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NITROGEN IMMOBILIZATION IN PADDY SOILS AS AFFECTED BY REDOX CONDITIONS AND RICE STRAW INCORPORATION

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N immobilization may represent one of the most critical aspects affecting long-term soil fertility and fertilizer efficiency. Redox processes play an important role in N availability and cycling in rice agro-ecosystems. Detailed information on the driving processes and factors controlling N immobilization in paddy soils is however, highly necessitated. This work aims at providing knowledge on the changes in fertilizer-N immobilization as a function of soil redox conditions and rice straw incorporation. A paddy soil collected from an ongoing long-term crop residue management trial (Vercelli, NW Italy) was treated with enriched ammonium-15N and incubated for five months under flooded or non-flooded conditions, with or without the addition of rice straw. Distribution of immobilized N among SOM fractions was assessed by combining aggregate-size and density fractionation, while microbial utilization of applied N was evaluated by compound-specific d15N analysis of amino sugars, important constituents of microbial cell walls. Fast immobilization of applied N (c. 37% applied N) was observed in both anoxic and oxic soils, however in the latter most of this N was released during incubation. The finer soil fractions in both macro- and microaggregates served as the greatest sink of immobilized N, sequestering 60-85% of the total immobilized N. Straw addition enhanced immobilization, particularly under anoxic conditions, with 12% of total immobilized N associated with the light fraction. The increasing incorporation of 15N into amino sugars also suggested that incorporation of straw to paddy soils may lead to the effective microbial-mediated immobilization and stabilization of significant portions of N inputs.