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## The Role of Calcite-Dissolving Bacteria in Promoting Sustainable Peanut (*Arachis hypogaea*) Production

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### Abstract

Calcium is an essential macronutrient for proper growth and development of peanut (*Arachis hypogaea*). Calcium plays a significant role in cell wall development, nutrient uptake, and embryo formation. Calcium deficiency in peanut development leads to embryo abortion, reduced yields, and increased susceptibility to pathogens. To mitigate calcium deficiency various strategies have been employed, including the use of plant growth-promoting rhizobacteria (PGPRs). PGPRs are a diverse group of beneficial bacteria that are known to enhance plant growth and provide various benefits to plants. One of these PGPRs are Calcite Dissolving bacteria (CDB), which are capable of dissolving calcite, a mineralized form of calcium, producing and facilitating the uptake of calcium by the peanut plant. CDB have been isolated from soil in southern Georgia peanut fields and identified through 16s rRNA Sanger and whole-genome Illumina sequencing. To date 117 CDB have been identified and morphologically characterized, including the rate of calcite dissolution. Recent findings have begun to elucidate the CDB dissolution function. The function of CDB's ability to dissolve calcite is unknown, however results indicated that CDB produces an organic acid able to significantly change pH and manipulate their environment. Further investigation into identifying dissolution mechanism will allow us to modify CDB to increase its applications to field production. Our results have shown that application of CDB to calcium deficient soil significantly increases the available calcium by an average of 30% compared to the control. Peanut seeds treated with CDB showed an increased germination rate, a reduction in disease severity caused by soilborne fungal pathogens and provide drought resistance. In conclusion, calcium deficiency can have severe implication for peanut growth and productivity. The application of CDB is a promising strategy to mitigate calcium deficiency and provide an alternative to traditional management strategies.

**Keywords:** Biocontrol, Biofertilizer, PGPR, Crop Protection, *Aspergillus flavus*, Calcium.