Carlos Arellano

Production and Biodegradability of Dissolved Organic Carbon from Different Litter Sources

Dissolved organic carbon (DOC) plays an important role in ecosystems because of its mobility and because it is the most available fraction of organic matter for microorganisms in soil, being particularly active in microbial degradation processes through soil profile. The ability of moving through soil, that DOC has, makes it an essential part of the organic loading to the streams, forming a bridge between the carbon of terrestrial and aquatic systems. However, relatively little is known about the production and fate of DOC from its main source, which is plant organic matter. The correlation between the type of litter and the characteristics of the DOC produced from it represent the knowledge gap that this study aimed to fill.

Litter from six plant species was used to extract DOC over different extraction periods from one up to forty eight hours. Also, a degradation study on the DOC extracts was performed and the resulting degradation curves were analyzed in relation to the extraction time, percentage of aromaticity and to the nitrogen composition of the litter. The results showed that only in some of the species surveyed the DOC leaching from the wood litter is lower than the one from the leaf litter. Moreover, the DOC aromaticity did not increase over extraction time as was expected, but instead it tended to decrease. The degradation experiment showed an increase in lability until the 16 hours extraction, which was different to the expected pattern of decreasing lability as extraction time increased. Significant differences in DOC leaching rate and lability were also found between evergreen plant litter and summer green plant litter. The differences in production and degradability of the DOC are thus related to a wide range of factors, other than the chemical composition of the litter. Other factors such as physiological variations among species and plant structures appear to play a significant role in the DOC production. The results show that assumptions made in models about DOC production depending only on chemical structure of litter can possibly be improved by including physiological differences among species and morphological structures.

Keywords: Physical Geography and Ecosystem analysis, Dissolved Organic Carbon, Biogeochemical cycles, Carbon Cycle, Soil Biogeochemistry

Advisor: **Martin Berggren**
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