微生物植生刺激素提升作物耐逆境能力評估

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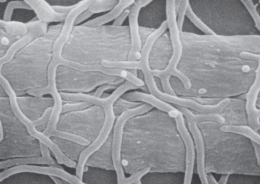
摘　要

生物刺激素是來自天然或合成來源的物質或微生物，能夠增強植物的生長發育並提高對非生物和生物逆境的抵抗力。這些物質主要作用於植物的生理過程和功能，如細胞分裂、生長擴展、養分運輸和抗氧化機制，促使植物更高效地吸收養分和抵抗環境壓力，進而提升作物的品質和產量。其中，植物周邊根圈中促進生長的細菌和非病原性的植物根圈菌及內共生菌 (endophytes) 的重要性日益增加，這些微生物的代謝產物尤其被視爲提高作物抗逆境能力的關鍵因素。本研究利用芽孢桿菌屬及鏈黴菌屬等有益微生物菌株的代謝體，建立「微生物植生刺激素於作物耐逆境能力提升之評估平台」，專門用於篩選對植物有益的微生物代謝物。本研究實驗證實特定的環二肽（cyclodipeptides, CDPs）能顯著提升植物對鹽害的抵抗力。後續針對CDPs合成酶設計專用的引子並進行了優化，成功篩選出具有強訊號的鏈黴菌*Streptomyces* sp. TCSF 7-6菌株，證實其在提升植物抗鹽能力方面的潛力。透過植物益生菌及其分泌的生物刺激素，植物的抗病和抗逆境能力被有效提升，這爲開發無需依賴基因改造的耐候農業策略提供了一個環保的選擇。未來，此篩選平臺將持續被用於開發對作物具有高潛力的耐逆境生物刺激素，以應對氣候變遷和日益增加的糧食需求。

關鍵字：生物刺激素、鏈黴菌、環二肽、耐候、鹽害逆境、氣候變遷



Evaluation of Microbial Biostimulants for Enhancing Corp Stress Resistance

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ABSTRACT

"Biostimulants" are substances or microorganisms derived from natural synthetic sources that can enhance plant growth and development and improve resistance to abiotic and biotic stresses. These substances primarily act on plant physiological processes and functions, such as cell division, growth expansion, nutrient transport, and antioxidant mechanisms, enabling plants to absorb nutrients more efficiently and resist environmental pressures, thereby improving crop quality and yield. The importance of growth-promoting bacteria and non-pathogenic rhizosphere and endophytic microbes around plant roots is increasing, and the metabolites of these microorganisms are particularly regarded as key factors in enhancing crop stress resistance. This study utilizes the metabolites of beneficial microbial strains such as *Bacillus* and *Streptomyces* to establish an Evaluation Platform for Microbial biostimulants in Enhancing Crop Stress Resistance, specifically for screening beneficial microbial metabolites for plants. The study confirmed that specific cyclodipeptides (CDPs) can significantly enhance plant resistance to salt stress. Subsequently, primers specific to CDP synthase were designed and optimized, successfully screening out the *Streptomyces* sp. TCSF 7-6 strain with strong signals, confirming its potential in enhancing plant salt resistance. Through plant probiotics and their secreted biostimulants, plant disease and stress resistance are effectively enhanced, providing an eco-friendly option for developing climate-resilient agricultural strategies without relying on genetic modification. In the future, this screening platform will continue to be used to develop high-potential stress-resistant biostimulants for crops to address climate change and the increasing demand for food.

Keywords: Biostimulant, *Streptomyces*, cyclodipeptides, Climate-resilient, Salt stress, Climate change