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Nanotechnology applications of agrochemicals toward sustainable agriculture

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Food and nutrition security is a pressing grand societal challenge in China, given that China feeds one-fifth of the total population with only 7% of arable land in the world. Finite land, water and other resources of the earth used for agricultural and food production and processing have already largely been exploited. The yield increase for the past decade was primarily due to the technologies, products and applications of agrochemicals, broadly including fertilizers, pesticides, herbicides and antimicrobials. Using nanotechnology and nanomaterials to create novel formulations of pesticides and fertilizers has shown great potential in enhancing efficacy, improving bioavailability and reducing environmental residual. Agrochemical nanoformulations may be developed by two pathways, directly processed into nanoparticles and using nanomaterials as carriers to formulate smart delivery systems. Nanoferlizers and nanopesticides have many advantages over their conventional equivalents such as high efficiency, environmental friendliness, high-targeting delivery and smart controlled release. In addition, the development of nanoformulation for pesticides focuses on enhancing efficacy and reducing spray drift, while fertilizers focuses on problems of bioavailability due to soil chelation, overuse and runoffs. Due to the technological advancement, extensive utilization of nanofertilizers and nanopesticides in crop production has already become more accessible. As a most promising and attractive field of nanotechnology application in agriculture, these novel agrochemical products will bring multiple benefits such as reduced use of chemicals and subsequently reduced water pollution and food product residual contamination, efficient use of agricultural resources, increased soil and environmental qualities.

Biography

Xiang Zhao has completed his PhD from Chinese Academy of Agricultural Sciences. He is a Young Researcher and his main research areas are agricultural chemicals precisely controlled-release technology, nano-biotechnology and the application of nanomaterials in agriculture.

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