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Nanotechnology in Agriculture - Current and Future Situation

Fawzy ZF[1]*, Li Yunsheng[2], Shaymaa I Shedeed[3] and AM El-Bassiony[1]

[1]Vegetable Research Department, Agriculture and Biological Research Division, National Research Centre, Egypt

[2]Institute of Geographical Sciences and Natural Resources Research, Chinese Academy of Science, China

[3]Plant Nutrition Department, Agriculture and Biological Research Division National Research Centre, Egypt

Review Article

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***For Correspondence**

Zakaria Fouad Fawzy Hassan, Ph.D., Professor, Vegetable Research Department, Agriculture and Biological Research Division, National Research Centre, Egypt.

E-mail: zakaria6eg@gmail.com

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ABSTRACT

In the developing countries, agriculture sector is very important sector in the economy. Actually, in the development countries are a big problems look like food scarcity in agriculture mainly due to the negative impact of environmental factors. Indeed, by 2050, as the total population increases, there will be a great scarcity of food that needs to be resolved on a sustainable basis. Furthermore, some new technologies have been developed that show the potential increase in agricultural productivity, as well as reduce the environmental costs and resources related to agricultural production.

Nanotechnology has a great potential in agriculture sector and the food industry, by improving the quality of life through its applications. Moreover, to overcome and solve this problem, nanotechnology tools are used to enhance the ability of plants to absorb nutrients etc. In the near future, nanostructured catalysts will be prepared for use which will increase the efficiency of many kind of fertilizer use whether it is used to add soil or spray to crops and allowing lower doses to be used. Some potential applications of nanotechnology in agriculture will be reviewed in this manuscript, especially in the field of fertilizers.

INTRODUCTION

Applications of nanotechnology in agriculture

The main objective of nanotechnology in agriculture is to reduce the use of fertilizers and pesticides to protect plants and crops, to reduce nutrient losses in fertilization and to increase yields of plant crops through optimal nutrient management. Nanotechnology and nanoparticles are used, such as nanoparticles, and nutrient absorption from plants, and nanotechnology devices derived from plant breeding and genetic transformation. Using, a specific target can reduce damage to non-target plant tissues and the amount of chemicals released into the environment. Nanoparticles that are applied in agriculture are derivatives of biopolymers such as carbohydrates and proteins with low-impact presentations on human health and the environment.

Nanotechnology has been used to regulate the release of nutrients based on the needs of crops - which act as soluble fertilizers - and can also be said that nanotubes are more efficient than ordinary fertilizers.

Despite these potential advantages, innovative products in agricultural nanotechnology face difficulties in accessing agricultural markets.

Indeed, the use of pesticides and/or fertilizers to enhance production of food leads to an uncontrolled release of undesired substances into the environment issues. Nowadays, nanotechnology represents a promising approach to improve agricultural production and remediate contaminated water, soil as well as underground water. Many scientific researchers reported the recent applications of nanotechnologies in agro-environmental studies, with particular attention to the fate of nanomaterial's

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once introduced in water and soil. They found that the use of nanomaterial's improved the quality of the environment and helped detect and remediate polluted sites, moreover, just a small number of nanomaterial's demonstrated potential toxic effects [1]. Furthermore, the impact of iron nanoparticles on terrestrial plants revealed that orange–brown complexes/plaques, formed by root systems of all plant species from distinct families tested, were constituted of nanoparticles containing iron. Moreover, the formation of iron nanoparticles/Nano complexes was reported as an ideal homeostasis mechanism evolved by plants to modulate uptake of desired levels of ionic iron [2].

NANO FERTILIZERS

Nanomaterials are either NMs that can supply one or more nutrients to plants, resulting in increased growth and yield at the same time, or those that perform the best performance of conventional fertilizers, without directly feeding crops [3]. Some field studies have already demonstrated the importance of using modern advanced nanomaterials. Some beneficial effects include increased efficiency of nutrient use, better productivity of agricultural crops and reduced soil pollutant contamination with pollutants [4]. Indeed, the potential contribution of Nano fertilizers to improving the growth, development and productivity of agricultural crops is their ability to increase both absorption and high interactivity. Nanoparticles can enter plant cells directly through cell wall structures that resemble sieve if the particle sizes are smaller than the size of the cell wall pores (5-20 nm). However, no scientific research has refuted either that the additional absorption of Nano fertilizers occurs through solubility in the water/soil solution. In other words, nanomaterial's simply dissolve in solution and release nutrients (or ozone) as soluble ions. Plants absorb the soluble nutrient ions as randomly as they do from the traditional soluble fertilizers. However, the solubility rate and the extent of Nano satellites in the water/soil solution should be higher than those in bulk solids due to smaller particle sizes and higher surface surfaces in the past [3].

Slow-soluble Released fertilizers (SRF) - Nanomaterial's because of their unique nutrient release properties over an extended period of time. The slowly released fertilizers and the released fertilizers are released to gradually release their nutrients and conform to the nutrient requirements of the plant. These fertilizers can be prepared physically by coating traditional fertilizer granules with different materials that reduce their degradation rate [5,6]. Therefore, the efficiency of nutrient uptake is greater, and the loss of freshness is lower for CRF products compared to easily available fertilizer forms [7]. Release rates and solubility of soluble fertilizers in water depend on the coatings. This highlights the idea of developing trapped inside nanomaterial's [8]. Consequently, Fertilizers are therefore protected by nanomaterials for better survival in polluted soils, allowing them to be released into the soil [9].

Actually, the development of nanotechnology in conjunction with biotechnology has significantly expanded the application of nanotechnology in various fields. A variety of carbon-based dendrimers, minerals and base metals (Nano-sized polymers) and nano-biocomposites materials [10,11] are being developed.

Advantages of using nanotechnology in the agricultural sector

Nanotechnology is now used for agriculture in a large field of fertilizers, water and water treatment because agriculture is the most important economic efficiency factor of any country.

Why we use nanotechnology in agriculture

Because it gives a very large surface area such as for example, coal-oxide oxides, which gives a large surface area of 600 cubic meters, fertilizer and water treatment, because water contains many solid materials, microbes and microbes.

For example, dehydration of water requires very high energy, low efficiency, resulting in an undesirable odor, using too many substances and diseases resulting from the use of drinking water, whether Malaria or VRS C or Taifod.

Carbon nano tube

Used to remove bacteria and viruses from water, because conventional filters cannot completely remove all bacteria from water. In carbon nanoparticles they make filters that remove all bacteria and viruses from water.

The use of magnetic materials in the removal of pigments or viruses in water, and there have been published research used calcium and phosphorus and without any toxic effect on the plant or the environment or human and was used in the removal of heavy elements such as lead, arsenic and copper for up to 95 to 99%.

There is, for example, pigment produced from the remnants of factories in which pigments are used as factories of pollination and polluting water sources and have an effect on the human sedimentation is used for these particles and in the end, we get completely clean water.

Nano pesticides: In the use of pesticides cause's problems for the environment, human or soil, using nanotechnology we get the technology and revolution and modern and we do the protection of plants from weeds and diseases that reach the plant.

The use of nano steads: The permeability is very high and reduces the amount used and therefore the cost is very low.

Examples of nanostructures

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The material produced in nanostructures has been widely produced so that it uses less quantity and gives the same strength

Compared to normal glycerol in the control of pests, when using Nano-glycerin using a very small quantity given very high efficiency up to kill all pests within 6 hours only reversed the normal method, which consumes very large amounts and in a period of up to 24 hours.

This saves time and saves cost as well as permeability to kill all larvae in a much shorter time and each plant was given the required dose at a lower cost

Also use capric oxide in diseases affecting tomato, blister and plant paper and we use very little concentration and efficiency up to 95%.

Titanium dioxide: The use of aluminum and silicon materials in mold rotting in grapes, as well as solving problems of corn, brown spots and plant problems as a whole, using nanotechnology without plant, as well as the control of plant diseases fruitful using nanotechnology and all research published and applied.

The cost in nanotechnology is low and the quantity is very low at very low concentrations compared with the excessive use, thus reducing the diseases that affect human, environment or human.

In fertilizer we suffer from fertilizer use which leads to environmental pollution in the soil and plant and eventually reaches the human through very many diseases.

The advantage in nanoparticles is the large surface area, which reduces the size or concentration used and thus reduces the excessive use and does not cause problems for forests or humans after that, which are environmentally friendly materials.

People can also benefit from the nutrients they need or the nutrients that reach the cells that the plant needs at very low concentrations.

Nowadays, iron, zinc and magnesium are made. These are all concentrates needed by the plant, and the nano-sedica is added to it. It has the advantage of being resistant to drought, disease and insects and increases the utilization of phosphorus for the plant. However, it gives an increase in yield and vitality of the plant and without wrinkles of the paper.

It has been tried on mango and gives a very high yield and reduces the loss or fall of fruits and increases the buds in cotton. Nano magnesium, Manganese, Zinc, Potassium are all compounds in the form of nanostructures that the plant needs in a very small form compared to the available fertilizer.

NANO FOOD

Nano-food is used in packaging materials, which are anti-microbial substances, to ensure the safety of foodstuffs for the maximum possible time and to store light, moisture and sun from stored materials.

It also uses signs of food such as frozen poultry. It has a green mark to ensure its freshness. When it turns orange, it is also safe. However, when the mark is turned red, the preservatives are not safe due to color change using Nano-food.

Mango is also sprayed with a safe substance that increases the fruit preservation period for up to 45 days compared to regular fruits.

It was also used to store strawberries for up to 20 and 28 days without any molds using nano-kutuzan compared to normal kotosan.

Nanotechnology will improve the strength of chemical pesticides while reducing the cost of chemical treatment of crops, which will greatly improve the elimination of insects and pests that kill crops, as well as being safe to use, and also develop special Nano-tools to help improve the nutritional absorption of plants Leads to an increase in plant growth and improved production, as well as using nanotechnology can make Nano detectors have the ability to detect and display diseases that affect plants and clearly, which helps producers to monitor their crops in a more scientific and professional.

Agriculture and food production have developed significantly over the past 10 years. Food companies are seeking to apply modern technologies such as nanotechnology for better crop production. Scientists believe that the use of nanotechnology will help food companies produce food free from preservative damage and less. As well as the price of what it is today, and through the use of less chemicals in the preparation and production of food in the future.

Micro-nutrients are important in agricultural production in terms of quantity, quality and human health. There are more than 3 million people in the world suffering from micronutrient deficiencies, especially zinc and iron, and the enrichment by the addition of supplements or salts is not the optimal name for solving the problem, especially in poor countries. Which includes one of the methods of adding these nutrients as fertilizers? Nutrients are known to be natural bio fortification. The micro-specific plant growth is chiefly the quality of the product nutritionally despite the quantitative quantities that you need crops in relation to major nutrients. Despite the availability of various mineral and amphibious fertilizer sources (synthetic and natural Nutrients) and the availability of different additives (in addition to the soil and added to the spray of the leaves or both. The efficiency of using this

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fertilizer does not exceed 5% of the additive. Recently, there has been a tendency to adopt micro-feed fertilizers manufactured Nanoparticles, which hopefully will solve part of the problem but the subject is still in its infancy and requires further study. Of course, with unknown risks which can be combined with such fertilizer types? There is still no need to devices of Nano scale or even microwaves to accompany the study of nanoparticles so that fate can be studied and the behavior of compost added to the soil system - plants such as sensors can be implanted in small size sensors at the level of the microbial cells that can be used in Study of manganese deficiency and toxicity in soil with altered content Wet There are some of these micro machines in the field [12]. There are small cameras implanted in places certain roots are visualized and describe the movement of roots and nutrients [13] between the liberator and any fertilizer formula and specific plant requirements and growth stages that feed and soil fertility techniques fertilizers reach them for greater absorption efficiency and less environmental pollution. There is hope about nanotechnology and Nano biotechnology (nanotechnologies) of access to the ultimate goal, which is the most environmentally friendly fertilizers. There are some successes with urea and the field is open to many in other fertilizers it is hoped to increase the efficiency of use fertilize of 5% to fold this figure which improves from productivity, product quality and human health.

CONCLUSION

Nanotechnology has a great potential in agriculture sector and the food industry, by improving the quality of life through its applications. Moreover, to overcome and solve this problem, nanotechnology tools are used to enhance the ability of plants to absorb nutrients etc. In the near future, nanostructured catalysts will be prepared for use which will increase the efficiency of many kind of fertilizer use whether it is used to add soil or spray to crops and allowing lower doses to be used. The outcomes open an extensive variety of conceivable outcomes for utilizing Nanoparticles as a part of general plant exploration and agronomy. Nanotechnology enhances their execution and adequacy by expanding viability, security and in addition eventually lessening social insurance costs.

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