

ORGANO-MINERAL FERTILISER FOR SUSTAINABLE SLUDGE RECYCLING

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ABSTRACT

This paper reports on the progress of a programme to develop a range of new Organo-Mineral Fertilisers (OMF) based on sewage sludge for more sustainable agricultural recycling. The preliminary results seem to indicate that the formulated OMF are suitable for application on both grassland and wheat. Therefore, they could prove to be a low-cost fertiliser with improved physical characteristics and whose storage and handling could be enhanced by means of using large fertiliser bags. The production of OMF appears to be a sustainable solution for the recycling of sewage-sludge to agriculture and would help to secure this route for disposal while protecting the water industry's business.

KEY WORDS

Organo mineral fertilizer, OMF, Agricultural recycling

BACKGROUND

Recycling sewage sludge into agriculture is regarded as the 'best practicable environmental option' by the UK Government. In practice, however, it presents a number of difficulties that would need to be overcome to increase current levels of up-take. Among these are logistics problems; e.g. spreading, storage, transport, and handling and the main concern regarding its use in agriculture is with respect to its fertiliser value. Although the benefits of applying biosolids to agricultural land are widely recognised, application rates based on N requirement by the crop may lead to build-up of soil-P. In addition, the amount of N available after application has not been clearly determined and the nutrient release characteristics are generally largely un-quantified. The combination of these factors determines a highly variable agronomic performance and could prove to be risky to the environment [Axisa, 2007]; e.g. nitrate leaching, NPK imbalance, unpredictable performance.

The present paper reports on the progress of a programme to develop a range of new Organo-Mineral Fertilisers (OMF) based on sewage sludge for more sustainable agricultural recycling. The programme comprises a project under the Knowledge Transfer Partnership between United Utilities and Cranfield University together with a DEng project, also sponsored by United Utilities.

DEVELOPMENT PROGRAMME

Organo-mineral fertiliser (OMF) is essentially a nutrient balance sludge-based product in a pellet form. Such a product is intended to produce a better nutrient release characteristics which may be bagged to improve supply and application logistics.

The development of Organo-mineral fertiliser (OMF) products made from nutrient enriched biosolids would significantly contribute to address the problems highlighted above. A novel method of blending mineral fertilisers with biosolids to produce OMF has recently been developed by United Utilities plc. This method allows the concentration of nutrients in the OMF to be adjusted to meet specific needs while ensuring a safe product ($\geq 99.9999\%$ pathogens destruction). Two OMF formulations are being produced for experimental purposes in granules of 2-4 mm in diameter with up to 85% dry matter content. A series of interconnected experiments has been set-up to identify the effects of the use of OMF in

arable crops and grassland and to quantify the potential environmental risk in various soil types. These include the use of plots, pots, lysimeters, and incubators.

PROGRESS SO FAR

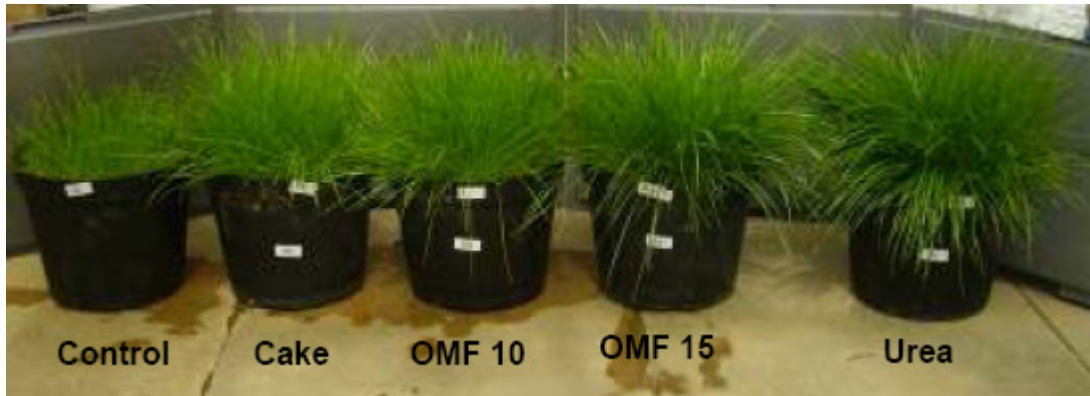


Figure 1: Growing grass in the pot trials

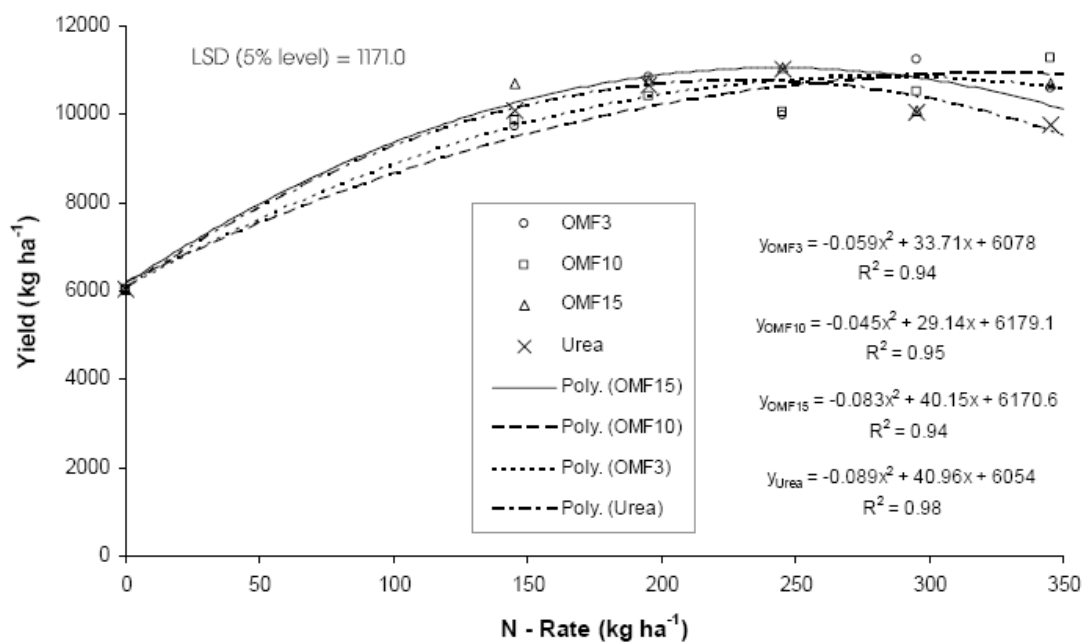


Figure 2: Wheat yield performance in the plot trials

The results of the various trials to date may be summarised as follows:

Pot trial:

- OMF produced similar responses due to similar composition
- Differences in fertiliser type were mainly due to urea at R2
- N in plant material, urea > OMF > cake
- P in plant material needs further analysis

Plot trial:

- Differences only between control and treated
- Significant effect of initial application
- Incubation experiment
- Urea > OMF
- Need to assess evolution in the long term

These preliminary results seem to indicate that the formulated OMF are suitable for application on both grassland and wheat. Therefore, they could prove to be a low-cost fertiliser with improved physical characteristics and whose storage and handling could be enhanced by means of using large fertiliser bags. The production of OMF appears to be a sustainable solution for the recycling of sewage-sludge to agriculture and would help to secure this route for disposal while protecting the water industry's business.

CONCLUSIONS

It has been shown that sludge cake could be converted to a nutrient balance sludge-based product in a pellet form. Two OMF formulations have been produced for experimental purposes. The granules were 2-4 mm in diameter with up to 85% dry matter content.

The experimental OMF product has been used in a series of interconnected experiments for arable crops and grassland trials. The preliminary results seem to indicate that the formulated OMF are suitable for application on both grassland and wheat. Therefore, they could prove to be a low-cost fertiliser with improved physical characteristics and whose storage and handling could be enhanced by means of using large fertiliser bags.

The production of OMF appears to be a sustainable solution for the recycling of sewage-sludge to agriculture and would help to secure this route for disposal while protecting the water industry's business.

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Axisa, J. (2007) The Feasibility of Using Nutrient Enriched Sewage Sludge with Soil-Forming Materials as Growing Media to Establish Herbaceous Vegetation. MSc Thesis, School of Applied Science, Cranfield University.