Differential effects of soil properties on leaf nitrogen release

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Abstract Identifying the determinants of the N dynamics of plant prunings or litter is important for the efficient management of agroecosystems in order to improve their productivity. The plant materials in these ecosystems are managed as soil surface mulches or are incorporated into the soil. Numerous studies have been conducted to investigate which plant chemical parameter best governs N release. In these studies, different plant materials have been incorporated into a soil with a set of known characteristics. The objective of the present study was to examine the effects of different soil properties on N release from plant leaves, when they were incorporated into soils under non-leaching conditions. A laboratory incubation experiment (for 8 weeks) was carried out with dried and ground leaves of six leguminous plants and wild sunflower, which were mixed with three soils (alfisol; ultisol, udult; ultisol, humult). Leaf cellulose was the major chemical parameter that determined leaf N release in the alfisol and ultisol, udult. In the ultisol, humult, the C/N ratio and hemicellulose concentration were better related to N release. Cellulose was not a good indicator of N release in the ultisol, humult, possibly due to a low soil pH which did not favour the activity of the cellulose-degrading enzymes of microbes active in decomposition. Soil pH determined the specific C source that was used to generate energy for microbial action and N mineralization/in immobilization. It also had an effect on the nitrification of the mineralized N. The levels of labile soil C fractions governed the mode or nature of N release (i.e. mineralization or immobilization). The levels of labile leaf C fractions incorporated into the soils governed the extent of N release. The soil N concentration in the decomposable organic matter pool, as compared to the leaf N concentration, determined whether leaf N limited its own release. It is recommended from this study that, in grouping different leaf materials as sources of N, the properties of soils into which they are incorporated should also be considered, in addition to leaf quality in terms of its chemical composition. In future studies, the relationships identified under laboratory conditions in this experiment should be verified under field conditions.

Key words Leaves • Decomposition • Nitrogen release • Soil properties

Introduction

Identifying the determinants of the N dynamics of plant prunings or litter is important for the efficient management of tropical agroecosystems in order to improve their productivity. Crop residues play a major role in supplying N and maintaining soil organic matter (SOM) in conventional agroecosystems. In agroforestry systems like alley cropping the prunings of N₂-fixing leguminous trees release N which is taken up by food crops (Kang et al. 1985). In alley cropping, under ideal conditions, nutrients contained in the prunings should be released at rates which are synchronised with the nutrient demand rate of the food crop. The plant materials in these systems are managed as soil surface mulches or are incorporated into the soil. The surface mulches are also subsequently incorporated into the soil after fragmentation due to catabolism and comminution by soil organisms.

Plant chemical parameters which determine N release are apparently ecosystem-specific, because, as was revealed recently, the degree of control of the chemical parameters on N release depends on the moisture level of the leaf-litter layer (Seneviratne et al. 1998), which
The Feasibility of Developing the Victoria Reservoir into a Sustainable Fishery

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ABSTRACT: The capture fishery at the Victoria reservoir, which was a subsidiary enterprise under state patronage was under the control of the Ministry of Fisheries, since the reservoir was commissioned in 1984. The present situation is characterised by financial constraints and absence of organized management, with no in-depth knowledge about the eco-system itself. The main cause for this is the change in Government policy, which took effect from July 1990. The present on-going studies have monitored the temporal changes in the mean monthly catch, and the breeding success of the exotics. Results obtained during this study reveal that in addition to hydro-power there is the potentiality of developing the Victoria reservoir into a sustainable enterprise. It is apparent that the absence of appropriate knowledge on fish populations, by exploiters could jeopardise the fish yield of this reservoir.

INTRODUCTION.

The short history of reservoir fisheries in Sri Lanka has shown that the main goal has been to enhance fish production in large perennial irrigation tanks and reservoirs. This has been achieved by the introduction of exotic species. In fact, the reservoir fishery became successful only after introduction of the cichlid *Oreochromis mossambicus* from Singapore in 1952, which has established itself in all our inland water bodies, and has now become the mainstay of Sri Lanka's inland fishery.

Victoria, one of the newly built highland reservoirs, is the largest hydro-power reservoir in the country. Since its impoundment, the Government of Sri Lanka stocked this reservoir with African cichlids and Indian and Chinese carps, with the object of establishing a fishery as a source of protein supply to the rural communities in the area.