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Recycling coffee wastes for healthy urban agriculture: do spent coffee ground and its biochar reduce the impact of antimony on soil quality and plant growth?

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**Sustainable Urban Agricultures (UA) :
Vector for Ecological Transition !**



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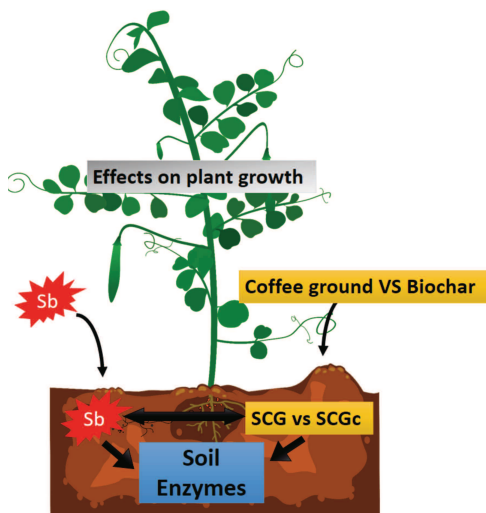
Recycling coffee wastes for healthy urban agriculture: do spent coffee ground and its biochar reduce the impact of antimony on soil quality and plant growth?

Context

Challenge of soil quality for Urban Agriculture
Concept of coupling remediation and amendment in one-shot:
Revalorization of wastes is a matter of current concern! (fresh, composted, biochar...)
Spent coffee ground (SCG) or its charred by-product (SCGc) showed intriguing outcomes:
Suitable in remediation actions as 'buffer' amendments in soils receiving contaminants
Direct interaction between biochar and rhizospheric microorganisms...

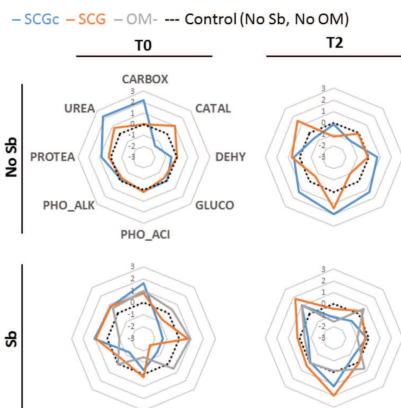
Objectives

To determine whether addition of SCG and SCG-derived biochar reduce the impact of Sb on selected extracellular enzyme activities and plant performance.



Material and methods

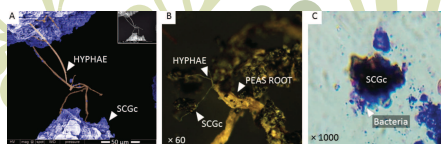
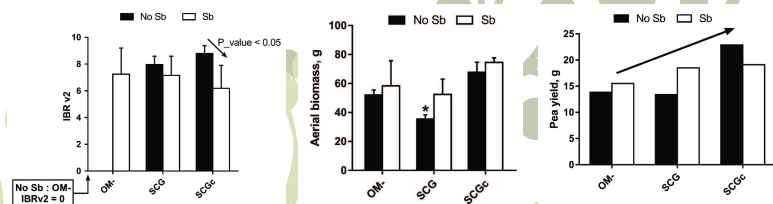
- Scale** - Microcosm pot experiment under greenhouse condition
- Plant** - Peas (*Pisum sativum* L.)
- Soil** - Loam agricultural loam
- Treatments** - 5% (w/w) of SCG or SCGc.
 - Half of the pots were spiked with antimony tartrate (KSb)
- Measurements** - Soil enzyme activities, at sowing and harvest
 - Pea yield, plant growth
 - Colonization of SCGc by microorganisms
- Analysis** - Use of the "Integrated Biological Response" index (IBRv2)



Variation of enzyme activity for different amendments [SCG, SCGc, OM]. CARBOX, carboxylesterase; CATAL, catalase; DEHY, dehydrogenase; GLUCO, β-glucosidase; PHO_ACI and PHO_ALK, acid and alkaline phosphatases; PROTEA, protease; UREA, urease. The dotted grey line (zero) represents the activity in the control soil (No Sb, OM).

Results

SCG caused a phytotoxic effect on plant growth and pea yield
SCGc enhanced plant performance and was colonized by microorganisms
SCG and SCGc impacted soil enzymes activity (time & treatment-dependent)
SCGc activated extracellular enzymes implied in C- and P-cycling
SCGc decreased Sb toxicity at the end of the experiment



SCGc provides a recalcitrant shelter for microbial development and buffers Sb toxicity in soil

Interactions are complex between Sb, SCG/SCGc and soil microbial communities



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Jean Jaurès

