**144-AGR**

**TOPIC : Performance study for winter cover crop species and varieties in Tennessee.**

Cover crops play a crucial role in sustainable agriculture and agroecological conservation, particularly in the context of climate change. However, specific varieties and mixtures suited for different locations like Middle Tennessee remain unidentified. This research evaluated the performance of four cover crop species: namely, Crimson clover, Vetch, Winter pea, and Rye, in Nashville, Tennessee, and is identifying adapted, high quality cover crop varieties for this location. The experiment was conducted using a split-plot design with three replications, and five varieties per the four species. The cover crop species were used as main factors, while the varieties of each species represented sub-plot factors. Seeds were manually planted in Fall 2024 with 7 inch row spacing and 9 row plots. Irrigation was provided for optimal germination. Data collection during the Winter season, included aerial metrics, such as fall emergence, spring stand, weed suppression and biomass. Canopy coverage and biomass accumulation were quantified using an OakD Monocam imaging system on a 1.5 m pole leveled with a gamble RGB and stereoscopic camera and software from the National Winter Cover Crop variety trial coordinators at NCSU and University of Missouri. Initial results indicated that ryegrass exhibited the highest canopy coverage and biomass production, followed by winter peas and crimson clover. Root morphology and measurements will be conducted for each plot. Soil samples from rhizosphere regions will be collected for DNA extraction to analyze microbial diversity through 16S rRNA sequencing, evaluating alpha diversity, beta diversity, and species abundance. This multi-method approach aims to determine high-performing cover crops and microbial synergies to strengthen agroecological sustainability in Tennessee. This study will also evaluate 16S rRNA-based metagenomic analysis of rhizosphere associated bacteria for their contribution to sustainable agricultural productivity by soil sampling at surface and 20 cM depth at cover crop termination. Additionally, post-frost aerial imagery captured using a DJI Mavic Pro drone will facilitate the calculation of Normalized Difference Vegetation Index (NDVI), Leaf Area Index (LAI), and Green Leaf Index (GLI).