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Amendments to improve the functioning of urban lawns

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Pollution of soil with heavy metals, salts, hydrocarbons and other toxic agents is of huge concern in urban areas. Contaminants can affect non solely human wellbeing but also the functioning of urban green infrastructures. Urban lawns are the most widespread green infrastructure in the cities; they release a full range of ecosystem services. Use of amendments and lawn's management can improve the lawn's functioning in the conditions of soil contamination.

The aim of this study was to evaluate the interactions between the lawn's management (amendment and irrigation), the lawn's functioning, and the release into the soil of typical urban contaminants. For this purpose, *Festuca arundinacea* was planted in a turf-sand mixture with and without amendment addition (zeolite + vermicompost). To reproduce the impact of traffic-related contaminants, pots were treated with a solution containing de-icing salt (NaCl) and 6 heavy metals (Zn, Cd, Pb, Cr, Cu, Ni). After contamination, half of pots was maintained at optimum soil water content (Smart irrigation), another half was left to periodical drying (Periodic irrigation). CO_2 net ecosystem exchange (NEE), ecosystem, soil and heterotrophic respiration were measured up to 3 months since the treatment start. Release of contaminants with leaching into the groundwater was reproduced in a model experiment.

Soil amendment increased the system C uptake (+56% NEE). A relevant reduction of NEE was observed shortly after application of traffic-related contaminants. The contaminants had the greatest impact on lawns under Periodic irrigation (-49% and -66% in amended and non-amended pots, respectively), while lawns under Smart irrigation were less affected (-35% and -26% in amended and non-amended pots, respectively). Different respiration sources were characterized by different sensitivity to management and contamination. Heterotrophic flux was not sensitive to soil amending but declined with contamination with enhanced negative effect under Smart irrigation. Response of ecosystem respiration to contamination was less pronounced in confront to soil respiration suggesting leaf-level buffering. Three months after the contaminants input the effect of contaminants on lawn gas exchange ceased for all treated pots. Instead, the irrigation effect persisted depending on whether pots were amended or not.

Amending declined the leaching from soil of Cu and didn't affect the release of other pollutants. We conclude, that performance of such green infrastructure as lawns in terms of C sequestration under multiple anthropogenic stressors could be efficiently improved through soil amending and irrigation control.

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