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A REGIONAL DIGEST FROM THE NRCS PLANT MATERIALS PROGRAM

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In This Issue

National Cover Crop Adaptability Trials

Natural Resources Conservation Service's (NRCS) soil health campaign has stimulated great interest and many questions on soil health improvement practices, including optimum management of cover crops. This interest is driven by the many ecosystem service benefits of cover crops, such as erosion control, nutrient management, carbon sequestration, habitat and food sources for wildlife and pollinators, and overall biodiversity.

Through the use of cover crops, farmers are capturing sunlight and retaining nutrients at times of the year when commodity crops are not in the field, covering the soil and creating living roots that help build healthier soils. While cover crops provide numerous benefits, these benefits are not fully attained unless specific cover crop varieties/ cultivars are used that meet the overall objectives and the producer's expectations.

In association with the National Soil Health Campaign, all 4 Northeast Plant Material Centers (PMCs) and 19 other Plant Materials Centers (PMCs) across the U.S. have initiated cover crop adaptation trials. These trials focus on 8 cover crop species that are commercially available, economically feasible, and have multiple conservation benefits. The 8 species (see list on page 2 for species and cultivars) of cover crops are being evaluated on the following growth characteristics and production attributes:

- Germination and field emergence
- Spring green-up date (if applicable)
- Bloom and flowering period of cover crop species
- Plant height
- Canopy cover
- Disease and insect resistance
- Winter hardiness
- Biomass
- N content (NY, MD only)

Results will provide recommendations for produces and NRCS service centers as well as help move farmers away from generic "variety not stated" cover crop seed to higher quality cultivars appropriate to local soil health and conservation needs.

Figure 1. Daikon radish cultivars seeded at the Big Flats PMC on August 28, 2015. Photograph taken October 12, 2015. The deer loved most radish!

Figure 2. Cereal rye cultivars seeded at the Big Flats PMC on Sept 3, 2015. Rye was also seeded Oct 7, 2015 (not shown).

This list identifies the 8 species of cover crop cultivars that are being evaluated. All 4 Northeast PMCs (NY, NJ, MD, and WV) are evaluating all varieties.

Small Grains

Cereal Rye (*Secale cereale*) @ 100 lb/a

Wheeler, Abruzzi, Elbon, Oklon, Maton, Maton II, Merced, Prima, Wintergrazer-70, FL 401, Hazlet, Aroostook,Guardian, Brasetto

Black Oats (*Avena strigosa*) @ 60 lb/a

Soil Saver, Cosaque

Legumes

Balansa Clover (*Trifolium michelianum*) @ 5 lb/a

Fixation, Frontier

Crimson Clover (*Trifolium incarnatum*) @18 lb/a

Dixie, AU Robin, Contea, AU Sunrise, Kentucky Pride, AU Sunup

Red Clover (*Trifolium pratense*) @ 9 lb/a

Kenland, Wildcat, Cyclone II, Dynamite, Starfire II, Cinnamon Plus, Starfire, Freedom MR

Hairy Vetch (*Vicia villosa*) @ 18 lb/a

Purple Prosperity, Vallana, TNT, Lana, Purple Bounty, Cover Crop Solutions

Field Peas (*Pisum sativum*) @ 70 lb/a

Arvica, Maxum, Survivor-15, Whistler, Frost Master, Dunn, Windham, Lynx

Broadleaf

Daikon Radish (*Raphanus sativus* L.) @ 9 lb/a

Driller, Eco-Till, Nitro, Defender, Tillage, Sodbuster Blend, Lunch, Groundhog radish

Preliminary Data: Big Flats Plant Materials Center, near Corning, New York

Daikon Radish Cultivars (main differences were deer resistance and root structure)

- All radishes were heavily impacted by high deer pressure throughout the growing season, except for Defender which showed only moderate browse.
- Defender reached a height, at harvest, of 39 cm (~15in). All others averaged 26 cm (10 in); root lengths averaged 24.1 across all cultivars.
- Most radish cultivars produced as much aboveground biomass (1900 lb/acre) as their belowground bio mass (1850 lbs/acre), except for Defender.
- Most Radishes produced 80-85% canopy cover

Preliminary Data: Big Flats Plant Materials Center, near Corning, New York (continued)

Black Oat Cultivars (main differences between the 2 cultivars is growth habit and leaf rust resistance)

- SoilSaver attained a height of 34 cm and showed more disease resistance to leaf rust that Cosaque. Cosaque reached 18 cm and 90% of the stand had leaf rust.
- SoilSaver, at harvest, had 96% canopy cover; Cosaque had 83% canopy cover.
- SoilSaver produced 1800 lb/ac of dry matter and Cosaque produced 1700 lb/ac.

Cereal Rye Cultivars (main differences were # of seeds/lb, dry biomass production, and growth habit)

- All rye had some deer browse throughout the growing season as deer pressure was high in the study area
- When harvested 2 months after fall planting, Florida-401 and Merced were the top biomass producing cultivars, 3300 lb/ac and 3550 lb/ac, respectively. Their fast growth and spring-type habit could potentially be a nice addition to winter forage needs in the Northeast. Most plants of Merced and FL-401 produced seedheads but no viable seed.
- All other cultivars, on average, produced approximately 1500 lb/ac of dry matter.

Preliminary Data: Norman A. Berg National Plant Materials Center, Beltsville MD

- All of the plots in the MDPMC's Cover Crop Adaptability Trial were seeded on September 15th.
- An electric fence was installed on November 16th due to the presence of deer feeding on the Austrian winter pea and radish cover crops.
- 'FL401' & 'Merced' cultivars of cereal rye reached the boot stage and or head emergence stage 9 weeks after seeding (Fig. 3).
- 'Lana' vetch had visibly greater biomass and cover 9 weeks after seeding and even more so 16 weeks after seeding but is now showing signs of winter damage.
- 'Dunn', 'Maxum'and 'Arvica 4010' Austrian winter pea cultivars are starting to show signs of winter damage.
- 'Soil Saver' black oats are showing signs of severe winter damage/desiccation whereas the 'Cosaque" black oats aren't showing any signs of damage (Fig. 4).
- The red clover cultivars are indistinguishable from each other but clearly have less biomass than all of the crimson clover cultivars.
- All of the balansa clover varieties are very small (cannot see the individual rows in each plot) and are all showing signs of winter damage.
- After several nights in January with temperatures in the teens, all of the radish cultivars are showing signs of winter damage.

Figure 3. Cereal rye cultivars seeded at the MDPMC on September 15th, 2015. 'FL401' & 'Merced' cultivars reached the boot stage and/or head emergence stage 9 weeks after seeding.

Figure 4. 'Cosaque' (on the left) and 'Soil Saver' (on the right) black oats plots at the MDPMC. 'Soil Saver' is showing signs of winter desiccation.

Comparing Radishes for Remediating Severe Soil Compaction

The MDPMC is working with Cliff Bienko, Cecil/Harford County District Conservationist, Annette Ensor, Harford County Soil Conservationist, and Dean Cowherd, Assistant State Soil Scientist for Maryland to mitigate soil compaction prior to re-vegetating a cattle paddock. The purpose of this project is to evaluate three different radishes for their ability to alleviate severe soil compaction. The owner of the cattle farm is enrolled in NRCS' CREP program. He wants to increase the size of his existing CREP riparian forest buffer that is adjacent to the paddock. NRCS is trying to improve soil properties in preparation for planting hardwood trees in the paddock. In order for the trees to successfully establish in the cattle paddock, the severely compacted soil must be alleviated so that their roots can penetrate the soil to obtain the nutrients, water, and structural support they require for survival.

'Nitro', 'Tillage', and 'Graza' forage radishes were broadcast seeded into separate plots approximately 2,800ft2 in size on August 10th at 5 lbs. per acre (Fig. 5). After seeding, the plots were rolled with a cultipacker to ensure proper seed/soil contact. An area of the cattle lot was left unseeded as a control to measure soil compaction over time where no radishes were planted. This area won't likely be planted with trees due to mower access issues. Percent canopy cover ratings were taken 30 and 60 days after planting. Soil penetrometer readings were taken on the same day that the radishes were seeded to measure the severity of compaction at the beginning of the study and again 90 days later.

Figure 5. Radish test field layout showing establishment and canopy cover 30 days after planting the seed.

Percent canopy cover of 'Graza' was significantly less than both Tillage and Nitro radish 30 and 60 days after seeding (Fig. 6). All three radish varieties were seeded in the greenhouse at equal rates to compare their germination rates. Fewer 'Graza' radish seeds germinated compared to Nitro and Tillage radish seed indicating that the lower percent cover rating of 'Graza' in the field was due to a lower germination rate. When the study is repeated next year, germination tests will be performed on all three varieties prior to seeding to ensure a more accurate comparison (i.e., seeding rates will be based on percent germination).

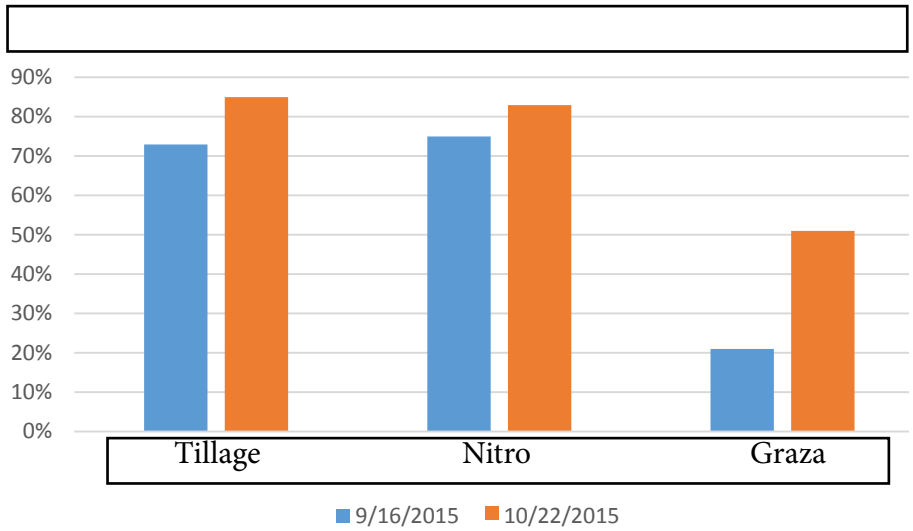

Figure 6. Percent canopy cover for three radish varieties as measured on September 16th and again on October 22nd.

Soil penetrometer readings taken on August 10th were approximately equal in all four plots (Fig. 7). An average of four readings in each plot ranged between 270-290 psi at a depth of 3 inches and it should be noted that the penetrometer could not be pushed into the soil beyond 3 inches. This result indicates that soil compaction in the paddock was uniform. According to the specifications of the penetrometer, a reading of 300 psi or above indicates poor growing conditions. All of the plots rated fair growing conditions but the entire paddock was very close to having poor growing conditions prior to planting the radishes. Soil compaction readings were taken again 14 weeks after the intital planting. Four samples were taken in each plot to the depth of 3 inches and the average psi was determined. 'Tillage' and 'Nitro' plots had 130 psi, indicating good growing conditions. The 'Graza' and control plots had 215 psi and 240 psi respectively, indicating fair growing conditions. Despite these differences, all four plots had decreased soil compaction over time (Fig. 7).

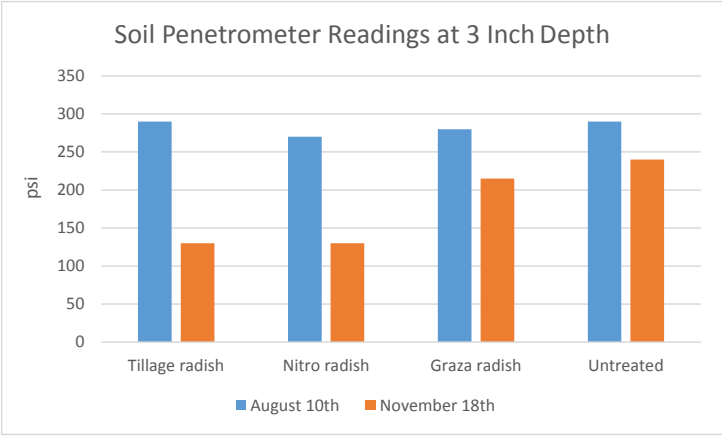

Figure 7. Soil penetrometer readings indicate a decrease in compaction over time.

Although 'Tillage' and 'Nitro' radishes successfully alleviated soil compaction in the top 3 inches of soil, the soil penetrometer could not be pushed into the soil beyond 3 inches. The radishes struggled to establish roots below the top 3 inches of soil (Fig. 8) and many of the radishes protruded above the soil (Fig. 9). Because the 'Graza' radish seed used in this project has a lower tested germination rate, there was not a high enough density of radishes in this plot to alleviate compaction. Excluding cattle from the paddock and allowing weeds to germinate helped to alleviate some of the compaction in the control plot but it was considerably less than where the 'Tillage' and 'Nitro' radishes were planted.

Figure 8. Tillage radish 60 days after planting struggling to penetrate the severely compacted soil.

In order to ensure a successful tree planting in the paddock, it will be necessary to alleviate soil compaction to a depth of at least 6 inches. A summer cover crop will be planted in May and a second season of radishes will be planted in August 2016. Soil penetrometer readings will be taken periodically throughout 2016 to measure the reduction in soil compaction in the four plots.

Figure 9. Large Nitro radish protruding from the soil surface .

Cape May PMC participates in the BLM-Seeds of Success Program

The lack of commercial availability of a wide range of coastal species after Superstorm Sandy in 2012 has prompted the Department of Interior-Bureau of Land Management to fund a large seed collection effort through their Seeds of Success Program. While traditionally a western US Program designed to provide seed for revegetation of federal lands, this is an effort to expand the Program to the Eastern US. Over the course of two years, the Seeds of Success (SOS) Technical Protocol will guide seed collection and banking efforts to provide native locally adapted seed for coastal restoration projects funded through the Supplemental Sandy Mitigation Fund.

Seed collections will target species found in the habitats most impacted by Hurricane Sandy, including sub-tidal habitats, beaches and dunes, wetlands and marshes, near-coastal freshwater habitats, coastal forests, and inland rivers and streams. All collections will be sent to the Cape May Plant Materials Center to be cleaned, weighed, and tested for germination and purity. A subset of cleaned seed will be sent to long term germplasm storage for genetic preservation and the balance will be returned to the collecting teams for use in designated restoration projects.

A Bureau of Land Management intern on the lookout for native seeds in a North Carolina field. Credit: Amanda Faucette, Conservation Botanist, North Carolina Botanical Garden

The Cape May PMC is partnering with collecting teams located at the City of New York's Mid-Atlantic Regional Seed Bank (MARSB) at Greenbelt Native Plant Nursery on Staten Island, the New England Wild Flower Society near Boston, MA, and the North Carolina Botanical Garden in Chapel Hill, NC. The three institutions hire interns through the Chicago Botanic Garden's Conservation and Land Management Internship Program. These interns comprise the collecting teams that plan to make an estimated 1,400 seed collections over 2 seasons. This past year, approximately 800 collections have been made already. Many of these seed lots will be used in Fish and Wildlife Refuges from southern New England to North Carolina to revegetate damaged areas from Superstorm Sandy. In addition to making seed collections, building partnerships among federal land managing agencies and private, state and local land owners will be necessary to continue the efforts of establishing a sustainable native plant materials development program in the Eastern United States.

Shady Valley, Tennessee Cranberry Bog WRP Project

Tennessee NRCS has requested assistance from the Appalachian Plant Materials Center for a Wetland Reserve Program (WRP) restoration project located in the Shady Valley community of Johnson County, TN. Shady Valley is a diverse and unique southern Appalachian ecosystem that is home to at least 26 rare plants and animals. The valley's high elevation wetlands are one of only two places in Tennessee where cranberries (*Vaccinium macrocarpon*) grow naturally. This rare wetland ecosystem was once covered with a network of sphagnum/cranberry peat bogs and is also home to several Federal and State listed Threatened and Endangered species. The restoration objectives of this WRP plan are tailored to the federally threatened Bog Turtle (*Glyptemys muhlenbergii*), which use the bogs throughout their life cycle.

Bog turtle; photo courtesy of USFWS

Wild cranberry growing in a mountain bog at Shady Valley, Tenneessee.

Presently, the WRP site is overgrown with tall fescue (*Schedonorus arundinaceus*) and reed canarygrass (*Phalaris arundinacea*). NRCS' objective, in partnership with the Tennessee Wildlife Resources Agency, the US Fish and Wildlife Service and The Nature Conservancy, is to restore a more natural community within the larger landscape of Shady Valley by re-establishing sphagnum moss/cranberry bogs to improve the habitat for the Bog Turtle and other rare and endangered species. Other plant species of interest that have been shown to be associated with Bog Turtle habitat include: upright sedge (*Carex stricta*), jewelweed (*Impatiens capensis*), arrowhead (*Sagittaria*), rice cutgrass (*Leersia oryzoides*), and smartweed (*Polygonum*). Since this is a unique restoration project targeting specific species found in the valley, there is not an open market seed/plant source for any of these ecotypes. Thus, Tennessee NRCS requires and has requested specialized technical assistance from the Appalachian PMC with collection of seed and cuttings, propagation of the species, and guidance when planting the species on the site.