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Rehabilitation of microbial patrimony with Miscanthus x giganteus crops on polluted soils

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The discharge of urban waste water on farm land has led to a widespread introduction of pollutants into our environment, locally causing acute and diffuse contamination of soils. As a consequence, contaminated soils are unsuitable for crop production and need rehabilitation. One strategy is the establishment of energy crops such as *Miscanthus x giganteus*, a C4 grass used for biofuel production. Although the economical potential of this crop is known, its effects on soil biological properties remain unclear.

The aim of this study was to assess the effects of Miscanthus perennial cropping on the microbial properties in a contaminated soil. The work is based on an experimental real field site close to Paris irrigated for more than hundred years by raw wastewater (Pierrelaye, France). Soil microbial communities were characterized in terms of abundance, diversity and composition with molecular tools (soil DNA extraction, estimation of molecular biomass and high throughput sequencing of 16S and 18S ribosomal genes). The impact of perennial crops on microbial communities was assessed by (a) a synchronic study comparing communities between a field under Miscanthus for four years and a field managed under conventional cereal cropping (tillage, crop rotations); and (b) by a diachronic study monitoring communities during a two years-period of growth of Miscanthus following implantation.

Our results showed that the composition of the microbial community at the site was indicative of polluted state of the soil, with populations involved in PAH and hormone degradations. Perennial cropping significantly increased bacterial and fungal diversity, richness and equitability. Such perennial cropping stimulated bacterial and fungal *genera*, known to live in association with roots and/or to degrade easily organic matter via copiotrophic attributes. The establishment of Miscanthus appears as a good strategy to stimulate microbial resources in polluted sites and favorable for their rehabilitation.

Keywords: microbial diversity, rehabilitation, polluted soil, miscanthus