Southern Cover Crops Conference 2026

Unlocking the Secrets of Cover Cropping in the South

Poster Session

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Professional Poster Session

Poster #1: Benchmarking Soil Health in Cotton for the Georgia Southern Coastal Plain

Emily Ball — Soil Health Institute

Soil health improvement can contribute to improved environmental conditions beneficial to cotton production including minimized erosion, improved water infiltration, increased nutrient availability and reduced disease pressure. Soil health management systems (SHMS) include practices that minimize soil disturbance, maximize diversity, increase plant residue on the soil surface and maintain a living root system in the soil. Setting goals for soil health improvement, however, requires an understanding of how healthy a region's soil can be. To do this, the Soil Health Institute led a soil sampling campaign in the Southern Coastal Plain region of Georgia to compare minimally disturbed reference sites with typical baseline systems as well as regenerative soil health systems. Essential indicators that were measured for 131 locations included organic carbon concentration, aggregate stability, and carbon mineralization potential. Additionally, predicted available water holding capacity was also calculated. In this region, fields utilizing soil health practices had, on average, an increase of 18% soil organic carbon concentration, 11% aggregate stability, 22% carbon mineralization potential, and 3% predicted available water holding capacity. Results indicate that agricultural fields can achieve soil health indicator values of 50% or more of the reference values and soil health management systems can further improve these values.

Poster #2: Beneficial Cover Crops for Tennessee Nurseries

Kaitlin Barrios — Tennessee State University

Tennessee has an area of roughly 17,800 football fields (over 23,600 acres) of nursery production in the open (without a shade house or other covered structure) according to the 2022 USDA Census of Agriculture. Much of that land is field-grown plants that will be dug and sold as bareroot or balled and burlapped (B&B) stock. After a new row of crops is transplanted, the soil surface can remain bare for several months, which is prone to structural decline and erosion, especially during heavy rain and/or strong wind. During summer, increased temperature of bare soil can stress plant roots, kill soil microorganisms and excessively evaporate soil moisture. In addition to water loss, bare soil is prone to losing nitrogen (N) and other nutrients through volatilization and during rain or irrigation via leaching and/or runoff. When harvesting ornamental trees and shrubs in field production, accompanying soil is lost. Since amending soil with bulk organic material is not economically viable, growers can employ best management practices such as not tilling to suppress weeds and sowing cover crops to improve soil (SARE, 2012). There are approx. 620 licensed businesses in middle TN (and 1,000 statewide) producing flowering shrubs and trees, conifers and broad-leaf evergreen plants (TN Dept. of Ag.). To identify ideal cover crop species and application methods for the middle TN region, Dr. Anthony Witcher's lab conducted research trials at the Otis L. Floyd Nursery Research Center and participating growers' fields. From these trials, species mixes of cool season cover crops were identified, along with seeding rates. Recommended mixes, rates, methods and additional details will be presented. A TSU Cooperative Extension factsheet and an industry magazine article have been published of these recommendations to inform and encourage TN growers to utilize cover crops on their nurseries.

Poster #3: Covercrops: A Correlation to Biomass and Units of Nitrogen

Cliff Collins — University of Georgia Cooperative Extension

What are the benefits of cover crops? Does cover cropping return fertility to the soil? We hear regularly that cover cropping is too expensive to make it worth the return Long-term cover cropping is not a topic that has been largely studied in the south. Cover cropping is an integrated, dynamic system that takes time to study and understand the benefits. A long term, large plot research trial was used, where there are twelve row plots randomized and replicated four times. There are three treatments and a control: Cereal Rye alone, Cereal Rye and Red Clover Mix, six-way mixed species mix, and conventional/no cover plots (control). All 16 plots are planted with a cash crop each year: Corn, Cotton, or Peanuts and then after harvest each year, the plots with treatments are planted with the cover crop for that plot. Before termination in the spring, the three treatments are harvested to biomass measurement and then sent to the UGA Agriculture and Environmental Services Lab for Nitrogen Return Analysis. This study has allowed further research into soil health, nematode populations, biomass amounts, water infiltration, soil electroconductivity, soil analyses and many other studies. This study has shown that the higher level of biomass leads to a larger nitrogen credit return. It has also shown that the best “bang for the buck” when referring to nitrogen return is the Mixed Species block. It averages out to be $1.00 per acre for 1 unit of nitrogen return. Whereas Cereal Rye and Crimson Clover averages out to be about $1.10 per acre for one unit of nitrogen return. Lastly, Cereal Rye alone costs about $3.80 per acre for 1 unit of nitrogen return. All in all, the study has determined that cover cropping can be valuable for both soil health and for fertility value return.

Poster #4: CHEERS - Conservation Hub for Economic Empowerment of Rural Stakeholders

Jose Dubeux — University of Florida

Currently, 95% of the 4.1 million acres of cropland in FL, AL, and GA is let to fallow after harvesting the summer row crops. This productive land could be used for winter cropping systems, including integrated crop-livestock systems, oilseed crops, grain crops, and vegetable crops. These winter cropping systems will create economic development and promote partnerships among farmers, including opportunities for the younger generation to start farming. Maintaining living roots in the ground year-round helps to build soil health and reduce nitrate leaching, helping our environment as well. A novel aspect of this project is that farmers and ranchers, at the project and state level, will “co-create”, with an interdisciplinary team of researchers, extension educators and value chain stakeholder partners, the design, implementation and assessment components of the five-year project. This will involve a nontraditional, cross boundary and transdisciplinary approach to problem solving and the adoption of interwoven systems and practices that concurrently deliver multiple ecosystem services. Our HUB will bring stakeholders together to discuss challenges and opportunities to promote winter cropping systems in the Tri-State area. The stakeholder group will be embedded in the project leadership helping to finetune our actions and making our outcomes impactful to change the current scenario and understand the bottlenecks for adoption. We envision our team working together with the farming community and use their input to co-create opportunities in the agricultural sector and have positive social, economic, and environmental benefits to our region. The expected results include the improvement of the social and economic status of rural areas in the Southeast while building soil health and reducing nitrate leaching from our agricultural fields.

Poster #5: Resources and Tools from GROW (Getting Rid of Weeds)

Michael Flessner — Virginia Tech/GROW

Herbicide-resistant weeds have increased globally, with major economic consequences for farmers. The GROW (Getting Rid of Weeds) Network is a scientist-led network offering research and education to help farmers and land managers adopt integrated weed management (IWM) tactics. The GROW team consists of agronomists, weed scientists, communicators, and economists from around the U.S. with support from the federal government, commodity boards and the private sector, with the goal of helping producers combat herbicide resistance through the implementation of diverse weed control strategies. GROW research has focused on IWM strategies such as cover crops, harvest weed seed control and precision weed management technology. Via its website (https://growiwm.org/), GROW provides resources to advance these and other IWM practices through weekly news posts, Farmer Forums (farmer led webinars), educational web pages and factsheets, decision support tools, and farmer case studies. By integrating multiple weed control tactics, we can effectively manage herbicide-resistant weeds while mitigating herbicide resistance development.

Poster #6: How Cover Crop Species and Termination Timing Affect Slug Pressure, Nutrient Cycling, and Soybean Yields

Joseph Haymaker — Virginia Tech

In Virginia's Coastal Plain, cover crops (CC) are widely used to improve water quality and soil health, yet they can also increase slug pressure in soybean systems. This study investigated how CC species and termination timing influence slug populations, nutrient cycling, and soybean yield. A split-plot experiment at Virginia Tech's Eastern Shore AREC evaluated cereal rye, black oats, and wheat terminated at four timings (March 15, two weeks pre-plant, at planting, and two weeks post-planting), alongside a no CC control. Measurements included slug population dynamics, soybean seedling damage, CC biomass and nutrient accumulation, and soybean nutrient uptake and yield.

Biomass did not differ among CC species ($p=0.068$) but increased significantly with later termination, averaging 89 lb./acre/day ($R2=0.79$) after mid-March termination. Nitrogen accumulation was similar across species ($p=0.292$), while differences were observed for P_2O_5 ($p=0.005$; $LSD0.05=2.6$) and K_2O ($p<0.001$; $LSD0.05=14$). Cereal rye accumulated more P_2O_5 (24 lb. P_2O_5/acre) than black oats (21 lb. P_2O_5/acre) and wheat (19 lb. P_2O_5/acre), whereas black oats accumulated the most K2O (108 lb. K_2O/acre), compared to cereal rye (78 lb. K_2O/acre) and wheat (66 lb. K_2O /acre).

Soybean slug damage was significantly greater in the CC treatments ($p<0.001$), with 85–90% of plants damaged at two weeks after planting and 97–99% at five weeks, compared to 64% and 86% in the no CC control; however, termination timing had no effect on slug damage. Despite increased slug damage in CCs, soybean yields did not differ significantly across the CC species and the no CC control ($p=0.471$). Within cereal rye and black oats, however, yields were reduced when CCs were terminated two weeks after planting (45.8 and 40.1 bu./acre, respectively) compared to earlier termination (49.8–55.4 bu./acre; $LSD0.05=5.8$). Mid-March termination of cereal rye did not differ from two weeks post-planting, while wheat showed no yield differences across termination timings.

Poster #7: Cover Crops as a Soil Health and Nutrient Management Strategy for Florida Vegetable Systems

Laura Jalpa — Lygos

The sandy coastal plain soils of Florida present persistent challenges for tomato production, including low soil organic matter (SOM), rapid nutrient turnover, and limited carbon retention. Evaluations of conventional tomato production under drip-irrigated plasticulture showed that nitrogen (N) fertilization effectively met crop demands during the season, yet SOM levels typically remained below 1%. These conditions highlighted the importance of incorporating organic inputs to strengthen nutrient cycling and long-term soil functionality.

To address this need, multi-year cover crop trials were conducted using grass species such as winter rye and sorghum-sudangrass to evaluate biomass production, seasonal compatibility, and nutrient capture within tomato rotations. Both grasses contributed meaningful carbon inputs and consistently recovered residual fertilizer N, with winter rye accumulating 6.9 to 14.9 kg N ha^{-1} and sorghum-sudangrass accumulating 8.4 to 11.1 kg N ha^{-1} across seasons. These findings confirmed the utility of grass cover crops for enhancing SOM inputs and supporting improved nutrient retention in sandy soils. A subsequent soil-health focused experiment expanded the evaluation to include the legume sunn hemp. Across seasons, cover crops enhanced active carbon, soil protein, and microbial diversity, all of which are key indicators of biologically driven soil improvement. Microbial community analyses revealed regionally distinct patterns but consistently more diverse and even communities in cover-cropped soils. North Florida soils showed greater abundances of nutrient-associated Proteobacteria such as Burkholderiales, while south Florida soils supported microbial groups linked to high organic matter turnover.

These results demonstrate that cover crop integration enhances the biological and chemical foundations of soil health, even over short timeframes, while maintaining stable physical properties under Florida's commercial tomato production systems. Together with observed improvements in nutrient cycling, these soil-health gains highlight the value of cover crops as a practical and regionally adaptable strategy for building long-term soil function in vegetable systems.

Poster #8: Rainfall Simulator and Produce Safety Education

Billy Mitchell — UF FSHN IFAS

Speciality crop growers may be covered by the Food and Drug Administration's (FDA) Food Safety Modernization Act's (FSMA) Produce Safety Rule (PSR). One requirement of the PSR is for growers to assess their agricultural water sources and determine how to reduce hazards, such as fecal-oral pathogens, dirt, and debris, from impacting those water sources. Research has shown that covered soil can reduce the movement of pathogens, dirt, and debris into agricultural water sources. The rainfall simulator simulates rainfall over soils with different levels of cover that may range from bare ground, grass cover, and cover cropped soils. This educational tool has traditionally been used by the Natural Resources Conservation Service (NRCS) and Extension to demonstrate the impact different covers on soils may have on runoff and infiltration, simulates rainfall over soils with different levels of cover that may range from bare ground, grass cover, and cover cropped soils. This educational project used the traditional presentation of the rainfall simulator and added fake bird poop with Glo Germ to the top of the soils to visually demonstrate the potential movement of pathogens and the impact covered soils

may or may not have on that movement. Glo Germ glows under black light and a blacklight will visually reveal how much of the Glo Germ has run-off off or infiltrated into soils with different cover. This educational project also provides an opportunity for NRCS, Agricultural and Natural Resources (ANR) Extension staff, and produce safety educators to collaborate and potentially reach a wider audience of growers while educating on the benefits of cover cropping including the traditional eco-system benefits communicated at workshops and the potential to reduce produce safety risks.

Graduate Student Competition- MS

Poster #9: Evaluating Cover Crop Mediated Palmer Amaranth Suppression in Cotton-Corn Rotation System (MS Competition)

Himani Ahlawat — University of Georgia, Athens, Georgia

Palmer amaranth is a pernicious weeds across agricultural production systems due to rapid growth, herbicide resistance, and high fecundity. These challenges underscore the need to investigate Integrated Weed Management (IWM) systems. A multi-year research study was conducted in Watkinsville, Georgia, from 2019 to 2025, using a randomized complete block design with three cover crop treatments: crimson clover, cereal rye, white clover (living mulch), and a bareground control. This study investigates the effect of cover crops on the germination rate, fecundity, and recruitment of Palmer amaranth. Cotton was grown from 2019 to 2023. In 2024, the field was rotated to corn to evaluate Palmer amaranth responses to cover crop use and crop rotation. The early-season seed bank in 2023 showed 26 times more seeds in the seedbank under living mulch treatment compared to bare ground. However, the seedbank from 2024 showed no differences among any of the cover crop treatments. Despite the differences in seedbank composition in 2024, the total number, total biomass, and male-to-female ratio of Palmer amaranth did not show differences among all treatments. The research also indicated that rotating cotton with corn reduced Palmer amaranth's fecundity by approximately 50% in bare ground and nearly 25% under living mulch conditions, demonstrating a strong rotational effect. In the 2024–2025 season, crop yields did not differ between any cover crop treatment and the bare ground control. Further research is needed to investigate the long-term impacts of corn rotations with cotton on Palmer amaranth demographics, where living mulches have been implemented.

Poster #10: Cover Crop Strategies for Better Nitrogen Use Efficiency in Corn (MS Competition)

Joseph Burch — Auburn University

Cover crops are increasingly recognized for their potential to improve nitrogen (N) use efficiency in corn production systems, particularly under the sandy loam soils and high N demand conditions common in Alabama. This study, conducted at the Gulf Coast Research and Extension Center in Fairhope, AL, evaluates multiple cover crop strategies and their impact on N dynamics and corn performance. A randomized split-plot design was implemented with cover crop treatments as main plots and four N fertilizer rates (0, 40, 80, 120 lb N/ac) as subplots. Cover crop strategies included fallow, crimson clover terminated prior to planting, Durana white clover and alfalfa that were band sprayed over the row prior to planting. Measurements included nitrogen concentration in ear leaf tissue at VT, biomass at R4 and black layer, and grain yield at harvest. Preliminary results indicate that living mulch systems, such as

non-terminated clovers, reduced corn yield due to competition, while crimson clover provided higher biomass and N contribution compared to white clover. Winter legumes demonstrated potential to supply up to 40 lb N/ac when biomass reached 2 tons/ac. Future work will refine spray width and timing to mitigate competition and explore alternative cover crops to optimize N use efficiency in Alabama corn systems.

Poster #11: Cover Crop Impacts on Soil Fertility in a Century-Old Fertility Experiment (MS Competition)

Laura Melo Sciencia — Auburn University

Cover crops play a central role in nutrient cycling and soil fertility improvement in the southeastern United States. In particular, legume cover crops are valuable for supplying N in the highly-weathered, low organic matter soils of the region. Established in 1911, the Cullars Rotation, located on the Auburn University campus in Alabama, is the oldest continuous soil fertility experiment in the Southern U.S. The experiment includes 14 fertility treatments designed to assess the long-term impacts of specific nutrient application exclusions or with and without winter legumes (crimson clover and hairy vetch). Crops are rotated annually through a three-year sequence (cotton, corn, wheat, and soybean) and have been managed under conservation tillage since 1997. Soil samples were collected to 10 cm (~4 in) in 2020 to evaluate soil health indicators including soil organic matter (SOM) and ACE protein, an indicator of potentially mineralizable nitrogen. Soil samples were collected in 2025 to 90 cm (~3 ft) depths for soil pH and Mehlich-1 extractable nutrient analysis. Crop yields have been recorded according to treatment since 1911. Mehlich-1 extractable nutrients and soil pH did not differ between treatments with and without winter legumes. However, winter legumes increased both SOM and ACE protein in the no N treatments, indicating improved N availability from soil organic matter mineralization. Corresponding yield increases were also observed in the no N plots with a winter legume, showing a 126% increase in corn yield and an 8% increase in cotton lint yield compared with the no N plots without a legume cover crop. SOM and ACE protein were highest in complete fertility and lowest in no amendment plots. These results suggest that integrating winter legumes with improved fertilizer management can enhance soil health and support higher crop productivity.

Poster #12: Flying Seeds: Maybe a Solution for Delayed Cover Crop Planting (MS Competition)

Kamana Pilania — University of Georgia

Cover crops have been an integral part of integrated weed management strategies for cotton. However, end-of-season operations like defoliation, harvesting, and crop residue management in cotton delay the timely seeding of cover crops. To evaluate early establishment of cover crops, a drone trial to seed cover crops was initiated in 2024 at three on-farm locations in Georgia. The study design was a randomized complete block design with a 3 by 3 factorial arrangement of treatments with a non-treated check included and 4 replications. The first factor was timing of cover crop seeding: 14 Days before defoliation (drone), after picking (drone), and a grower standard practice using a ground spreader after harvest. The second factor was cover crop mixture: single species (‘Wrens Abruzzi’ rye @ 67.25 kg/ha), two species mix (‘Wrens Abruzzi’ rye @ 50.44 kg/ha with ‘Dixie’ crimson clover @ 11.21 kg/ha) and four species mix (‘Wrens Abruzzi’ rye @ 22.42 kg/ha, ‘Coker’ oat 22.42 kg/ha, ‘Dixie’ crimson clover @ 6.73 kg/ha, and ‘AU ‘Merit’ vetch @45 kg/ha). Cover crops were evaluated for germination, established stand diversity, cover crop canopy coverage, and biomass by species.

The pre-defoliation cover crop planting had significantly greater biomass compared to the drone and grower standard planting after picking. The major composition of biomass was rye in the two and four-species mixtures. The results show that the overall performance of early drone-seeded cover crops is better than drone seeding or ground broadcasting practices of cover crops after picking.

Poster #13: Effect of Cover Crops and Crop Rotation on Soil Organic Matter in a 130-Year Cotton Rotation Experiment in the Southeastern US (MS Competition)

Cecilia Sagastume — Auburn University

Cover crops and crop rotation are beneficial practices for improving soil organic matter (SOM) concentrations and overall soil health in southeastern crop production systems. Approximately 58% of SOM is comprised of soil organic carbon (SOC). Within SOM, we differentiate between two fractions: Particulate Organic Matter (POM), which is more easily decomposed by soil organisms, and Mineral-Associated Organic Matter (MAOM), which is more stable in soil. Long-term studies are beneficial to assess the impact of management practices on SOM over time. The Old Rotation Experiment in Auburn, Alabama, has been ongoing since 1896 and includes treatments of continuous cotton with and without winter legumes and N fertilizer, as well as cotton-corn and cotton-corn-wheat-soybean rotations with and without legumes and N fertilizer. The objective of our study was to evaluate the long-term effects of cover crops and crop rotation on SOM storage at The Old Rotation. Soil samples were collected to a depth of 90 cm (~3 ft) and analyzed for POM, MAOM and SOM. Treatments with a diverse crop rotation and a cover crop had up to 2.9- and 6.4-times greater SOM in the top 5 cm (2 in) when compared to a continuous cotton rotation without a legume. SOC stocks were higher in treatments with a diverse crop rotation. The Cotton-Corn-Wheat-Soybean stored up to 39.65 Mg ha^{-1} of which 27.14 Mg ha^{-1} of C represented the MAOM fraction and 12.51 Mg ha^{-1} of C the POM fraction. Cotton-Corn stored up to 41.28 Mg ha^{-1}, in which 26.95 Mg ha^{-1} C represented MAOM and 14.33 Mg ha^{-1} C the POM fraction. Results suggest that cover cropping and crop rotation positively affect long-term SOC sequestration and, therefore, SOM storage, which is a central indicator of soil health and critical to maintaining crop productivity.

Poster #14: Impacts of Cover Cropping on a Smallholder South African Farm in Western Cape (MS Competition)

Will Ubben — Virginia Tech

In 2023, a smallholder farmer in Western Cape, South Africa, secured 80-ha from the government with the mission of providing food and education to the nearby township of Khayelitsha. The farmer was given 5 years to demonstrate productivity, but faces many challenges, including a lack of agricultural background and sandy soils (>90% sand) with low fertility. In collaboration with the smallholder farmer, Virginia Tech established the Western Cape Research and Education Farm (WeCaRE farm), a site for both research and community outreach. The farm is designed as a demonstration space where visitors can see the benefits of soil health practices such as cover cropping and compost use.

WeCaRE farm plots were arranged in a randomized complete block design with three replicates. Treatments included a no amendment control and inorganic N fertilizer treatment; single specie cover crops (CC) of field pea and faba bean; cow manure compost applied at a low-rate (141 kg ha-1) or high-rate (428 kg ha-1), each combined with a faba bean CC; and two CC mixtures, a high residue mix (faba

bean, field pea, and forage oat) and a high diversity mix (faba bean, field pea, forage oat, red clover, barley, and phacelia).

Vegetables selected by the farmer are continuously grown using conventional practices. Crop yield is measured at harvest, and leaf chlorophyll content is assessed with a handheld SPAD meter. This study aims to demonstrate practical strategies for improving productivity and soil health in challenging environments, while providing educational opportunities for the surrounding community.

Graduate Student Competition- PhD

Poster #15: Breeding Red Clover for Biomass and Seed Yield (PhD Competition)

Emmanuel Affram — University of Florida

Genetic variability is a prerequisite for effective crop improvement and sustained genetic gain. To develop a breeding population targeting enhanced seed yield and biomass potential in red clover, 20 full-sib families—each represented by 45 plants (900 individuals total)—were phenotyped for vegetative and reproductive traits. Measurements included plant height (PH), canopy diameters (d_1 and d_2), days to first flowering (DFF) and 95% flowering (D95F), number of inflorescences per plant (HNP), and seed yield, all evaluated in a randomized complete block design with individual-plant data collection. Due to a constrained seed-threshing window for seed-yield data, a two-stage phenotypic selection strategy was implemented. First, all 900 individuals were ranked by HNP, a trait previously reported to be strongly correlated with seed yield. The top 450 plants were retained for further evaluation. A Growth Index (GI), calculated as GI=1/2 PH+1/4(d_1+d_2), was used as a proxy for biomass potential. A GI × HNP bivariate plot was then constructed to classify individuals into four quadrants (Q1–Q4) reflecting combinations of vegetative vigor and reproductive performance: Q1 = high GI/high HNP; Q2 = low GI/high HNP; Q3 = low GI/low HNP; and Q4 = high GI/low HNP. Based on this classification, 200 individuals were selected and threshed individually to generate half-sib family bulks. Analysis of variance revealed highly significant differences among the 200 half-sib families for seedling emergence ($P < 0.0001$). A broad-sense heritability estimate of 0.81 for seedling emergence indicated a strong underlying genetic signal (LR statistic 117.14, $P < 0.0001$). Together, these results demonstrate the utility of GI and HNP as effective aids to selection, providing a robust foundation for improving seed yield and biomass potential in red clover.

Poster #16: Identifying Genetic Resistance to Guava Root-Knot Nematode in Cowpea for Sustainable Rotations and Cover-Crop Integration (PhD Competition)

Habib Akinmade — University of Florida

Meloidogyne enterolobii, the guava root-knot nematode, is fast becoming one of the most damaging soilborne pests in the southeastern United States, threatening vegetable, legume, and cover-crop systems. Cowpea (*Vigna unguiculata*) is widely used for soil improvement, nitrogen fixation, forage, and as a rotational cover crop, yet durable resistance to *M. enterolobii* has not been established. To identify resistance sources suitable for sustainable cropping systems, we evaluated the UCR cowpea minicore across four seasonal replications (2023–2025), quantifying gall rating, reproduction factor (RF), and eggs per root mass (EPRM). Significant phenotypic variation was observed for all traits, with moderate to high

broad-sense heritability (H^2 = 0.35–0.73). Resistance traits were positively correlated (r = 0.42–0.76), and classification schemes showed diverse response types, including true-resistant, tolerant, hypersensitive, and susceptible accessions. Notably, several commercial cultivars we used as checks clustered in the highly susceptible group. Genome-wide association analyses using FarmCPU and BLINK identified 11 significant SNPs across chromosomes 1, 3, 4, 6, and 10. A major locus on chromosome 4 (SNP 2_13574) was consistently detected across all traits, explaining up to 21% of phenotypic variance and co-localizing with the known Rk QTL resistance region. Additional loci on chromosomes 1, 3, 6, and 10 showed novel genomic regions not previously associated with nematode resistance. Candidate genes near significant SNPs highlighted functions related to cell-wall modification, vesicle trafficking, signal transduction, and transcriptional regulation. Our findings provide the first genomic dissection of *M. enterolobii* resistance in cowpea and identify strong candidate parents for breeding programs aimed at developing nematode-resistant cowpea cultivars for resilient southern cover-crop and rotational systems.

Poster #17: Comparison of Black Oat (*Avena strigosa* S.) and Cereal Rye (*Secale cereale* L.) Cover Crops (PhD Competition)

Jenna Beville — Auburn

Cover crops play a key role in many cropping systems and provide both agronomic and environmental benefits. Farmers in the mid-Atlantic region oftentimes favor cereal rye (*Secale cereale* L.) due to its biomass production and weed suppression ability. However, cereal rye can have a high carbon to nitrogen (C:N) ratio, which oftentimes causes nitrogen immobilization. Thus, many Virginia farmers have started considering black oats (*Avena strigosa* S.) as a substitute for cereal rye. To compare biomass production and nutrient composition as well as weed suppression of black oat and cereal rye cover crops, experiments were conducted at two Virginia locations. Cover crop biomass samples were collected throughout April using randomly placed 0.25 m^2 quadrats in each plot. Weed density was assessed on the top five weed species present at each location one month after soybean (*Glycine max* L.) planting using two 0.5 m^2 quadrats placed randomly in the middle interrow of each plot. At soybean planting, cereal rye produced more biomass (4622.5 kg ha^{-1}) on average compared to black oats (3442.5 kg ha^{-1}). The cereal rye's lignin content (~4%) was also more than black oats (~2.4%). C:N ratios of both cover crops were similar at planting and gradually increased during April. Also, black oats tended to suppress fewer weeds than cereal rye likely due to less biomass accumulation. Overall, these results indicate that black oats are not an effective substitute for cereal rye for weed suppression or to avoid nitrogen immobilization.

Poster #18: Assessing the Viability of Pennycress for Double Cropping Systems in Tennessee (PhD Competition)

Bailey Burns — University of Tennessee

Pennycress (*Thlaspi arvense*) is a novel winter oilseed species with both environmental and economic benefits through biofuel manufacturing. This species shows potential for integration into Tennessee corn and soybean rotations, yet limited information is available on agronomic performance, particularly in response to planting date and regional growing conditions. To evaluate the effects of these factors and how they influence crop yield and development, a field trial was conducted during the 2024-2025

growing season at two Tennessee locations (Springfield and Knoxville) using a split-plot design with four replications. Five planting dates were evaluated: September 15th, October 1st, October 15th, November 1st, and November 15th. Five varieties were represented within each planting date, and phenological development and yield data was collected throughout the season. Data are being analyzed and will be presented. Findings from this work will inform optimal planting dates and varietal selection for pennycress establishment and productivity in Tennessee.

Poster #19: Nutrient Cycling of Leguminous Living Mulch in Organic Corn (PhD Competition)

Andrew Lawson — University of Tennessee

Organic corn production faces two significant challenges: supplying sufficient nitrogen and suppressing weeds. Living mulch is a cover crop grown in tandem with a cash crop. This system can suppress weeds, add nutrients through fixation and desiccation, and protect against pests by offering habitat resources to beneficial insects. An organic corn and living mulch system was planted in Knoxville and Spring Hill, TN, USA, during 2024 and 2025, with the overall goal of comparing the nitrogen contribution and corn yield response among six living mulch systems. Treatments included four leguminous species: white clover (*Trifolium repens* L.), red clover (*Trifolium pratense* L.), crimson clover (*Trifolium incarnatum* L.), and hairy vetch (*Vicia villosa* Roth), and two controls: hairy vetch cover crop, terminated at planting, and winter fallow. Corn tissue samples were evaluated for nutrient composition (N, P, K) at growth stage V6, V10, and R1 while stalk, grain samples, and grain yield were evaluated at harvest. Corn data was evaluated using a mixed model analysis of variance in SAS® 9.4. Results will be presented.

Poster #20: Interseeding Buckwheat Improves Corn Crown Root Traits and Performance in Reduced-Till Organic Systems (PhD Competition)

Luvina Madrid — Clemson University

Interseeding cover crops into standing organic corn is a potential strategy to improve soil function and crop resilience. However, its effects on corn crown root traits remain poorly understood. To explore this, a field trial was conducted in 2023 at Clemson, SC, to evaluate how buckwheat, pigeonpea, white clover, and a mixture of the three, interseeded at the V8–V9 corn growth stage, under conventional and reduced tillage, shape corn crown root traits and aboveground performance in an organic production system. Corn crown roots were excavated at physiological maturity, washed, and scanned using WinRHIZO to quantify total root length, surface area, average diameter, crown root volume, fine roots and coarse roots. Corn shoot biomass and grain yield were measured at physiological and harvest maturity, respectively. Among tillage treatments, reduced tillage showed higher total root length and surface area compared to conventional tillage. Across treatments, reduced tillage without cover crops produced the lowest total crown root length and surface area compared with conventional tillage. Responses varied among species, but buckwheat had the most significant contrast to the reduced-till control. Buckwheat-interseeded corn under reduced till, exhibited higher crown root length, surface area, and volume than the reduced-till control. Additionally, thinner roots were observed in corn with interseeded buckwheat under reduced tillage. Aboveground responses aligned with these root patterns. Corn shoot biomass was higher in the reduced-till buckwheat treatment than under conventional tillage, and grain yield showed a similar trend. These results showed that buckwheat interseeding enhanced the benefit of reduced till for organic corn. Reduced tillage reduced crown root growth and fine-root

production in the control; however, when buckwheat was interseeded, reduced tillage coincided with greater fine-root development, higher crown root surface area, and modest improvements in biomass and yield.

Poster #21: Cover Crop Integration and Nitrogen Fertilizer Rate Impacts on Cotton Physiological Responses and Productivity (PhD Competition)

Nkem Nwosu — University of Florida

Integration of cover crops (CCs) and optimal nitrogen (N) fertilizers rates are potential nutrient management practices for enhancing global crop performance. However, the impact of CCs and N rates on cotton physiology and yield is dependent on the CC type and CC combination, location, termination timing, cash crop, and stage of cash crop growth. Therefore, the response of cotton (*Gossypium hirsutum* L.) physiology and yield to combined influence of CCs and N rates was evaluated at the West Florida Research and Education Center in Jay, FL. The NG 3195 cotton variety was seeded in a split-plot design consisting of four CCs [cereal rye, crimson clover, cereal rye + crimson clover, white clover (as living mulch), and no cover crop (as control)] as main-plot factor and four N-rates [0, 50, 101 and 151 kg N ha^{-1}] as sub-plot factor. All CCs except white clover were chemical terminated and rolled prior to cotton seeding. Data was collected on normalized difference vegetation index (NDVI), leaf area index (LAI), relative water content (RWC), and cotton lint yield. No cover gave the highest interaction effect on NDVI ($p<0.001$) and highest main effect on LAI ($p=0.023$). The N rate at 101 kg ha^{-1} had the best RWC across the cotton growth stages. Crimson clover and N rate at 151 kg ha^{-1} gave the best lint yield under FL conditions, indicating the importance of CCs type and optimal N rates for improving cotton physiology and yield in FL sandy soils.

Poster #22: Impacts of Cover Crops and Soil Amendments on Soil Health and Tree Performance in Florida Sandy Soils (PhD Competition)

Jose Prieto — University of Florida - Citrus Research and Education Center

Cover crops are increasingly being promoted to enhance soil health, nutrient cycling, and overall resilience in perennial citrus systems, yet evidence from commercial groves in Florida is limited. In 2025 we established a field experiment in a commercial organic Sugar Belle ®mandarin hybrid (“Clementine” mandarin × “Minneola” tangelo) grove in central Florida to evaluate how cover crops and organic amendments influence soil properties and citrus fruit quality. The trial follows a strip-field layout and includes two warm-season cover crop species: Cowpea (*Vigna unguiculata*) and Sunn hemp (*Crotalaria juncea*), grown with or without an organic amendment blend (orange-peel powder and compost). A no-cover, no-amendment control is maintained as a baseline. Our hypothesis is that cover crops, alone or combined with amendments, will contribute to plant-available nutrients that can be detected in the soil and reflected in citrus performance and juice quality. Nearly one year into the study, several practical insights have emerged. We found that establishment success was highly dependent on rainfall timing and species characteristics. Cowpea germinated reliably across the site, while Sunn hemp showed limited emergence, highlighting the need to match species to local soil moisture patterns. Spatial heterogeneity in soil texture, organic matter, and existing nutrient levels created additional confounding, requiring careful georeferencing and repeated seasonal sampling to distinguish treatment effects from background variability. Preliminary soil measurements indicate clear seasonal shifts in

nutrient availability. In late November 2025, the first fruit sampling event was completed to quantify treatment-level impacts on juice quality parameters. This ongoing project provides early evidence that integrating cover crops and organic amendments into organic citrus systems presents both opportunities and logistical challenges. Continued monitoring across seasons will help clarify whether these practices can meaningfully enhance nutrient availability and fruit quality under commercial Florida conditions.

Poster #23: Corn Growth and Yield Response to Nitrogen Rates Under Living Mulch and Terminated Legume Cover Crop System (PhD Competition)

Kulpreet Singh — University of Florida

Legume cover crops can influence nitrogen (N) availability and subsequent corn productivity depending on termination timing and management. A field study evaluated the effects of cover crop type including terminated crimson clover (*Trifolium incarnatum* L.; CC), living white clover (*Trifolium repens* L.; WC), and no cover control (NC) combined with four N rates (0, 80, 160, and 240 kg N ha^{-1}) on corn biomass accumulation and yield. Both cover crop ($p < 0.001$) and N rate ($p < 0.001$) significantly affected biomass, with the highest accumulation under CC (12,199 kg ha^{-1}), followed by NC (10,695 kg ha^{-1}) and WC (7,125 kg ha^{-1}). Grain yield showed a significant cover crop × N rate interaction ($p = 0.01$). At 240 kg N ha^{-1}, CC and NC produced greater yield (14.3 and 13.2 Mg ha^{-1}) than WC (7.24 Mg ha^{-1}). Similar trend was observed at 80 and 160 kg ha-1 where CC and NC had significantly higher yield than WC. However, no difference was observed among cover crops at 0 kg ha-1. Yield exhibited a quadratic response to N, while biomass increased linearly ($R^2 = 0.89$), indicating yield was biomass-limited rather than N-limited. CC achieved higher biomass and yield at lower AONR (226 kg N ha^{-1}), whereas WC, maintained as live mulch, suppressed corn growth and yield across all N rates. These results indicate that terminated legumes can enhance N efficiency and yield potential, while live mulches may constrain early growth through resource competition.

Poster #24: Evaluating a Cowpea Cover Crop as Living Mulch for Weed Suppression in Hemp (PhD Competition)

Moriah Williams — University of Florida

Industrial hemp (*Cannabis sativa* L.) for fiber is an emerging crop for Florida that can provide carbon sequestration during crop production in addition to yielding fiber and hurd, which can be used in a host of products. Due to relatively slow germination and establishment, hemp can quickly be overwhelmed by fast germinating weeds. Currently, only a single herbicide is registered for use in hemp in Florida. Since cowpea (*Vigna unguiculata* (L.) Walp.) has been used effectively as living mulch in corn (*Zea mays* L.), we hypothesized that cowpea can be used as a living mulch for cultural weed management in hemp. The objective of the field trial was to evaluate the effect of time of cowpea living mulch planting, hemp seeding rate, and hemp row spacing on weed suppression, and hemp establishment and yield. The HanNE hemp variety was planted at 15, 30, and 45 lb/acre with 7.5- and 15-in between-row spacings. Cowpea (US-1138) was planted at 0, 7, and 14 days after planting (DAP) hemp. Hemp plant density was higher with delayed cowpea planting than with same day planting and hemp density increased as seeding rate increased. However, neither cowpea planting date nor hemp seeding rate had a significant effect on hemp biomass. With the 7.5-in spacing, weed density and weed biomass were more effectively

suppressed with cowpea planted at 0 and 7 DAP than at 14 DAP. With the 15-in row spacing, there was no significant effect of planting date on weed density, but weed biomass was higher with cowpea planted 7 DAP hemp than at 0 and 14 DAP. The cowpea living mulch exhibited a vining growth habit and used the hemp stems for support. Frequency of hemp lodging due to cowpea vining was greatest with early-planted cowpea.

Poster #25: Cover Crops Impact Soil Biology in Alabama Cropping Systems (PhD Competition)

Prasanna Kumara Dayasena Yaddehi Arachchilage — Auburn University

YAPK Dayasena, Audrey V Gamble, Yucheng Feng

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Cotton rotated annually with peanut or soybean is a common crop rotation practice in Alabama. The adoption of cover crops to enhance soil health during the winter season has been a long-standing practice in the state. The effects of cover crops on soil health have been studied, particularly regarding their influence on soil physical and chemical properties. However, the influence of cover crops on soil biological health needs further investigation. The objective of the present study was to study the effect of common winter cover crops on soil biological health properties in Alabama after seven years of cover crop incorporation into a cotton crop rotation. Two field experiments were established in 2017 with cover crop treatments of rye, crimson clover, Daikon radish, and a three-species mixture on a Lucy loamy sand (south Alabama) and a Dewey silt loam (north Alabama) soil. Soil samples were collected from depths of 0–10 and 10–30 cm (0–4 and 4–12 inches) in November 2024, following cash crop harvest. After seven years, both the clover and three-species mixture treatments increased soil organic matter (SOM) and microbial biomass carbon (MBC) in the top 0–10 cm of the Lucy loamy sand soil. In the Dewey silt loam soil, only the cover crop mixture treatment increased SOM and MBC compared to fallow in the top 10 cm of soil. However, cover crop treatments did not enhance SOM or MBC at the 10–30 cm depth in either soil. Yield data for cotton, peanuts, and soybeans is currently being analyzed and will be discussed. Overall, results indicate that the cover crop mixture treatment is more advantageous than fallow, and long-term management plays a crucial role in improving the biological health properties of soils in the Southeast.