

ACADEMIA SINICA
EARLY-CAREER INVESTIGATOR
RESEARCH ACHIEVEMENT AWARD



李承叡

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代表著作：

- 📖 P-W Ong, Y-P Lin, H-W Chen, C-Y Lo, M Burlyaeva, T Noble, R Nair, R Schafleitner, M Vishnyakova, E Bishop-von-Wettberg, M Samsonova, S Nuzhdin, C-T Ting, **C-R Lee**. 2023 June. Environment as a limiting factor of the historical global spread of mungbean. *eLife* 12:e85725.
- 📖 H Matsumura, M-C Hsiao, Y-P Lin, A Toyoda, N Taniai, K Tarora, N Urasaki, SS Anand, NPS Dhillon, R Schafleitner, **C-R Lee**. 2020 Jun. Long-read bitter melon (*Momordica charantia*) genome and the genomic architecture of non-classic domestication. *Proceedings of the National Academy of Sciences* 117:14543-14551.
- 📖 LN Carley, JP Mojica, B Wang, C-Y Chen, Y-P Lin, KVS Prasad, E Chan, C-W Hsu, R Keith, CL Nunez, CF Olson-Manning, CA Rushworth, MR Wagner, J Wang, P-M Yeh, M Reichelt, K Ghattas, J Gershenzon, **C-R Lee**, T Mitchell-Olds. 2021 Aug. Ecological factors influence balancing selection on leaf chemical profiles of a wildflower. *Nature Ecology & Evolution* 5:1135-1144.

簡評：

李承叡博士的研究深化了我們對植物馴化和作物演化的理解。透過研究兩種在台灣與附近地區的常見食品：綠豆和苦瓜，他揭示了這些作物眾多品系間在不同地理區域的差異與原因、它們在亞洲的歷史擴張路徑以及潛在的作物改良方式。

Dr. Cheng-Ruei Lee's research has greatly enriched our understanding of plant domestication and crop evolution. By studying mungbean and bitter melon, two culinary staples in Taiwan and nearby regions, he has revealed how and why the varieties differ across geographic regions, their historical expansion route across Asia, and potential avenues for crop improvement.

簡歷：

李承叡畢業於國立臺灣師範大學，後赴美國杜克大學取得生物學博士學位，隨後於國立臺灣大學與奧地利孟德爾分子植物生物學研究所進行博士後研究，並於 2016 年回到國立臺灣大學任教。李承叡過去的研究主軸為野生動植物的族群遺傳與基因體學，著重以遺傳角度探究生物的生態適應與物種分化。回到臺灣後，研究主軸轉為亞洲本地農作物的遺傳多樣性，以演化與生態學的視野探討農作物馴化及傳播的遺傳與生態機制。近年研究目標包含苦瓜、野生芭蕉、綠豆、與紅豆，統合生物學、考古學資訊、及歷史文獻，探討農作物演化的過程，找出未來可加利用的重要基因。

Cheng-Ruei Lee graduated from National Taiwan Normal University and obtained a PhD in Biology from Duke University, USA. After conducting postdoctoral research at the National Taiwan University and Gregor Mendel Institute of Molecular Plant Biology, he obtained a faculty position at National Taiwan University. Previously, Lee's studies focused

on the population genetics and genomics of wild animals and plants, investigating organismal ecological adaptation and speciation from the genetics perspective. After returning to Taiwan, his research shifted to the genetic diversity of Asian local crops, investigating the genetic and ecological mechanisms of crop domestication and expansion from the evolutionary and ecological perspectives. Recent study targets include the bitter melon, wild banana, mung bean, and adzuki bean. Integrating biology, archeological information, and historical records, he investigated crop evolutionary processes to identify the crucial genes for future applications.

代表作簡介：

農作物馴化是一個漫長的過程。經由人為選擇，野生品系逐漸被轉變為符合人類需求的栽培品系。然而，很少人會去深究農作物在某地被馴化後，是如何傳播到世界各地的？是隨著人類活動由起源地向所有方向傳播，或是有既定的方向與路徑？這些方向又是被哪些因素決定的？我們發現綠豆在南亞次大陸被馴化後，並沒有隨著人類活動直接傳播到鄰近的中亞，而是以逆時鐘方向傳播到東南亞、東亞、最後才到達中亞。這是因為農作物較容易往環境差異較小的方向傳播，逐漸適應亞洲大陸迥異的氣候區，並演化出適應各地的形態。我們的研究統合遺傳學、考古資訊、與歷史文獻，以嶄新的角度顯示生態環境如何影響農作物傳播並形塑各地栽培品系的特質。

Crop domestication is a long process. Through artificial selection, humans gradually transformed wild plant progenitors into cultivars that suit human needs. Few researchers have questioned how crops expanded worldwide after being domesticated from one locality. Did crops radiate from their origins in all directions with human activities? Or is there a specific direction and route? What determined these routes? We showed that after being domesticated in the South Asian subcontinent, mung beans did not directly expand to nearby Central Asia through human activities. Instead, mung beans followed a counterclockwise route to Southeast and

East Asia, reaching Central Asia at the latest. This route could be explained by the crop's easier expansion towards locations with less environmental difference. During the process, mung beans gradually adapted to the distinct Asian climatic zones and evolved locally adaptive morphologies. Our study integrates genetics, archeological information, and historical records, demonstrating how ecological factors affected crop expansion and shaped the morphological differences of worldwide cultivars.

得獎感言：

感謝中央研究院給予本團隊的肯定。在較少使用到各式尖端儀器的生態、演化、農業領域，這次獲獎對我們是非常大的鼓勵。我由衷感謝團隊內一起努力的所有夥伴，一路指導幫助我的師長，國內外的合作者，以及論文和研究計畫審稿者的厚愛。感謝臺灣大學給我很大的自由，還有國科會的經費，讓我可以往更加整合性、跨領域的方向前進。我更要感謝父母對我的支持，還有太太與兩位可愛女兒的陪伴。你們的愛與笑容是我遇到挫折時最溫暖的療癒。

I am grateful to Academia Sinica for the award to our team. In the fields of ecology, evolutionary biology, and agronomy – areas with fewer opportunities to utilize cutting-edge instruments – this award is a tremendous encouragement to our team. I sincerely thank all the hard-working partners in our team, the mentors who guided me throughout my career, the great collaborators in Taiwan and abroad, and the support from proposal and paper reviewers. I appreciate the great freedom granted by National Taiwan University and funding from National Science and Technology Council, allowing me to pursue a more integrative and interdisciplinary path. I wish to express my heartfelt thanks to my parents for their support and my wife and two lovely daughters for their cherished companionship. When facing frustration, your love and smiles have been my greatest comfort.