



Properties of Biochar Derived from Organic Deposit

Rozita Ahmad^{1*}, Chua Kai Ying², Siti Salwana Hashim¹, Tumirah Khadiran³, Puad Elham³, Wan Rasidah Kadir¹,
 Mohamad Fakhri Ishak¹, Abdul RRazak Sahril¹ and Tariq Mubaraq Husin⁴

¹Forest Biotechnology Division, ³Forest Product Division, ⁴Forest and Environmental Division, Forest Research Institute Malaysia

² Chemistry Department, Faculty of Science, University of Malaya

*Corresponding author: rozita@frim.gov.my

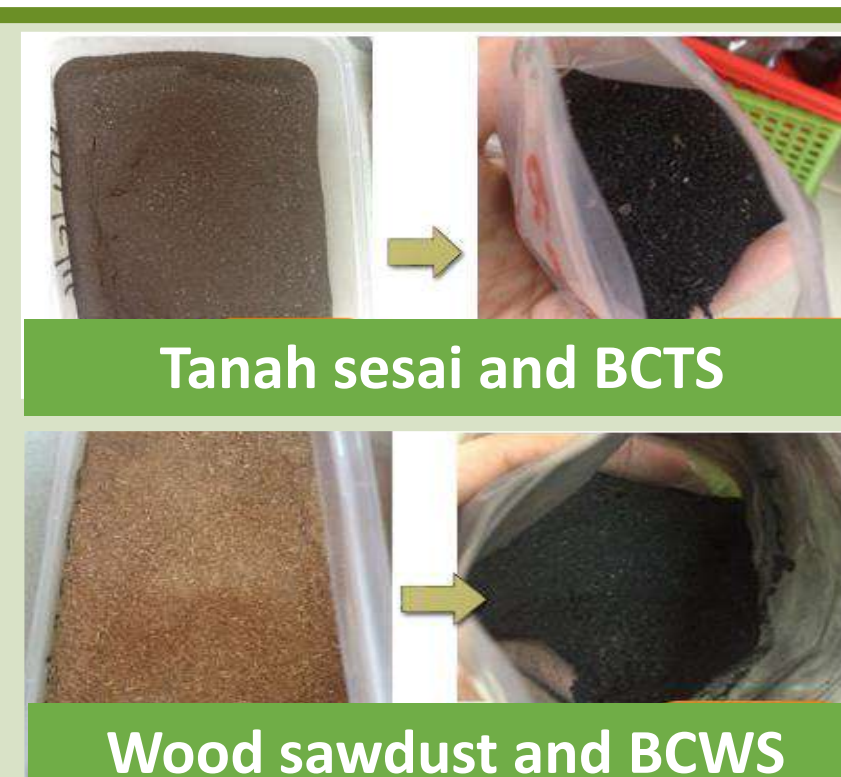
HIGHLIGHTS

- Converting organic waste material into biochar can help to minimise cost and environmental issue associated with waste disposal.
- Organic deposit (*Tanah sesai*) was once a concern to Tanjung Piai in the Johor mangrove forest because of its acidic condition, covered the plant roots that avert to breathing and became unsafe to plants.
- A comparison between biochar tanah sesai (BCTS) and biochar wood sawdust (BCWS) from other sources was carried out.

METHODS

1. SAMPLE PREPARATION

- *Tanah sesai* was collected nearby Tanjung Piai National Park.
- Wood sawdust was obtained from *Bengkel Kerja Kayu*, FRIM.
- Materials was oven dried at 60°C and further pyrolyzed at about 500°C



2. PHYSICO-CHEMICAL ANALYSIS

- Total nitrogen: Micro Kjeldahl digestion
- Organic Carbon: Wakley and Black rapid titration method
- Available P: Bray and Kurtz no. 2 procedure and Denige Blue method
- pH: pH meter (1:2.5 sample:water suspension).
- Total elements: acid digestion and ICP-OES
- Phytotoxicity test :method Keeling *et.al.* (1994).
- Polycyclic aromatic hydrocarbon (PAHs) and polychlorinated biphenyl (PCBs) : by ERA Lab Sdn. Bhd.

FINDINGS

Table 1 : Chemical properties of biochar (BCTS = biochar tanah sesai; BCWS = biochar wood sawdust)

BC	pH	N (%)	C (%)	C:N	Avail P (ppm)	K (%)	Ca (%)	Mg (%)	Cu (ppm)	Zn (ppm)	Mn (ppm)
BCTS	10.4	0.6	7.0	11.7	8.5	0.46	3.6	1.9	35.6	53.1	413.0
BCWS	9.9	0.3	8.8	29.3	4.3	0.11	0.4	0.06	2.5	6.8	25.6

Nutrients	C:N	pH
❖ BCTS contain an acceptable amount of nutrients (N, Avail P & K) and micronutrients (Cu, Zn & Mn) require for plant growth. ❖ BCWS recorded a lower amount of nutrients compared to BCTS.	❖ BCTS has a good C:N ratio suggest that it contains enough nitrogen to support microbial growth thus improving the availability for plants. ❖ However, BCWS has a higher C:N of 29.3. This is attributed to low N content and a higher percentage of C.	❖ Both biochars have alkaline pH contributed from Ca, Mg and K which can be functioned as liming agent in acid soil to improve nutrient availability in soil.

Table 2 :Toxicant range and germination of BCTS and BCWS

Test	Maximum allowed threshold (ppm)	BCTS	BCWS
PAHs	6 - 20	1.0 – 2.5	0.5-12
PCBs	0.2 – 0.5	ND	ND
Germination	Pass /Fail	88%	100%

Note: ND = not detectable; Maximum threshold levels were obtained from IBI testing guidelines compiled from European countries, Canada, Australia, and USA

Test	Remarks
PAHs & PCBs	The levels in both the product tested were within the permissible range as stated by IBI (2013).
Seed germination	The test recorded above the passing range of 85%. This suggest safe use of biochar.

CONCLUSION

- Both raw materials have similar sawdust feature but BCTS has higher amount of nutrients compared to BCWS.
- Both biochars are alkaline in pH and their toxicant levels are within the permissible range as stated by the IBI.
- Test from phytotoxicity analysis recorded above the passing range indicated both biochars were safe for seed germination.

ACKNOWLEDGEMENT

- The funding support of this study under project "Membangunkan Teknik Penanaman Inovatif dan Menilai Keberkesanan Zon Penampakan bagi Melindungi Persisiran Pantai Negara" is greatly appreciated.
- Sincere thanks to En Mohd. Yasin Nasir and En. Muhd. Amiruddin Zaini from Tanjung Piai Johor National Park for their assistance during work at Tanjung Piai.
- The help rendered by all personel from Soil Management Branch, FRIM for assisting in sample collection and laboratory works are highly appreciated.