Pesticide recidues in recycled fertiliser products – Development of plant biotests to assess product safety

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Background

Increased use and development of recycled fertiliser products promotes circular bioeconomy and sustainable food production by reducing dependence from mineral fertilizers and ensuring security of maintenance. However, organic fertiliser raw materials may contain pesticide residues such as pyralides or glyphosate.

Pyralides, such as clopyralid and aminopyralid, can cause a decrease in plant growth even at very low concentrations, although there are differences in the sensitivity between plant species. Glyphosate has been shown to accumulate in manure when added to feed. When manure is spread on the field, plant growth is weakened.

Fig 1. Pot growth test showing physiological response of tomato to clopyralid 50 µg/kg (middle) and glyphosate 40 mg/kg (right) after 14 d incubation. Left: control without pesticide addition.

Fig 2. Pot growth test showing physiological response of lentil to clopyralid 50 µg/kg (middle) and glyphosate 40 mg/kg (right) after 14 d incubation. Left: control without pesticide addition.

Effective tools, both for manufacturers and regulatory authorities, are needed to determine pesticide residue effects on plant growth and to ensure the safe use of recycled fertiliser products. Therefore, the specific aim of this study was to develop sensitive plant biotests suitable for safety assessment of recycled fertiliser products.

Methods and Preliminary results

The effects of clopyralid (50 µg/kg) and glyphosate (40 mg/kg), were tested on 13 different plant species using standardized methodology and controlled conditions. Peat-based growing medium was spiked with pesticides and plant response, using three replicates, was assessed by germination and shoot growth inhibition after 5 and 14 days of incubation (Fig. 1-2).

First results indicated sensitivity of lentil (*Lens culinaris,* 'Anicia'*)* and tomato *(Solanum lycopersicum, '*Matina'*)* to the pesticides used. However, differences between plant species and pesticide type were detected (Fig. 3).

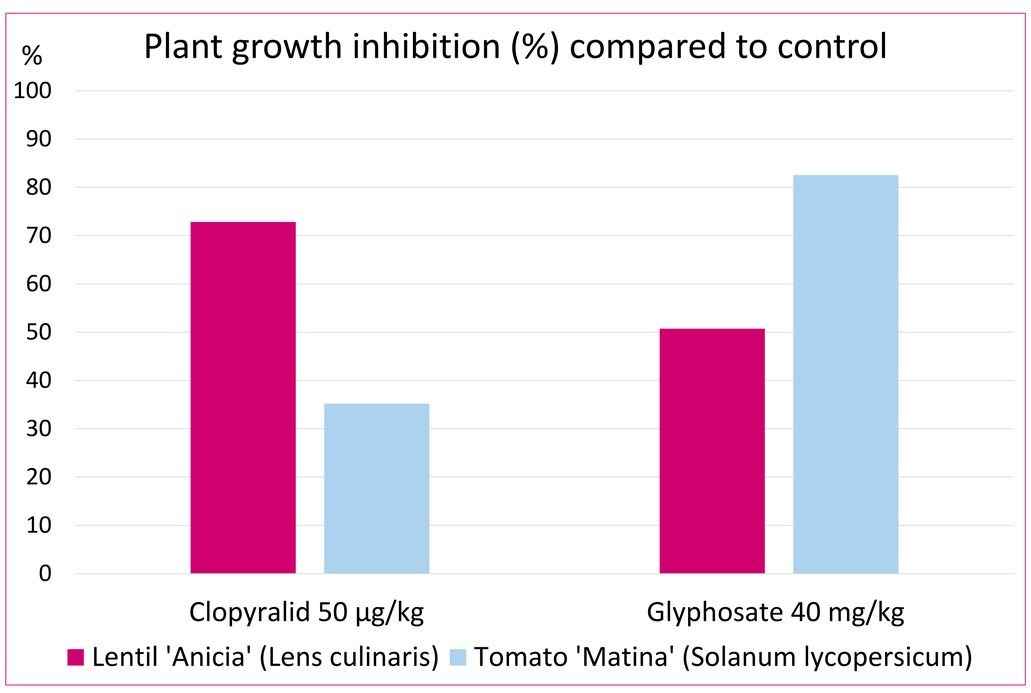

Fig. 3. Plant response to clopyralid and glyphosate shown as effect on plant growth.

Further studies, including testing with different types of recycled fertilizer products spiked with known concentrations of pesticides, are needed to verify the most promising plant biotests. Results will be published in 2025.

This study is part of "Towards a sustainable circular economy: Residue of plant protection agents in recycled fertilizers and growing media, and their management (Kiertokas)", a project funded by the Ministry of Agriculture and Forestry of Finland from the Development Fund for Agriculture and Forestry (Makera).