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Green Synthesis of Iron Oxide Nanoparticles Using *Moringa oleifera* Leaf Extract for the Adsorptive Removal of Arsenic from Groundwater in Southern Punjab, Pakistan

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INTRODUCTION & AIM

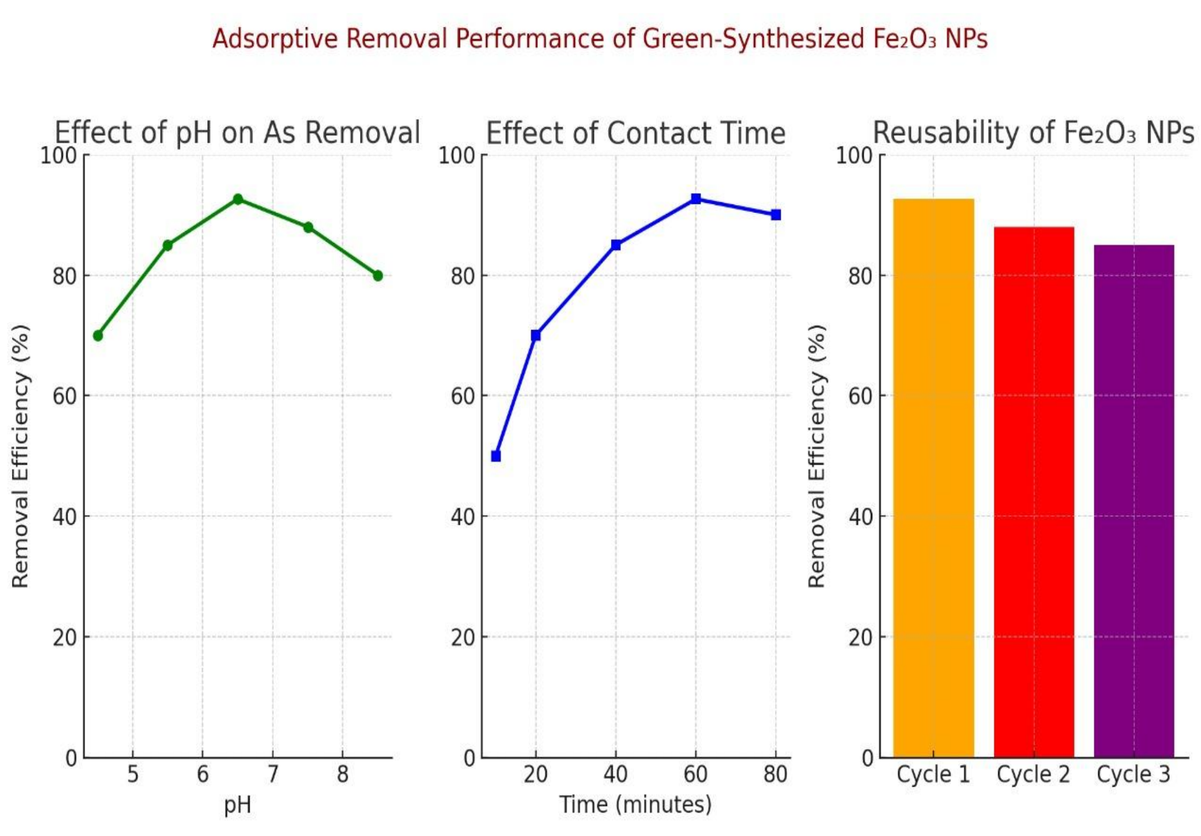
- Arsenic in Punjab groundwater exceeds WHO limits.
- Conventional methods are costly and harmful.
- Fe_2O_3 NPs show strong arsenic adsorption.
- Aim: Green synthesis using *Moringa oleifera* leaves.

METHOD

- Aqueous leaf extract as reducer/stabilizer.
- Green synthesis of Fe_2O_3 NPs.
- Characterization: UV–Vis, FTIR, XRD, SEM.
- Batch adsorption under varied pH, time, dosage.
- Groundwater tested with AAS.
- Reusability tested across cycles

RESULTS & DISCUSSION

- Spherical NPs, 20–40 nm size.
- 92.6% removal at pH 6.5 in 60 min.
- 85% efficiency after 3 cycles.
- Eco-friendly, low-toxicity method.
- Cost-effective arsenic remediation.



CONCLUSION

- *Moringa*-based Fe_2O_3 NPs are eco-friendly and efficient
- Practical due to high efficiency and reusability.

FUTURE WORK / REFERENCES

- Test large-scale field applications and long-term use.