Title : Application of Actinobacteria to Enchance Growth of Kale (*Brassica oleracea* var. *sabellica*) in Hydroponic System Under Low Nutritional Stress

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ABSTRACT

Hydroponic farming has become a popular alternative cultivation method due to its ability to control environmental factors and prevent soil contamination. Additionally, this system allows for year-round harvesting. In hydroponic cultivation, plants grow in a nutrient solution, absorbing essential nutrients directly through their roots. Kale is a highly nutritious vegetable with increasing consumer demand with requires large amount of fertilizer for growth. However, reducing the use of chemical fertilizer in the nutrient solution may affect kale growth. Actinobacteria are large group of Gram-positive bacteria, known for their plant growth-promoting properties. Therefore, this study aims to evaluate the potential of *Streptomyces thermocarboxydus* isolate S3 in promoting the growth of kale (*Brassica oleracea* var. *sabellica*) under low-nutrient hydroponic conditions. The experiment consisted of six treatment groups a control group where seeds were soaked in distilled water and experimental groups where seeds were treated with a spore suspension of *S. thermocarboxydus* isolate S3. Plants were grown in 100%, 50% and 25% nutrient solution for 45 days. *S. thermocarboxydus* isolate S3 significantly enhanced the growth of kale under low-nutrient conditions. Kale plants treated with *S. thermocarboxydus* isolate S3 exhibited higher fresh weight (169.56 ± 73.82 g), dry weight (17.20 ± 5.11 g) and total chlorophyll content (1.73 ± 0.35 mg/L) compared to the control group. Furthermore, *S. thermocarboxydus* isolate S3 reduced H_2O_2 accumulation in kale grown under low-nutrient hydroponic conditions. Additionally, the presence of *S. thermocarboxydus* isolate S3 was detected in the plant roots, suggesting a successful colonization.

Keywords: Kale (*Brassica oleracea* var. *sabellica*), Low-nutrient conditions, Hydroponic, Actinobacteria