

Contaminants in manure – a problem for organic farming?

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Abstract

Animal manure used in organic agriculture might be contaminated by undesirable elements such as heavy metals, veterinary medicines or pesticides. Contamination might occur by using conventional fodder or manure, from on farm usage of veterinary medicines, from drinking water or animal fixtures. In turn these contaminants can be transferred to the food chain, thus posing a risk to the health of soil organisms, animals, plants and humans. Research has shown that undesirable elements, e.g residues of veterinary medicines, can be taken up by plants. There is, however a lack of knowledge concerning the fate of many undesirable compounds. More research is needed related to these compounds' dissipation rate and particularly their potential for transfer to plants. This is necessary in order to secure safe management of manure on organic farms and also to enable decision makers in framing satisfactory standards for use of manure in conventional and organic farming.

Introduction

Within certain restrictions, conventional animal manure can be used in organic farming when the farm's own resources do not cover the demand for plant nutrients.

Research has shown that the pathways of organic compounds such as veterinary medicines and pesticides may be unpredictable and that undesirable elements can be transferred to the food chain. The purpose of this investigation was to gain more knowledge concerning potential contaminants in manure and how they might influence the quality of organic produce. The work was carried out through a literature review and through contact with researchers, governmental authorities, organic certifying organizations and organic farmer organisations, mainly in the Nordic countries but also in other European countries.

A Nordic workshop for researchers, control bodies, advisers and government administration was arranged to exchange knowledge and to discuss the need for future research.

Findings

A survey (Holten 2012) among Norwegian certified organic farmers showed that different types of conventional manure are used for both fodder and food production. Many farmers wish to continue using manure from conventional farming.

The literature review (Serikstad et al. 2012), which came forward as a request from The Norwegian Food Safety Authority (NFSA) and The Advisory Committee for Organic Farming Regulations, describes both sources of possible contaminants, status on research and need for further investigations.

The sources of heavy metals in manure are mainly the fodder but also drinking water, bedding and the fixtures where the farm animals are kept. Manure from pigs and poultry can contain amounts of copper (Cu) and zinc (Zn) at levels that reduce the quality and affect its usage according to Norwegian regulations for organic fertilisers. This might apply to manure from other animals and other heavy metals as well.

Residues of veterinary medicine can be found in animal manure (Jacobsen and Halling-Sørensen 2006, Martínez-Carballo et al. 2007). These residues can be taken up by plants and localised in different parts depending on the plant species and the type of medicine (Boxall et al. 2006, Eggen et al. 2011). Special attention should be given to veterinary medicine used as prophylactic treatments for the whole herd.

Residues of certain herbicides in manure and compost have been found to give crop failure or deformation. Particular consideration should be given to persistent pesticides. Pesticide residues can reduce the quality of commercial manure and compost and cause problems for the companies who sell these products. The decomposition time of organic compounds in the environment, including potential residues of medicines or pesticides, will be prolonged in the cold, Nordic climate compared to a warmer climate.

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Conventional manure is used in organic farming in Norway. The manure can come from parallel production on the farm, conventional farms or as commercial fertilisers. Usage is restricted based on the amount of nitrogen. As yet there are no special restrictions regarding levels of contaminants in animal manure from one's own or imported conventional manure. Commercial fertilisers based on conventional animal manure are regulated through the general governmental regulation for fertilisers. This only specifies levels for heavy metals. For other potential contaminants such as veterinary medicines or pesticides, the regulation only requests precaution so products won't contain such substances at levels that might pose a threat to health or the environment.

Discussion

The basic principles of organic farming, in this case especially related to the principles of health, ecology and care, imply that special attention should be given to precaution and responsibility. These are key concerns in the management of organic farming. Taking these principles seriously would mean a more restrictive practice on the use of animal manure from conventional farming. A more restrictive use of manure could, however, lead to nutrient deficiency in organic management. On the other hand, it is important for both the environment and the reputation of organic food products that this source of nutrients doesn't contain any toxic contaminants. Through identifying which compounds might be present, their environmental properties and their residue levels in manure and environment, the authorities will be able to establish restricted practice based on knowledge.

Conclusion

Both the literature review and contact with relevant research and advisory institutions in Europe shows that there is a need to investigate the topic further. There is a lack of documentation on residue levels of veterinary medicine and pesticides in animal manure. Furthermore, when the risk compounds are detected, there is a need for knowledge related to these compounds' dissipation rate, and particularly their potential for transfer to plants. Since there are no analytical methods established for many of the relevant compounds in environmental matrixes, establishing this and performing a screening of potential risk compounds in different manures after medicinal treatment should be the very first step. Those who make standards for use of manure in conventional and organic farming need more knowledge to make better decisions.

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