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Biochar
L'ACCHIAPPA CARBONIO

Le proprietà del biochar e i suoi possibili usi

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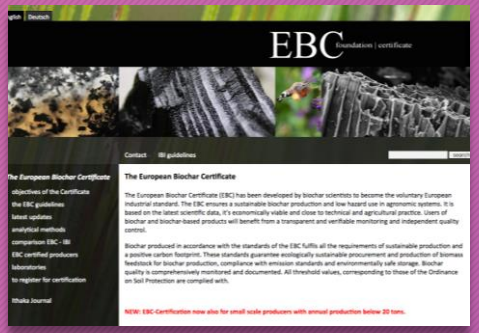
UNIONE EUROPEA
Fondo Europeo Agricolo per lo Sviluppo Rurale

RegioneEmilia-Romagna

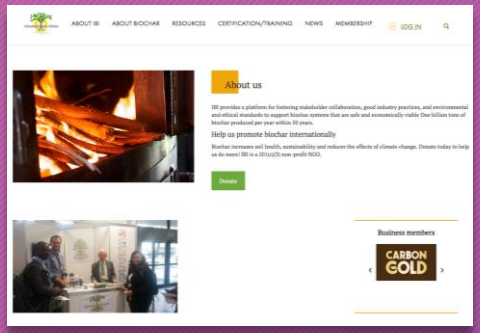
L'Europa investe nelle zone rurali

I riferimenti internazionali



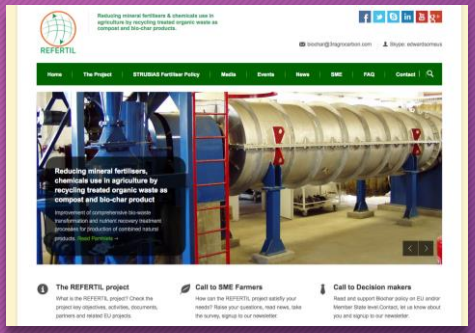
European Biochar Certificate

http://www.european-biochar.org



International Biochar Initiative

https://biochar-international.org/



REFERTIL project

http://www.refertil.info/

“Biochar is a solid material obtained from the thermochemical conversion of biomass in an oxygen-limited environment. Biochar can be used as a product itself or as an ingredient within a blended product, with a range of applications as an agent for soil improvement, improved resource use efficiency, remediation and/or protection against particular environmental pollution, and as an avenue for greenhouse gas (GHG) mitigation.”

Definizione dalle linee guida IBI Biochar Standards (2015)

I materiali utilizzati per la produzione di biochar hanno un impatto diretto sulla natura e sulle proprietà del biochar che si produce

Le caratteristiche del biochar

Proprietà basilari

Umidità %

Carbonio organico e rapporto H:C

Ceneri totali %

Azoto totale

pH

Conducibilità elettrica

Distribuzione delle dimensioni delle particelle

Valutazione dei contaminanti

Inibizione della germinazione

Idrocarburi policiclici aromatici totali

Diossine/furani, PCB

Arsenico – Cadmio – Cobalto – Cromo – Mercurio – Molibdeno – Nichel - Piombo – Rame – Selenio - Zinco

Boro – Cloro - Sodio

Proprietà di miglioramento del suolo

Azoto minerale disponibile

Fosforo e Potassio totali

Fosforo disponibile

Calcio, Magnesio e zolfo totali

Calcio, Magnesio e solfato disponibili

Sostanze volatili

Area superficiale totale

Area superficiale esterna

The 55 uses of biochar

by Hans-Peter Schmidt & Kelpie Wilson

Biochar – that black charcoal like substance discussed so often in recent days for its miraculous effects on soil and compost - is good for more than just your garden. One of the key materials for a sustainable future of the planet, biochar has many other uses that can be integrated into new organic systems for farming, building, clothing, electronics and a whole range of consumer products. Biochar can initiate multiple cascades to optimize and recycle current material, nutrient and energy flows.

I possibili usi del biochar

Ammendante dei suoli

Altri usi industriali

Trattamento delle acque

Produzione di biogas

Allevamento animale

Edifici e costruzioni

Decontami-nazione

Usi tessili

Applicazioni mediche

Properties	COMPOST[1]	ANIMAL MANURE[2]	DIGESTATE (anaerobic digestion)[3]	BIOCHAR[4]
Increase in content of organic matter	increases soil organic matter, humic substances	increases soil organic matter, depends on animal diet	depends on feedstock - humic acids (mainly solid fraction)	affects the stability of existing organic matter
Modification of C:N ratio			low C/N ratio due to digestion	increase
Improvement of water holding capacity	Increases		improves	increases due to surface structure
Supply of nutrients (N, P, etc.) nutrient balance	enhances nutrient supply	leaching of N and P – content differs with animal species	depends on feedstock - mineral N, P (mainly liquid fraction), possible leaching	reduces leaching of nutrients / slow release fertilizer - provides P and K
Modify pH	lowers pH		high pH	increase in soil pH of acidic soils
Modification of cation exchange capacity	Increases			increase in soils with low CEC
Improvement of texture and aggregation state	amelioration of structure and porosity	reduces density	reduces density, increase in aggregate stability	increase in porosity, stability of aggregates
Sequestration of pollutants/contaminants	through humic substances		not reported	can sequester pollutants, but also increase mobility
Addition of pollutants/contaminants	might contain persistent pollutants	micronutrients supplied to animals	might contain persistent pollutants, metals	can contain pollutants, in this case it is not usable
Decrease in salinity	Improvement		can increase salinity with repeated applications	can sequester salts and modify CEC
Soil conservation (e.g. minimise erosion)	remediates degraded soils		still to be investigated	still to be investigated
Increase in microbial biomass	increase	Increase	considerable increase	increase
Increase in microbial diversity	increase or decrease	Increase	significant changes	significant differences
Stimulation of specific microorganisms	no indication	antibiotic resistance	dominance of slowly growing microorganisms	arbuscular and ectomycorrhiza
Increase in enzymatic activities	increase in soil microbial activity	Increase	nitrogen mineralization, other enzymes	reports on increase in enzymatic activities
Increase in diversity of fauna	Limited observations, differing effects		limited observation, increase	Limited observations, differing effects
Effects on plants growth	positive	very positive	positive	mostly positive
Increase of yield	Positive	Positive	fertilizer capacity	reports on increase of crop yield
Increase of product quality	not significant			not assessed
Improve in defense against pathogens	Positive effects			Limited observations, positive effects
Origin, raw materials	biomass from different sources		biomass from different sources	biomass from different sources
Production requirements	requires large amounts of energy, long time			depends on biomass feedstock - importance of temperature
Standardisation of product	Quality assessment differs in the countries	not possible	not possible	just starting
Cost (including transport)	moderate		depends on feedstock	depends on feedstock - high
Positive carbon emission	emissions during composting	emissions of CH_4 and N_2O, NH_3	during digestion GHG emissions, NH_3 emission	could stimulate CO_2 emissions by microbes
Negative carbon emission	carbon sequestration in humic		decrease of emissions from manure	removal during growth of biomass, C - sequestration
Legislation, norm			can be amendment or fertilizer	limited
Social acceptabil		lished	Low	not yet tested
Additional benefi			production of biogas	reduction of N_2O emissions
Ecosystem servi				

Abbiamo eseguito un confronto tra diversi ammendanti organici per alcune proprietà fondamentali (Sci Total Environ, 2018)

Confronto tra biochar

I char da biomasse di origine non vegetale (digestato, pollina) contengono più ceneri e sali e hanno pH più basici di quelli di origine vegetale

I char di origine vegetale stimolano la crescita di piante (orzo, lattuga)

I char di origine vegetale hanno una microstruttura con superficie più estesa

Biochar	Process	Biomass
A1	thermoreforming	Digestate
A2	thermoreforming	Poultry litter
A3	thermoreforming	Wood pellet
A4	Pyrolysis	Wood pellet
E1	Pyrolysis	Wood chip