Tropentag, October 11-13, 2006, Bonn

"Prosperity and Poverty in a Globalised World—
Challenges for Agricultural Research"

Impact of Residue Decomposition and Nutrient Release on Soil Enzyme Activity and Nutrient Turnover in Soils in the Humid Tropical Lowlands of Cameroon

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Abstract

We studied the impact of leaf residue decomposition and nutrient release of two weed / fallow species - *Imperata cylindrica* and *Chromolaena odorata* — and one pioneer tree — *Phyllanthus discoideus* - on enzyme activity and nutrient turnover in soils in the humid tropical lowlands of southern Cameroon in a pot experiment. We tested **(i)** the impact of litter types on decomposition rate, nutrient release and enzyme activities in soil, and **(ii)** whether soils from different vegetation and land uses differed in their ability to support decomposition under controlled conditions. We measured mass loss, nutrient release of N and P from decomposing residues, and soil enzymes of the C cycle (ß-glucosidase), N cycle (protease) and P cycle (acid and alkaline phosphatase) over 120 days.

Faster decomposition of *Phyllanthus* and *Chromolaena* residues and greater release of nutrients of N and P from decomposing leaves compared to *imperata* residues concurred with differences in residue quality. After 120 days, *Chromolaena* and *Phyllanthus* residue had released nearly three times as much of its initial pools of N and P than had *Imperata* residue. However, rapid recycling of N and P from *Imperata* residues in the early stages of decomposition increases the risk of nutrients being lost from the topsoil without contributing to SOM build-up in the long-term.

Most of the variation in ß-glucosidase activity was associated with differences among residue types. Decomposition and mass loss from the plant residue triggered C mineralisation in soils and were matched by equivalent increases in ß-glucosidase activity. By contrast, litter type had no impact on activities of alkaline phosphatase and protease. The role of N and P supply in regulating activity of enzymes that mineralise N and P differed for both nutrients. Protease was more responsive to variations in N supply than were P mineralising enzymes to P supply. Increases in residue nutrient fluxes of P associated with residue decomposition were not related to acid and alkaline phosphatase activity but was positively related to protease activity.

Keywords: Resiude decomposition, soil enzyme activity, weed infestation

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