



教師指導學生專題製作與論文競賽補助 成果報告

一、申請補助計畫基本資料

申請教師	黃祥恩	核定經費	8,000
單位系所	生命科學系	經費執行情況	<input type="checkbox"/> 已請購核銷完畢 <input checked="" type="checkbox"/> 尚未請購核銷 <input type="checkbox"/> 經費餘款_____
計畫執行 年度/學期	114 年度上學期	參賽期程	112 年 11 月 7 日 ~ 112 年 11 月 8 日
參加競賽/學術 活動名稱	2025 植物學年會- 海報競賽	作品名稱	Enhancing Broad-Spectrum Basal Resistance of Tomato Against <i>Colletotrichum</i> spp. Fungi Using Inactivated <i>Bacillus thuringiensis</i> BtHS1 Bacterial Remnants
指導參賽學生 姓名	林嘉盈	班級	生命科學系四年級
競賽性質	<input checked="" type="checkbox"/> 國際性 <input type="checkbox"/> 校際 <input type="checkbox"/> 校內(院級以上)	參賽地點	國立中興大學
系所主管 簽章		日期	
學院院長 簽章		日期	



二、參賽作品：(論文摘要或作品說明)

Enhancing Broad-Spectrum Basal Resistance of Tomato Against *Colletotrichum* spp. Fungi Using Inactivated *Bacillus thuringiensis* BtHS1 Bacterial Remnants

Jia-Ying Lin, Ching-An Chang, Hsiang-En Huang

Department of Life Sciences, National Taitung University, Taiwan R.O.C

Abstract

Bacillus thuringiensis (Bt) is a commonly used biocontrol bacterium in agriculture and has long been applied for pest management. Recent studies have shown that Bt not only suppresses insects but also has the potential to enhance plant resistance against pathogens and abiotic stresses. However, field applications have revealed that large amounts of viable Bt cells may pose potential risks to humans and animals as opportunistic pathogens, increasing the possibility of biological contamination. In previous studies, our laboratory isolated a Bt strain, HS1, which was shown to enhance tomato tolerance to drought, heat stress, and anthracnose disease caused by *Colletotrichum karsti* by upregulating ferredoxin (Fd) expression and activating salicylic acid (SA) and jasmonic acid (JA)-related defense pathways. To reduce the biosafety risk associated with live HS1 cells, a high–low temperature deactivation method, designated HS1-5s-10 (-20 °C for 4 h followed by 50 °C for 15 min), was developed. This treatment reduced the viable cell count from 10⁸ CFU/mL to <100 CFU/mL, and the inactivated preparation was subsequently used for tomato biocontrol experiments. The results showed that HS1-5s-10 treatment alleviated disease severity in tomatoes infected with *C. karsti*, *C. gloeosporioides*, and *C. camelliae-japonicae*. HS1-5s-10 treatment had no significant effect on the levels of H₂O₂ and total peroxide in infected plants but enhanced the accumulation of total phenolic compounds without affecting soluble peroxidase activity. These findings suggest that HS1-5s-10 may strengthen tomato defense against pathogens by promoting the accumulation of secondary metabolites rather than inducing oxidative stress responses. Moreover, the metabolic fragments of HS1-5s-10 also exhibited direct inhibitory effects on *Colletotrichum* species.

Keyword

Bacillus thuringiensis 、*Colletotrichum* 、tomato 、ROS 、HS1-5s-10



三、參加之競賽活動：(請依據參加活動次數，依序附上相關活動簡章或海報、議程與參加證明等佐證資料)

Enhancing Broad-Spectrum Basal Resistance of Tomato Against *Colletotrichum* spp. Fungi Using Inactivated *Bacillus thuringiensis* BtHS1 Bacterial Remnants

Jia-Ying Lin, Ching-An Chang, Hsiang-En Huang
Department of Life Sciences, National Taitung University

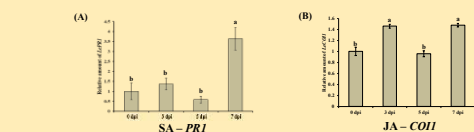


Abstract

Bacillus thuringiensis (Bt) is a commonly used biocontrol bacterium in agriculture and has long been applied for pest management. Recent studies have shown that Bt not only suppresses insects but also has the potential to enhance plant resistance against pathogens and abiotic stresses. However, field applications have revealed that large amounts of viable Bt cells may pose potential risks to humans and animals as opportunistic pathogens, increasing the possibility of biological contamination. In previous studies, our laboratory isolated a Bt strain, HSI1, which was shown to enhance tomato tolerance to drought, heat stress, and anthracnose disease caused by *Colletotrichum karstii* by upregulating ferredoxin (Fd) dependent ascorbic acid (AsA) and isoenzyme acid (JA)-related defense pathways. To reduce the biosafety risk associated with live HSI1 cells, a high-low temperature deactivation method, designated HSI-5s-10 (<20 °C for 4 h followed by 50 °C for 15 min), was developed. This treatment reduced the viable cell count from 10^6 CFU/mL to <100 CFU/mL, and the inactivated preparation was subsequently used for tomato biocontrol experiments. The results showed that HSI-5s-10 treatment alleviated disease severity in tomatoes infected with *C. karstii*, *C. gloeosporioides*, and *C. camelliae-japonicae*. HSI-5s-10 treatment had no significant effect on the levels of H₂O₂ and total peroxide in infected plants but enhanced the accumulation of total phenolic compounds without affecting soluble peroxidase activity. These findings suggest that HSI-5s-10 may strengthen tomato defense against pathogens by promoting the accumulation of secondary metabolites rather than inducing oxidative stress responses. Moreover, the metabolic fragments of HSI-5s-10 also exhibited direct inhibitory effects on *Colletotrichum* species.

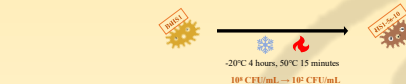
Result

BtHS1 Activates Both SA and JA Defense Pathways in Tomato



▲ Induction of tomato defense genes by BtHS1 irrigation
Tomato plants were grown in a controlled growth chamber and, after 45 days, irrigated with 10^6 CFU/mL BtHS1 bacterial suspension. Leaf tissues were harvested at 0, 3, 5, and 7 days post-irrigation, and total RNA (1 µg) was extracted for semiquantitative PCR analysis using the $\Delta\Delta Ct$ method. Transcript levels were normalized to *LeEF1a* as the internal control. (A) represents the *SA-PR1* defense gene, and (B) represents the *JA-COI1* defense gene. Statistical analysis was performed using SPSS software with ANOVA, followed by Fisher's protected least significant difference (LSD) test. Different letters (a-c) indicate significant differences (n = 3, p < 0.05). Data are presented as mean \pm standard error. Growth conditions: 12 h light / 12 h dark photoperiod, light intensity 400 µmol m⁻² s⁻¹, 25 °C.

BtHS1 Inactivation by -20°C and 50°C Temperature Treatment



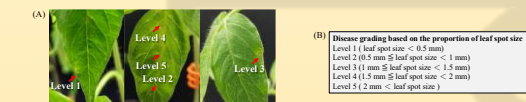
▲ Inactivation of BtHS1 by high-low temperature treatment (HSI-5s-10)
Bacillus thuringiensis BtHS1 was cultured in Lysogeny Broth (LB) medium with shaking for 18 hours, reaching a cell density of 10^6 CFU/mL. The culture was subjected to a combined temperature treatment consisting of incubation at -20 °C for 4 hours followed by a 50 °C water bath for 15 minutes. After serial dilution and plating, the bacterial count was reduced to <100 CFU/mL, indicating effective inactivation.

Colony Growth and Spore Morphology of *Colletotrichum* spp. on PDA



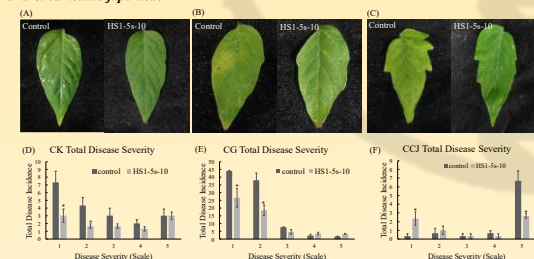
▲ Mycelial growth and spore morphology of *Colletotrichum karstii*, *C. gloeosporioides*, and *C. camelliae-japonicae* on PDA medium
Colletotrichum karstii, *C. gloeosporioides*, and *C. camelliae-japonicae* were cultured on PDA medium under dark conditions at 25 °C. After 7 days of incubation, colony morphology was photographed to observe mycelial growth. Each *Colletotrichum* species was also cultured in PDB liquid medium under shaking conditions (dark, room temperature) for 14 days, and the spore morphology was examined under a microscope. (A) *C. karstii* colony and spore morphology; (B) *C. gloeosporioides* colony and spore morphology; (C) *C. camelliae-japonicae* colony and spore morphology.

Different Severity Levels of Anthracnose Disease in Tomato Caused by *Colletotrichum* spp.



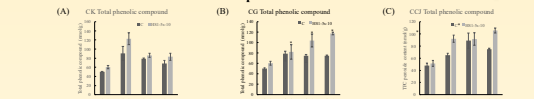
▲ Disease severity scale (Level 1–5) of tomato leaves infected with *Colletotrichum* spp.
Tomato plants were grown in a controlled growth chamber and, after 45 days, irrigated with 50 mL of 10-fold diluted inactivated HSI suspension. The control group was irrigated with 50 mL of 10-fold diluted Luria-Bertani (LB) medium. Five days after irrigation, a *Colletotrichum* spp. spore suspension (1×10^6 spores/mL) mixed with 1/5 PDB and 10 mM MgSO₄ (20 mL per plant) was uniformly sprayed onto the abaxial surface of tomato leaves. Disease symptoms were photographed 7 days after inoculation. (A) Representative tomato leaves showing disease severity (Level 1–5). (B) Criteria for disease severity classification. Growth conditions: 12 h light / 12 h dark photoperiod, light intensity 400 µmol m⁻² s⁻¹, 25 °C.

HSI-5s-10 Effectively Enhances Tomato Resistance Against *C. karstii*, *C. gloeosporioides*, and *C. camelliae-japonicae*



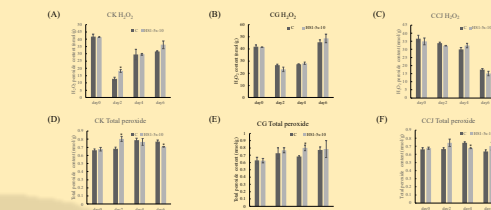
▲ Inactivated BtHS1 irrigation enhances tomato resistance against *Colletotrichum* spp. induced anthracnose
Tomato plants were grown in a controlled growth chamber and, after 45 days, irrigated with 50 mL of 10-fold diluted inactivated HSI suspension. The control group was irrigated with 50 mL of 10-fold diluted Luria-Bertani (LB) medium. Five days after irrigation, a *Colletotrichum* spp. spore suspension (1×10^6 spores/mL) mixed with 1/5 PDB and 10 mM MgSO₄ (20 mL per plant) was uniformly sprayed onto the abaxial surface of tomato leaves. Disease symptoms were photographed 7 days after inoculation. (A–C) Representative leaf symptoms of *C. karstii* (CK), *C. gloeosporioides* (CG), and *C. camelliae-japonicae* (CCJ) in control and HSI-5s-10 treatments. (D–F) Total disease severity per plant. Growth conditions: 12 h light / 12 h dark photoperiod, light intensity 400 µmol m⁻² s⁻¹, 25 °C. Statistical analysis was performed using SPSS software with ANOVA, followed by an independent sample t-test. Asterisks (*) indicate significant differences (n = 3, p < 0.05). Data are presented as mean \pm standard error.

HSI-5s-10 Increases Total Phenolic Compound Content in Tomato



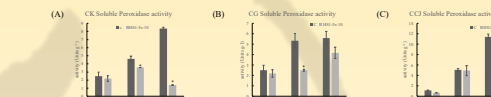
▲ Total phenolic compound content in tomato leaves after irrigation with inactivated BtHS1 and infection by *Colletotrichum* spp.
Tomato plants were grown in a controlled growth chamber and, after 45 days, irrigated with 50 mL of 10-fold diluted inactivated HSI suspension. The control group was irrigated with 50 mL of 10-fold diluted Luria-Bertani (LB) medium. Five days after irrigation, a spore suspension of *C. karstii*, *C. gloeosporioides*, or *C. camelliae-japonicae* (1×10^6 spores/mL) mixed with 1/5 PDB and 10 mM MgSO₄ (20 mL per plant) was uniformly sprayed onto the abaxial surface of tomato leaves. Total phenolic compound content was measured at 0, 2, 4, and 6 days post-inoculation. (A) Total phenolic compound content after inoculation with CK, (B) Total phenolic compound content after inoculation with CG, (C) Total phenolic compound content after inoculation with CCJ. Growth conditions: 12 h light / 12 h dark photoperiod, light intensity 400 µmol m⁻² s⁻¹, 25 °C. Statistical analysis was performed using SPSS software with an independent sample t-test. Asterisks (*) indicate significant differences (n = 3, p < 0.05). Data are presented as mean \pm standard error.

HSI-5s-10 Has No Effect on H₂O₂ and Total Peroxide Content in Tomato



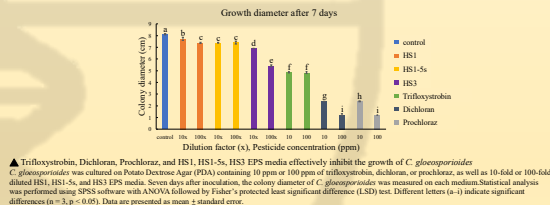
▲ H₂O₂ and Total Peroxide content in tomato leaves after irrigation with inactivated BtHS1 and infection by *Colletotrichum* spp.
Tomato plants were grown in a controlled growth chamber and, after 45 days, irrigated with 50 mL of 10-fold diluted inactivated HSI suspension. The control group was irrigated with 50 mL of 10-fold diluted Luria-Bertani (LB) medium. Five days after irrigation, a spore suspension of *C. karstii*, *C. gloeosporioides*, or *C. camelliae-japonicae* (1×10^6 spores/mL) mixed with 1/5 PDB and 10 mM MgSO₄ (20 mL per plant) was uniformly sprayed onto the abaxial surface of tomato leaves. H₂O₂ and total peroxide content were measured at 0, 2, and 5 days post-inoculation. (A) *C. karstii*, (B) *C. gloeosporioides*, (C) *C. camelliae-japonicae*. Total peroxide content after inoculation with CK, CG, and CCJ. Growth conditions: 12 h light / 12 h dark photoperiod, light intensity 400 µmol m⁻² s⁻¹, 25 °C. Statistical analysis was performed using SPSS software with an independent sample t-test. Asterisks (*) indicate significant differences (n = 3, p < 0.05). Data are presented as mean \pm standard error.

HSI-5s-10 Does Not Increase Soluble Peroxidase Activity in Tomato Infected with Anthracnose



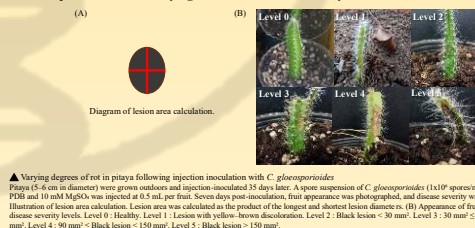
▲ Soluble peroxidase activity in tomato leaves after irrigation with inactivated BtHS1 and infection by *Colletotrichum* spp.
Tomato plants were grown in a controlled growth chamber and, after 45 days, irrigated with 50 mL of 10-fold diluted inactivated HSI suspension. The control group was irrigated with 50 mL of 10-fold diluted Luria-Bertani (LB) medium. Five days after irrigation, a spore suspension of *C. karstii*, *C. gloeosporioides*, or *C. camelliae-japonicae* (1×10^6 spores/mL) mixed with 1/5 PDB and 10 mM MgSO₄ (20 mL per plant) was uniformly sprayed onto the abaxial surface of tomato leaves. Soluble peroxidase activity was measured at 0, 2, and 5 days post-inoculation. (A) Soluble peroxidase activity after inoculation with CK, (B) Soluble peroxidase activity after inoculation with CG, (C) Soluble peroxidase activity after inoculation with CCJ. Growth conditions: 12 h light / 12 h dark photoperiod, light intensity 400 µmol m⁻² s⁻¹, 25 °C. Statistical analysis was performed using SPSS software with an independent sample t-test. Asterisks (*) indicate significant differences (n = 3, p < 0.05). Data are presented as mean \pm standard error.

Effects of Trifloxystrobin, Dichloran, Prochloraz, and HSI, HSI-5s, HSI3 EPS Media on the Growth of *C. gloeosporioides*



▲ Trifloxystrobin, Dichloran, Prochloraz, and HSI, HSI-5s, HSI3 EPS media effectively inhibit the growth of *C. gloeosporioides*
C. gloeosporioides was cultured on Potato Dextrose Agar (PDA) containing 10 ppm or 100 ppm of trifloxystrobin, dichloran, or prochloraz, as well as 10-fold or 100-fold diluted HSI, HSI-5s, and HSI3 EPS media. Seven days after inoculation, the colony diameter of *C. gloeosporioides* was measured on each medium. Statistical analysis was performed using SPSS software with ANOVA, followed by Fisher's protected least significant difference (LSD) test. Different letters (a-c) indicate significant differences (n = 3, p < 0.05). Data are presented as mean \pm standard error.

C. Gloeosporioides Cause Varying Levels of Infection in Pitaya



▲ Varying degrees of rot in pitaya following injection inoculation with *C. gloeosporioides*
Pitaya (5–6 cm in diameter) were grown outdoors and injection-inoculated 35 days later. A spore suspension of *C. gloeosporioides* (1×10^6 spores/mL) mixed with 1/5 PDB and 10 mM MgSO₄ was injected at 0.5 mL per fruit. Seven days post-inoculation, fruit appearance was photographed, and disease severity was assessed. (A) Illustration of lesion area calculation. Lesion area was calculated as the product of the longest and shortest lesion diameters. (B) Appearance of fruits at different disease severity levels. Level 0: Healthy. Level 1: Lesion with yellow-brown discoloration. Level 2: Black lesion < 30 mm². Level 3: 30 mm² ≤ Black lesion < 90 mm². Level 4: 90 mm² ≤ Black lesion < 150 mm². Level 5: Black lesion > 150 mm².

HSI-5s-10 Suppresses Persistent Infection in Mildly Anthracnose-Infected Pitaya



▲ Injection of inactivated BtHS1 suspension halts persistent infection in level 2 and 3 Anthracnose-infected pitaya
Pitaya fruits with anthracnose symptoms were classified as Level 2, 3, or 4. Each lesion was treated by injecting 0.5 mL of inactivated HSI suspension per fruit. (A) Appearance of Level 2 infected fruits before and 7 days after HSI treatment. (B) Appearance of Level 3 infected fruits before and 7 days after HSI treatment. (C) Rate of persistent infection. Statistical analysis was performed using SPSS software with ANOVA, followed by Fisher's protected least significant difference (LSD) test. Different letters (a-c) indicate significant differences (n = 3, p < 0.05). Data are presented as mean \pm standard error.

Conclusion

1. HSI-5s-10 reduced disease severity in tomato infected with *C. karstii*, *C. gloeosporioides*, and *C. camelliae-japonicae*.
2. HSI-5s-10 increased total phenolic compound content.
3. HSI-5s-10 did not increase soluble peroxidase activity.
4. HSI-5s-10 may enhance defense via secondary metabolite accumulation.
5. HSI-5s-10 metabolic fragments directly inhibited anthracnose pathogens.
6. Inactivated HSI-5s-10 induces resistance while avoiding biosafety risks of live bacteria.





2025. 11. 7-8



國立中興大學
圖書館 7F,
農業環境科學大樓 10F

臺灣植物學年會暨研討會

植物科學與 未來農業的 跨界對話

Plant Science Shapes
the Future of Agriculture



主辦單位: 臺灣植物學會 國立中興大學

DAY 1 11.7 (Fri.) 國立中興大學圖書館 7F

13:00 - 14:00	報到
13:00 - 14:00	報到, 海報展
2025 開幕式, 會員大會與事務報告	
主持人: 呂冠儒 助理教授 國立中興大學生物科學研究所	
廖適 助理教授 國立中興大學生物化學研究所	
14:00 - 14:40	開幕, 會員大會與事務報告
農畜管理處長	
國立中興大學植物病理學系終身特聘教授兼校長	
林秋燕特別講座 Keynote Speech	
主持人: 方東漢 研究員 中央研究院農業生物科學研究中心	
14:40 - 15:10	Dr. Juniko Kyozuka, Distinguished Professor, Department of Ecological Developmental Adaptability life sciences, Tohoku University Stepwise Evolution of Hormone Signaling: The Strigolactone Story

頒獎典禮	
主持人: 呂冠儒 助理教授 國立中興大學生物科學研究所	
廖適 助理教授 國立中興大學生物化學研究所	
2025 終身成就獎、2025 新秀獎、林秋燕教授植物科學新研究獎、2025 最佳博士/碩士論文獎	
新秀獎得主演講	
15:30 - 15:45 廖適 助理教授 國立中興大學生物化學研究所	
Unravel the mechanisms behind the mechanosensing pathways that lead to wound-induced cell regeneration	
15:45 - 16:15 大合照、Coffee Break	
3 分鐘優等論文演講賽	
主持人: 王中茹 副研究員 中央研究院植物微生物學研究所	
16:15 - 17:00 3 分鐘優等論文演講賽	
壁報比賽 圖書館 1F	
17:00 - 17:45 壁報展	
17:45 - 18:30 壁報展	
19:00 - 21:00 晚餐 菊園酒家會館	

DAY 2 11.8 (Sat.) Room: 國際會議廳

壓力下植物調控發育以適應環境之策略	
主持人: 林登仲 教授 國立臺灣大學植物科學研究所	
09:00 - 09:15 張皓麟 副教授 國立臺灣大學植物病理與微生物學系	
種子微生物群及種子相關超微結構提供大豆耐土傳病原菌之抗病性	
09:15 - 09:30 陳建弘 助理教授 國立中興大學植物病理學系	
植物組織在生物性環境下的組織免疫反應	
09:30 - 09:45 吳季穎 助理教授 中央研究院植物微生物學研究所	
植物適應陸生的關鍵因子: HSF 如何整合發育與環境反應	
09:45 - 10:00 陳建弘 助理教授 國立成功大學生物技術與產業科學系	
以質譜多體學在單細胞與空間解析度下剖析非生物環境中的熱激反應	
特選摘要論文演講	
10:00 - 10:10 許安 碩士班學生	
國立臺灣大學生命科學系	
Decoding maize anther development through integrative approaches	
10:10 - 10:20 莊毅凱 博士後研究員	
中央研究院植物微生物學研究所	
The U1 snRNP Component RBP45d Regulates Temperature-Sensitive Splicing in Plant Thermomorphogenesis	
10:20 - 10:40 Coffee Break	

科學之路怎麼走? 疑難雜症來問我!

主持人: 林登仲教授 國立臺灣大學植物科學研究所

10:40 - 12:00 座談會與談人

呂冠儒 助理教授 國立中興大學生物科學研究所

林登仲 助理教授 國立中興大學農藝學系

陳建弘 助理教授 國立成功大學生物技術與產業科學系

廖適 助理教授 國立臺灣大學生命科學系

鄭博君 副教授 國立臺灣大學生物化學系

12:00 - 13:30 午餐 農場大樓 1F 教室、2F 會議室

Distinguished Lecture

主持人: 吳秉華 特聘研究員 中央研究院植物微生物學研究所

13:30 - 14:00 廖適 院長 中央研究院

Design of synthetic C2 plants: the McG cycle

林秋燕特別講座 Keynote Speech

主持人: 吳志航 副研究員 中央研究院植物微生物學研究所

14:00 - 14:30 Dr. Alberto P. Macho, Principal Investigator, Center of Excellence in Molecular Plant Sciences, Chinese Academy of Sciences, China

Deciphering the interaction between plants and bacterial pathogens: beyond activation and suppression of immunity

林秋燕教授植物科學教育基金會與 2025 研究新獎

主持人: 呂冠儒 助理教授 國立中興大學生物科學研究所

廖適 助理教授 國立中興大學生物化學研究所

張麗芳 教授 國立中興大學植物病理學系

2025 林秋燕教授植物科學教育基金會與 2025 研究新獎得主演講

劉明輝 副研究員 中央研究院農業生物科學研究所

14:35 - 14:50 Decoding the translation initiation mechanism in plants

14:50 - 15:05 山田昌史 助理教授 中央研究院農業生物科學研究中心

The roles of an RGF peptide in root meristem development

15:05 - 15:25 Coffee Break

大講講座 | 2025 終身成就獎

主持人: 農畜管理處長 國立中興大學植物病理學系終身特聘教授兼校長

15:25 - 15:40 2025 終身成就獎得主

賀麗華 博士 中央研究院植物微生物學研究所

15:40 - 15:55 2025 終身成就獎得主

余淑美 博士 中央研究院分子生物研究所

閉幕式及頒獎典禮

主持人: 呂冠儒 助理教授 國立中興大學生物科學研究所

廖適 助理教授 國立中興大學生物化學研究所

15:55 - 16:35 閉幕式及頒獎典禮

DAY 2 11.8 (Sat.)

農業環境科學大樓 10F Room: 10B05

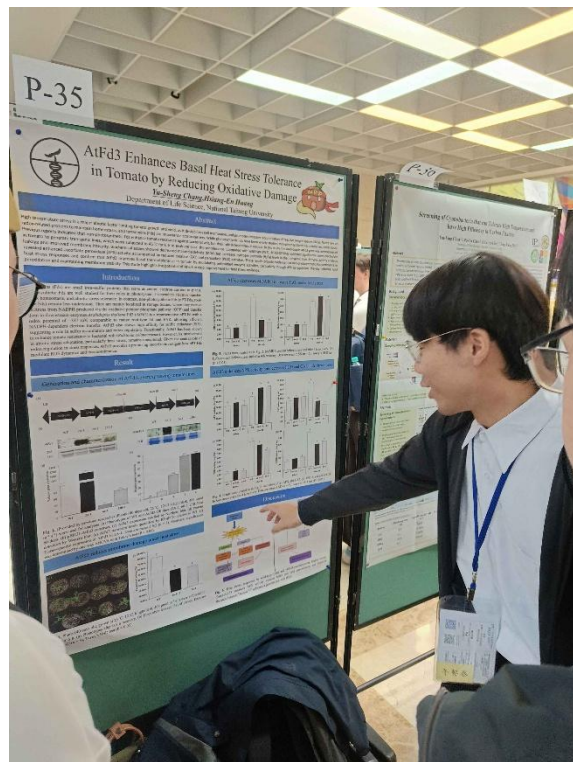
影像技術應用於作物栽培與精準育種的潛力	
主持人: 鄭舒允 副教授 國立中興大學農藝學系	
09:00 - 09:15 許紹鈺 助理教授 發揚大都市設計與永續發展學系	
陸地作物適應性基於水稻穀粒含水量評估	
09:15 - 09:30 蔡慧萍 副教授兼系主任 國立中興大學土木工程學系	
結合作物量測指標與無人機多光譜影像於茶樹生長評估	
09:30 - 09:45 陳佐宏 副研究員 附屬法人國家實驗研究院國家儀器科技研究中心	
結合高光譜影像與機器學習之種子非破壞性檢測	
09:45 - 10:00 鄭麗金 副教授兼系主任 國立中興大學生物產業機械工程學系	
數位影像技術於茶葉育種之應用	
特選摘要論文演講	
10:00 - 10:10 Miguelito Isip 博士班學生	
中央研究院 植物微生物學研究所	
Disentangling plant responses to microbiota using unsupervised latent representation and explainable AI	
10:10 - 10:20 Juan Carlos Lopez-Agudelo 博士班學生	
中央研究院農業生物科學中心	
To infinity and beyond: A novel agrobacterial strain allows transient expression and functional genomics research across plant lineages	
10:20 - 10:40 Coffee Break	
植物編輯: 從技術到實務	
主持人: 吳志航 副研究員 中央研究院植物微生物學研究所	
10:40 - 10:55 邱顯淵 副教授 國立成功大學熱帶植物與微生物學研究所	
原生質體基因編輯提升丹參藥用成分	
10:55 - 11:10 蘇育彰 助理教授 國立臺灣大學農藝學系	
利用 CRISPR/Cas9 精準育種策略改良番荔枝實性狀	
11:10 - 11:25 黃耀豐 助理教授 國立中興大學生物科學研究所	
藉由 Potexvirus 載體實現的非轉基因多重基因編輯: 從菸草到蘭花與大麥	
11:25 - 11:40 馬家威 副研究員 中央研究院植物微生物學研究所	
以組合式基因編輯技術促進多基因功能分析	
特選摘要論文演講	
11:40 - 11:50 Puyam Tondon Singh 博士班學生	
國立臺灣大學生物科學研究所	
Chromosomal deletions in banana somaclonal variants reveal negative regulators of immunity underlying Fusarium wilt resistance	
11:50 - 12:00 陳曉謙 碩士班學生 國立中興大學植物病理學系	
A novel PEGylated chitosan double-stranded RNA nanoparticle for controlling Colletotrichum orbiculare, the causal pathogen of anthracnose	

Room: 10D07

跨學科解析植物訊息傳遞與代謝機制	
主持人: 陳建弘 副教授 國立成功大學生物技術與產業科學系	
09:00 - 09:15 黃浩仁 特聘教授 國立成功大學生命科學系	
作物在陸地環境下的生理與分子反應: 氮素吸收與多巴胺在調控中的角色	
09:15 - 09:30 陳建弘 研究員 中央研究院農業生物科學研究中心	
植物核心免疫半世紀之謎: 質譜前技術揭示 PR1 之功能	
09:30 - 09:45 賴建威 終身特聘教授 國立中興大學分子生物學研究所	
AZL180 水稻突變株的全方位體學分析揭示與黃色胚乳及營養性狀相關的代謝與蛋白質特徵	
09:45 - 10:00 杜元凱 研究員 農業部農業試驗所	
以多體學分析毛桃和油桃之絨毛形成控制機制	
特選摘要論文演講	
10:00 - 10:10 侯良謙 博士後研究員	
中央研究院植物微生物學研究所	
Early phosphorylation events across organelles orchestrate NRC4 resistosome-triggered hypersensitive cell death	
10:10 - 10:20 高仲慶 博士後研究員	
國立臺灣大學植物科學研究所	
Single-cell and triple spatial omics reveals progressive loss of xylem developmental complexity across seed plants	
10:20 - 10:40 Coffee Break	
生活植物學與新世代農業的連結	
主持人: 林登仲 教授 國立中興大學生命科學系	
10:40 - 10:55 黃麗芬 教授 元智大學生物技術與工程研究所	
天山雪蓮二次代謝物增強技術於新藥應用	
10:55 - 11:10 陳宗標 助理教授 國立中央大學生命科學系	
利用多體學分析法篩選水稻白葉枯病菌的群體感應物抑制劑	
11:10 - 11:25 陳仕聰 助理教授 國立嘉義大學農藝學系	
植物不寂寞: 微生物守護者	
11:25 - 11:40 廖適 助理教授 國立中興大學生物化學研究所	
F-肌動蛋白穩定化與細胞完整性主導後誘導性細胞重編程中的再生模式與細胞延緩性	
特選摘要論文演講	
11:40 - 11:50 李志輝 博士後研究員	
中央研究院農業生物科學中心	
A Divergent PaWUS-PaCLV3 Module Regulates Shoot Regeneration in Phalaenopsis aphrodite	
11:50 - 12:00 鄭金基 博士後研究員	
中央研究院農業生物科學中心	
Seeing a window of time to harvest transgenic Arabidopsis seeds through a mini-scale floral dip method with the RUBY reporter	

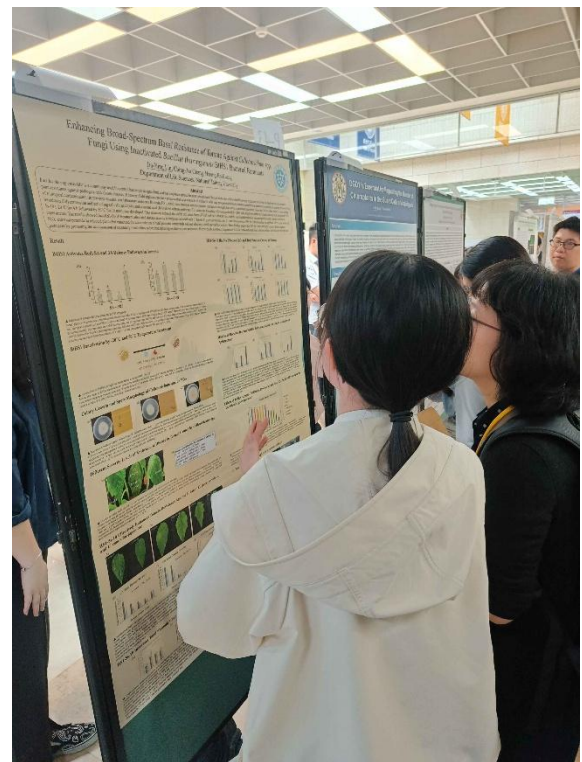


四、參賽準備與活動記錄



圖說明：

遇到已畢業學長他為我們介紹海報



圖說明：

壁報參賽過程中與研究員討論議題



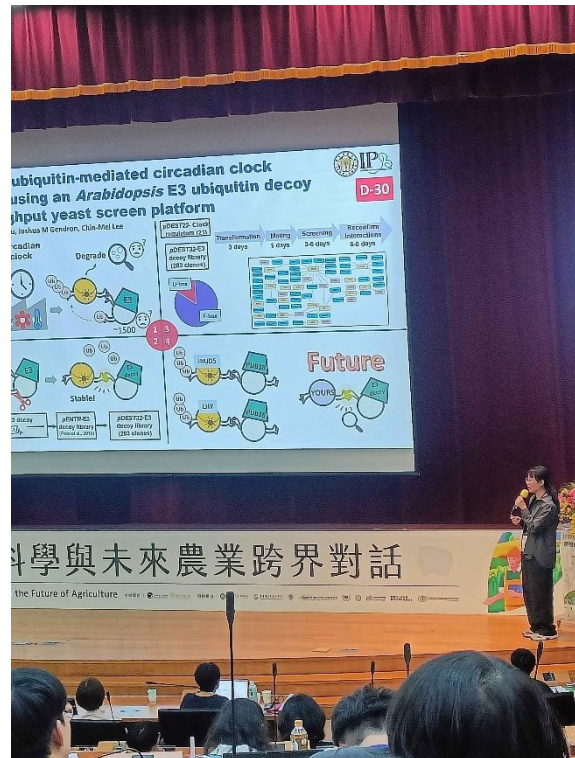
圖說明：

參與終身成就獎頒獎典禮



圖說明：

實驗室成員與中研院研究員在晚宴一同共餐



圖說明：

觀摩三分鐘論文短講競賽



圖說明：

聆聽馬家威博士關於多基因編輯的演講

五、參加競賽成果 (參賽證明、得獎證明或學生心得)

林嘉盈同學

今年的植物學年研討會對我而言是一段特別的經驗。過去的幾年我都以參加者的身分前往，單純聽演講、看別人的成果展示。今年則第一次以發表者的身分站在壁報前，向不同領域的研究者說明自己的研究內容，這讓我對學術交流更有深刻印象，也更有參與其中的感覺。我發表的題目是：

「利用去活化的蘇雲金芽孢桿菌 *Bacillus thuringiensis* BtHS1 細菌分離株殘骸提高番茄對於炭疽病菌屬真菌的廣泛性基礎抗性」。

這次壁報競賽讓我真正練習到如何把複雜的研究背景、實驗設計、結果，用簡短的時間清楚地說給不同背景的聽眾與評審理解。每位停下腳步觀看壁報的人都會提出不同角度的問題，有的人關心實驗設計的細節，有的人提出可能的機制，也有人分享他們遇過類似問題的經驗。這些討論讓我覺得很新鮮，也讓我重新思考研究中一些容易忽略的環節。透過這樣的互動，我也感受到學術交流真正的意義，不是單方面說明結果，而是透過溝通讓研究變得更完整、更有方向。

除了自己的壁報之外，我也參加了多場不同領域的研究演講。講者們分享的最新發現與研究方法讓我看到植物科學的多樣面貌，不論是病害機制、生理反應、基因調控還是應用策略，都讓我獲得新的靈感。



這次研討會最大的收穫，是讓我從聽眾變成分享者。站在壁報前一次次的講述與回答問題的過程讓我更有信心，也讓我意識到自己還有很多可以進步的地方，例如資料在壁報的呈現方式、敘述的流暢度，以及對研究整體脈絡的掌握。這次植物學年研討會的經驗對我而言不只是一次活動，而是一個讓我成長的機會。它提醒我，做研究不是關在實驗室裡，而是要不斷與他人交流、反思與調整。未來我也希望能持續參與類似的學術場合，累積更多分享與學習的經驗，讓自己的研究之路越走越穩。

邱炳榮同學

我很榮幸能參加 11 月 7 日於國立中興大學舉辦的「2025 植物科學與未來農業跨界對話研討會」年會。對我而言，這次活動具有特別的意義。回想三年前剛加入實驗室時，因為得知資訊太晚而無法報名，錯失了向外界學者學習與交流的機會。經過這三年的努力，我參與了中研院與國科會的大專生研究計畫，也逐漸具備自行設計實驗的能力，並修習更多植物科學相關課程，使我對這個領域有了更深的認識。

這次能與祥恩實驗室的夥伴一起參加年會，讓我感到非常開心。會場中各式海報展示豐富而多元的研究主題，每一張海報都凝聚了研究者的心血，讓我深刻體會到科學研究的廣度與挑戰性。由於海報數量很多，我挑選了幾張特別感興趣的主題進行詢問，其中有部分是馬家威實驗室夥伴的研究，聚焦於阿拉伯芥根聯細菌對植物的影響。這類研究不僅有助於理解植物與微生物的互動，也可能對農業生產帶來實際應用。

在與研究者討論的過程中，我更清楚地理解了他們的研究方法與結果，也激發了我對未來研究方向的思考。雖然目前我在生物資訊方面的技術仍不夠熟練，但透過他們的講解，我對一些基礎概念與應用有了初步的掌握，這也是我未來想加強的能力之一。這次經驗讓我更確信，若能掌握更多工具與分析方法，將能大幅提升研究的深度與廣度。

除了學術面向，我也把握機會與來自不同機構的研究者建立聯繫。這讓我感受到科研社群中的互助與支持，也從彼此的交流中獲得許多靈感，對於我未來的研究方向帶來新的啟發。我開始思考如何把目前習得的實驗技術運用到更廣泛的植物研究之中，這讓我對未來充滿期待。

這次年會不僅讓我看見最新的研究成果，也提供了一個與各界學者交流的寶貴平台。透過這次參與，我對植物科學的熱情更加提升，也深刻體會到持續學習與交流的重要性。我希望未來的學弟妹也能擁有這樣的機會，從中獲得啟發並開拓視野。

林崇育同學

這次植物學年會，比起去年，多去了第一天的壁報比賽，聆聽到了各學校，中研院各實驗的內容，有些內容畢竟還實驗室的實驗方向大同小異，這次前去年會在聽講解時，也和同學聊了一下，在對於幾個在壁報上的問題，並討論和自己實驗相關的改進或是能夠更注重的地方，這在第一天的活動有了一些的心得，而第二天則是聽各學校、實驗室當下做的實驗或者實驗室研究的方向，讓參加年會的學者、同學看看實驗的結果，但因為這天有三個不同研究



方向的大講廳在同時分享，所以就也只能從中選擇幾場題目有興趣的場次去聽。

吳東儒同學

身為初入實驗室的我很自然而然的參與了這次有關本實驗室研究主題的研討會活動，在這裡讓我因為經驗的不足而看不懂參賽海報的內容，在這裡讓我因為語言能力欠佳導致許多場演講都無法理解，但在這裡我可以明白自己的能力有何需改進，有什麼樣有興趣的內容可以再回來深入思考並鑽研，對於我一個領域新人來說實際體驗差距是難得也是很美好的體驗。

陳怡綸同學

作為剛加入實驗室的人，能夠參加與實驗室研究方向相關的研討會對我來說是一個很寶貴的經驗。雖然因為經驗尚淺，海報的內容常常難以抓住重點，演講時也因語言障礙而無法完全理解，但正是這些挑戰讓我更清楚自己還有哪些能力需要加強。

在研討會中，我也注意到一些令我感興趣的研究題目，雖然目前還無法完全理解，但我希望未來能回過頭去深入學習。

此外，研討會中我了解到，SLs 最初只是植物與菌根真菌之間的訊號分子，隨著演化中的基因變化，它們才逐漸擁有了調控植物生長的功能。這讓我意識到，許多植物機制其實都是從基本需求逐步演化而來的，背後的脈絡比我想像中更有連貫性，也讓我對相關知識的理解更為清晰。

吳承諺同學

這次去植物學年會聽到許多很有趣很厲害的演說，其中我印象深刻的是，利用特定病毒將建構好的 DNA 片段送入植物中，而此方式的轉入效率比一般在用的轉入方法還要高，這需要對該病毒有了解才做得到，而我這學期的病毒學也剛好有學到病毒的七種類型、複製方式，能夠在聽演講的時候把剛學到的知識套用上去，我覺得很開心，同時也讓我知道了，我還要學習更多相關領域的知識，才有機會像這些講者一樣厲害。

王鈞綸同學

這次在中興大學舉辦的植物學年會，雖然我沒有發表海報，但我真的學到了很多。

除了聆聽我們實驗室學長姊的報告外，我特別感謝學長和我去看其他學校的海報，並且一起討論。這讓我對實驗設計的思路與方向有了更深層次的了解，對我之後讀研究所有非常實質的幫助。

看別人的海報也讓我對自己現在的實驗產生了更多想法。特別有一篇關於熱逆境的海報令我印象深刻，可以透過參考其他人的方式來精進自己的實驗方式。

除了海報，也有許多教授分享他們的最新研究成果與突破，他們分享了自身經歷，告訴我們在研究路上感到迷惘時要如何調適與面對，讓我感到非常受用。

除了學術之外，這次研討會的伙食也很奢，非常期待明年在日本舉辦的研討會，希望屆時能換我貼海報，分享我的成果。