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Optimizing Cover Cropping for Carbon Sequestration Under Future Climate Change Scenarios

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Resilience to climate change in agroecosystems depends on soil carbon (C) sequestration, which involves stabilization of freshly added C. Mineral-associated organic matter (MAOM) is a form of chemically and physically stabilized C in soil that constrains bioavailability and turnover. Particulate organic matter (POM) is characterized by shorter residence times in the soil because it is generally more bioavailable and susceptible to degradation. Optimizing C sequestration to favor buildup of MAOM could help preserve C in agroecosystems undergoing environmental disturbance. In the US Mid-Atlantic, winter conditions are projected to become warmer and wetter due to climate change. Our work examines the effects of soil moisture, as a proxy for future climate change scenarios, on the fate of freshly added C by winter cover crops. We are testing triticale (*X Triticosecale Wittmack*) and hairy vetch (*Vicia villosa*) in undisturbed soil mesocosms under different elevated moisture regimes. Stable isotope 13C-CO_2 is being pulsed and traced among different pools of SOM to understand how changes in soil moisture impact the fate of freshly added C. Fourier transform ion cyclotron resonance mass spectrometry (FTICR-MS) is being used to study the molecular characteristics of each SOM fraction that will first be separated by sonication at specific energies. With this data, we aim to develop new cover cropping strategies for agroecosystems to enhance C storage and mitigate climate stress.