

## البحث الثامن

Ahmed A.M. Awad, Mostafa M. Rady, Wael M. Semida, **Eman E. Belal**, Wael M. Omran, Hatim M. Al-Yasi and Esmat F. Ali. (7 September 2021). Foliar Nourishment with Zinc-Containing Different Forms Effectively Sustains Carrot Performance in Zinc-Deficient Soil. *Agronomy*, 11, 1853.

التغذية الورقية بالصور المختلفة للزنك تحافظ علي أداء الجزر بشكل فعال في الأراضي التي تعاني من نقص الزنك.

### ملخص البحث باللغة الانجليزية:

Among the essential micronutrients, zinc (Zn) affects vital functions in crop plants. The influences of foliar nourishing with certain Zn-containing forms on the growth, productivity, and physiology of carrot plants (cv. Fire wedge F1) and their nutritional contents when grown in Zn- deficient soil were examined in both 2019/2020 and 2020/2021 field trials. Two doses of zinc oxide nanoparticles (ZnO-NPs(1)= 20 and ZnO-NPs(2)= 40 mg L<sup>-1</sup>), zinc-EDTA (Zn-EDTA(1)= 1 and Zn-EDTA(2)= 2 g L<sup>-1</sup>), or bulk zinc oxide (ZnO-B(1)= 200 and ZnO-B(2)= 400 mg L<sup>-1</sup>) were applied three times. The data outputted indicated, in general, that ZnO-NPs (2) was the best treatment that conferred more acceptable plant growth (measured as shoot length, fresh and dry weights), physiology (measured as cell membrane stability index, SPAD readings, and nutrient uptake), and nutritional homeostasis (e.g., P, Ca, Fe, Mn, Zn, and Cu contents). All these positive attributes were reflected in the highest yield, which was measured as fresh weight, dry matter, length, diameter, volume, and total yield of carrot roots. However, there were some exceptions, including the highest membrane stability index in both seasons, the highest Cu uptake and Mn content in the first season, and root fresh weight in both seasons obtained with ZnO-NPs(1). Moreover, the maximum P uptake and root dry matter were obtained with ZnO-B (1) and the highest content of root P was obtained by ZnO-B(2). Based on the above data, foliar nourishing with ZnO-NPs (2) can be recommended for the sustainability of carrot cultivation in Zn-deficient soils.