Review of: "Synthesis, Characterization and Ameliorative Effect of Iron Oxide Nanoparticles on Saline-Stressed Zea Mays"

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Potential competing interests: No potential competing interests to declare.

The work presented by the authors gives a relatively comprehensive assessment of the ameliorative potential of the FeONPs, which were synthesized using the leaf extract of *Diodella sarmentosa,* on the pigment and antioxidative index of saline-stressed maize. It is beyond doubt that the selected experiments for writing the paper offer novelty and uniqueness. The methods used in the article to determine the characteristics of the nanoparticles are relatively well described. The discussion is well written, and the results are supported by relatively recent literature. The conclusion very well highlights the main results obtained in the course of the research. Despite the novelty of the experimental approach, there is much to be desired in the formation of a better-argued article. I have weak remarks in the presentation and description of the results that need to be corrected.

The manuscript contains a few incomprehensible sentences and minor ambiguities, e.g.:

Abstract:

1. Line 1: “High soil salinity induces osmotic and ionic stress that threatens crop production worldwide and affects food security.”
2. Line 6: “…photosynthetic pigments (total chlorophyll (175.71%), chlorophyll a (256.34%), chlorophyll b (77.01%), carotenoid…”

Comment: Recommendation - It would be good to make a smooth transition between the first and second sentences of the abstract, to indicate the need for the introduction and exploitation of nanoparticles on plants in salinity conditions.

Introduction:

1. Line 12: “…from the Food and Agriculture Organization (FAO), there is a need to produce 60% more food by 2050 in order to feed the…”.

Comment: Without “in order.”

1. Line 30: “Lately, a number of studies (Etesami and Glick, 2020; Etesami and Jeong, 2018; Liang et al., 2018) have concentrated on…”.

Comment: Replace “a number of” with “several.”

1. Line 45: “Nanoparticles range in sizes between 1 and 100 nm, and…”
2. Line 51: “The process is known as green synthesis, and it is both cost-effective…”

Comment: Without “both.”

1. Line 54: “Nanoparticle-based iron fertilizers can act as a bioavailable iron reservoir for plants, as…”.
2. Lines 55-56: “…due to their low levels of toxicity and high affordability.”.
3. Lines 57-61: “The application of green-synthesized iron oxide nanoparticles to soil was found to considerably improve the morphological qualities of plants, such as the number of leaves, the percentage of sprouting, the biomass of the plant, the biomass of the shoots and roots, the characteristics of the roots, and the duration of the first leaf appearance phase (Haydar et al., 2022). However, this study looked at the biochemical effects of applying green-synthesized Fe nanoparticles to the leaves of saline-stressed Zea mays.”.
4. Lines 63-64: “Iron nanoparticles have been employed in medicine, industry, agriculture, and laboratories.”.

Comment: This sentence is redundant.

Materials and Methods:

1. Line 107: “The soil sample was sieved to remove gravel and debris using a 2 mm…”.
2. Line 111: “In each pot (A, B, C, D, and E) containing an equal quantity (4.5 kg)…”.
3. Line 115: “After the ten-day treatment period,…”.

Results:

1. Line 164: “For the purpose of identifying and characterizing the organic compounds that capped FeONPs, the Fourier-transform…”.
2. Line 166: “…provided precise designations for the detected absorbance peaks (supplementary attachment 2).”
3. Line 178: “…better deciphered from these observed functional groups (supplementary attachment 2).”
4. Line 206: “An observed decrease in the shoot and root lengths of the salinized plant when compared with the control was recorded.”
5. Lines 207-208: “An increase was also observed in the roots of the plants treated with FeONPs (supplementary attachment 3) when compared with the control and untreated plants (Tables 2 and 3).”.

Comment: Rethinking is needed.

1. Line 212-213: “The root length (Table 3) and average root length per experimental pot (Fig. 6) indicates that salinity stress statistically ($p<0.05$) caused a decline in the average root length of the *Z. mays*.”
2. Figure 6: “Root length” replace with “Root length”. I find a mistake in the legend.
3. Lines 230-231: “When the water potential of the soil in which plants grow is less than that of the soil, the plants absorb water through their roots”.

Comment: This sentence is incomprehensible.

1. Line 246: "…the saline-stressed root (sample D) by 9.87% over the control."
2. Lines 247-250: "Considering that the application of FeO-NPs on the unsalinized Zea may (sample C) improved the shoot and root length by 8.97% and 0.99%, respectively, this indicates that the no significant ($p<0.05$) effect observed on the shoot length of the FeONPs-treated salanized Zea mays may have resulted from the counter effects of the salinity".

Comment: This sentence is incomprehensible.

1. Lines 258-262: "The significant ($p<0.05$) reduction of the superoxide activities in sample C, comparable to the positive control (B), clearly justified the mitigating role of the nanoparticles in reducing oxidative stress. This finding agrees with Moradbeygi et al. (2020), that an increase in phenolic and flavonoid contents and a decrease in antioxidant enzyme activities occurs in *Dracocephalum moldavica* L. root under saline stress."

Comment: The comparison is incorrect.

1. Figure 8: Review the statistics.
2. Lines 279-281: "Pot C, which was not polluted but treated with the nanoparticles significantly ($p<0.05$), recorded the highest chlorophyll a and b contents when compared to the other groups. This is an indication that the nanoparticles promoted the content of chlorophyll a and b. The group polluted without treatment (B)…".

Comment: Replace the verb "polluted" with the verb "treated".

1. Figure 9: Review the legend.
2. Line 288: "Figure 10 shows the carotene content of the saline-stressed Zea mays.".

Comment: "Carotenoids", not "carotene".

1. Figure 10: Review the legend.
2. Lines 291-296: "Salinity negatively affected all the studied indices in the salinized pot B (Table 4). The high activity of the oxidative stress biomarkers catalase and superoxide dismutase recorded in the same pot B is a confirmation of stress. Treatment with iron nanoparticles (sample D) remarkably reversed almost all the observed effects. The significant reduction ($p<0.05$) of CAT and SOD activities compared to the positive control (Pot B) indicates the scavenging role of the NPs. This finding agrees with Ahmed et al., (2023), who reported that the foliar application of iron nanoparticles can promote the growth of *Soliddago virgaureal*.""

Conclusions:

1. Lines 298-305: "In this study, FeONPs were synthesized using leaf extract of Diodella sarmentosa (SW) Bacigalupo El & Cabral ex Borhidi) at 80 0C. The leaf extract served as a reducing agent for the extraction of iron nanoparticles from iron (iii) chloride hexahydrate (FeCl3.6H2O). The synthesized spherical and amorphous iron nanoparticles, with a size ranging from 2.22 to 27.83 nm, were confirmed at the maximum light absorption peak of 380 nm to have about 2.5 Kev energy. Foliar application of the FeONPs on the saline-stressed Zea mays ameliorated the adverse effects of salinity

on plants by increasing the chlorophyll and carotenoid contents of the plant and enhancing the enzymatic activity of SOD and CAD (antioxidant enzymes). The overall result suggests that iron oxide nanoparticles may be a beneficial agent to enhance plant tolerance to salinity….".