Article title	Recent advances in nano-enabled fertilizers and pesticides: a critical review of mechanisms of action
Authors	Ishaq O. Adisa, Venkata L. Reddy Pullagurala, Jose R. Peralta-Videa, Christian O. Dimkpa, Wade H. Elmer,Jorge L. Gardea-Torresdey and Jason C. White
Abstract	The use of nanomaterials in agriculture as nanofertilizers, nanopesticides, or nano-enabled sensors to increase crop yield is gaining increasing interest. Engineered nanomaterials (ENMs) can improve crop productivity by influencing fertilizer nutrient availability in soil and uptake by plants. These materials can suppress crop diseases by directly acting on pathogens through a variety of mechanisms, including the generation of reactive oxygen species (ROS). ENMs may also suppress disease indirectly by improving crop nutrition and enhancing plant defense pathways. Efficient use of ENMs may complement or replace conventional fertilizers and pesticides, subsequently reducing the environmental impact of agricultural practices. This review evaluates the current literature on ENMs used as pesticides and fertilizers, and highlights critical knowledge gaps that must be addressed to ensure sustainable application of nanotechnology in agriculture so as to achieve global food security.
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