The Effects of Using Cereal Rye (*Secale cereale)* as a Cover Crop for Control of Italian Ryegrass (*Lolium multiflorum)* in Fallow Land in the Southern Piedmont of North Carolina

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INTRODUCTION

Herbicide-resistant Italian ryegrass has long infested North Carolina. In particular, the southern Piedmont has widespread ALS resistance (Osprey and PowerFlex) spotty ACCase-(Hoelon and Axial XL), and glyphosate resistance. And there is now confirmed paraquat-resistant ryegrass in the region. While pyroxasulfone (Zidua/Anthem Flex) provides residual control of the weed, it, and other related herbicides, do not control emerged ryegrass. It is only a matter of time before our few pre-emergent modes of action are lost to resistance.

Paraquat-resistant Italian ryegrass poses a serious threat to all crops in North Carolina (Figure 1). Although small grain production will most likely be hit the hardest, the inability to control Italian ryegrass burndown seriously threatens the timely planting of corn, cotton, and full-season soybeans. Waiting for Italian ryegrass to decline naturally will push planting of these crops into June and greatly reduce yield potential.

Figure 1. Ryegrass interfering with corn, cotton, and winter wheat production

OBJECTIVES

1. Explore the effectiveness of using cereal rye as a management tool for controlling Italian ryegrass
2. Determine the ideal planting date, seeding rate, pre-emergent herbicide, and which combinations best control Italian Ryegrass.
3. Determine fertilization rates to produce cereal rye for hay and straw production.

MATERIALS & METHODS

Experimental trials were conducted over a 2-year period (23/24 & 24/25) and arranged in a randomized strip trial (4 reps by location) and small plot randomized complete block design (RCBD).

1.) Planting Date x Seeding Rate (PD x SR). 2023 planting dates were drilled in 4 separate fields with an unnamed variety. Strips were 15' x 100' with planting date replicated by location. Corn, cotton and soybeans were planted into 3 of the 4 fields in 2024 using cooperating grower practices and equipment. In 2024 plots were only 7.5' wide, co-located in one field, had 3.25 oz/ac of pyroxasulfone, 30 lbs N/ac applied at spike, and 'Abruzzi' was used.

2.) Cereal Rye + Pre-emergent Herbicides (CR +PRE). Treatments were applied using a 15' tractor mounted boom sprayer in 2023 and a backpack sprayer in 2024.

3.) Forage Fertility (FF). Two seeding rates of 50 & 100 lbs/ac were evaluated at 3 N-rates of 0, 30, and 60 lbs N/acre at planting. Dry matter estimates were collected with a falling plate meter.

Seeding Rate x Planting Date

Planting Date	Seeding Rates (lbs/acre)
9/29/2023, 10/16/2023, 11/7/2023,11/28/2023	0, 25, 50, 75, 100
10/14/2024, 10/23/2024, 10/31/2024, 11/7/2024	0, 50, 100

Figure 2. An overhead image of the 2024 trial site. PD X SR (left), CR + PRE (middle) and a forage fertility trial (right).

MATERIALS & METHODS

Cereal Rye + Pre-emergent Herbicides

Planting Date; 10/16/2023, 10/23/2024		
Seeding Rate; 100 lbs/acre		
Application Date; 10/23/2023, 11/5/2024		
Active Ingredient	MOA	Rate (ozs/A)
Pyroxasulfone (Zidua)	15	3.25
Pyroxasulfone + Carfentrazone-ethyl (AnthemFlex)	15 + 14	3.0
Pyroxasulfone + Flumioxazin (Fierce)	15 + 14	1.5
Flumioxazin (Valor)	14	2
Clomazone (Command 3ME)	13	16
Clomazone (Command 3ME)	13	32
Clomazone (Command 3ME)	13	53
Only Cereal Rye	Allelopathy, competition	100 lbs/ac drilled
Bare Ground	0	0

RESULTS & DISCUSSION

Figure 3. Italian ryegrass in competition with cereal rye (left) vs alone (right). Planted 10/23/2024. Photo taken 3/5/2025

Figure 4. Ryegrass from check plots (left), in light competition (center), and heavy competition (right). Photo taken 4/12/2024

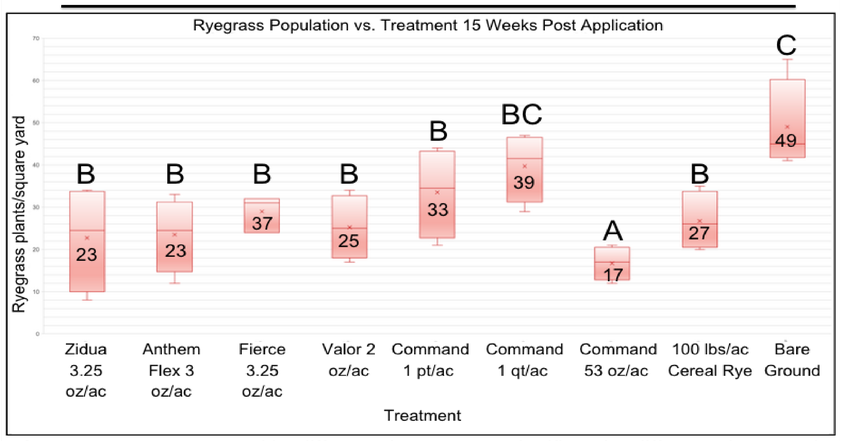

Figure 5. Treatments with different letters are significantly different ($p < 0.1$). Command 3ME at 53 oz/ac provided the best control at 15 weeks post application, however CR and clomazone are not compatible (left) and effectively reduced CR biomass. Emerged RG was not affected (center). Command is safe and labelled on soybean (right). Of note, timely planted CR provided similar control to residual herbicides. Data collected 3/5/2025. Photos; 11/26/2024, 3 weeks after treatment.

RESULTS & DISCUSSION

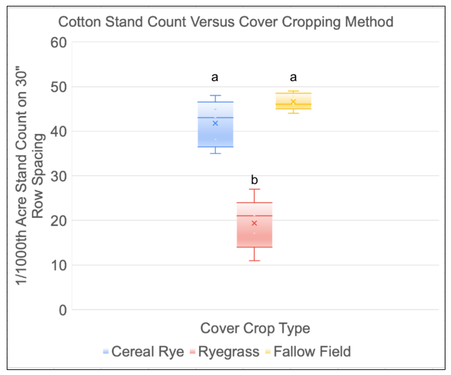

Figure 6. Cotton stand counts by cover crop type. Stand counts taken on 6/18/2024. Grower planted at 48,000 seeds/acre. Cotton planted into ryegrass had significantly lower stands while cereal rye and fallow land had statistically similar populations. ($p < 0.05$).

Figure 7. Cotton planted in the PD X SR trial on 5/25/2024. No modification to planting equipment. 100 lbs/acre CR (left), ryegrass (center) bare ground (right). Planted; 48,000 seeds/acre. Photo taken 6/18 &7/29/2024, respectively.

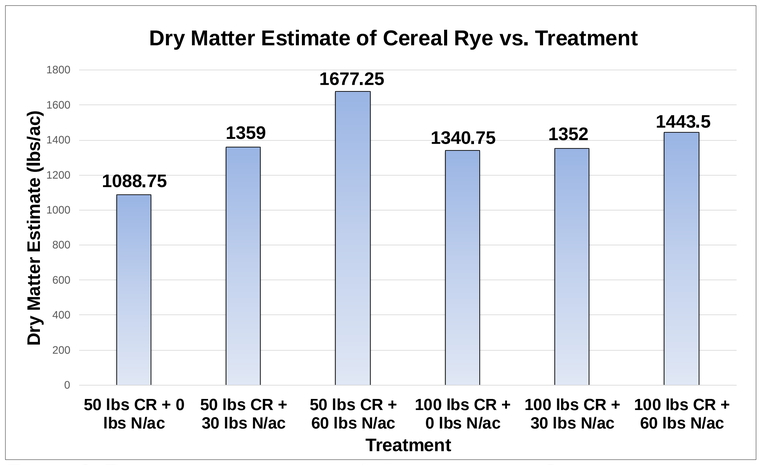

Figure 8. Estimates collected with a falling plate meter. Statistical analysis with a two-way ANOVA shows no significant different in seeding rate. N-fertilization rates show significant difference within a single seeding rate ($p < 0.05$).

CONCLUSIONS

- RG in competition with CR had shorter seed heads, and less biomass than RG alone.
- Cotton stands are statistically similar when planted in CR vs. bare ground.
- Timely planted CR has the same efficacy as CR + residual herbicides.
- Intensely managing CR provides superior suppression of RG compared to minimal management.
- Planting a forage variety of CR 'Abruzzi' may allow lower seeding rates for weed suppression and as a forage.

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