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Title: Electrostatic Method to Remove Particulate Organic Matter from Soil

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Author Questionnaire

1. **Microscopy**: Does your protocol require the use of a dissecting or stereomicroscope for performing a complex dissection, microinjection technique, or something similar? **NO**

2. **Software:** Does the part of your protocol being filmed include step-by-step descriptions of software usage? **NO**

3. **Interview statements:** Considering the COVID-19-imposed mask-wearing and social distancing recommendations, which interview statement filming option is the most appropriate for your group? **Please select one**.

   ☒ Interviewees wear masks until videographer steps away (≥6 ft/2 m) and begins filming, then the interviewee removes the mask for line delivery only. When take is captured, the interviewee puts the mask back on. Statements can be filmed outside if weather permits.

4. **Filming location:** Will the filming need to take place in multiple locations? **NO**

Current Protocol Length

Number of Steps: 8
Number of Shots: 14

Introduction

1. Introductory Interview Statements

REQUIRED:

1.1. **Stewart Wuest:** Electrostatic attraction is an efficient way to reduce particulate organic matter in a soil sample.

1.1.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera.

1.2. **Stewart Wuest:** The main advantage of this method is that it requires minimal visual judgement and works on fine particles not visible to the eye.

1.2.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera.

OPTIONAL:

1.3. **Stewart Wuest:** Removing un-decomposed organic fragments improves accuracy and consistency in measuring long-term soil carbon storage.

1.3.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera.

Protocol

2. Preparation

2.1. After collecting soil samples to the desired depth **[1]**, thoroughly dry them at 40 degrees Celsius **[2]**. Sieve the soil through appropriate-sized soil sieves to obtain approximately 10 to 25 grams of sieved soil **[3]**.

2.1.1. WIDE: Establishing shot of talent with the soil samples.

2.1.2. Talent drying the samples.

2.1.3. Talent sieving the soil.

2.2. Place the soil in a clean, dry metal or glass flat-bottomed pan that is large enough for the soil to be spread thin **[1]**. Gently shake the pan horizontally to distribute the soil in as thin a layer as possible **[2]**.

2.2.1. Talent placing the soil in a pan.

2.2.2. Talent shaking the pan.

2.3. Hold a 100-millimeter diameter glass or polystyrene Petri dish top or bottom in one hand and vigorously rub the outer surface with a clean piece of nylon cloth, cotton cloth, or polystyrene foam several times. Perform the surface charging away from the sample **[1]**. *Videographer: This step is important!*

2.3.1. Talent charging the surface.

2.4. When finished, inspect the surface of the Petri dish to make sure that it is clean **[1]**.

2.4.1. Clean Petri dish.

3. Remove particulate organic matter

3.1. Lower the charged surface to within 0.5 to 2 centimeters above the soil and move it horizontally to pick up as much particulate material as possible **[1]**. Attraction to the surface can be noted visually and audibly **[2]**. When the Petri dish no longer attracts additional particles, move the dish away from the sample **[3]**.

3.1.1. Talent picking up material with the charged surface.

3.1.2. ECU: Material being picked up.

3.1.3. Talent moving the dish away from the sample.

3.2. To clean the electrostatic surface, hold it over a collection dish and use a fine brush to transfer the electrostatically attracted material from the Petri dish surface into the collection dish **[1]**. *Videographer: This step is important!*

3.2.1. Talent cleaning the surface.

3.3. Repeat this process until the number of organic matter particles being picked up decreases **[1]**. Redistribute the soil sample by horizontal shaking of the soil pan to expose new material at the surface and continue electrostatic collection **[2]**.

3.3.1. Talent collecting more material.

3.3.2. Talent shaking the soil pan.

3.4. Determine the endpoint by visual inspection of the charged surface **[1]** to determine whether a significant amount of organic particulates has been removed from the soil **[2]**. *Videographer: This step is difficult!*

3.4.1. Talent inspecting the charged surface.

3.4.2. Charged surface after sufficiently cleaning the soil.

Results

4. Results: Particulate organic matter in the fine soil fraction

4.1. This protocol was used for the analysis of silt loam soils from agricultural sites in the Pacific Northwest **[1]**.

4.1.1. LAB MEDIA: Table 1.

4.2. About 1 to 6% of the total soil mass was removed **[1]**. In all cases the proportion of total sample carbon removed was greater than the soil mass removed **[2]**. The carbon concentration and carbon to nitrogen ratio of the electrostatically removed soil fraction was always greater than the remaining soil **[3]**.

4.2.1. LAB MEDIA: Table 2.

4.2.2. LAB MEDIA: Table 2. *Video Editor: Emphasize the C column.*

4.2.3. LAB MEDIA: Table 2. *Video Editor: Emphasize the C:N column.*

4.3. The ambient conditions and the combination of materials used to produce the charged surface affected the results **[1]**.

4.3.1. LAB MEDIA: Table 3.

4.4. The effects of treatment endpoints were examined by collecting a series of three electrostatic samples one after the other from the same soil sample **[1]**. The first treatment collected the greatest amount of carbon **[2]**. The following two treatments were still highly enriched in carbon compared to the remaining soil **[3]**.

4.4.1. LAB MEDIA: Table 4.

4.4.2. LAB MEDIA: Table 4. *Video Editor: Emphasize the 1st treatment row.*

4.4.3. LAB MEDIA: Table 4. *Video Editor: Emphasize the 2nd and 3rd treatment rows.*

4.5. Finally, the amount of particulate material that could be electrostatically removed from the fine silt-size fraction that passed through a 53-micrometer screen was tested on five silt loam soils. The electrostatically removed fractions demonstrated very little enrichment of particulate organic matter **[1]**.

4.5.1. LAB MEDIA: Table 5.

4.6. Microscopic inspection revealed that particulate organic matter does exist in the fine soil fraction of these soils, but in very small quantities **[1]**.

4.6.1. LAB MEDIA: Figure 1. *Video Editor: Emphasize C and D.*

Conclusion

5. Conclusion Interview Statements

5.1. **Stewart Wuest:** The C to N ratio tends to stabilize as incompletely decomposed organic matter is removed. This might lead to better models of long-term soil organic matter.

5.1.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera.