Litter decomposition in rivers. A travel between terrestrial and aquatic systems

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In rivers, the adjacent terrestrial systems (floodplains or riparian zones) have a great influence on stream biogeochemical processes, such as litter decomposition. Rivers are subject to expansions and contraction phases of the stream channel which cause the interaction of terrestrial and aquatic systems and important effects on stream functioning [1, 2]. In floodplains or riparian zones, coarse organic matter, such as leaf or wood litter can be remained for a long time before reaching the stream channel. During this period, organic matter is exposed to biotic and abiotic factors that alter its chemical quality which affect its decomposition by aquatic organisms when this organic matter reach the stream channels.

In this sense we have carried out an experiment to simulate and analyze the effects of leaf litter exposure in floodplains on its subsequent aquatic decomposition. To approach this question we have developed an experiment with two phases, an initial terrestrial phase and a final aquatic phase. In the early terrestrial phase, we deployed Phragmites australis litterpacks in two different floodplain habitats (open and close canopy) in three geographic locations, Murcia (SE of Spain), Gerona (NE of Spain) and Berlin (Germany) for three and half months. After the end of floodplain exposure period we immersed all the litterpacks in the same stream in Murcia in order to analyse the effect of floodplain exposure in the two habitats, on aquatic litter decomposition and leaching. To do this we compared these results with those obtained from leaf litter without any previous exposure, immersed in the same stream, the Alharabe stream in Murcia.

This picture shows the three different habitats where the Phragmites australis leaf litter had been exposed during the terrestrial and the aquatic phases. A) leaf litter pack under in close canopy habitat in Tordera stream in Girona; B) leaf litter pack in an open canopy.
habitat in Parra stream in Murcia; C) leaf litter packs immersed in Alharabe stream in Murcia.

The floodplain exposure period caused important changes in leaf litter quality and organic matter mass loss through the terrestrial fungi activity and the loss of soluble compounds related to rains. Both, the changes in chemical quality and the presence of fungi in the exposed leaf litter caused a great influence on its aquatic decomposition.

This work shows how the exposure of litter in terrestrial environments can affect its subsequent aquatic decomposition by limiting the availability of nutritive resources in litter. Thus, changing the allochthonous litter role into heterotrophic trophic webs in streams.

References