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Nanotechnology in agriculture: Plant disease control

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Nanotechnology has grabbed a lot of attention in recent years. It has been employed in several fields like medicine, pharmaceutical industries, catalysis, energy and materials. Nanoparticles (ranging from 1 to 100 nm) have a lot of medical, agricultural and industrial applications and can be synthesised through various methods. Nanoparticles are being used due to their optical scattering properties for imaging purposes as well as in the detection and diagnosis of diseases. Therefore, nanotechnology can be applied in the field of agriculture which is the largest interface between humans and the environment and is a major cause of climate change and ecosystem degradation. The use of pesticides to promote plant growth, prevent diseases, and increase crop productivity is prevalent in agriculture. However, pesticide chemicals may induce oxidative stress leading to the generation of free radicals that are damaging to plants. Hence, nanoparticles can be used in controlling plant diseases and limiting the use of pesticides. Nanotechnology offers a great opportunity to develop new products against pests. Nanoscale materials can be used in electrochemical biosensors to detect and quantify viruses, bacteria, toxins and other bio-hazardous substances. Furthermore, carbon nanotubes can be used as a vehicle to deliver the desired biomolecules into seeds for protection against diseases. Additionally, nanoemulsions can encapsulate functional ingredients within their droplets, thus they can be used to formulate nano pesticides that are more sustainable than conventional pesticides. Nanosilver has also demonstrated a reduction in root diseases due to its antibacterial, antifungal and antiviral properties. Therefore, nanotechnology provides a lot of potential for improving the overall growth and health of plants through sustainable agriculture practices.

Keywords: Nanotechnology, Disease control, Nanoscale devices, Carbon nanotubes, Nanoemulsions, Sustainability

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