

## **Moringa arborea-mediated Iron Oxide Nanoparticles, their Characterization and their Anti-cancer Potential on Highly and Weakly Metastatic Human Breast Cancer Cells**

Huzaifa Umar 1, Maryam Rabiou Aliyu 2

Operational Research Centre in Healthcare, Near East University 1  
Department of Energy System Engineering, Cyprus International University 2

### INTRODUCTION & AIM

Nanoparticles (NPs) have become valuable tools for bridging materials across scales, ranging from large to atomic dimensions. Various precursors, including iron, nickel, zinc, copper, silver, and gold nanoparticles, are widely used in their synthesis due to their favourable properties and applicability across a wide range of uses (Devatha et al., 2017). In cancer treatment, Fe<sub>2</sub>O<sub>3</sub> NPs have been investigated for their ability to generate reactive oxygen species or localized heat that affects cell proliferation (El-Zahaby et al., 2019).

The study aimed to investigate the cytotoxic potential of the Iron Oxide Nanoparticles (IONPs) synthesized using *Moringa arborea* (M.A.) through various assays, such as trypan blue and MTT assays, of the synthesized iron oxide nanoparticles (IONPs).

### METHOD

IONPS synthesis with M.A. leaves was achieved using the method employed by Huzaifa et al. (2023) with some modifications. Biosynthesis of NPs was carried out using 0.001 M ferric chloride solution and 20% M.O. methanolic extract.

The *Moringa arborea*-mediated IONPs (M A IONPs) were analyzed using a range of techniques, including Fourier-transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), UV-vis spectroscopy (UV-vis), scanning electron microscopy (SEM), and energy-dispersive X-ray spectroscopy (EDX). The FTIR, XRD, and SEM-EDX results confirmed the successful synthesis of IONPs.

We assessed the effect of synthesized M O Fe<sub>2</sub>O<sub>3</sub> NPs on MDA-MB 231 and MCF-7 cells using the method described by Umar et al. (2023). These cells were subjected to varying concentrations of the extract and then incubated for 24 hours. Following removing the treatment, we introduced diluted trypan blue and incubated it for 10 minutes in darkness. Subsequently, we count the number of both dead and viable cells

### RESULTS & DISCUSSION

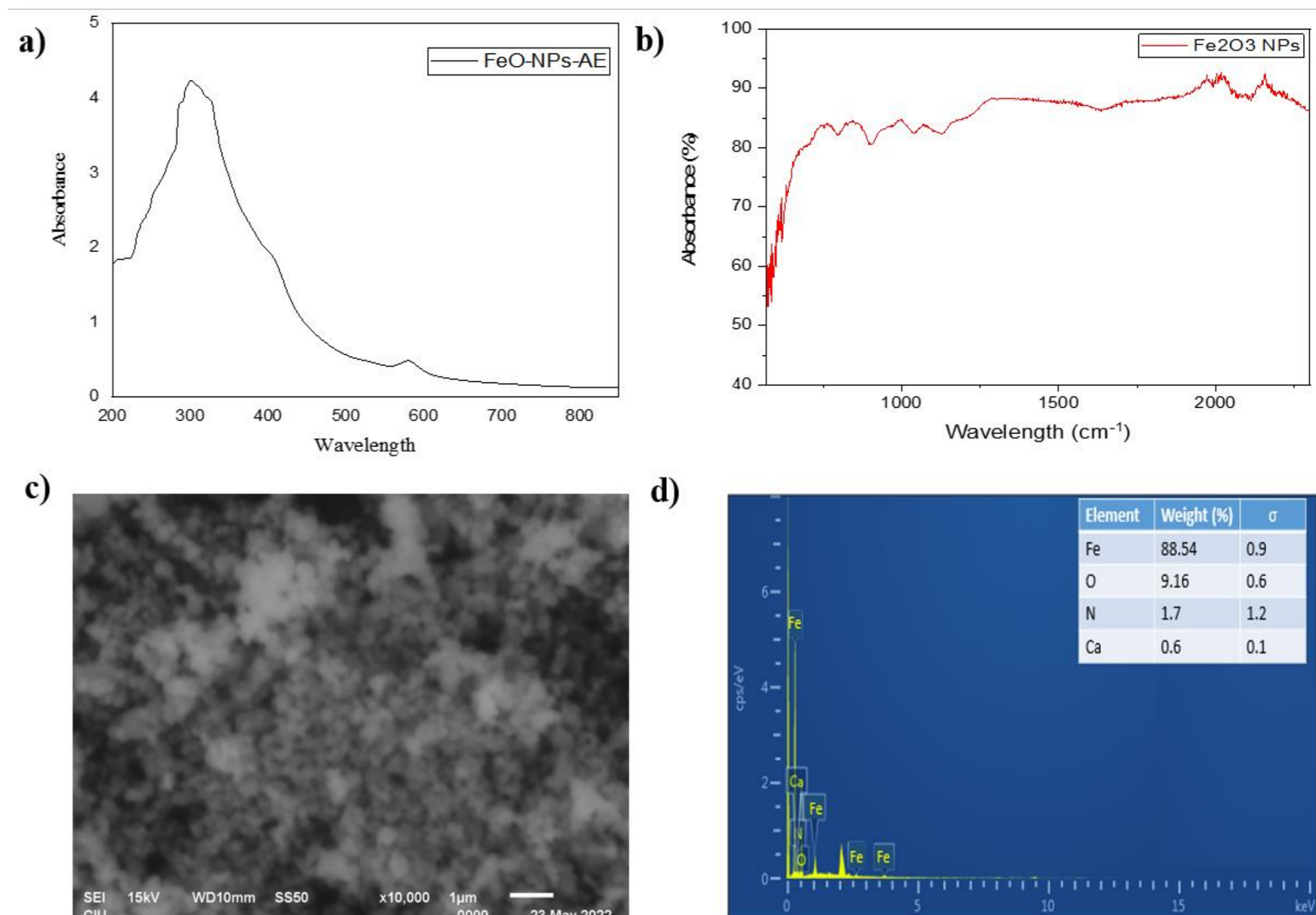


Fig. 1. (a) UV-vis spectroscopy, (b) FTIR, (c) SEM and EDX of the synthesized IONPS

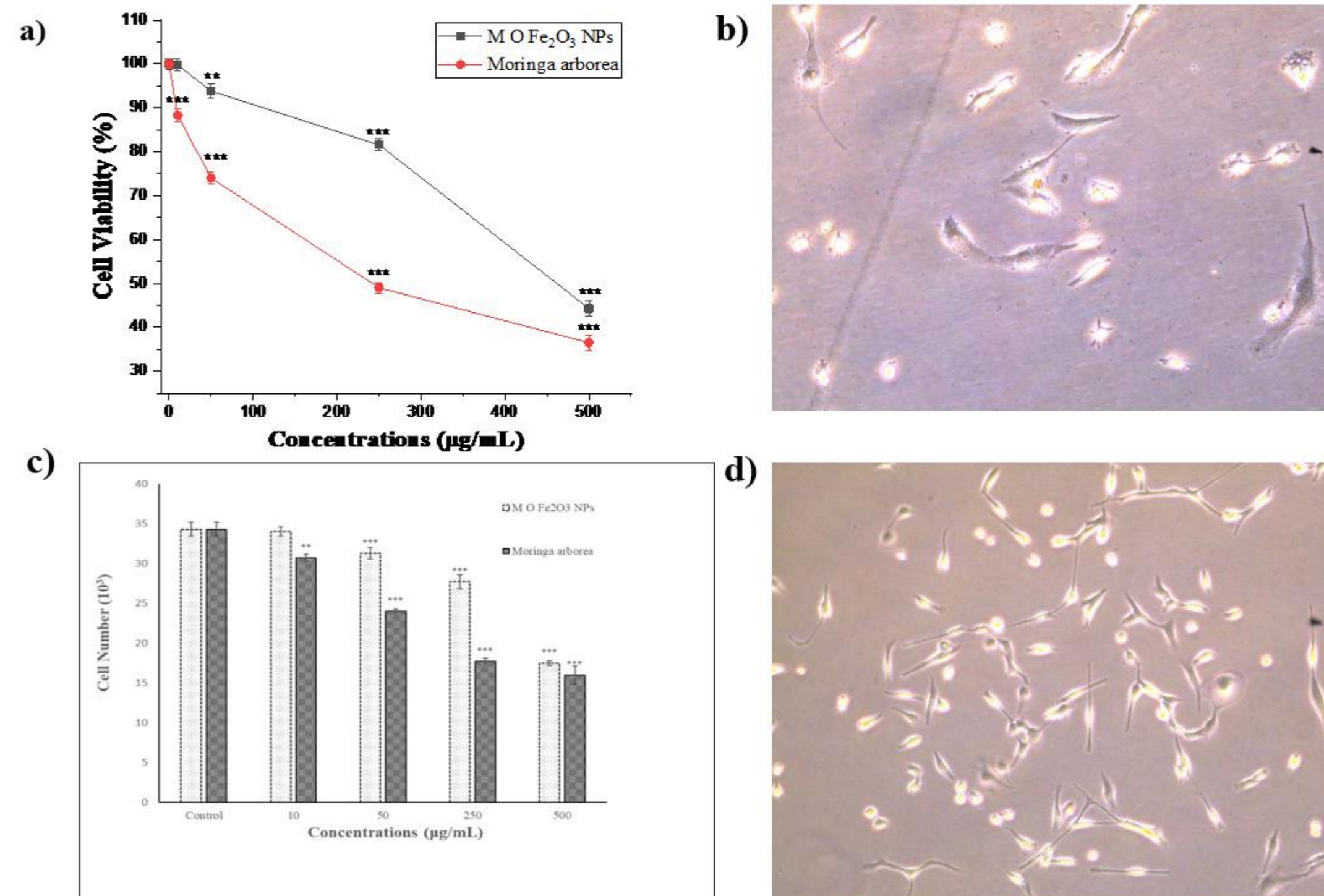


Fig. 2: (a) Cytotoxic effect of various concentrations of IONPS and *Moringa arborea* of MDA-MB 231 cells, (b) Typical phase-contrast light-microscopy image of the treated cells (c) Effect of various concentrations of IONPS and *Moringa arborea* on the Proliferation of MDA-MB 231 cells (d) Typical phase-contrast light-microscopy image of the treated cells prior to MTT assay. \*\*P<0.01, \*\*\*P<0.0001.

### CONCLUSION

Stable IONPs were synthesized using a methanolic extract of *Moringa arborea*. The nanoparticles exhibited cytotoxic potential on highly and weakly metastatic human breast cancer cell lines.

### FUTURE WORK / REFERENCES

Devatha CP, Thalla AK and Katte SY (2016). Green synthesis of iron nanoparticles using different leaf extracts for treatment of domestic wastewater. J.Clean. Prod., 139: 1425-1435.  
El-Zahaby SA, Elnaggar YSR and Abdallah OY (2019). Reviewing two decades of nanomedicine implementations in targeted treatment and diagnosis of pancreatic cancer: An emphasis on state of the art. J.Control Release, 10(293): 21-35.  
Umar H, Rizaner N, Usman AG, Aliyu MR, Adun H, Ghali UM, Uzun, OD and Abba SI (2023). Prediction of cell migration in MDA-MB 231 and MCF-7 human breast cancer cells treated with *albizia lebbbeck* methanolic extract using multilinear regression and artificial intelligence-based models. Pharmaceuticals, 16(6): 858.