United States Department of Agriculture

FINAL STUDY REPORT
(Cape May PMC, Cape May Courthouse, NJ)

Late Season Fall-Seeded Cover Crop Observation Study

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ABSTRACT

A one season, fall-seeded cover crop observational study was installed at the Cape May Plant Materials Center, Cape May, NJ to help determine which cover crops or cover crop mixes would be most suitable for growers in the South Jersey region. This demonstration study focused on seven of the most commonly used fall-seeded cover crops in the region and three pre-made mixes. The species were: cereal rye; winter triticale; oats; hairy vetch; annual ryegrass; tillage radish; crimson clover; phacelia; 3 separate cover crop mixes; and control. Height (cm), stem width (mm), plant spread (cm), percent living cover, and percent cover of dead residue were recorded. Measuring dates were: 11/07/2014 (fall); 04/22/15 (spring); 05/06/15 (late spring); and 07/09/15 (early summer). Overall, each cover crop species and cover crop mix in this late season fall-seeded trial was successfully established and grew vigorously except phacelia. Winter triticale, crimson clover, and annual ryegrass all performed better in this study when grown with other cover crops in a mix. Although the tillage radish never reached its maximum size, achieving moderate growth before the winterkill created enough overwintering groundcover to help reduce compaction and potential erosion. The results of this observational study indicate that there are several cover crops and cover crop mixes that can be established successfully before the frost and thrive the following spring even when planted as late as the first week in October in South Jersey. State Office staff and service center personnel should update program delivery to include the first week of October as a viable seeding date in South Jersey for the use of each of the cover crops included in this study excepting phacelia.

INTRODUCTION

As the USDA-NRCS refocuses its efforts on the interface between cover crops and soil health, State Office staff and service center personnel have expressed interest in determining the viability of using pre-made cover crop mixes and select cultivars for more efficient program delivery. A one-season, fall-seeded cover crop observational study was installed at the Cape May Plant Materials Center, Cape May, NJ to help determine which cover crops or cover crop mixes would be most suitable for growers in the South Jersey region. Information provided by the Plant Materials team would then be sent to the State Office Resource personnel for consideration and possible inclusion in cover crop Practice Standard NJ340.

This demonstration study focused on seven of the most commonly used fall-seeded cover crops in the region and three pre-made mixes (see Materials and Methods section). The mixes in this study, at most, contained three species (each from a different functional group), while many cocktail mixes that are being currently promoted may contain up to 8–15 different species and include both warm and cool season broadleaf species, and warm and cool season grasses (Salon, 2012; McGuire, 2013). The advantages to growing fewer species would be the ease of handling, mixing, establishment, and management of the mix for the grower, and the ease at studying the potential interactive (symbiotic) relationships between species for the researcher. McGuire (2013) is correct in describing the “daunting”

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task of the researcher who tries to find the right cocktail mix within all the complexity 15 or more species and their potential interactions could create in a particular soil, climate, and cropping system. The approach of this study is more modest, exploratory, and observational in nature.

In addition to plant x plant interactions, the timing of planting is important to cover crop stand establishment and soil health improvement. This study was established at the latest practical window of planting that still allowed for adequate growth before winterkill. In commercial farm scenarios this planting date would follow a late harvest of sweet corn or squash in New Jersey.

MATERIALS AND METHODS

Site Location The location for the study was the USDA-NRCS Cape May Plant Materials Center, in Cape May County, NJ (Field 31). The study area was 0.4 acres of a well-drained, slightly acidic (6.19), downer sandy loam soil with <1% slope. The mean annual precipitation of the area is 28–59 in. and the mean annual air temperature is 46–79° F.

Methods

A late season, fall-seeded cover crop was installed on 10/03/2014. The field, previously covered with crimson clover and crabgrass sod, was deeply tilled several times with a cultivator prior to planting. Seed was broadcast according to recommended seeding rates in twelve 30’ x 30’ plots then lightly disked and cultipacked. The species were: cereal rye; winter triticale; oats; hairy vetch; annual ryegrass; tillage radish; crimson clover; phacelia; 3 separate cover crop mixes; and a control. All legumes were inoculated before planting. The field was rain-irrigated the day after establishment and once more during the first week. The weather was otherwise sunny, with high temperatures in the mid-70’s.

Height (cm), stem width (mm), plant spread (cm), percent living cover, and percent cover of dead residue were recorded. Measuring dates were: 11/07/2014 (fall); 04/22/15 (spring); 05/06/15 (late spring); and 07/09/15 (early summer). Although these plots were not replicated, data was recorded in a spreadsheet and information was shared with State Office personnel.

RESULTS AND DISCUSSION

Overall, each cover crop species and cover crop mix in this late season fall-seeded trial was successfully established and grew vigorously except phacelia. Because phacelia is a long-day plant, the late seeding date of this study most likely did not provide the best conditions for establishment. For more successful establishment, phacelia should be seeded in late summer/early fall (Gilbert, 2003). Otherwise, each of the remaining species could be a viable option for growers who would like to plant after sweet corn or squash in the first week of October in South Jersey.

Winter triticale, crimson clover, and annual ryegrass all performed better in this study when grown with other cover crops in a mix (Figures 1, 2, 3). Both triticale and annual ryegrass were grown separately in mixes that contained both tillage radish and crimson clover. As tillage radish did not perform significantly different in a mix when compared to tillage radish planted alone, it seems the beneficial interaction of the mix (positive symbiosis) occurred between the grass (triticale or annual ryegrass) and legume species (crimson clover) (Figure 4).

When comparing across all species for height, the usefulness of the data depends on the plant development stage and the farmers intended use for the cover crop. In this study, the species with the most vigor and best growth in the fall was spring oats (Figure 5). However, this species also suffered the

most during the winterkill, and consequently put on the least growth during the following spring. Although it did not produce the greatest biomass in the spring, it is easy to imagine a scenario in which a farmer would prefer to use such a plant in the fall for weed suppression as well as its ease of termination and management in the spring.

Although the tillage radish never reached its maximum size, achieving moderate growth before the winterkill created enough overwintering groundcover to help reduce compaction and potential erosion. Similar to the spring oats mentioned above, the lack of spring biomass in tillage radish may be more beneficial to a farmer as there would be less residue and holes in the soil to interfere with an early spring planting. If a farmer was more interested in having abundant spring residue for weed suppression or no-till in late spring/early summer, according to this study his/her best option would be to grow cereal rye, triticale in combination with crimson clover, or just triticale alone (Table 1).

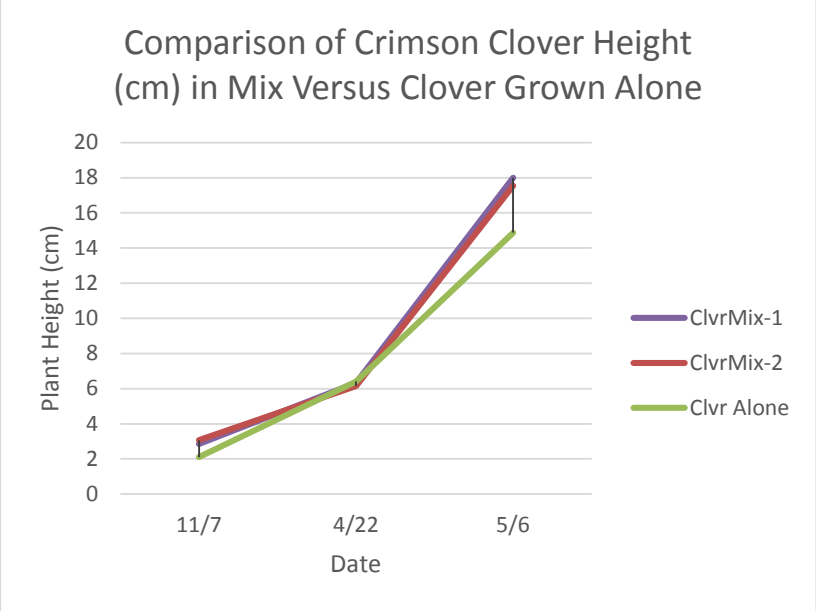

Figure 1. Plant height (cm) of crimson clover planted alone and in two cover crop mixes. Mix 1 combined clover, ryegrass, and tillage radish; while Mix 2 combined clover, triticale, and tillage radish.

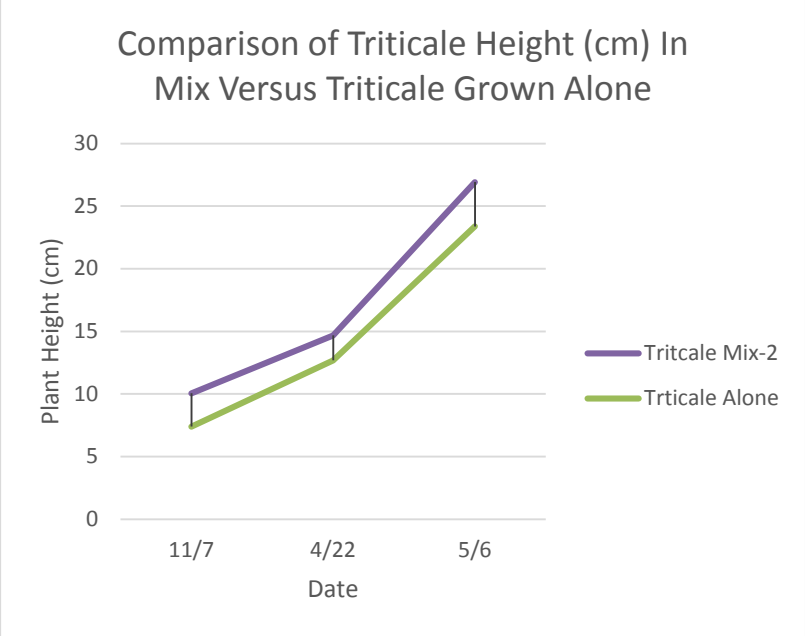

Figure 2. Plant height (cm) of triticale planted alone and in a cover crop mix. Mix 2 combined clover, triticale, and tillage radish.

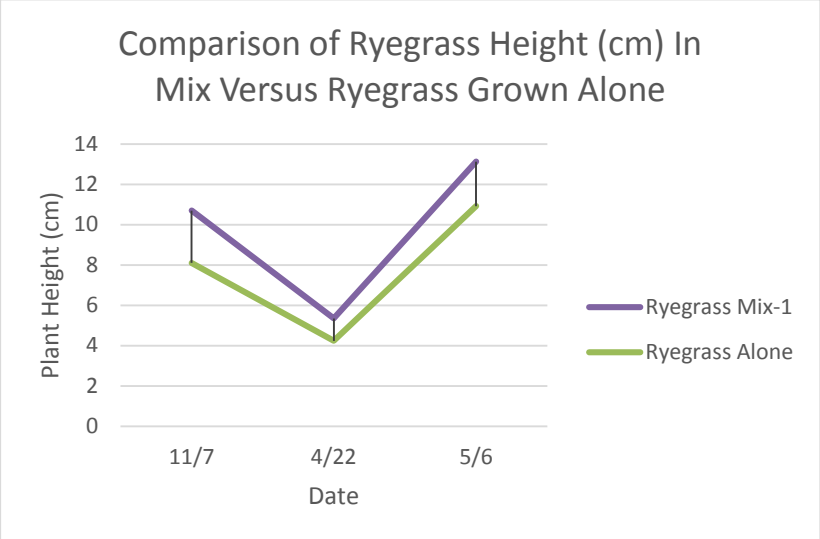

Figure 3. Plant height (cm) of annual ryegrass planted alone and in a cover crop mix. Mix 1 combined clover, ryegrass, and tillage radish.

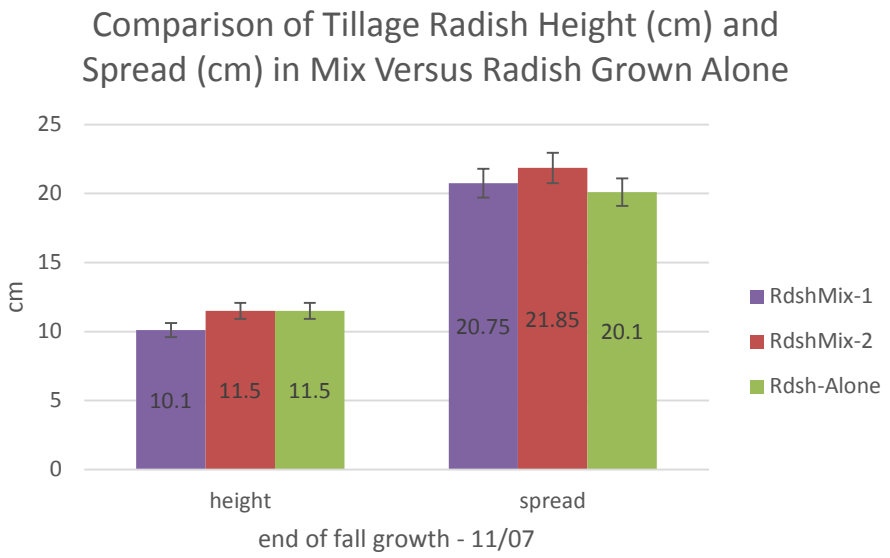

Figure 4. Plant height (cm) of tillage radish planted alone and in two cover crop mixes. Mix 1 combined clover, ryegrass, and tillage radish; while Mix 2 combined clover, triticale, and tillage radish.

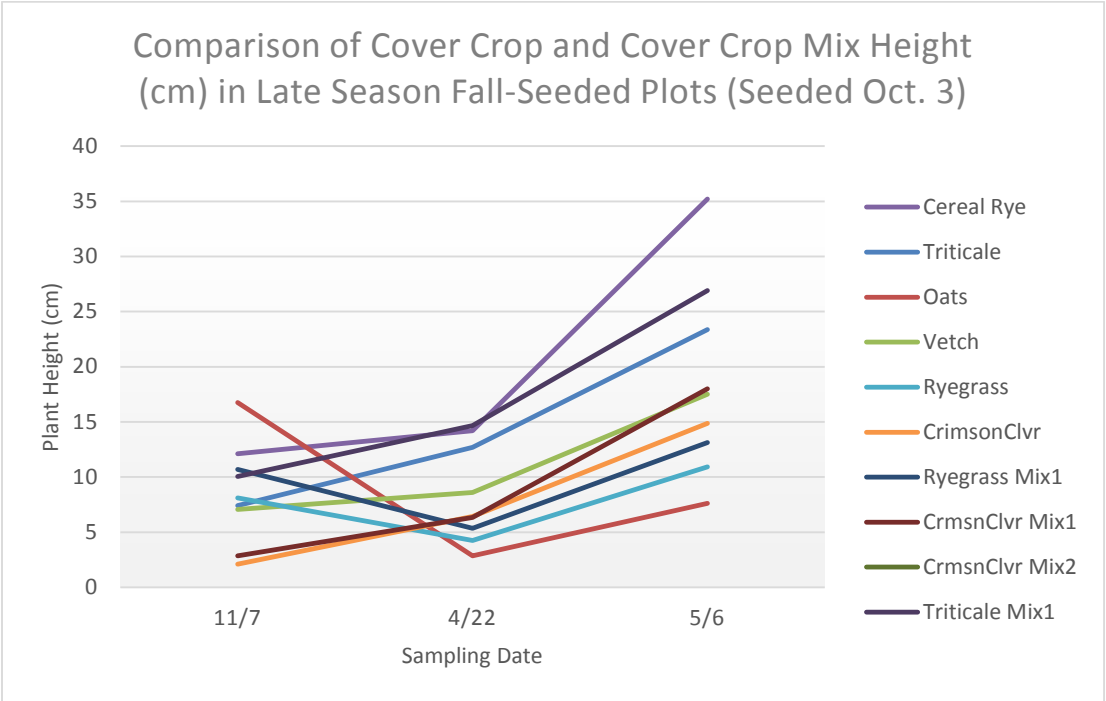

Figure 5. Comparison of plant height (cm) in late season fall-planted cover crop species measured during late fall (11/7), early spring (4/22), and late spring (5/6).

Table 1. Plant height (cm), plant spread (cm), and stem thickness (cm) measured in fall, spring, and at plant termination.

Height (cm)					
Fall	**(cm)**	**Spring**	**(cm)**	**at Termination**	**(cm)**
Oats (Mix 3)	22.8	Triticale(Mix 2)	14.7	Cereal Rye	35.2
Oats	16.8	Cereal Rye	14.2	Triticale(Mix 2)	26.9
Cereal Rye	12.1	Triticale	12.7	Triticale	23.4

Spread (cm)	
Fall	**(cm)**
Triticale(Mix 2)	25.7
Triticale	2245
Radish (Mix 2)	21.85

Stem Thickness (cm)			
Spring	**(cm)**	**at Termination**	**(cm)**
Triticale (Mix 2)	4.75	Oats	6.35
Triticale	4.6	Triticale(Mix 2)	5.80
Cereal Rye	4.1	Triticale	5.47

Table 7. Percent cover crop residue remaining in a late season fall-seeded cover crop trial recorded on 07/09/15.

% Cover Crop Residue Recorded on 07/09/15	
Cover Crop Mix 1	82%
Annual Ryegrass	78%
Cover Crop Mix 2	67%
Winter Triticale	56%
Cereal Rye	48%
Cover Crop Mix 3	34%
Oats	29%
Hairy Vetch	25%
Crimson Clover	21%
Tillage Radish	na (dead)
Phacelia	na (dead)

CONCLUSION

This planting was established the first week of October, 2014 and had 35 days of growth until the first hard frost, when some species in the study were expected to winterkill. The results of this observational study indicate that there are several cover crops and cover crop mixes that can be established successfully before the frost and thrive the following spring even when planted as late as the first week in October in South Jersey. The only species that was not established successfully was phacelia. Annual ryegrass was one species that had a high percentage of residue remaining during late spring/early summer. This may be beneficial to farmers interested in no-till planting, however large amounts of residue can increase populations of beneficial microbes and their consequent demand for nitrogen. Thus, the following crop may suffer from N immobilization if the percentage of cover crop residue remaining in late spring is too high. A replicated trial of five species of millet was planted into the terminated annual ryegrass plot in the late spring and was poorly established, and grew with poor vigor. This was likely caused by microbes "locking up" N as a food source as the annual ryegrass residue did not contain enough N to both satisfy microbial demand and the N requirements of the following millet crop. This anecdotal finding highlights the importance of choosing the correct cover crop based on the farmer's desired cash crop rotation. A good way to ensure that enough N is available to the following crop is to mix grasses with legumes in multi-species cover crop mixes. The data in this study also documents the advantages of including grasses with legumes during fall and spring production.

Literature Cited

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