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Biosynthesis of manganese oxide nanoparticles using *Lawsonia innermis* extract and their effect on the growth of *Cicer Arietinum*

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Biosynthesis of nanoparticles from living plant extracts can be used for conversion of metal ions into nano form. These nanoparticles are capable in controlling plant growth. If nanoparticles can enhance the growth of plants, it will be a great boon to the agricultural domain of developing countries that are particularly facing great challenges in order to improve the agricultural sector. *Lawsonia innermis* (henna) is a plant with various ethnomedicinal and antimicrobial activities. The chemical constituents of *L. innermis* include β-sitosterol glycoside, xanthones, flavonoids, coumarins, gallic acid, lawsone, etc., responsible for its activity. Manganese is one of nine essential micronutrients for plant growth. Synthesis of Ag nanoparticles has been reported by aqueous extract of *Lawsonia innermis* but not much work has been done on the synthesis of manganese nanoparticles. Present study was done with an aim to synthesize manganese nanoparticles by aqueous extract of *Lawsonia innermis* and effect of biosynthesized manganese nanoparticle on the growth of *Cicer arietinum*. For nanoparticle synthesis, 10% aqueous extract of plant is mixed with 10^{-3}M $MnSO_4$ solution and incubation of this reaction mixture was done at room temperature for 48 hours. Formation of nanoparticles was confirmed visually by the reaction mixture colour which turned to brown and the characterization of nanoparticles was done by UV-Vis Spectroscopy and Particle Size Analysis. Results suggests that biosynthesized nanoparticle treatment significantly enhance all the growth parameters i.e., fresh weight, dry weight, root length and shoot length of *Cicer arietinum* as compared to other treatment.

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Nanoengineered peptidomimetic for diagnosis and treatment of cancer

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Introduction: ^{68}Ga-NODAGA-THERANOST is a nanoengineered $\alpha_v\beta_3$ integrin antagonist (IAC) and the first radiolabeled peptidomimetic to reach clinical development for targeting integrin receptors. In this first-in-human study, the feasibility of integrin-receptor peptidomimetic PET imaging was confirmed in patients with non-small-cell-lung-cancer and breast cancer.

Methods: Images were obtained 60 min post-injection of 300-500 MBq of ^{68}Ga-NODAGA-THERANOST.

Results: ^{68}Ga-NODAGA-THERANOST revealed high-tumor-to-background ratios (SUV_{max}=4.8) and uptake at neoangiogenesis sites. Reconstructed fused images distinguished cancers with high malignancy potential and enabled enhanced bone metastasis detection. ^{18}F-FDG-positive lung and lymph node metastases did not show uptake, indicating absence of neovascularization.

Conclusion: Nanoengineered ^{68}Ga-NODAGA-THERANOST was found to be safe and effective, well tolerated, exhibiting rapid blood clearance, stability, rapid renal excretion, favorable biodistribution and PK/PD, low irradiation burden (μSv/MBq/μg) and convenient radiolabeling. This radioligand might enable theranostics, i.e., a combination of diagnostics followed by the appropriate therapeutics, namely anti-angiogenic therapy, image-guided pre-surgical assessment, prediction of pathologic response, neoadjuvant-peptidomimetic-radiotherapy, targeted chemotherapy and personalized medicine strategies. Further clinical trials evaluating ^{68}Ga-NODAGA-THERANOST are warranted.

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