Agro industrial use of nanoparticle – A Review

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Introduction:

Nanotechnology has received a lot of interest in recent years because of its numerous uses in fields such as health, pharmaceuticals, catalysis, energy, and materials. These nanoparticles with tiny to large surface areas (1-100 nm) have a variety of possible applications. Nowadays, sustainable agriculture is required. Nano chemicals have emerged as potential agents for plant growth, fertilisers, and insecticides. Nano-material's have recently been suggested as an alternate approach for controlling plant pests such as insects, fungus, and weeds (Nazar et al., 2012). Specific uses of nanotechnology in agriculture include Nano fertilizers and Nano pesticides to trail products and nutrients levels to boost production without decontaminating soils and waterways, as well as protection against numerous insect pests and microbiological illnesses. Nanotechnology is extensively employed in the agro-industry to create goods such as fertilisers, herbicides, insecticides, fungicides, and nano-sensors. These developments can assist in meeting future agricultural demands by improving crop quality and production, lowering chemical pollution, or even shielding crops from environmental pressures (Pattanagul, W., & Thitisaksakul, M. (2008)).

Nanomaterial's are distinguished by having at least one dimension with a size between 1 and 100 nm (length, height, and width). Because of the larger surface area and the quantum qualities that are shown on this scale, they exhibit different properties (optical, electrical, and chemical, among others) than their bulk equivalent (Rico et al., 2011). Green approaches for manufacturing nanoparticles with plant extracts are desirable because they are easy, convenient, environmentally benign, and need minimal reaction time. Nanomaterial's created using environmentally friendly and green processes have the potential to improve agriculture by enhancing fertiliser, plant growth regulators, and insecticides (Baxter & Lahner, (2008). Furthermore, they reduce the amount of toxic substances that damage the environment. As a result, this method contributes to the reduction of environmental contaminants. The vast surface area provided by small nanoparticles, in particular, makes them

appealing for addressing difficulties that physical, chemical pesticides, and biological control approaches cannot handle. Nanotechnology in agriculture has acquired a lot of traction in the recent decade, thanks to a lot of public money, but the stage of development is good, even if many approaches have been incorporated into agriculture. Nanotechnology offers novel agrochemical agents and delivery systems to boost crop output while reducing pesticide applications. Nowadays, sustainable agriculture is required. It may be perceived to provide a good ecological strategy in the long run. Excessive tilling of the soil, which causes erosion, and irrigation without enough drainage are two practises that can cause long-term soil damage. This will result in salinization. This is to meet the demands of humans for food, animal feed, and fibre (Sharma et al., 2012). Zinc Although it is only required in small levels in plants, it has been regarded an important mineral for metabolic activity. Zinc was discovered to have a significant function in the regulation of reactive oxygen species and the protection of plant cells from oxidative stressors. Magnesium oxide (MgO) is an essential inorganic substance with several applications including adsorbents, fire retardants, improved ceramics, hazardous waste remediation, and photo electronic devices. As a result, numerous methodologies and approaches for MgONP synthesis have been documented (Wang et al., 2009). Various physical and chemical processes were used to create nanomaterials such as copper oxide (CuONPs), zinc oxide (ZnONPs), magnesium hydroxide (MgOHNPs), and magnesium oxide (MgONPs) [21]. With the rising need to reduce the usage of environmentally hazardous compounds such as pesticides, the biosynthesis of nanoparticles has gained prominence as an emerging feature of the junction of nanotechnology and biotechnology. Several nanomaterial's, including silver nanoparticles, are utilised as antibacterial agents in food packaging. This is due to its extensive usage. Titanium dioxide (TiO2), zinc oxide (ZnO), silicon oxide (SiO2), magnesium oxide (MgO), gold, and silver are some additional nanoparticles that are now in use. Each of them has unique properties and purposes; for example, zinc Nano crystal exhibits antibacterial and antifungal activity. Recently, the application of Nano silver against the phyto-pathogen Colletotrichum gloeosporioides has been investigated. Apart from antibacterial capabilities, several nanoparticles (Fe, Cu, Si, Al, Zn, and carbon nanotubes) have been shown to have negative impacts on plant development (Zou et al., 2014).

Conclusion

The emergence and development of new pathogenic races is an on-going issue, and the use of pesticides to manage pests is both costly and ineffective. Nanomaterial's have recently been suggested as an alternate approach for controlling plant diseases. Agricultural methods often entail the systematic administration of a diverse variety of active chemicals at varying doses and frequency, resulting in a diverse set of selective regimes. Green techniques for manufacturing nanoparticles with plant extracts are favourable since they are easy, convenient, environmentally benign, and take less time to complete. Nanomaterial's produced using

environmentally friendly and green processes have the potential to improve agriculture by increasing fertilisation, plant growth regulators, and pesticide delivery of active components to desired target locations, wastewater treatment, and nutrient absorption in plants. Nanotechnology applications are now being investigated, evaluated, and in some cases implemented throughout the full food technology spectrum, from agriculture to food processing, packaging, and food supplements. They have distinct chemical, physical, and mechanical characteristics.

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