PRACTICE ABSTRACT NO. 11

SEA2LAND

UNIVERSITÀ POLITECNICA DELLE MARCHE

UNIVERSITÀ DEGLI STUDI DI MILANO
DIPARTIMENTO DI SCIENZE AGRARIE E AMBIENTALI - PRODUZIONE, TERRITORIO, AGROENERGIA

Testing the amending efficacy of compost-biochar composite from fish waste

Main results / outcomes

A compost–biochar composite (CB) was produced by co-composting fish waste with biochar, also derived from fish waste, and a bulking agent (pruning waste), (biorefinery scheme in Figure 1). CB was analyzed (Table 1) to evaluate its compliance with REGULATION (EU) 2019/1009 for classification as an organic soil improver (PFC 3(A)). Its properties were also compared with a reference compost (C), obtained by composting fish waste with pruning waste without biochar. In addition, a pot incubation trial was conducted to assess the soil amending efficacy of CB relative to C. The trial evaluated their effects on water holding capacity (WHC) and retained water after 7 days without watering in two soils with contrasting textures: a sandy-loam (SL) and a clay-loam soil (CL) (Table 2).

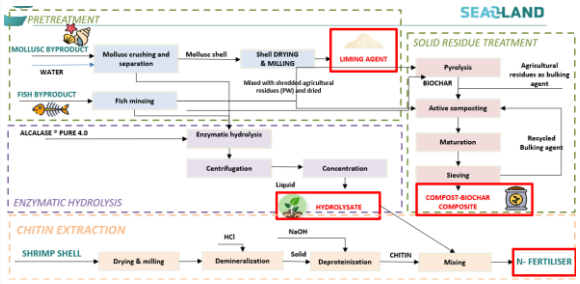

Figure 1 Biorefinery scheme of Adriatic Sea pilot

Table 1 Chemical characterization of simple compost (C) and Compost-Biochar composite (CB)

Parameter	C	CB	EU 2019/1009
Dry matter	89.64 ± 0.02	90.17 ± 0.07	> 20
pH	7.11 ± 0.02	7.15 ± 0.04	
Electrical conductivity	2.42 ± 0.00	2.1 ± 0.03	
Organic carbon %	30.64 ± 0.99	43.89 ± 1.11	> 7.5
Total Nitrogen %	3.47 ± 0.04	2.93 ± 0.11	
Organic Nitrogen %	3.44 ± 0.04	2.89 ± 0.11	
C_{org}/N	8.82	14.96	
P_2O_5 %	1.65 ± 0.09	1.08 ± 0.17	
K_2O %	1.05 ± 0.1	0.9 ± 0.07	
Salmonella	Not detected	Not detected	0
E. coli	<10	<10	< 1 000

Table 2 Residual water after 7 days withot watering and water contet at full WHC

	residual water after 7 d	water content at WHC
	% D.M.	% D.M.
SL soil		
B	4.1 ± 0.3	31.6 ± 3.3
C	5.0 ± 0.2	35.1 ± 0.2
CB	5.6 ± 0.4	35.5 ± 0.2
CL soil		
B	10.6 ± 0.5	51.7 ± 2.7
C	11.3 ± 0.3	55.3 ± 2.6
CB	12.0 ± 0.4	53.2 ± 1.5

Practical recommendations

Several bio-based, waste-derived materials are used as soil improvers due to their high organic C content and positive influence on soil physical and chemical properties, such as soil-water relationships and soil's ability to retain nutrients in bioavailable forms. Compliance with parameters established by REGULATION (EU) 2019/1009 for organic soil improvers (PFC 3 (A)) alone does not provide comprehensive information about a product's actual effectiveness in enhancing soil fertility. Field trials can offer such insights, but they are resource-intensive. In contrast, pot trials offer a more efficient and versatile alternative, enabling to test different materials across various soil types simultaneously. Moreover, they allow for greater flexibility: testing parameters can be expanded and the incubation time adjusted as needed. This adaptability enhances the reliability and applicability of pot trials as a practical tool for evaluating the efficacy of organic soil improvers.

Further information

https://biochar.co.uk/soil-improver/

Garbowski et al. An overview of natural soil amendments in agriculture. Soil&Tillage Res. 225, 105462 (2023)

About this abstract

Authors: Marta Dell'Orto (UMIL), Salman Nisar (UNIVPM), Carla Maggetti (UNIVPM), Francesco Fatone (UNIVPM), Fabrizio Adani (UMIL)

Date: May 2025

SEA2LAND project is a collaborative Innovation Action(IA) funded by the EU in the frame of the Horizon 2020 programme. The project aims to provide solutions to help overcome challenges related to food production, climate change and waste reuse. Based on the circular economy model, SEA2LAND promotes the production of large-scale fertilisers in the EU from own raw materials. This solution is expected to reduce the soil nutrient imbalance in Europe. The project is running from January 2021 to June 2025.

Website: www.sea2landproject.eu

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DIPARTIMENTO DI SCIENZE AGRARIE E AMBIENTALI - PRODUZIONE, TERRITORIO, AGROENERGIA

Valutazione dell'efficacia ammendante di un composito compost-biochar

Main results / outcomes

Un composito compost-biochar (CB) è stato prodotto mediante co-compostaggio di scarti di pesce con biochar, anch'esso derivato da scarti di pesce, e scarti di potatura (schema di bioraffineria in Figura 1). Il CB è stato analizzato (Tabella 1) per valutarne la conformità al REGOLAMENTO (UE) 2019/1009 come ammendante organico (PFC 3(A)). Le sue proprietà sono state inoltre confrontate con quelle di un compost di riferimento (C), ottenuto mediante compostaggio di scarti di pesce con scarti di potatura senza biochar. Inoltre, è stata condotta una prova di incubazione in vaso per valutare l'efficacia ammendante del CB rispetto al C. La prova ha valutato i loro effetti sulla capacità idrica massima (WHC) e sulla ritenzione idrica dopo 7 giorni senza irrigazione in due suoli con tessiture contrastanti: uno franco sabbioso (SL) e uno franco-argilloso (CL).

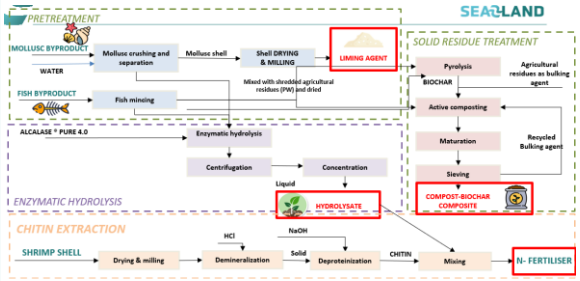

Figura 1 Schema di bioraffineria impianto pilota Adriatico

Tabella 1 Caratterizzazione chimica di un compost senza biochar (C) e di un composito compost-biochar

Parameter	C	CB	EU 2019/1009
Dry matter	89.64 ± 0.02	90.17 ± 0.07	> 20
pH	7.11 ± 0.02	7.15 ± 0.04	
Electrical conductivity	2.42 ± 0.00	2.1 ± 0.03	
Organic carbon %	30.64 ± 0.99	43.89 ± 1.11	> 7.5
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Salmonella	Not detected	Not detected	0
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Tabella 2 Acqua residua dopo 7 giorni senza irrigazione e capacità idrica

	residual water after 7 d	water content at WHC
	% D.M.	% D.M.
SL soil		
B	4.1 ± 0.3	31.6 ± 3.3
C	5.0 ± 0.2	35.1 ± 0.2
CB	5.6 ± 0.4	35.5 ± 0.2
CL soil		
B	10.6 ± 0.5	51.7 ± 2.7
C	11.3 ± 0.3	55.3 ± 2.6
CB	12.0 ± 0.4	53.2 ± 1.5

Practical recommendations

Diversi materiali biologici derivati da rifiuti vengono utilizzati come ammendanti grazie al loro elevato contenuto di C organico e all'influenza positiva sulle proprietà fisiche e chimiche del suolo, come il rapporto suolo-acqua e la capacità di trattenere i nutrienti in forme biodisponibili. Il solo rispetto dei parametri stabiliti dal REGOLAMENTO (UE) 2019/1009 per gli ammendanti organici (PFC 3 (A)) non fornisce informazioni esaustive sull'effettiva efficacia di un prodotto nel migliorare la fertilità del suolo. Le prove in campo possono offrire tali informazioni, ma richiedono un elevato impiego di risorse. Al contrario, le prove in vaso offrono un'alternativa più efficiente e versatile, consentendo di testare contemporaneamente materiali diversi su diversi tipi di terreno. Inoltre, consentono una maggiore flessibilità: i parametri di prova possono essere aumentati e il tempo di incubazione regolato in base alle esigenze. Questa adattabilità aumenta l'affidabilità e l'applicabilità delle prove in vaso come strumento pratico per valutare l'efficacia degli ammendanti organici.

Further information

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