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# Effect of ZnO Nanoparticles on Wheat Plants

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**Abstract—***Nanotechnology has developed many outlooks of modern society through wide application in the fields of biotechnology, environmental remediation, agriculture, and medicine. It could open up novel applications in the field of biotechnology and agriculture. Research and development in this field is growing rapidly throughout the world. The accumulation of NPs of metals at high levels in the plant could not only impact their growth, but could pose a route for contamination of the food chain. The interaction mechanisms at the molecular level between nanoparticles and biological systems are largely unknown. With the progression of nanotechnology, the use of nanoparticles in consumer products have increased dramatically. Because of their broad scale use, these nanomaterials can be expected to be present in the environment, raising concerns about their effects on the lives of plants and animals. Different nanoparticles have been used by researchers for the growth and development of plants. The activity of nanoparticles is dependent on their structures. Effectiveness of NPs is dependent on its concentration which varies from plants to plant. Zinc oxide, a nanomaterial, has specific surface area, high pore volume, low toxicity and long life-span and thus is being used as promising material for cosmetics, antibacterial, chemical absorbents, polymer additives and catalysts. In this study, ZnO engineered nanoparticles (ZnO ENPs) were characterized using various techniques like XRD (X-ray diffraction), SEM (Scanning electron microscopy), DLS (Dynamic light scattering) and UV-VIS (UV Visible) Spectroscopy. Further the effect of ZnO nanoparticles grown in hydroponics media was tested on different parts of wheat plant.In hydroponic study Zn sources were applied at the rate of 0, 5, 25 and 50 mg Zn $L^{-1}$. Under hydroponic condition plant growth was retarded at 25 mg Zn $L^{-1}$ concentration in ZnO NP treatments. ZnO NP significantly increased the super oxide dismutase, guaiacol peroxidase, ascorbate peroxidase activity and lipid peroxidation (measured as Malondialdehyde) activity in wheat plants; however, catalase activity was significantly reduced as compared to control. Further these findings, could be applied to enhance the mechanistic approach of mechanism which is involved in the interaction of nanoparticles at molecular level.*

**Keywords***: Nanotechnology, Engineered nanoparticles (ENPs), Zinc oxide (ZnO), XRD, DLS, SEM, UV-VIS.*