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Barbara Rodrigues, Guido Rychen, Matthieu Delannoy

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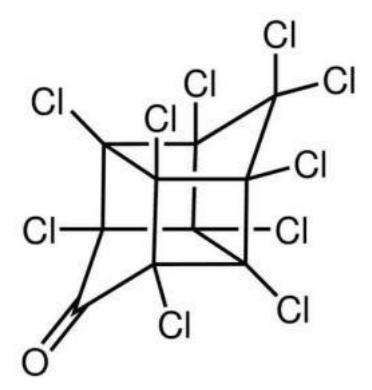
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Development of a chlordecone sequestration strategy on West Indian soils amended with biochars or activated carbons derived from Sargasso, an invasive alga

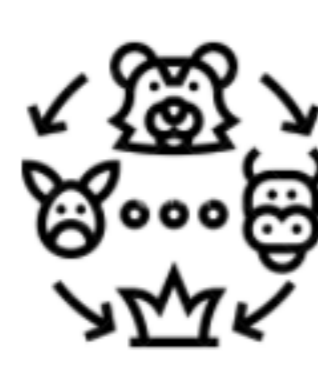
RODRIGUES B¹, RYCHEN G², DELANNOY M¹

1 URAFPA, Université de Lorraine, USC 340 INRAE, 2 Avenue de la Forêt de Haye, 54500, Vandoeuvre-lès-Nancy, France
E-mail contact : barbara.rodrigues@vetagro-sup.fr

Context



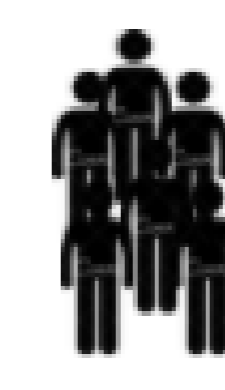
- Widely used as a pesticide in banana plantations in French West Indies
- Lipophilic, Persistent Organic Pollutant (POP)



- French West Indies: outdoor reared animals
- Almost 100% of relative bioavailability of CLD in soil
- 6-9% carcasses over CLD Maximum Residue Limit



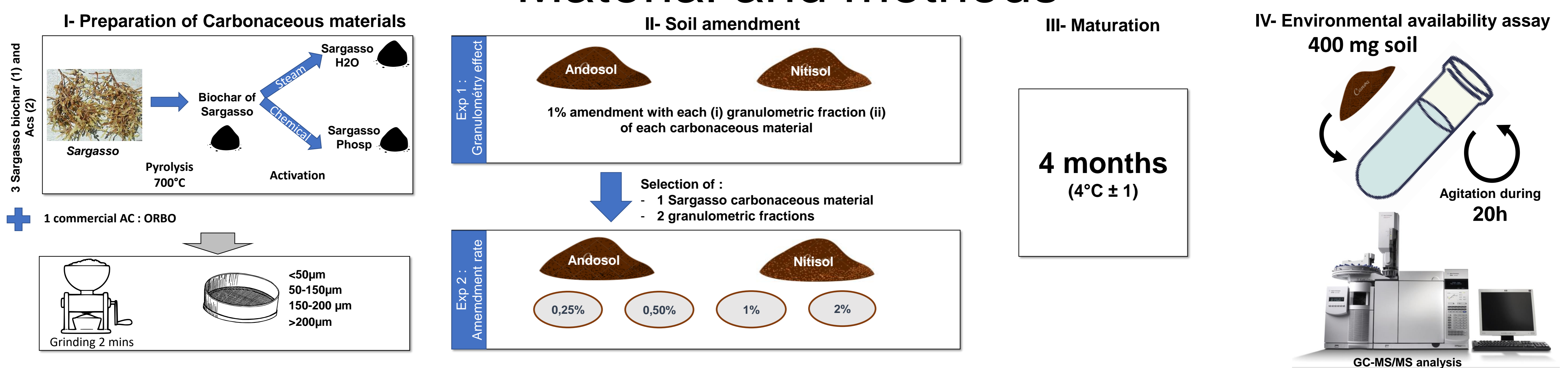
- Soil as a major source of contamination
- 5-7 centuries persistency
- ¼ of agricultural lands contaminated



- Alimentary route as the main exposure pathway
- High toxicity: neurodevelopment and prostate cancer

Using activated carbon and biochars as a sequestration strategy = Efficient strategy to reduce the environmental availability of chlordecone in soil [1].
The objective of this study is to evaluate the impact of (I) the **granulometry** and (II) the **rate of amendment** in this sequestration.

Material and methods



Results and discussion

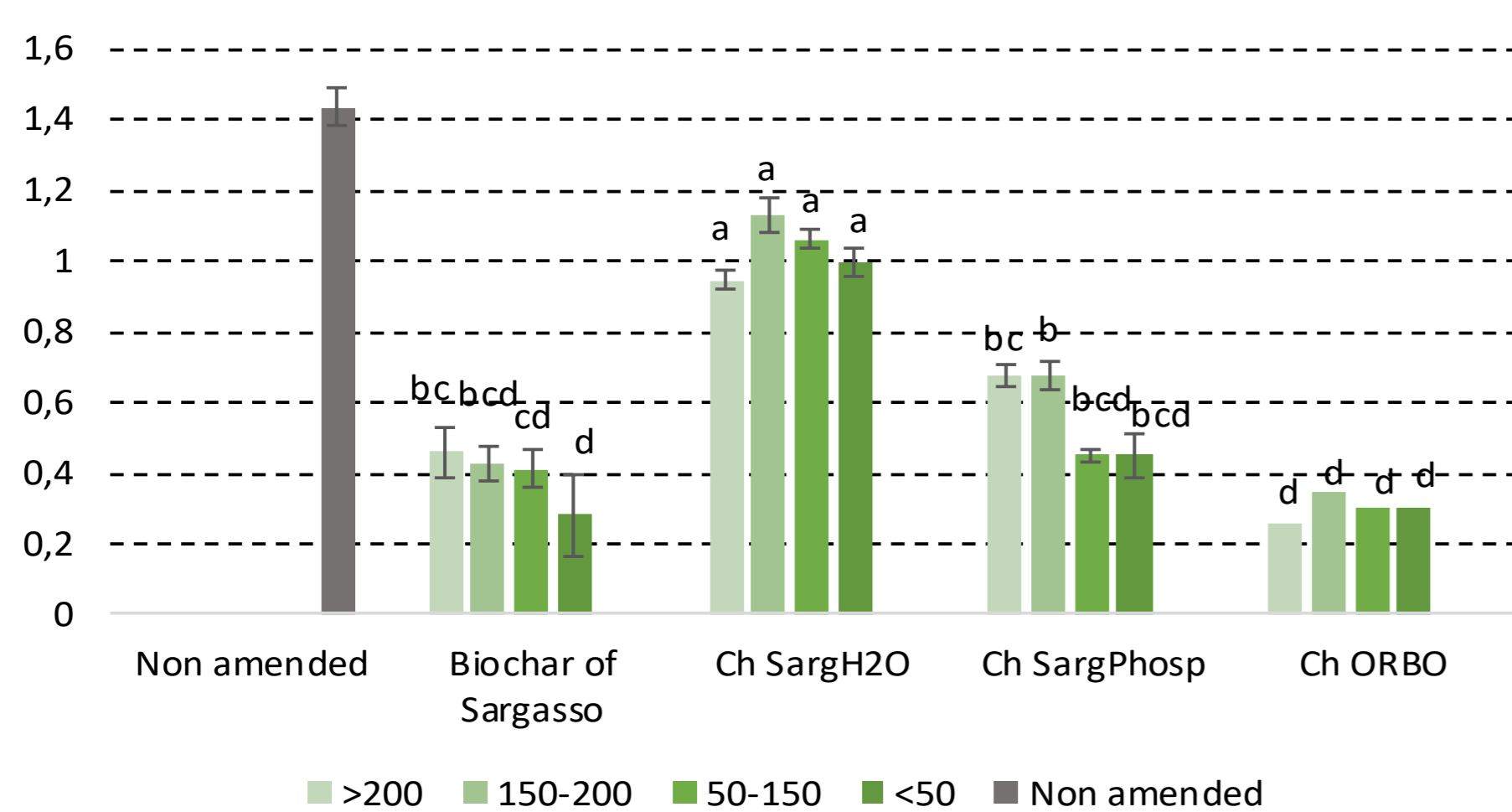


Figure 1. Granulometry effect on the environmental availability of chlordecone using different carbonaceous matter as a sequestration strategy in Nitisol
Letters are assigned in a way that any two treatments sharing a letter are not significantly different

Type	BET Surface area (m ² .g ⁻¹)	V _{Micropores} (D-R) (cm ³ .g ⁻¹)
Bioch Sarg	872	0.44
Sarg P	877	0.30
Sarg H ₂ O	109	0.12
ORBO	1121	0.46

Figure 3. Physical characteristics of the different carbonaceous materials [1]

Granulometric effect

- Biochar and ORBO showed the **highest decreases** of CLD environmental availability.
- No significant sequestration** when using ACs from Sargasso in Andosol.
- Best sequestration were found in the **smaller particles (<150µm)**, with a clear type of biochar/AC + granulometry interaction.
- Strategy appears to be more effective on Nitisol than Andosol

Such results are consistent with other studies [2,3]

Porosity

- Biochar and ORBO showed the **highest decreases** of CLD environmental availability.

Amendment rates

Significant granulometry effect was demonstrated through Dunnett test in Andosol.
A clear effect of rate of amendment was observed on Andosol, whereas it was not the case for Nitisol
Indeed, in nitisol sequestration appear efficient for all amendment rates.

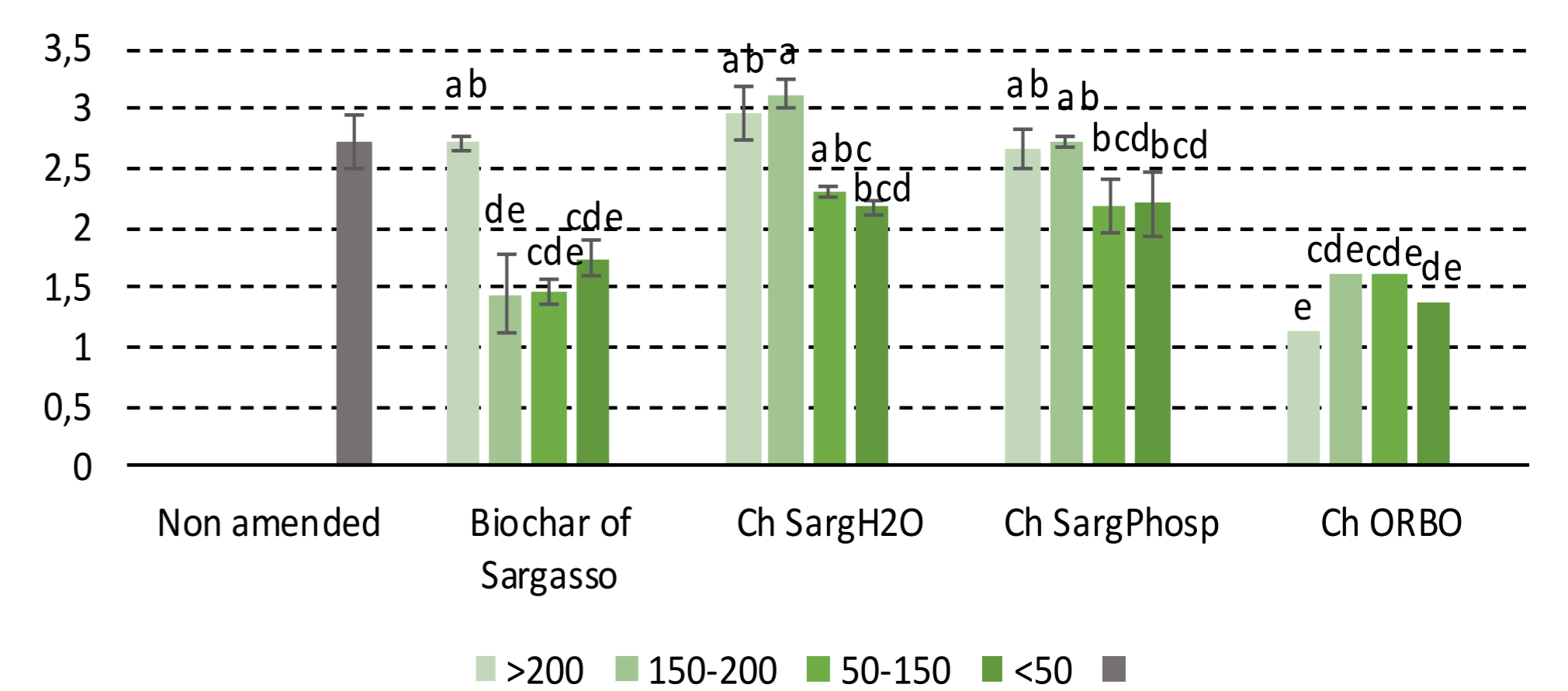


Figure 2. Granulometry effect on the environmental availability of chlordecone using different carbonaceous matter as a sequestration strategy in Andosol
Letters are assigned in a way that any two treatments sharing a letter are not significantly different

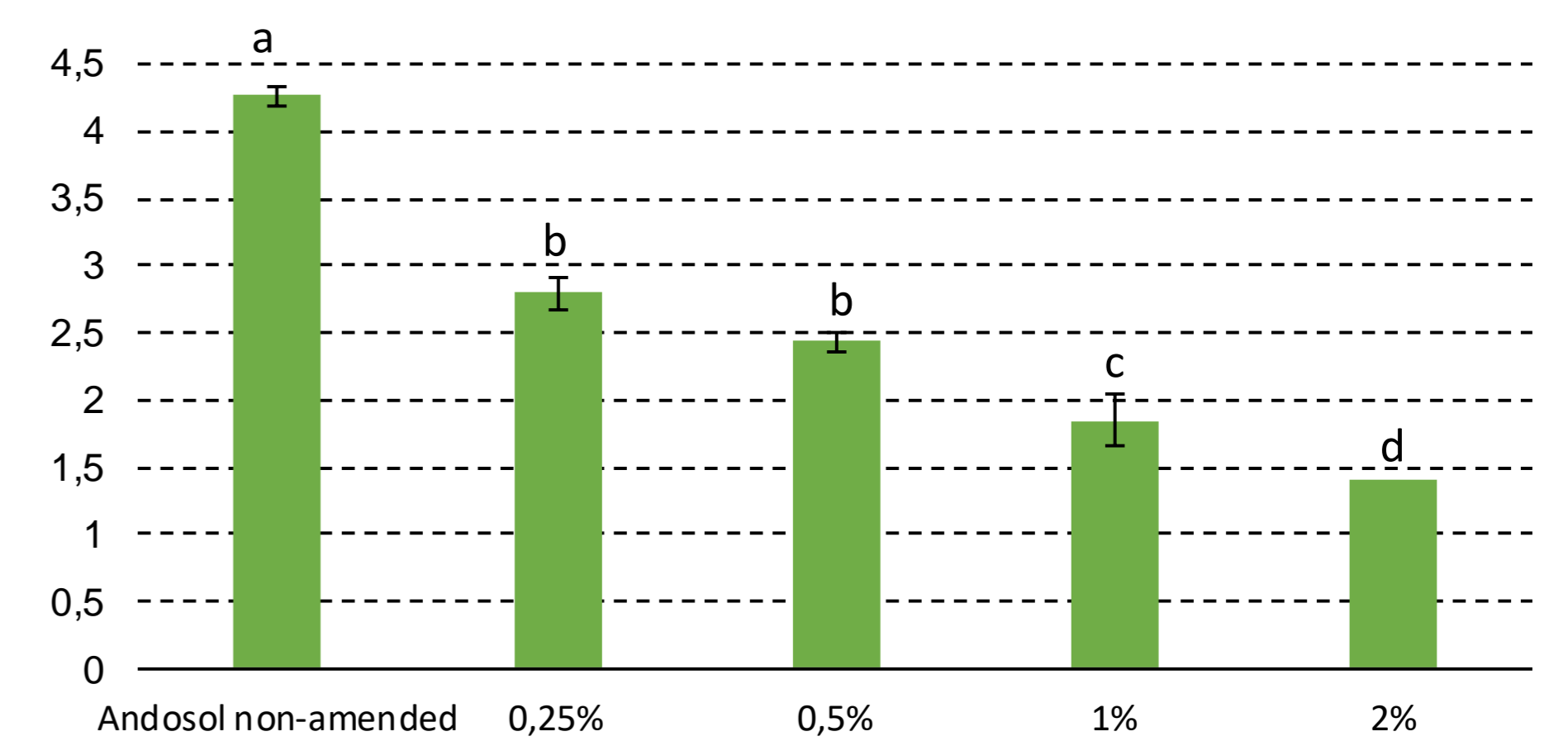


Figure 3. Granulometry effect on the environmental availability of chlordecone using different carbonaceous matter as a sequestration strategy in Nitisol
Letters are assigned in a way that any two treatments sharing a letter are not significantly different

Conclusions & Perspectives



Soil
Nitisol appears as the most sensitive to the sequestration strategy



Particle size
Finest particles improve the sequestration of CLD when amending soil



Porosity
Microporous \nearrow (>800m².g⁻¹) = Sequestration \nearrow



Amendment rate
Amendment rate \nearrow = Sequestration \nearrow (specially in Andosol)

[1] Ranguin et al., « Biochar and Activated Carbons Preparation from Invasive Algae Sargassum Spp. for Chlordecone Availability Reduction in Contaminated Soils ».

[2] Tomaszewski, Werner, et Luthy, « Activated Carbon Amendment as a Treatment for Residual DDT in Sediment from a Superfund Site in San Francisco Bay, Richmond, California, USA ».

[3] Zimmerman et al., « Effects of Dose and Particle Size on Activated Carbon Treatment to Sequester Polychlorinated Biphenyls and Polycyclic Aromatic Hydrocarbons in Marine Sediments ».