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Assessing the strength of soil aggregates produced by two types of organic matter amendments using the ultrasonic energy

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The presence of organic matter (OM) is known to stimulate the formation of soil aggregates, but the aggregation strength may vary with different amount and type/quality of OM. Conventionally wet sieving method was used to assess the aggregates' strength. In this study, we wish to get insight of the effects of different types of C inputs on aggregate dynamics using quantifiable energy via ultrasonic agitation. A clay soil with an inherently low soil organic carbon (SOC) content, was amended with two different sources of organic matter (alfalfa, C:N = 16.7 and barley straw, C:N = 95.6) at different input levels (0, 10, 20, & 30 g C kg^{-1} soil). The soil's inherent macro aggregates were first destroyed via puddling. The soils were incubated in pots at moisture content 70% of field capacity for a period of 3 months. The pots were housed in a 1.2L sealed opaque plastic container. The CO_2 generated during the incubation was captured by a vial of NaOH which was placed in each of the sealed containers and sampled per week. At 14, 28, 56, and 84 days, soil samples were collected and the change in aggregation was assessed using a combination of wet sieving and ultrasonic agitation. The relative strength of aggregates exposed to ultrasonic agitation was modelled using the aggregate disruption characteristic curve (ADCC) and soil dispersion characteristic curve (SDCC). Both residue quality and quantity of organic matter input influenced the amount of aggregates formed and their relative strength. The MWD of soils amended with alfalfa residues was greater than that of barley straw at lower input rates and early in the incubation. In the longer term, the use of ultrasonic energy revealed that barley straw resulted in stronger aggregates, especially at higher input rates despite showing similar MWD as alfalfa. The use of ultrasonic agitation, where we quantify the energy required to liberate and disperse aggregates allowed us to differentiate the effects of C inputs on the size of stable aggregates and their relative strength.