Co-Incorporation of Vegetable Crop Residues with Immobilizing materials for Reducing Nitrate Leaching Losses

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INTRODUCTION
Crop residues of field vegetables are often characterized by large amounts of biomass with a high N content. Even when these residues are incorporated in autumn, high rates of N mineralization and nitrification still occur causing important N losses through leaching. Crop residues thus pose a possible threat to meeting water quality objectives, but at the same time they are a vital link in closing the nutrient and organic matter cycle of soils. Different management strategies to reduce N losses from crop residues are evaluated.

PROJECT SET-UP
Evaluation of two fundamentally different management strategies

On-field treatment
• Long term field experiments (18 months)
  - Inclusion of non-vegetable crops or catch crops in vegetable crop rotations
  - Simulation of long term N dynamics using EU_rotate_N

• Short term field experiments (2 – 6 months)
  - comparison between:
    (i) conventional crop residue incorporation
    (ii) leave crop residues untouched on field
    (iii) total removal of crop residues
    • Undersow of catch crops
    • Application of immobilizing materials
    • In situ stabilization

Removal and valorization
• Mechanization of crop residue removal
• Ensilage
• Composting
• Co-digestion

Two field experiments evaluating the potential of immobilizing materials were set up and will here be discussed in more detail.

MATERIALS AND METHODS
• Cauliflower crop residues (Brassica oleracea var. botrytis)
• Incorporation mid November
• Immobilizing materials:
  - immature green waste compost (50 t ha⁻¹)
  - cereal straw (12 t ha⁻¹)
  - corn straw residue (12 t ha⁻¹)

Field experiment 1
1. Refinement of crop residues
2. Application immobilizing materials
3. Incorporation

Field experiment 2
1. Application immobilizing materials
2. Incorporation

RESULTS
Field experiment 1 (Fig. 1)
• Cereal straw appears to immobilize N
• Limited effect of corn straw residue
• No effect of immature green waste compost

Field experiment 2 (Fig. 2)
• No effect observed for all co-incorporated materials

CONCLUSION AND PERSPECTIVES
Sufficient and homogeneous mixing of crop residues and immobilizing materials appears to influence immobilization efficiency of the materials. The best potential to immobilize N was achieved with cereal straw. Results of the management options will be presented at the Nutrihort conference (16-18 September 2013, Gent).

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