

**Title :** Genomic Analysis of *Streptomyces gardneri* MC1-2 and Its Application in Biofertilizer Development from Spent Mushroom Substrate

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## ABSTRACT

*Streptomyces gardneri* MC1-2 is a plant-beneficial actinobacterium with the potential to enhance tomato growth and yield under drought stress. Spent mushroom substrate (SMS), a biomass waste from mushroom cultivation, has suitable physical properties and nutrient content for agricultural reuse, particularly as a carrier material for microbial inoculants in biofertilizer applications. This study aims to investigate the molecular mechanisms of *S. gardneri* MC1-2 in promoting plant growth under drought stress using genome mining approach and to develop biofertilizer with SMS. Genome mining of *S. gardneri* MC1-2 using the RAST server revealed genes related to plant growth promotion and responses to osmotic and oxidative stresses. For biofertilizer development two formulations were prepared using *S. gardneri* MC1-2 as follows: formula F1 SMS; formula F2 SMS, and 1% (w/w) carboxymethyl cellulose (CMC). A shelf-life evaluation was conducted by storing all biofertilizers at 4°C, 30°C, and 40°C for 0, 14, 21, 30, and 45 days. The initial actinobacterial count of formulas F1 and F2 were  $1.36 \times 10^7$  CFU/g and  $1.03 \times 10^9$  CFU/g, respectively. However, *S. gardneri* MC1-2 showed no viability after 7 days of storage. To enhance actinobacterial viability, *S. gardneri* MC1-2 was cultured in semi-solid ISP2 medium before biofertilizer formulation, followed by a shelf-life assessment. On the initial day of storage, F1 and F2 contained *S. gardneri* MC1-2 at  $7.60 \times 10^8$  CFU/g and  $2.61 \times 10^9$  CFU/g, respectively. After 21 days, the highest survival rates were observed at 4°C, with  $1.29 \times 10^7$  CFU/g in F1 and  $2.14 \times 10^7$  CFU/g in F2. In contrast, at 30°C, the bacterial counts declined to  $1 \times 10^4$  CFU/g in F1 and  $4 \times 10^6$  CFU/g in F2. These findings highlight the potential of *S. gardneri* MC1-2 and SMS as components of effective biofertilizers.