

Nano-pesticides: Solution or threat for a cleaner and greener agriculture?

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Research is urgently needed to evaluate the risks and benefits of nano-pesticides to human and environmental health. Melanie Kah and Thilo Hofmann from the Department of Environmental Geosciences of the University of Vienna recently performed an extensive analysis of this emerging field of research. The results were published June 6th in the internationally recognized journal *Critical Reviews in Environmental Science and Technology*. The study presents the current scientific state of art on nano-pesticides and identifies direction priorities for future research.

Nanotechnology has developed tremendously in the past decade and was able to create many new materials with a vast range of potential applications. Some of those [innovative materials](#) are promising to reduce [environmental pollution](#). For instance, carbon nanotubes and metal nano-particles are great candidate materials for cleaning [polluted water](#) and soils.

However, the risk that nano-particles may pose to human and environment health is not yet fully understood. The precautionary principle therefore suggests keeping environmental release of nano-particles minimal until their fate and toxicity is better understood. "A good understanding of nano-materials is essential to evaluate whether the benefits overcome potential new risks", explains Thilo Hofmann, dean elected at the Faculty of Geosciences, Geography and Astronomy of the University of Vienna.

Among numerous proposed applications, nanotechnology has the potential to revolutionize [agricultural practices](#) and food systems. Research has been extremely active over the past few years to develop new pesticides products based on nanotechnology. "Nano-pesticide research is emerging at high speed at the agrochemical labs, however, this topic has not reached public awareness or state authorities so far, nor are any products available at the market. Since those nano-pesticides have new or enhanced properties, this will change in near future and will inevitably result in both new risks and new benefits to human and environmental health", states Thilo Hofmann.

Nano-pesticides encompass a great variety of products, some of which are already on the market. The application of nano-pesticides would be the only intentional diffuse input of large quantities of engineered nanoparticles into the environment. Innovation always results in both drawbacks and benefits for human and [environmental health](#). Nano-pesticides may reduce environmental contamination through the reduction in pesticide application rates and reduced losses. However, nano-pesticides may also create new kinds of contamination of soils and waterways due to enhanced transport, longer persistence and higher toxicity.

The current level of knowledge does not allow a fair assessment of the advantages and disadvantages that will result from the use of nano-pesticides. As a prerequisite for such assessment, a better understanding of the fate and effect of nano-pesticides after their application is required. The suitability of current regulations should also be analyzed so that refinements can be implemented if needed. Research on nano-pesticides is therefore a priority for preserving the quality of both the food chain and the environment.

More information: Nano-pesticides: state of knowledge, environmental fate and exposure modeling: Melanie Kah, Sabine Beulke,

Karen Tiede and Thilo Hofmann. *Critical Reviews of Environmental Science and Technology* (2012) [www.tandfonline.com/doi/abs/10 ... 10643389.2012.671750](http://www.tandfonline.com/doi/abs/10.10643389.2012.671750)

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