

出國報告（出國類別：開會）

參加美國植物病理學會 2023 年會 (Plant Health 2023)

服務機關：農業部農業藥物試驗所

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派赴國家：美國

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報告日期：112 年 11 月 7 日

摘要

美國植物病理學會 2023 年會 (Plant Health 2023) 由美國植物病理學會 (American Phytopathological Society) 舉辦。今年度於科羅拉多州丹佛市舉行，舉辦時間為 8 月 12 至 16 日，為期 5 天；共有 1,100 名來自世界各國的研究學者、政府單位人員以及業界人士共同參與。本次會議主題包含：新病害之通報與研究、病原菌與寄主的交互作用以及作物抗病能力探討、病害管理、病害診斷技術等研究議題。筆者亦發表成果海報一份，題目為：「An endophytic *Bacillus* sp. isolate REnB8 from grey mangrove has the antimicrobial activity and the potential to protect cabbage from heat stress」。透過參與此次會議，不僅有助於專業知識的提升，更提供與國際學者交流的平台，促進未來合作的機會，同時也讓筆者對於工作、研究方向以及研討會籌備方式有以下的想法與建議：(1) 在農藥風險溝通方面，我國政府單位採取的策略與重視程度其實不亞於其他國家，他國參與者提出的解方大同小異，重點在於是否持續的推行、(2) 在生物防治研究方面，可以採收前期的病蟲害防治作為開發方向，亦可作為減少化學農藥使用的替代方案、(3) 除了專題演講、論文宣讀和海報發表，研討會辦理可採用更多元的模式舉行，以增加與會者的參與度，讓前輩提攜後進，達到國內學術研究的傳承與持續發展的目標。總結而言，這是一個充滿收穫的學術體驗，期待能將這些學到的知識和經驗應用於未來的研究工作中，持續學習、與時俱進。

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壹、前言及目的

美國植物病理學會（The American Phytopathological Society，簡稱為APS）於1908年12月成立，其成立宗旨為：促進以及協助植物病理學之科學研究發展（*invaluable aid in promoting the future development of this important and rapidly growing subject*）。學會成員皆致力於探討如何有效地管理植物病害，其研究領域包含：植物生理學、微生物學、作物科學、土壤學、環境科學、遺傳學、生物化學、分子生物學等等；會員組成除了學術界，亦包括政府與業界人士。研究領域的多樣性以及定期舉辦國際研討會，讓參與人員皆能從互相交流與討論的過程獲得更多新知。

第一屆的APS年會（APS Annual Meeting）於1909年在美國的麻薩諸塞州波士頓（Boston）舉辦，當時共有50名與會者並有45篇論文發表；直至今年，年會已於美國各地區不間斷地舉辦了115場次，唯2020和2021年因為流行性疾病（*covid-19*）的影響而改成線上會議。

本（2023）年度為流行性疾病受到控制後得以參與該研討會的第一年，此次會議自8月12至16日於美國科羅拉多州丹佛市（Denver）的喜來登酒店舉行，會議主題為「植物健康（Plant Health）」。該研討會主題多能反映出當前植物病理學研究面臨的主要問題，除了發表研究成果之外，也能與國際的專家學者進行交流獲得新知，增進國際視野。因此，本次與會目的包含：（1）發表論文（投稿接受函詳如附錄一，發表內容詳如附錄二）以及（2）學習與增進植物病理學研究專業知識，並與各國學者交流；期望除了擴展己之專業知能外，亦能增加與他國學者於未來共同合作的機會。

貳、行程紀要

台灣時間	美國時間	活動內容
112 年 8 月 12-13 日	8 月 11-12 日	台北（桃園國際機場）→洛杉磯國際機場→丹佛國際機場→轉乘鐵路至會場與報到
112 年 8 月 14 日	8 月 13 日	參與 2023 年會，活動摘要如下： <ol style="list-style-type: none"> 1. 開幕式 2. 張貼會議海報 3. 參加 idea café 活動 4. 論文宣讀（special/ technical sessions）
112 年 8 月 15 日	8 月 14 日	參與 2023 年會，活動摘要如下： <ol style="list-style-type: none"> 1. 論文宣讀（special/ technical sessions） 2. 海報展區時間
112 年 8 月 16 日	8 月 15 日	參與 2023 年會，活動摘要如下： <ol style="list-style-type: none"> 1. 論文宣讀（special/ technical sessions） 2. 參加 Speed Monitoring Event 活動 3. 海報展區時間並撤離會議海報
112 年 8 月 17 日	8 月 16 日	會議閉幕式
112 年 8 月 18-19 日		丹佛國際機場→舊金山國際機場→台北（桃園國際機場）（19 日清晨抵台）→台中

參、過程

一、會議簡介

依據大會統計，Plant Health 2023參與人員來自世界各國，人數約1,100人，72%來自學研單位、15%為業界人士、13%為政府部門人員（圖一）。

研討會舉辦日期為2023年8月12至16日，共5天。主題包含：新病害之通報與研究、病原菌與作物抗病能力探討、病害管理、病害診斷技術等研究議題；活動型式包含：3場專題演講、論文宣讀（15項特別主題（special sessions）及17項技術主題（technical sessions））以及海報發表（約700份）；除此之外，主辦單位也安排一些特別活動，以增進不同背景研究人員對於會議的參與度，例如：

（1）Idea Cafés & Trending Topics，共有27個主題，活動時間為1小時，每個主題有一張圓桌的空間，由主持人引導參與人員共同討論、

（2）病害診斷競賽（Plant Diagnostic Bowl），由科羅拉多州立大學植物實驗室提供植物病害樣本，參與人員除了診斷病害之外亦需推薦管理方法、

（3）Speed Mentoring Event，此為一對一進行的交談活動，主要讓新進的參與人員（mentees）可以和資深的研究人員（mentor）交流，活動時間共50分鐘，每一次對談時間10分鐘，時間到則需更換交談對象。參與人員需要事先報名。



圖一、美國植物病理學會2023年會參與人員之職業與國家組成。

（資料來源：Plant Health 2023活動網站，<https://www.apsnet.org/meetings/annual/meetingarchives/PH2023/Networking/Pages/WhoAttends.aspx>）

二、研討會內容摘要

1. 專題演講

- A. Dr. Daniel Wildcat 是「All Things Are Connected: The Circle of Life」(1997) 系列影片的協助創作者，該影集深入探討原住民族面臨的土地、空氣、水、生物和政策等議題。近年來，Wildcat 博士成立了美洲印第安人和阿拉斯加原住民的氣候變遷工作小組，以當地部落和大學作為中心的網絡。他曾編寫「Red Alert! Saving the Planet with Indigenous Knowledge」(2009) 一書，並於當日演講過後舉辦簽書會。於演講中，他提倡科學家應與民眾建立良好的關係，並學習以淺顯易懂的方式傳達知識，同時強調當我們發現無法以傳統思維解決問題時，應該開拓新方向或資源來解決問題，重點在於將這些成果付諸實踐以造福受眾。
- B. Dr. Corinne Valdivia 是密蘇里大學農業食品及自然資源學院應用社會科學部門的 D. Howard Doane 農業和應用經濟學教授 (D. Howard Doane Professor of Agricultural and Applied Economics in the Division of Applied Social Sciences, College of Agricultural Food and Natural Resources at the University of Missouri)。她的演講主題是「當地與本土知識：與農村社區合作以適應環境的快速變化 (Indigenous and local knowledge: collaborating with rural communities to adapt to rapid changes)」。Valdivia 博士於研究中探討個人、家庭和社區活動應變氣候變遷、全球化和科技創新的能力，並思考未來應考量的技術研發與政策擬定方向。
- C. Dr. Amanda Black 是紐西蘭毛利族裔的原住民研究員和科學家，也是現任紐西蘭生物保護中心主任。該中心以毛利價值觀為基礎，致力於生態系統的保護與維持。Black 博士的研究為探討土壤和森林生態系統，尤其專注於微生物群集、基因表現和碳儲存等功能之間的關係，以因應氣候變遷和生物安全方面的問題。其利用同位素和次世代定序等方法分析土壤微生物的 DNA，同時由文獻紀錄該土地曾發生的事件，探究其與森林土壤微生物之間的關聯。

2. 論文宣讀與海報發表

本次主題相當廣泛，例如：寄主抗性—寄主與病原菌的交互作用、病害綜合管理、土壤傳播病害管理、永續農業之挑戰和未來、植物病理學之推廣和教育、病害診斷的新技術和改進技術、抗性分子機制、流行病學等等。研討會無提供紙本手冊，行程以及發表的摘要皆以網頁或手機應用程式（Eventsential）瀏覽。摘錄部分研究內容如下：

A. Integrated management of Sclerotinia stem rot in organic soybean (*Glycine max*) systems (發表人：Kelly Debbink, University of Wisconsin-Madison, Madison, WI, USA)

大豆菌核病（Sclerotinia stem rot, SSR）係由 *Sclerotinia sclerotiorum* 引起，菌核即為初始的接種原。菌核病會危害大豆生長並造成產量損失。在傳統栽培系統中，大多使用抗性品種、更寬的種植行距、降低播種量和殺菌劑處理來管理 SSR；但在有機栽培模式中，由於無法使用化學農藥和基因轉殖的抗性品系，也就讓該病害更加難以控制。講者在威斯康辛州和印第安納州進行田間試驗以比較了 2 種大豆品種 Dwight（感性）和 MN1410（抗性）與 4 種微生物農藥、2 種化學殺菌劑和未經任何處理的負對照組對 SSR 的防治情形。結果顯示，抗性品種的防治效果顯著（ $P < 0.01$ ）；而兩個地點的微生物農藥處理之間沒有觀察到顯著差異（ $P > 0.05$ ）。雖然還需要做更多實驗了解有機大豆田區防治 SSR 的管理策略，但使用抗性品種應為一項重要的方法。

另外，講者在演講中也分享了 Disease rating 的計算方式，以及幾個名詞解釋向聽眾說明：

- i. Disease incidence (DI) : % of plants showing signs of disease /Stand count of plant assessed $\times 100$
- ii. Disease severity (DS) : average rating of symptomatic plants (例如：0-3 級)
- iii. Disease severity index (DIX) (%)= DI \times DS/最高罹病級數

病害嚴重度指標（disease severity index, DSI）可用於表示一個區域內，某一品種在抗病性的表現程度，並說明病害嚴重度與產量的關係。

- B. Why so picky: gene profiles and evolutionary genomics provide insights into watermelon variety-specific virulence of *Fusarium oxysporum* f. sp. *niveum* (發表人：Matthew Cullen, University of Florida, Gainesville, FL, USA)

宣讀一開始時，該講者說他前幾日剛完成博士班口試，台下的聽眾都給予恭喜的掌聲，現場氛圍良好。而本篇研究對象是引起的西瓜蔓割病的 *Fusarium oxysporum* f. sp. *niveum*。講者說明，過去大多認為 Secreted-in-xylem (SIX) proteins 與主要影響病原菌對寄主偏好性，因此比對自佛羅裡達州和喬治亞州的 54 個分離株，進行基因定序分析，並繪製成親緣關係樹。出乎意料的是，SIX profiles 與保守序列具有很強的相關性，顯示 SIX genes 之外的因子也會控制 Fon 毒力的表現。由結果中，講者也發現菌株的演化與地理分佈亦有相關性。後續將開發有助於 Fon 毒力標記的分子檢測方法，以幫助栽培業者更容易篩選西瓜抗性品種。

- C. Measuring Projected Greenhouse Gas Emission Reductions & Climate Adaptation Results with Indigenous Communities as Agents of Biodiversity Conservation (發表人：Jennifer Himmelstein, Associate Director of Corporate Analysis, ACDI/VOCA, Washington, DC, USA)

這是研討會中唯一和溫室氣體量測有關的研究。講者提到，美國證券交易委員會 (U.S. Securities & Exchange Commission) 已訂定，未來由美國資助的國際開發活動將會把環境保護目標列為要求之一。ACDI/VOCA (其為國際非營利性發展組織) 實施的原住民和非裔哥倫比亞賦權活動 (Indigenous Peoples and Afro-Colombian Empowerment Activity, IPACE) 致力於支持非裔哥倫比亞人和原住民的自我建設與獲得社經地位的機會，同時也提升社會對國家遺產和文化多樣性的尊重。IPACE 的三個策略主題之一就是透過永續自然資源管理來保護生物多樣性。為了呈現計畫成果，ACDI/VOCA 與 World Wildlife Fund 開發了減少溫室氣體排放的策略並建立氣候變遷調適指標。

- D. Detection and Quantification of Hop Powdery Mildew (*Podosphaera macularis*) Using Computer Vision and Automated Microscopic Imaging of Leaf Tissue (發表人：Michele Wiseman, PhD Candidate, Oregon State University, Corvallis, OR, USA)

在該研究中，講者探討機器深度學習模型在啤酒花白粉病 (hop powdery mildew) (*Podosphaera macularis*，簡稱 PM) 的辨識 (定性) 和定量的最佳化運用。為進行參數優化，首先取得病徵並以發病嚴重程度歸類，之後將未罹病的葡萄作為基線進行比較。訓練的重點和模型的組成在於菌絲或分生孢子梗的分類以及葉片本身的變異性，但是菌絲的反射不良和毛狀體 (trichome) 反射過多會導致模型準確性降低，尚須透過背景建模的調整來優化準確度。這項研究讓聽眾們得以了解深度學習模型和 High-throughput phenotyping (HTP) 在定量 PM 表型學方面的潛力。

- E. 筆者此次為海報發表，題目為 An endophytic *Bacillus* sp. isolate REnB8 from grey mangrove has the antimicrobial activity and the potential to protect cabbage from heat stress。展覽期間也與會議參與人員，例如：現職於孟加拉的 Dr. Ziaur Rahman Pintu、任職於 UPL 的 Pablo A. Navia Giné、就讀於科羅拉多州立大學的博士生 Jeongyun Choi、畢業於韓國全北大學 (Jeonbuk National University, Jeonju) 並準備赴美讀書的 Insoo Jeon、就讀於加利福尼亞大學戴維斯分校的 Matthew Cope-Arguello 以及任職於亞利桑那大學的 Dr. Jiahuai Hu，分享並討論該研究成果。

3. Idea Cafés & Trending Topics

該活動共有 27 個主題，每個主題有一張圓桌的空間，由主持人引導參與人員共同進行 1 小時的討論。筆者參與的主題是「How have you been communicating pesticide usage with friends, family and peers?」，主持人為來自加拿大農業及農業食品部 (Agriculture and Agri-Food Canada) 的 Rishi Burlakoti 博士，參與人員有博士生、農藥業者以及政府單位人士。

該主題探討：如何提升植物病理學家和作物保護相關人士與大眾進行溝通的能力。為了讓更多人得以了解化學農藥防治在農業和食品供應方面的貢獻，我們需要時常和民眾進行溝通。

筆者將討論內容統整為以下幾點：

- A. **事前準備**：農藥的類型、使用方法、應用範圍以及可能的風險，以提供準確和全面的資訊。
- B. **適當的用語和語調**：使用易於理解的用語，避免專業術語，以確保訊息容易被接受和理解。
- C. **傾聽和尊重**：在交流過程中，重視對方的觀點，尊重他們的意見，以建立溝通並達成共識。
- D. **具體事例**：提供具體的案例來強調觀點。
- E. **開放與持續性的溝通**：保持開放的態度，願意在不同時候、不同場合繼續進行對話和討論。

討論中較資深的與會者表示：這是我們的任務（mission），也期勉大家一起努力。最重要的是，要以尊重和理解的態度與人溝通，縱使有不同的觀點，但透過溝通定能找出更好的解決方案。

4. Speed monitoring event

此為一對一進行的交談活動，主要讓新進的參與人員（mentees）可以和資深的研究人員（mentor）交流，以幫助新進人員更能融入植物病理的科學研究以及 APS 的運作。完整的活動時間為 50 分鐘，參與者和每一資深研究人員對談的時間為 10 分鐘，時間到需更換交談對象。該活動需要於會議前事先報名。

筆者亦有報名參與，作為導師的資深研究人員來自於各單位，例如：Valent USA 的 Jill Calabro、Sakata Seed America, Inc.的 Bidisha Chanda、喬治亞大學的博士後研究人員 Navjot Kaur 以及任職於美國農業部的 Dr. Matthew Moscou。參與人員的交流相當熱絡，於會場中可發現話題源源不絕，所以筆者相信，在場的每一位 mentee 都有滿滿的收穫。

肆、心得

參加美國植物病理學會 2023 年會對筆者而言是一個極具啟發且收穫良多的經歷。該會議的主題相當多元，從寄主和病原菌之間的交互作用到綜合管理、診斷技術和病害防治等等，讓筆者深刻感受到植物病理學的廣度和深度。

儘管此次參與的台灣學者相對較少，但是仍不減研討會呈現出來的友善氛圍。每場論文宣讀後的問題討論時間都非常踴躍，體現了學者們對研究的熱忱和共鳴。

筆者此次參與年會發表的內容為：利用分離自海茄冬的內生細菌防治小白菜立枯病和炭疽病，由試驗中發現部份菌株得以產生氣體並抑制病原菌生長，甚至可以提升小白菜於高溫環境下的生長勢。雖然該研究還在初步發展階段，卻也提供我們一個新的契機以重新檢視目前實驗室的菌株庫，不僅測試對於不同種病原菌的防治效果之外，也評估其抑菌方式。

筆者曾參與 2015 年於加州舉辦的植物病理學年會，與之相比，筆者認為生物防治領域與倉儲病害管理的研究報告越來越多元，開發酵母菌作為防治病害的生物防治菌報告也逐漸增加，此次亦有多篇研究探討微生物和媒介昆蟲的關係，皆是得以參考的發展方向；在技術方面，除了過往常見的基因功能分析以了解致病和植物的抗感病機制外，透過總體基因體學(Metagenomics)評估微生物施用於環境後的影響、利用資訊學技術進行病害調查，甚至模擬病害發生的時機以提前管理等方法已越常被使用於研究中。縱使部份技術尚在發展階段，但也讓筆者明白，病害防治研究已不是 wet lab 的專利，這也是為什麼需要持續學習以及跨域合作，由不同知識與技術面切入，才有助於深入了解農業管理系統。

在會議的主題與流程安排方面也令筆者印象深刻，特別是對於新一代研究者的關注和培育。透過資深研究者的分享，讓我們有機會學習植物病理學領域的各個面向，不僅是研究態度，還有教學技巧和研究經驗等等，筆者認為這樣的活動安排有助於知識的傳承，雙向的互動對於學術界的永久發展也至關重要。

此次的參與讓筆者能夠與來自不同國家和地區的學者交流，分享彼此的想法和經驗，也增加了筆者對於植物病理學領域的學習熱忱。這是一個充滿收穫的學術體驗，期待能將這些學到的知識和經驗應用於未來的研究工作中，並且持續學習、與時俱進。

伍、建議

我認為國內研究人員參與國際會議是相當重要的，除了自我成長（了解新的研究成果和學習新技術）之外，也可以與他國學者進行交流；透過此次機會，也讓我對工作、研究方向以及研討會籌備方式有以下的想法與建議：

1. 加強農藥風險溝通：鼓勵研究人員學習如何有效地與公眾和同行溝通有關化學農藥的風險，並提倡安全使用的做法。透過參與 Idea café 活動，讓我發現我國政府單位採取的策略與重視程度其實不亞於其他國家，他國參與者提出的解方大同小異，重點在於是否能持續地推行。
2. 生物防治研究：我國對於生物防治技術的研究和應用大多侷限在有機或友善園區，或許可以對採收前期的病蟲害防治作為開發方向，於整個栽培期發展結合化學和生物農藥共用使用的方式，亦可作為減少化學農藥使用的替代方案。
3. 研討會舉辦模式：除了專題演講、論文宣讀和海報發表，亦可規劃不同的會議舉辦方式，以增加與會者的參與度，讓前輩提攜後進，以達國內學術圈的傳承與持續發展。

學海無涯，未來若有類似機會，建議政府單位可鼓勵國內專業人員參與國際研討會，增進與其他國家的農業合作與發展。

陸、附錄

附錄一、投稿接受函與會議邀請函

Dear Hui-Ru Pan,

We are pleased to inform you that your abstract "An endophytic *Bacillus* sp. isolate REnB8 from grey mangrove has the antimicrobial activity and the potential to protect cabbage from heat stress" has been accepted as a **Poster** presentation for Plant Health 2023 in Denver, Colorado U.S.A. We will be providing additional details regarding your poster session date and time in a future email.

If you haven't already, you will need to register by **Thursday, June 15** or your abstract will be withdrawn from the program. [Register online today.](#)

Thank you for your contribution to the annual meeting, and we look forward to seeing you in Denver!

Kind regards,

Tori Clark

Registration and Programming Coordinator

American Phytopathological Society (APS)

3285 Northwood Circle, Suite 100, St. Paul, MN 55121

Headquarters Phone: 1.651.454.7250

Direct Phone: 1.651.994.3854

Fax: 1.651.454.0766

Plant Health 2023

August 12–16
Denver, Colorado



Hui-Ru Pan
Taiwan Agricultural Chemicals and Toxic Substances Research Institute
No.11, Guangming Rd., Wufong Taichung TAIWAN

Dear Hui-Ru Pan,

On behalf of The American Phytopathological Society (APS), we would like to extend an invitation for you to attend Plant Health 2023. Over 1,000 attendees from all disciplines dedicated to the study and control of plant diseases are expected to attend this five-day scientific meeting, which will be held August 12 - 16, 2023 at the Sheraton Downtown Denver in Denver, Colorado. Join us as we explore the profound changes in plant health research, education, and engagement driven by climate, technology, and society in a variety of formats, including special sessions, technical sessions, and posters. In addition, approximately 20 companies will showcase their latest products and services available to you.

We would be delighted to have you join us in Denver. Personal invitations are not necessary to attend Plant Health 2023. All the society's meetings are open scientific events. APS welcomes all people who are interested in the science, who pay the necessary registration fees, and otherwise conform to the society's bylaws for its meetings. Each meeting is announced to the scientific community through publications, promotions, and the call for papers.

APS does not provide financial support to meeting participants. The registration fee, airfare, ground transportation, hotel, meals, travel insurance, and any other local expenses are the responsibility of each meeting participant. If you need to apply for a temporary non-immigrant visa to attend Plant Health 2023, you are advised to apply for your visa as soon as possible and not later than 3-4 months in advance. All applicants must be able to qualify for a visa on their own merits. The society cannot intervene with embassies in other countries on behalf of any meeting participants. You may submit this letter with your visa application to verify the name, dates, location, and purpose of Plant Health 2023. You may also take your registration confirmation paperwork to your visa interview. However, APS will not be able to provide additional visa support nor will APS call or generate personal letters to the embassy or consulate. We look forward to your participation in Plant Health 2023.

Sincerely,

Amy Hope

Chief Executive Officer

The American Phytopathological Society

3285 Northwood Circle, Ste. 100

St. Paul, MN 55121 USA

附錄二、發表內容

An endophytic *Bacillus* sp. isolate REnB8 from grey mangrove has the antimicrobial activity and the potential to protect cabbage from heat stress

Hui-Ru Pan (1), Wei-Chuan Hsiao (1), Yi-Jeng Chen (2)*

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(2) Department of Plant Medicine, National Chiayi University, Chiayi, Taiwan

Marine microbes have been considered rich sources of bioactivities in the recent decade. Among these organisms, endophytic bacteria (EB) could help the host to improve nutrient uptake, modulate stress, against pests, and antagonize competing plants. The objectives of this study were to screen EB from grey mangroves (*Avicennia marina*) with the potential to protect crops from pathogens and stress. A total of 48 isolates of EB were isolated from the respiratory root tissue of *A. marina* in Kaohsiung, Taiwan during 2021-22. Among these isolates, twenty of EB isolates can be cultured on nutrient agar containing 3% of sodium chloride, and they respectively showed 45-100 and 35-55% of inhibition ratios to *Rhizoctonia solani* and *Colletotrichum gloeosporioides* on potato dextrose agar. Further tests indicated that EB isolate REnB8 can also repress *R. solani* growth via volatile-producing. *In vitro* assays demonstrated that the cabbage seedlings kept the 1.5-gram of fresh weights under 36°C condition after 3-days-inoculation with REnB8 by rhizosphere drenching (10^8 CFU/ml), higher than the control group. The REnB8 was identified as *Bacillus* sp. via 16SrRNA and *gyrB* genes analysis. Thus, the EB in *A. marina* have a wide range of functions and potentially be used as agricultural materials.

Key words: endophytic bacteria, *Avicennia marina*, bio-control

An endophytic *Bacillus* sp. isolate REnB8 from grey mangrove has the antimicrobial activity and the potential to protect cabbage from heat stress



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Introduction

Marine microbes have been considered rich sources of bioactivities in the recent decade. Grey mangroves (*Avicennia marina*) is the one which can thrive to its full height in waters where both salt and fresh water are present. Previous study indicated that the endophytic bacteria could survive in different hosts and colonize in intercellular space, vascular bundle and intracellular of plant tissue. Endophytic bacteria could also help the host to improve nutrient uptake, modulate stress, against pests, and antagonize competing plants. When using drenching method to inoculation, endophytic bacteria will followed the root and move long distance by vascular bundle and short distance by intercellular space. The objectives of this study were to screen the endophytic bacteria from grey mangroves with the potential to protect crops from pathogens and environmental stress.

The ability of endophytic bacteria in inhibiting phytopathogens

For providing a safer and more effective biocontrol method for the diseases of cabbage, 20 bacterial isolates were tested for their ability to produce antifungal substances against *Rhizoctonia solani* and *Colletotrichum gloeosporioides* by using dual-culture in vitro. After 3-days streaking with a loop full of endophytic bacteria (EB) at 3 cm away the periphery of NA plate, a pathogen disc was inoculated on the dish 3 cm away the bacterial colony. The results showed inhibition ratios of 45-100% and 35-55% for *R. solani* and *C. gloeosporioides*, respectively (parts of data shown in Fig. 1-2).

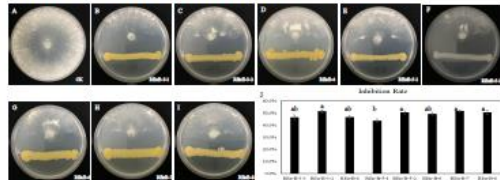


Fig. 1. Dual culture of antagonism test for endophytic bacteria against *Rhizoctonia solani*. (A)Control, (B-D)different EB against *R. solani*, (E)inhibition rates.

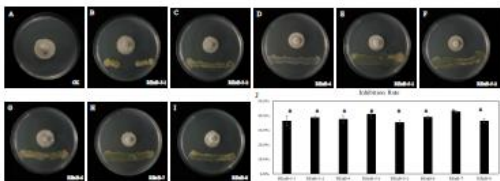


Fig. 2. Dual culture of antagonism test for endophytic bacteria against *Colletotrichum gloeosporioides*. (A)Control, (B-D)different EB against *C. gloeosporioides*, (E)inhibition rates.

Conclusions

Endophytic bacteria (EB) found in *Avicennia marina* exhibit a wide range of functions and have the potential for agricultural applications. REnB8, in particular, shows ability in inhibiting the growth of pathogens. Its bio-fumigation capabilities and the composition of its volatile secondary metabolites require further investigation in the future.

Bio-fumigation ability of endophytic bacteria in suppressing pathogens

To test bio-fumigation ability of EB, *R. solani* and *C. gloeosporioides* were covered with plates of the 3-day-old EB grown on NA plates, following the double dishes method, and sealed with paraffin. The control groups consisted of *R. solani* and *C. gloeosporioides* grown in potato dextrose agar individually without EB. The results show that REnB6 and REnB8 can suppress the growth of *R. solani* and *C. gloeosporioides* via volatile-producing, respectively (Fig. 3).

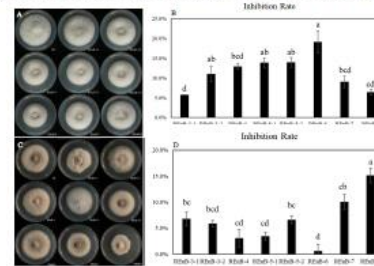


Fig. 3. The bio-fumigation of endophytic bacteria on controlling *Rhizoctonia solani* and *Colletotrichum gloeosporioides*. (A)different EB against *R. solani*, (B)inhibition rates in suppressing *R. solani*, (C)different EB against *C. gloeosporioides*, (D) inhibition rates in suppressing *C. gloeosporioides*.

Tolerance of heat stress on cabbage growth

A suspension of EB with a concentration of 10^8 cfu/ml was irrigated on the rhizosphere of the cabbage with each plant receiving 5 ml of the suspension. The control group was irrigated with sterile distilled water. On the 3rd day after the inoculation, the plants were sent to the growth chamber in 36°C for 5 days. The data showed that the cabbage seedlings treated with REnB8 maintained a fresh weight of 1.5 grams, which was higher than the control group (Fig. 4).

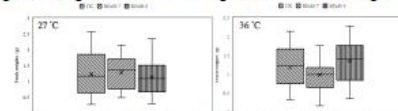


Fig. 4. Heat tolerance of cabbage in treating different kinds endophytic bacteria. The fresh weight in 27°C and 36°C.

附錄三、活動照片



一、丹佛喜來登酒店的大廳，
投影此次研討會 Plant health 2023 字樣。



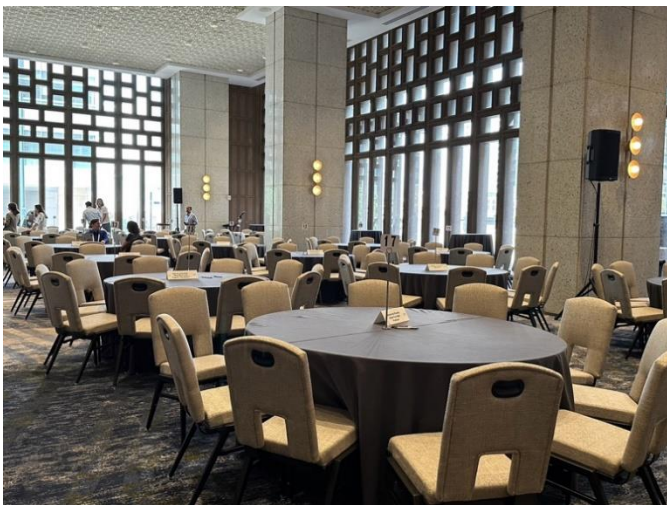
二、專題演講與部分宣讀場次場地（其一）。
圖片為 Dr. Daniel Wildcat 正在進行演說。



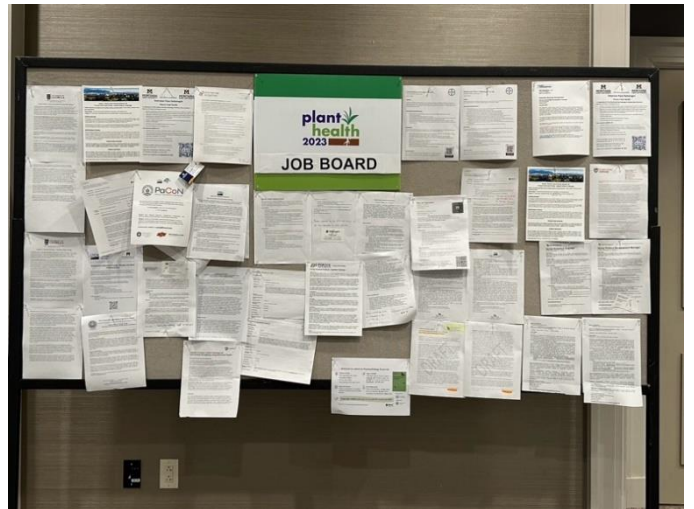
三、論文宣讀場次場地（其二）。



四、論文宣讀場次場地（其三）。



五、舉辦 Idea Cafés & Trending Topics 的場地，
活動時間之外亦可作為參與者的交流區。



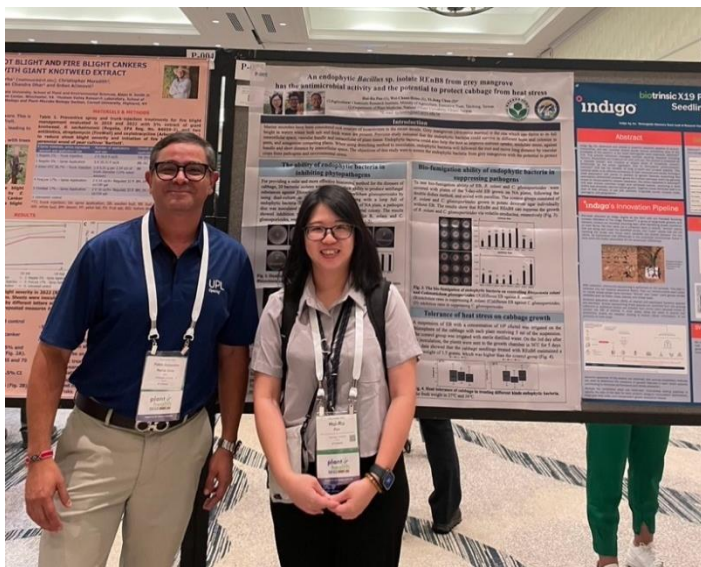
六、工作看板。



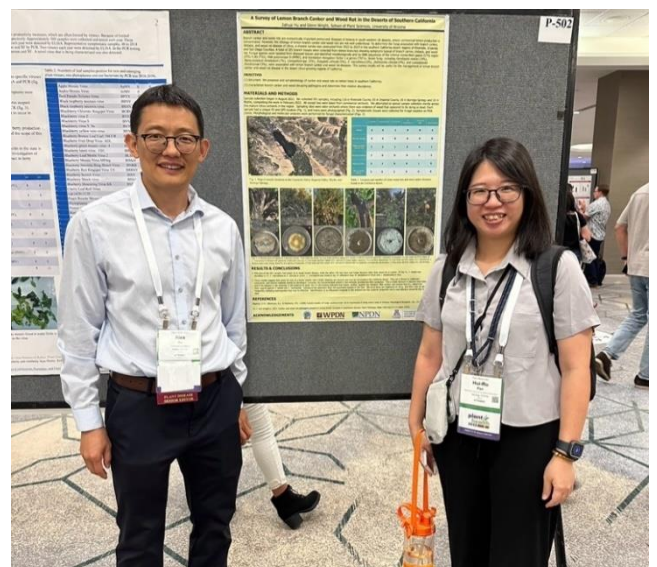
七、筆者參與 Idea Cafés & Trending Topics 討論。



八、APS 於社群軟體呈現年會相關照片。紅箭頭處為筆者參與 Idea Cafés & Trending Topics 的討論情形。



九、筆者與任職 UPL 的 Pablo A. Navia Giné 先生於此次發表的海報前合影。



十、筆者與亞利桑那大學的 Dr. Jiahuai Hu 合影。

附錄四、研討會議程

Plant Health 2023

Program Schedule Overview

Schedule as of August 5.

**Use the app or online schedule for the most current information and for full program details, including ticketed event designation.*

SATURDAY, AUGUST 12				
FIELD TRIP: Volunteer Opportunity - Leave Denver Better Than We Found It	7:15 AM	-	12:00 PM	
WORKSHOP: Capturing the Wind: A Guided Session on Low-cost Airborne Inoculum Sampler Construction and Use	8:00 AM	-	12:00 PM	Governor Sq 12
WORKSHOP: Learning the Basic Metagenomics Tools for Disease Diagnostics and Microbiome Analysis	8:00 AM	-	5:00 PM	Governors Sq. 14
WORKSHOP: Agricultural Microbiomes Thinkathon: A Community-based Interactive Workshop	8:00 AM	-	5:00 PM	Governors Sq. 15
FIELD TRIP: 2023 Ornamental Field Trip	8:30 AM	-	6:00 PM	
FIELD TRIP: Diseases, pests, and fire, oh my, forest health issues in alpine forests of the Southern Rockies	9:00 AM	-	5:00 PM	
FIELD TRIP: Local Foods, Local Flavors: An Urban Feast for the Brain and the Body!	9:00 AM	-	5:30 PM	
APS Publications Board Meeting	1:00 PM	-	2:30 PM	Tower A
WORKSHOP: APS Behavioral Based Interview Process, Sponsored by Bayer	1:00 PM	-	5:00 PM	Governor Sq 12
North American Fungicide Resistance Action Committee (NA-FRAC) Meeting, by invitation only	2:00 PM	-	3:30 PM	Plaza Sq 9
APS PRESS Editorial Board Meeting	2:30 PM	-	4:00 PM	Tower A
Exhibit Move-In	3:00 PM	-	5:30 PM	Plaza Ballroom
Registration Open	3:00 PM	-	6:00 PM	Plaza Exhibit/Foyer

PhytoFrontiers Editorial Board Meeting	4:00 PM	-	5:00 PM	Tower B
<i>PDMR</i> Editorial Board Meeting	4:00 PM	-	5:30 PM	Tower A
Speaker Ready Room Open	4:00 PM	-	7:00 PM	Plaza Client Office 1
First Timers' Orientation	5:00 PM	-	6:00 PM	South Convention Lobby
Undergraduate Student Primer	6:00 PM	-	7:00 PM	Tower C
SUNDAY, AUGUST 13				
<i>Plant Health Progress</i> Senior Editors Meeting	7:00 AM	-	8:00 AM	Governor Sq 9
<i>APS Phytopathology</i> Senior Editors' Meeting	7:00 AM	-	8:00 AM	Tower A
<i>APS Plant Disease</i> Senior Editors' Meeting	7:00 AM	-	8:00 AM	Tower B
Vegetable Seed Industry Breakfast	7:00 AM	-	9:00 AM	Windows
APS Education Center Board Meeting	7:00 AM	-	9:00 AM	Governor Sq 10
Registration Open	7:30 AM	-	5:30 PM	Plaza Exhibit/Foyer
Moderator Orientation	8:00 AM	-	8:30 AM	Square 16
<i>APS Plant Disease</i> Associate & Senior Editors Meeting	8:00 AM	-	9:00 AM	Tower B
<i>Plant Health Progress</i> Associate & Senior Editors Meeting	8:00 AM	-	9:00 AM	Governor Sq 9
<i>APS Phytopathology</i> Associate & Senior Editors Meeting	8:00 AM	-	9:00 AM	Tower A

Poster Set-Up	8:00 AM	-	12:00 PM	Plaza Ballroom & Exhibit/Foyer
Exhibit Move-In	8:00 AM	-	1:30 PM	Plaza Ballroom
Speaker Ready Room Open	8:00 AM	-	4:00 PM	Plaza Client Office 1
Relaxation Room Open	8:00 AM	-	6:00 PM	Plaza Court 6
OPENING GENERAL SESSION: Keynote Speaker - Dan Wildcat	9:00 AM	-	10:30 AM	Grand Ballroom 1 & 2
Lactation Room Open	9:00 AM	-	5:00 PM	Suite 3212 Plaza Building
Idea Cafés & Trending Topics	10:30 AM	-	11:30 AM	South & North Convention Lobby
Beyond Taxonomic Descriptions: Towards Functionally Predictive Understanding of Phyto-Microbiomes (Group 1)	Table: 1			<i>Idea Café</i>
Beyond Taxonomic Descriptions: Towards Functionally Predictive Understanding of Phyto-Microbiomes (Group 2)	Table: 2			<i>Idea Café</i>
Building Your Diagnostic Toolbox	Table: 3			<i>Trending Topic</i>
Disease potential and management in perennial grain crops	Table: 4			<i>Idea Café</i>
Data Transparency and Availability	Table: 5			<i>Trending Topic</i>
Connecting the Tropical Plant Pathology Community	Table: 6			<i>Idea Café</i>
chatGPT - Pros and Cons	Table: 7			<i>Trending Topic</i>
Harnessing Accessible AI Tools to Revolutionize Phytopathological Research	Table: 8			<i>Idea Café</i>
Combatting Burnout	Table: 9			<i>Trending Topic</i>
Caregiving Responsibilities of Professionals: Societal Awareness and Supporting Policies	Table: 10			<i>Idea Café</i>
Recruiting and Training Students	Table: 11			<i>Trending Topic</i>
Integrating Humanities into Agricultural Education for Improved Learning Outcomes	Table: 12			<i>Idea Café</i>

Navigating Department Mergers in Industry & Academia	Table: 13			<i>Trending Topic</i>
How have you been communicating pesticide usage with friends, family and peers?	Table: 14			<i>Idea Café</i>
Opening Keynote with Dan Wildcat - What Were Your Biggest Takeaways?	Table: 15			<i>Trending Topic</i>
Pitching a Future in Agriculture	Table: 16			<i>Idea Café</i>
Manuscript Review - Share Your Best Practices	Table: 17			<i>Trending Topic</i>
Growing Plant Pathologists in a Lonely Garden	Table: 18			<i>Idea Café</i>
Remaining Relevant in Commercial Ag Production	Table: 19			<i>Trending Topic</i>
Seed Pathology: Local, Regional and Global Implications	Table: 20			<i>Trending Topic</i>
Increasing Organic Disease Management Options	Table: 21			<i>Trending Topic</i>
Risk Assessment of Pospiviroid Seed Transmission in Pepper and Tomato	Table: 22			<i>Idea Café</i>
Effectively Communicating with Growers	Table: 23			<i>Trending Topic</i>
Turfgrass Disease Diagnostics: Challenges, Resources, and Future Improvements	Table: 24			<i>Idea Café</i>
Building Interdisciplinary Research Teams	Table: 25			<i>Trending Topic</i>
The Importance of Preserving Our Microbial Collections for Future Generations	Table: 26			<i>Idea Café</i>
Availability of Funding - What can we do?	Table: 27			<i>Trending Topic</i>
BOOK SIGNING: <i>Red Alert: Saving the Planet with Indigenous Knowledge</i>	10:30 AM	-	11:30 AM	North Convention Lobby
APHIS Widely Prevalent Bacteria Committee Meeting	11:00 AM	-	12:00 PM	Governor Sq 9
Division Officers' Luncheon	11:00 AM	-	12:30 PM	Tower C
Widely Prevalent Plant Pathogenic Fungi Working Group, by invitation	11:00 AM	-	12:30 PM	Governor Sq 10

Lunch Break	11:30 AM	-	12:30 PM	
APHIS Widely Prevalent Virus Working Group	11:30 AM	-	12:30 PM	Governor Sq 16
Sprout's Corner Open	12:00 PM	-	4:00 PM	Plaza Court 17
SPECIAL SESSION: Lightning Updates on Emerging and Re-emerging Diseases	12:30 PM	-	1:45 PM	Grand Ballroom 2
TECHNICAL SESSION: Postharvest Pathology	12:30 PM	-	1:45 PM	Governors Sq. 15
SPECIAL SESSION: Envision Accessible Science: Understanding Barriers to STEM Education and Careers for People with Disabilities	12:30 PM	-	1:45 PM	Grand Ballroom 1
TECHNICAL SESSION: Interesting Topics in Virology	12:30 PM	-	1:45 PM	Governors Sq. 14
SPECIAL SESSION: Schroth - Faces of the Future Session: Host Resistance and Host/Pathogen Interaction	12:30 PM	-	3:30 PM	Windows
TECHNICAL SESSION: Microbe-Microbe Dynamics	2:15 PM	-	3:30 PM	Governors Sq. 15
SESSION: Integrated Solutions: The Path Forward to a Sustainable Agriculture, <i>Sponsored by Corteva</i>	2:15 PM	-	3:30 PM	Governors Sq. 14
TECHNICAL SESSION: Integrated Pest Management	2:15 PM	-	3:30 PM	Grand Ballroom 2
SPECIAL SESSION: Interacting Biotic and Environmental Stressors Threatening Culturally and Ecologically Important Tree Species in an Uncertain Climatic Future	2:15 PM	-	3:30 PM	Grand Ballroom 1
APS Public Policy Board (PPB) Meeting	3:00 PM	-	4:30 PM	Governor Sq 12
Opening Happy Hour	3:30 PM	-	5:30 PM	Plaza Ballroom
Network with Exhibitors	3:30 PM	-	5:30 PM	Plaza Ballroom
Poster Viewing Hours	3:30 PM	-	6:30 PM	Plaza Ballroom & Exhibit/Foyer

APS PRESS Bookstore Open	3:30 PM	-	6:30 PM	Plaza Ballroom
Pitch 120 Event	4:30 PM	-	5:30 PM	Plaza Ballroom
University Alumni Networking Events	5:30 PM	-	6:30 PM	Plaza Ballroom
Industry & Student Networking Event	7:00 PM	-	8:30 PM	Earls Kitchen + Bar
MONDAY, AUGUST 14				
Extension Plant Pathologists' Breakfast	7:00 AM	-	8:00 AM	Tower D
Small Fruit Disease Workers' Discussion	7:00 AM	-	8:30 AM	Tower C
Speaker Ready Room Open	7:00 AM	-	4:00 PM	Plaza Client Office 1
Registration Open	7:30 AM	-	6:00 PM	Plaza Exhibit/Foyer
Poster Viewing Hours	7:30 AM	-	6:00 PM	Plaza Ballroom & Exhibit/Foyer
HOT TOPIC: Funding Opportunities for Plant Pathologists with Special Emphasis on Early Career Scientists	8:00 AM	-	9:15 AM	Grand Ballroom 2
TECHNICAL SESSION: Oomycete Disease Control	8:00 AM	-	9:15 AM	Governors Sq. 14
TECHNICAL SESSION: Chemical Control	8:00 AM	-	9:15 AM	Windows
SPECIAL SESSION: Plant Pathologists of the Future: Showcasing Graduate Student Presentation Winners from APS Division Meetings	8:00 AM	-	10:45 AM	Governors Sq. 15
Relaxation Room Open	8:00 AM	-	6:00 PM	Plaza Court 6
APS PRESS Bookstore Open	8:30 AM	-	5:30 PM	Plaza Ballroom

Sprout's Corner Open	9:00 AM	-	4:00 PM	Plaza Court 17
Lactation Room Open	9:00 AM	-	5:00 PM	Suite 3212 Plaza Building
TECHNICAL SESSION: Pathogen-Vector Interactions	9:45 AM	-	11:00 AM	Windows
SPECIAL SESSION: Leveraging the Theme of Plant Health 2023: Alternative Approaches and Biocontrol Strategies to Manage Postharvest Pathogens	9:45 AM	-	11:00 AM	Grand Ballroom 2
Plant Diagnostic Bowl	9:45 AM	-	11:00 AM	Grand Ballroom 1
TECHNICAL SESSION: Soilborne Disease Management	9:45 AM	-	11:00 AM	Governors Sq. 14
BOOK SIGNING: <i>Mineral Nutrition and Plant Disease</i>	11:00 AM	-	12:00 PM	Plaza Ballroom
Lunch Break	11:00 AM	-	12:30 PM	
Storkan-Hanes-McCaslin Research Foundation Luncheon	11:00 AM	-	12:30 PM	Tower C
Network with Exhibitors	11:00 AM	-	12:30 PM	Plaza Ballroom
OIP Silent Auction	11:00 AM	-	5:00 PM	Plaza Ballroom
TECHNICAL SESSION: Understanding Our Fungal Friends and Foes	12:30 PM	-	1:45 PM	Windows
SPECIAL SESSION: All Yeasts Considered, Characterization of Plant Colonizing Yeasts and Their Impact on Plant Health	12:30 PM	-	1:45 PM	Governors Sq. 14
SPECIAL SESSION: Harnessing the Phytobiome for Sustainable Agriculture: Challenges and Future of Phyllosphere Research	12:30 PM	-	1:45 PM	Grand Ballroom 1
TECHNICAL SESSION: Nematology	12:30 PM	-	1:45 PM	Governors Sq. 15
GENERAL SESSION & BUSINESS MEETING: Keynote Speaker - Corinne Valdivia	2:15 PM	-	3:30 PM	Grand Ballroom 1 & 2

Committee Connections Networking Hour	3:30 PM	-	4:30 PM	Plaza Ballroom
Network with Exhibitors	3:30 PM	-	6:00 PM	Plaza Ballroom
Plant Health Hub Networking Break	3:30 PM	-	6:00 PM	Plaza Ballroom & Exhibit/Foyer
Phytopathologist of Distinction (POD) Talks	3:45 PM	-	4:45 PM	Governors Sq. 14
Biosecurity and Microbial Forensics Interest Group Meeting	4:00 PM	-	5:30 PM	Governor Sq 12
Poster Viewing with Authors Present (P001- P329, Poster Sessions I)	4:15 PM	-	5:00 PM	Plaza Ballroom & Exhibit/Foyer
POSTERS: Chemical Control I				
POSTERS: Fungicide Resistance I				
POSTERS: Crop Loss I				
POSTERS: Integrated disease management I				
POSTERS: Biological Control I				
POSTERS: Disease Resistance I				
POSTERS: Molecular Plant-Microbe Interactions I				
POSTERS: Chemical and Biopesticide Control I				
POSTERS: Epidemiology I				
POSTERS: Mycotoxicology I				
Public Policy Board Listening Session	4:45 PM	-	5:45 PM	Tower A
Committee Connections Networking Hour	4:45 PM	-	5:45 PM	Plaza Ballroom

Poster Viewing with Authors Present (P331-P687, Poster Sessions I)	5:00 PM	-	5:45 PM	Plaza Ballroom & Exhibit/Foyer
POSTERS: New and Emerging Diseases I				
POSTERS: Pathogen surveys I				
POSTERS: Postharvest Pathology I				
POSTERS: Outreach and Extension I				
POSTERS: Pathogen vector/insect interactions I				
POSTERS: Seed Pathology I				
POSTERS: Soilborne diseases I				
POSTERS: Pathogen Biology I				
POSTERS: Phytobiomes I				
POSTERS: Late-Breaking Submission I				
POSTERS: Pathogen detection and quantification I				
POSTERS: Population Biology I				
Diagnosticians Open Forum Meeting	5:30 PM	-	7:00 PM	Governors Sq. 14
Early Career Professionals' Networking	6:00 PM	-	7:00 PM	Governor Sq 11
Publications Senior Editors' Reception	6:00 PM	-	7:00 PM	Tower D
LGBTQIA+ Networking Event	7:30 PM	-	9:00 PM	Earls Kitchen + Bar
Industry & Extension Networking Event	7:30 PM	-	10:00 PM	Lucky Strike Denver
TUESDAY, AUGUST 15				

Annual Meeting Board Meeting	7:00 AM	-	8:45 AM	Tower A
Speaker Ready Room Open	7:00 AM	-	2:00 PM	Plaza Client Office 1
TECHNICAL SESSION: Regulatory Plant Pathology	8:00 AM	-	9:15 AM	Governors Sq. 15
SPECIAL SESSION: Emerging Diseases of Hemp – Nationwide Collaborative Efforts and Status Update	8:00 AM	-	9:15 AM	Grand Ballroom 1
TECHNICAL SESSION: Outreach and Learning	8:00 AM	-	9:15 AM	Governors Sq. 14
SPECIAL SESSION: 22nd I. E. Melhus Graduate Student Symposium: Systems-Based Approaches, Tools, and Tactics to Combat Mycotoxins for a Sustainable and Safe Food Supply	8:00 AM	-	11:00 AM	Grand Ballroom 2
SPECIAL SESSION: New Products and Services	8:00 AM	-	11:00 AM	Windows
Poster Viewing Hours	8:00 AM	-	4:30 PM	Plaza Ballroom & Exhibit/Foyer
Registration Open	8:00 AM	-	4:30 PM	Plaza Exhibit/Foyer
Relaxation Room Open	8:00 AM	-	6:00 PM	Plaza Court 6
APS PRESS Bookstore Open	8:30 AM	-	4:30 PM	Plaza Ballroom
Sprout's Corner Open	9:00 AM	-	4:00 PM	Plaza Court 17
Lactation Room Open	9:00 AM	-	5:00 PM	Suite 3212 Plaza Building
SPECIAL SESSION: A More Diverse Plant Pathology Community: Sharing Innovative Teaching, Mentoring, and Career Pathways	9:45 AM	-	11:00 AM	Grand Ballroom 1
TECHNICAL SESSION: Molecular Mechanisms of Resistance	9:45 AM	-	11:00 AM	Governors Sq. 15
TECHNICAL SESSION: New and Improved Technologies for Disease Detection and Diagnosis	9:45 AM	-	11:00 AM	Governors Sq. 14

Lunch Break	11:00 AM	-	12:15 PM	
Network with Exhibitors	11:00 AM	-	12:15 PM	Plaza Ballroom
Public Policy Board Listening Session	11:15 AM	-	12:15 PM	Tower A
TECHNICAL SESSION: Epidemiology	12:15 PM	-	1:30 PM	Windows
TECHNICAL SESSION: Fungicide Sensitivity	12:15 PM	-	1:30 PM	Grand Ballroom 2
Plant Diagnostic Bowl	12:15 PM	-	1:30 PM	Grand Ballroom 1
SESSION: Early Career Development Workshop: A Roadmap for Your First Years in Industry, <i>Sponsored by Corteva</i>	12:15 PM	-	1:30 PM	Governors Sq. 14
SPECIAL SESSION: The Emerging Viruses in Cucurbits Working Group: Working Together to Create a Sustainable Future for Cucurbit Production in the United States	12:15 PM	-	1:30 PM	Governors Sq. 15
Committee Connections Networking Hour	1:30 PM	-	2:30 PM	Plaza Ballroom
Network with Exhibitors	1:30 PM	-	4:30 PM	Plaza Ballroom
Plant Health Hub Networking Break	1:30 PM	-	4:30 PM	Plaza Ballroom & Exhibit/Foyer
Poster Viewing with Authors Present (P002-P328, Poster Sessions II)	2:00 PM	-	2:45 PM	Plaza Ballroom & Exhibit/Foyer
POSTERS: Biological Control II				
POSTERS: Disease Resistance II				
POSTERS: Molecular Plant-Microbe Interactions II				
POSTERS: Chemical and Biopesticide Control II				
POSTERS: Epidemiology II				

POSTERS: Mycotoxicology II				
POSTERS: Chemical Control II				
POSTERS: Fungicide Resistance II				
POSTERS: Crop Loss II				
POSTERS: Integrated disease management II				
Poster Viewing with Authors Present (P330-694, Poster Sessions II)	2:45 PM	-	3:30 PM	Plaza Ballroom & Exhibit/Foyer
POSTERS: Soilborne diseases II				
POSTERS: Pathogen Biology II				
POSTERS: Phytobiomes II				
POSTERS: Late-Breaking Submission II				
POSTERS: Pathogen detection and quantification II				
POSTERS: Population Biology II				
POSTERS: New and Emerging Diseases II				
POSTERS: Pathogen surveys II				
POSTERS: Postharvest Pathology II				
POSTERS: Outreach and Extension II				
POSTERS: Pathogen vector/insect interactions II				
POSTERS: Seed Pathology II				
Phytopathologist of Distinction (POD) Talks	3:00 PM	-	4:00 PM	Governors Sq. 14
Hemp Diseases Working Group	3:00 PM	-	4:00 PM	Governor Sq 12

Academic Unit Leaders Forum (AULF), Hosted by APS	3:00 PM	-	4:30 PM	Governor Sq 10
APS Speed Mentoring Event	3:30 PM	-	4:30 PM	Plaza Ballroom
Poster Take-Down	4:30 PM	-	5:00 PM	Plaza Ballroom
Exhibit Move-Out	4:30 PM	-	7:00 PM	Plaza Ballroom
Colorful Colorado Party	7:30 PM	-	10:00 PM	Plaza Building Lobby
WEDNESDAY, AUGUST 16				
Speaker Ready Room Open	7:00 AM	-	8:30 AM	Plaza Client Office 1
Relaxation Room Open	8:00 AM	-	11:00 AM	Plaza Court 6
Registration Open	8:15 AM	-	11:45 AM	Plaza Exhibit/Foyer
SPECIAL SESSION: Plant Virus Evolution, Ecology, and Divergence in the Genomics Era	8:30 AM	-	9:45 AM	Governors Sq. 14
SPECIAL SESSION: New Paradigms for Ensuring Safe International Seed Movement	8:30 AM	-	9:45 AM	Grand Ballroom 1
TECHNICAL SESSION: An Examination of Biological Control Strategies	8:30 AM	-	9:45 AM	Windows
Lactation Room Open	9:00 AM	-	12:00 PM	Suite 3212 Plaza Building
CLOSING GENERAL SESSION: Keynote Speaker - Amanda Black	10:15 AM	-	11:30 AM	Grand Ballroom 1
Emerging Viruses in Cucurbits Working Group	1:00 PM	-	2:00 PM	Governor Sq 12
Western Plant Diagnostics Network Regional Meeting	1:00 PM	-	5:00 PM	Governor Sq 16