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Perspective

Modern application of nanotechnology in food production and agriculture

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DESCRIPTION

The emergence of smart and active packaging, nanosensors, nanopesticides, and nanofertilizers, in particular, has accelerated the transformation of the traditional food and agricultural industries. For enhancing food quality and safety, crop development, and environmental monitoring, numerous new nanomaterials have been produced. The most current developments in nanotechnology are reviewed in this article, along with the most difficult problems and exciting prospects in the food and agricultural industries, as shown by a few recent researches. These novel foods and agricultural products contain nanomaterials, and the basic principles of toxicology and risk assessment are also covered. We emphasised how biosynthesized and bio-inspired nanomaterial could be used for sustainable development. To encourage the active development and implementation of nanotechnology, fundamental questions about high performance, low hazardous nanomaterials must be answered. Regulation and regulation are essential for controlling the production, processing, use, and disposal of nanomaterials. To increase public acceptability of the revolutionary nano-enabled food and agriculture products, further work needs to be done. We draw the conclusion that nanotechnology presents a wide range of potential by offering a fresh and sustainable alternative in the food and agricultural industries.

The widespread use of nanotechnology in daily life is revolutionising society. Since the US Department of Agriculture published the first roadmap on September 9, 2003, it has been marching into the agricultural and food industries. Over the last ten years, study on this subject has increased dramatically. Agriculture, irrigation/water filtration, food processing and packaging, animal feed, and aquiculture are just a few of the areas that it almost completely covers in the food and agriculture sector. The food and beverage industry is a multi-trillion dollar one worldwide. According to a recent projection, nanotechnology will have a $3 trillion global economic impact by 2020, which might result in the employment of 6 million people in the expanding nanotechnology industry around the world. This is incredibly alluring, which is what has motivated many food businesses to develop and commercialise revolutionary nanomaterial-based goods while also enhancing manufacturing effectiveness, food features, flavour, and safety. Amazingly, over the previous ten years, hundreds of items have been launched and used in the food industry.

Agricultural and food nanotechnology at this time

In the field of nanotechnology, materials with at least one dimension between 1 and 100 nm are called nanomaterials. Inorganic (metal and metal oxide NPs), organic (mostly natural product NPs), and mixed nanomaterials have all been tested in the food business (i.e. clay). Due to its antibacterial properties, silver NP is the one used most frequently in industry, while gold NP is extensively researched as a sensor/detector. The use of titanium dioxide nanoparticles as a food additive (white colour pigment), disinfectant, and flavour enhancer is also well researched. Natural Products (NPs) are typically used in the food business as ingredients or supplements as well as delivery systems while much is yet understood; different nanomaterials have demonstrated intriguing possibilities in all facets of the food business, from crops to plates. The next sections will include a quick

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discussion of recent progress using examples from the last five years.

Food packaging, additives, and food preservation are just a few of the consumer products that have been affected by food nanotechnology. The acceptance of this cutting-edge technology has improved food processing and storage practises that ensure food safety. Numerous traditional compounds used as packaging or food additives have also been discovered to partially exist at the nanoscale scale. For instance, food-grade TiO2 NPs may currently be discovered up to 40% of the way down the nanoscale scale. TiO2 NPs, for example, are typically known to be minimally hazardous when used in ambient circumstances, but prolonged exposure to them may result in negative side effects.