

## الملخص الإنجليزي للبحث رقم ٢

عنوان البحث باللغة الإنجليزية :

Foliar nourishment with nano-selenium dioxide promotes physiology, biochemistry, antioxidant defenses, and salt tolerance in *Phaseolus vulgaris*.

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### ABSTRACT:

Novel strategic green approaches are urgently needed to raise the performance of plants subjected to stress. Two field-level experimental attempts were implemented during two (2019 and 2020) growing seasons to study the possible effects of exogenous nourishment with selenium dioxide nanoparticles (Se-NPs) on growth, physio-biochemical ingredients, antioxidant defenses, and yield of *Phaseolus vulgaris* (L.) plant growing on a salt-affected soil (EC = 7.55–7.61 dS m<sup>-1</sup>). At 20, 30, and 40 days from seeding, three foliar sprays were applied to plants with Se-NPs at a rate of 0.5, 1.0, or 1.5 mM. The experimental design was accomplished in randomized complete plots. The data indicate noteworthy elevations in indicators related to growth and yield; pigments related to effective photosynthesis, osmoprotectant (free proline and soluble sugars), nutrient and Se contents, K<sup>+</sup>/Na<sup>+</sup> ratio, cell integrity (water content and stability of membranes), all enzyme activities; and all features related to leaf anatomy induced by Se-NPs foliar spray. Conversely, marked lowering in markers of Na<sup>+</sup> content-induced oxidative stress (superoxide radical and hydrogen peroxide) and their outcomes in terms of ionic leakage and malondialdehyde were reported by foliar nourishment with Se-NPS compared to spraying leaves with water as an implemented control. The best results were recorded with Se-NPs applied at 1.0 mM, which mitigated the negative effects of soil salinity (control results). Therefore, the outcomes of this successful study recommend the use of Se-NPs at a rate of 1.0 mM as a foliar spray to grow common beans on saline soils with EC up to 7.55–7.61 dS m<sup>-1</sup>.