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Challenges and Future Prospects of Agri-nanotechnology for Sustainable Agriculture in India

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Abstract

Nanotechnology presenting an inventive frontier in present day agricultural practices is expected to turn into a key force in future by contributing innovative applications. This new approach using nano-principles in agriculture has immense possibilities in handling the world wide challenges of environmental security and sustainability, food production, food safety, food security and global threats of climate change. Nanotechnology is very expansively used in contemporary fields of agriculture, food processing, and food protection, packing industry, dairy industry, packaging, transportation and quality control of agricultural products. It has enormous prospective in making agriculture more proficient and resourceful by using nanoarticles to improve the precision in delivering the nutrients to the specific part at a specific time. Use of nano- based agro-chemicals, ceramic devices, filters; lamination methods have great potential of making agriculture more organized and efficient by transforming the conventional agro-practices. Indian government is also supporting this by making plans to extend support for expansion and commercial applications and acceptance of nanotechnology by encouraging private sector investments and empowering partnerships in public and private sectors. Though nanostructures have enormous benefits in agri-sector, still their relevance and significance had not moved up- to practical field environment. The concerns related to the availability, synthesis, level of toxicity, health hazards, transportation challenges and incongruity of regulatory structure restrict the broad recognition and acceptance of adopting nanotechnology in agriculture. The present paper is an attempt to analyze and propose inputs in addressing the present and future possibilities, perspectives, applications and challenges of incorporating nanotechnology in agricultural sector with a focus on Indian perspective.

Keywords: nanotechnology, agriculture, toxicity, sustainability, commercial

Introduction

Nanotechnology endorsing interdisciplinary relevance is accepted as the 6th most comprehensive technology in this current era. The development of nanoscience and nanotechnology has contributed and provided new and exciting frontier to almost every area of application with reflective influence on human life [1, 2]. The diverse applications of this technology are remarkable being acknowledged in all the fields like medicines, textiles, construction, energy, food, electronics, cosmetics, defense, and agriculture [3-5]. It is anticipated that the current pace of worldwide research and innovations in nanotechnology will make its market to reach up to 100 billion by the year 2020. (Research and Markets, 2015). At the same time it is also well recognized that nanotechnology has enormous probabilities in agricultural sector and can revolutionize it with the use of principles of nanotechnology. By the year 2050 world will have to deal with the testing task of feeding and nourishing **around 9.7 billion** people. The major concern in accomplishing this task is to find ways within boundaries of limited resources by

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