PROFESSOR PANCHANAN MAHESHWARI MEMORIAL LECTURE

YOU ARE CORDIALLY INVITED

Monday, November 11, 2013
at 11:00 am
Seminar Hall
Department of Botany
University of Delhi

"Nanobiotechnology in Agriculture and Environment"

by

PROFESSOR S.L. KOTHARI
University of Rajasthan, Jaipur

PROGRAMME

INVOCATION	11:00 AM
WELCOME	11:05 AM
MEMORIAL LECTURE	11:15 AM
VOTE OF THANKS	12:05 PM
LUNCH	12:15 PM

Department of Botany, University of Delhi, Delhi – 110 007 Telephone 011-2766-7573

Nanobiotechnology came as a hybrid discipline, a combination of biotechnology and nanoscience. Nano size (1-100 nm) results into nanomaterial exhibiting significantly improved/different physical, chemical, and biological properties that were hitherto unknown in the bulk material. Nanotechnology on the other hand can also provide an unprecedented understanding of the materials and devices. It is likely to have more and more impact in many fields including the health care, agriculture, food and environment. For example, the worldwide market for products incorporating nanotechnology, which was $254 Billion in 2009, is likely to cross a $3 trillion mark by 2020. Three types of nanomaterials, natural, incidental and engineered are known of which engineered nanomaterial can be made by a variety of chemical and physical processes and also through the biological routes. Plant based green synthesis of nanoparticles has been achieved in the past few years and it is gaining support over the chemical and physical synthesis processes due to its simplicity and ecofriendly nature. Most of the reports on photosynthesis of nanoparticles used leaf or fruit extract, and mixing it with the metal salt solution, such as silver nitrate. The plant extract acts as a reducing agent and metal elements are formed which assemble together to form the nanoparticles of different size.

Application of nanomaterial can help faster seed germination and consequently faster growth and maturation of the plants, which can be of great agricultural significance. Nanoparticles can also be used to deliver genetic material into plants. Nanobiotechnology can provide a better controlled and site specific means to provide pesticides and fertilizers to the plants, thereby reducing the use of the latter and protection to the environment. Application of nanotechnology in agriculture is at its nascent stage but one thing is certain that nanomaterials are being used at a very large scale and plants will have to face them in the environment in which they grow. Therefore, the study of toxic effects of nanoparticles on plants is also important. Controlled use of nanoparticles at optimum levels has been shown to benefit the crop plants. This needs further in depth studies with metabolomic and systems biological approaches. Recently, it has been shown in tobacco that carbon nanotubes can induce growth enhancement by activation of genes related to water channels (aquaporins), cell division and cell extension. Used at a low concentrations, carbon nanotubes have been shown to positively influence plant growth and yield of biomass. Silver nanoparticles have been reported as antimicrobials in several reports.

The potential adverse effect of the nanomaterials on the ecosystem and human health has also been a major concern in the recent past due to the reason that now the nanomaterials are being left in the environment at much higher scale than ever before. Environmental, health and safety of nanomaterials (Nano EHS) is restricted by our little knowledge about the particles as environmental contaminants. The ecotoxicologists consider only the soluble forms of the materials to be bio-available, whereas insoluble forms are thought of as non bio-available and considered as non-toxic. Nanomaterials will behave differently from the soluble chemicals. Interdisciplinary collaboration will be crucial for understanding and developing every aspect of nanobiotechnology, from synthesis to applications and health hazards and environmental risk analysis. A new generation of environmentalists is needed who have technical knowledge in physics and material science plus biology, chemistry, medicine and engineering to study and predict the environmental and health-related issues arising out of exposures to nanomaterial. Nanomaterials have very large surface to volume ratio and are highly reactive and with the passage of time their stability and properties also change. All this requires a multidisciplinary team to investigate the toxicological effects of nanomaterials in the environment, food chain, water pollution and human health.

S.L. Kothari, Department of Botany, University of Rajasthan, Jaipur 302 004 (India)
slkothari28@gmail.com, Telephone: +91 141 2703439, Mobile: 0989179692