

# Nanotechnology and its application in agriculture

## Editorial

The part “Nano” is usually used with very small particles which size is  $10^{-9}$  meter, thus these particles have unique physicochemical properties.<sup>1</sup> Some of these properties are the large surface area, more reactivity, being more absorbed, etc.<sup>2</sup> The success of nanotechnology applications in many industries, medicines, electronics and others enhanced the interesting in agricultural applications.<sup>3</sup> Firstly, the fear from toxicity of nanoparticles delayed their agricultural applications. Although more than 800 nanotechnologies-based consumer products are currently available worldwide, only 10 percent of these are foods, beverages and food packaging products.<sup>4</sup> Many articles indicated toxicity effect of nanoparticles on plants.<sup>5</sup> But these reports explain it as dose-response relationship. It also depends on nanoparticles type and plant species.<sup>1</sup> However, many researches indicated that, not all uses of nanomaterials in food and agriculture will result in exposure, and not all exposure will result in risk.<sup>6</sup> Nowadays, many countries have identified the potential of nanotechnology in the food and agriculture sectors and are investing in its applications to food production. In this view, the FAO/WHO expert report, 2010, assured some important recommendations about nanotechnology application, risk assessment and stakeholder confidence.<sup>7</sup>

Some reports showed positive effects of nanoparticles on plants. These studies assessed the impact of silver, gold, zinc oxide, titanium dioxide, silicon dioxide nanoparticles, carbon nano tubes, etc. on plant growth and development as well as their mechanisms in plants. They found that nanotechnology can be a magical tool for enhancing growth and development in agriculture crops. Nanotechnology can also serve in plant fertilizers industry, bio-production of energy, cleaning of water, controlling of plant diseases and sterilization.<sup>3,8</sup> In plant fertilization, nano applications can minimize nutrient leaching and increase the crop yield by controlling the release of nutrients due to plant query.<sup>3,9</sup>

Studies are important for more learning about physiological, biochemical, and molecular mechanisms of plants due to exposure to nanoparticles. Also, researches are needed to detect the mode of action of nanoparticles, their interaction with biomolecules and their impact on the regulation of gene expressions in plants.<sup>1</sup>

Finally, it is very true that we need to increase knowledge about nanotechnology in agriculture and food industry; its magical benefits in plant growth and development and the relationships between physicochemical characteristics of nanomaterials and biological interactions, but also we need to be careful about the risk with handling nanoparticles application in this important field.

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## Conflict of interest

The author declares no conflict of interest.

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