**Application of nanotechnology in agriculture: the case of nanopesticides**

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Nanoformulations are already used in the pharmaceutical and food industries. In comparison, applications in the agrochemical sector are only emerging and a rapid growth is predicted in the upcoming years. Deliberate application of nanoparticles as within agricultural practises could be one of the rare intentional diffuse inputs of engineered nanoparticles into the environment and thus requires urgent attention.

A variety of sources were extensively searched, and relevant information published over the last decade was combined from published literature, company websites, patent databases, reports from governmental and non-governmental institutions (Kah et al. 2013). The objectives were (i) to explore potential applications of nanotechnology within the pesticide formulation sector, (ii) to identify possible impacts on environmental fate, and (iii) to analyse the suitability of current exposure assessment procedures.

Shifts in the latest research trends provide a useful basis for identifying research gaps and future priorities (Kah & Hofmann 2014). The term “nanopesticide” represents a great variety of products. Polymer-based nanoformulations seem to have the greatest potential for further development and practical application, judging by the number of related publications, and their possible greater efficacy compared to commercial formulations. Polymer-based nanoformulations allow a wide range of objectives to be achieved, and also combined (e.g., slow release, protection against degradation, and low solubility of the AI), which makes them suitable for a large number of different applications.

Investigations into the environmental fate of nanopesticides remain scarce and the current state of knowledge does not appear to be sufficient for a reliable assessment to be made of the benefits and risks associated with nanopesticides. With the aim to address this knowledge gap, experimental work was carried out on a series of polymer-based nanopesticides. The application of regulatory protocols to determine sorption and degradation in two agricultural soils (OECD guidelines) confirmed that a nanoformulation can affect the fate of an active ingredient (Kah et al. 2014). Conclusions about exposure assessment outcomes should be made cautiously as currently used protocols were designed for solutes, and may not adequately described the “nano” behaviour of active ingredients associated with nano-carriers. Experimental results serve as a useful basis to discuss the (in)adequacy of current approaches, and make recommendations for a more robust regulatory evaluation of environmental risks (Kookana et al. 2014).

Kah et al. (2013) Crit. Rev. Env. Sci. Tec. 43: 1823-1867

Kah & Hofmann (2014) Environ. Int. 63: 224-235

Kah et al. (2014) Environ. Sci. Pollut. Res. 21, 11699-11707

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