Studying Plant-Microbe interactions by CRISPR tool and its effect on Crop-Yield

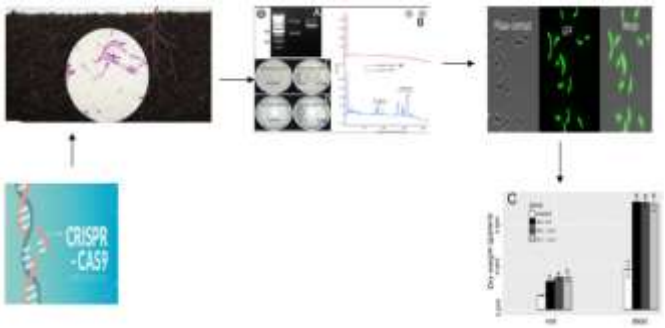
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Abstract

Statement of the Problem: To meet the healthcare needs and food demand in the COVID-19 pandemic there is a need for conservation, sustainable utilization, and management of plant genetic resources. Thus, the use of Plant Growth Promoting Rhizobacteria (PGPR) and understanding plant-microbe interaction studies by emerging CRISPR-Cas system will be beneficial to breed microbe-optimized plants and have a positive impact on future agriculture. Methodology & Theoretical Orientation: Bacillus one of the most appreciated PGPR faces certain limitations to study the plant-microbe interaction mechanism with conventional methods like homologous recombination and mutagenesis which is overcome by emerging genome editing tool CRISPR which has been adapted to target not only eukaryotes but prokaryotes as well. The method involves (a) Study of Bacterial strains and plasmids (b) DNA manipulation and oligonucleotides (c) Plasmid construction for genome editing (d) Stepwise Electroporation and mutant generation (e) Microscopy detection of fluorescent signals of the inserted mutant is done (f) Crude extracts subjected to HPLC for Lipoprotein extraction (g) Antifungal test followed by the effect of bacterial Volatile Organic Compounds on plants (h) Siderophore detection (i) Monitoring bacterial colonization on plant roots. Findings: Implementing CRISPR on Rhizosphere associated bacteria to study various aspects of plant-microbe interactions like production of biosurfactant lipopeptides, volatile organic compounds contributing to plant growth promotion followed by microscopy observations of labeled strain towards colonization. Based on colonization capability on roots, root-tip, and hair region mutant strain are compared with wild type strain showing the capability of mutants to increase the plant biomass and total chlorophyll. Thus, results indicate the involvement of organic compounds in plant growth-promoting activity which could affect root colonization. Conclusion & Significance: CRISPR based applications to study plant-microbe interactions enable us to understand plant health, growth, and disease that empower us to optimize plant cultivation and provide food for an ever-growing population.

Image



Recent Publications

1. Bhullar, G.R., Bhatia, A. Site Selection criteria and process in a clinical trial. International Journal of Pharmacology and Therapeutics 2020; 10(1): 12-16
2. Kaur, R., Mahajan A., and Bhatia A. (2018). Comparison of different methods of lipid extraction for microalgae Chlorella pyrenoidosa. Journal of Emerging Technologies and Innovative Research. 5(6), 115-120.
3. Bhatia, A., Arora, S., Singh, B., and Nagpal, A. (2020). Screening of rhizomes of Rheum emodi Wall. Ex. Meissen for antimutagenic potential employing Ames assay. The Nucleus, 63(2), 167-177
4. Dr. Anjana Bhatia (Ed.).Proceeding of Recent Developments in Science and Technology ISBN: 978-93-837-3071-1
5. Dr. Anjana Bhatia (2018). Increasing the Participation of Women in World of Computing In Edited Book " Wireless and Mobile Computing -2018" Page No.84 ISBN: 978-81-932-6024-1



Biography

Ruby Bhullar Garcha has her experience in research on Biofuels, with skill in CRISPR basics, Medical Coding, passion in research, and writing. Her research-oriented, re-skill, up-skill approach, led her to take initiative to learn more on COVID-19 by participating in the E-International Conference on COVID-19 then Webinar on Role of Aromatic and Medicinal plants in Immunity Building during COVID times which broadened her view to learn more about the main threats COVID-19 poses to food security, healthcare needs and climate change that scientists and farmers are facing in the front line. In the mid of these hurdles, a revolution in agriculture productivity is enabled by tools like CRISPR-Cas 9 which is implemented to study various aspects of PM interactions that directly influence our present agricultural practices.

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Session:
Presentation Category: Oral Presentation