Smart Farm Research Center

## BAY 3 ▶스마트팜 시스템 및 신재생에너지 II

■ 좌장 : 선우훈 교수 (순천대학교) ■

| | | |
|---|---|---|
| 11:10~11:22 | 101 | **스마트 파밍 용어 표준화 전략과 지침**<br>Strategy and Guideline for Development of Terminology Standards for Smart Farming<br>유정상(서울대학교), 김대현, 임종국, 강영선, 이중용* |
| 11:22~11:34 | 102 | **수경재배 토마토 정밀 관비를 위한 생육 모니터링 기반 작물 물 요구량 추정**<br>Estimation of Water Requirements based on Growth Monitoring of Tomatoes for Precision Hydroponic Solution Management in a Greenhouse<br>강민석(서울대학교), 김학진*, 이상현, 박성권, 조우재 |
| 11:34~11:46 | 103 | **순환신경망 모델 활용 온실 내부환경 최적 제어 방법 연구**<br>Research on Optimal Control of Greenhouse Internal Environment Using a Recurrent Neural Network Model<br>오광철(강원대학교), 김석준, 박선용, 조라훈, 전영광, 이충건, 김대현* |
| 11:46~11:58 | 104 | **온실 토마토 수경재배에서 정밀 관수를 위한 증발산 모니터링**<br>Monitoring Tomato Evapotranspiration for Precision Supply of Hydroponic Solution in a Greenhouse<br>박성권(서울대학교), 강민석, 이상현, 조우재, 김학진* |
| 11:58~13:00 | | BAY 1 – Break Time |
| 13:00~13:12 | 105 | **표면탄화를 적용한 임목부산물 발열량변화 예측 모델 개발 및 검증**<br>Development and Validation of Forest Byproducts Calorific value change Prediction Model using Surface Torrefaction<br>김석준(강원대학교), 박선용, 조라훈, 전영광, 오광철, 남서연, 김대현* |
| 13:12~13:24 | 106 | **휴대용 이온 분석기를 이용한 양액 내 Ca 이온 선택성 전극 성능 및 수명 평가**<br>Performance Evaluation of a Laboratory-made Ca Ion-Selective Electrode for Precision Hydroponic Solution Management Measurement<br>이상현(서울대학교), 김학진*, 강민석, 박성권, 박찬민 |
| 13:24~13:36 | 107 | **Development of Silk Fibroin-Based Non-Crosslinking Thermosensitive Bioinks for 3D Bioprinting**<br>Juo Lee(Sunchon National University), Iksong Byun, Hoon Seonwoo* |
| 13:36~13:48 | 108 | **Diatom-Encapsulated Hydrogels: Green Approach for Gibberellic Acid Delivery in Sustainable Agriculture**<br>Mahesh P. Bhat(Chonnam National University), Jae-Ho Lee, Cheol Soo Kim, Kyeong-Hwan Lee* |
| 13:48~14:00 | 109 | **Copper-Iron Based Bimetallic MOF Decorated Natural Diatoms for the Delivery of Thiabendazole**<br>Vinayak Hegde(Chonnam National University), Mahesh P.Bhat, Jae-Ho Lee, Cheol Soo Kim, Kyeong-Hwan Lee* |

# Diatom-Encapsulated Hydrogels: Green Approach for Gibberellic Acid Delivery in Sustainable Agriculture

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**Abstract**

Hydrogels have gained considerable attention in the agriculture due to their controlled release capabilities. The plant hormone gibberellic acid (GA), has been shown to improve germination and seedling development, thus enhancing crop quality. However, the inherent degradation characteristic of GA poses a major challenge for its field application. To overcome this obstacle, a pH-responsive hydrogel system is proposed. The system involves the formation of hydrogel beads using dopamine-functionalized hollow nanoporous diatom (DE-PDA) microparticles, which are then entrapped in alginate and chitosan hydrogel matrices. The inclusion of DE-PDA microparticles significantly extends the release behavior of GA. Notably, the hydrogel system with DE-PDA exhibits a substantially higher swelling rate. The beads exhibited 86.3% cumulative release on the 15$^{th}$ day, while the hydrogel systems without DE-PDA show only 300 min of GA release. Germination studies conducted with *Solanum lycopersicum* (Tomato) seeds exhibited highest biological activity. Furthermore, hydrogels prove more efficient than free GA in increasing physiological parameters of tomato plants. Thus, the developed hydrogel delivery systems are effectively deliver GA without compromising its stability, thereby offering a promising solution for sustainable agriculture.

**Keywords**

Gibberellic acid; hydrogel delivery system; sustainable agriculture.

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