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Mineralization of biochars in soils of contrasting mineral composition from Australia

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Biochar application to soils is considered an attractive management strategy because of its agronomic benefits and mitigation of greenhouse gas emissions in some soils. However, the stability of biochars in soils with varying mineral composition has not been comprehensively evaluated. In this study, we measured the stability of two wood biochars (450 and 550°C; Eucalyptus saligna; δ13C $\sim$-36‰ at three incubation temperatures (20, 40 and 60°C). The biochars (2% w/w) were incubated in the laboratory at 70% WHC with four soils (Inceptisol, Vertisol, Oxisol, Entisol) of contrasting soil properties including mineralogical composition. The results show that between 0.3 and 7% of added biochar C was mineralised during 12-month period. The lowest mineralization was observed in the Vertisol amended with the 550°C biochar incubated at 20°C, while the highest value occurred in the same soil amended with the 450°C biochar incubated at 60°C. The mineralization rate of biochar-C increased with increasing incubation temperature, and the mineralisation rate of 450°C biochar was consistently higher than the 550°C biochar in all soils. Biochar C stability was also influenced by soil types particularly at higher temperatures (40 and 60°C). The biochar application in the Inceptisol caused a positive priming of soil-C at all incubation temperatures; whereas in the other soils with higher clay content, biochar suppressed the mineralisation of soil-C over time.