

Management Options to Alleviate Negative Impacts of Reniform Nematode in Cotton

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Highlights

- Further affirmation that cotton yield is increased with reniform nematode resistant cotton varieties (whenever reniform nematodes are present).
- Higher cotton seeding rates supported significantly larger reniform nematode densities due to more root biomass per acre
- Mixing susceptible and reniform resistant varieties has the potential to serve as a refuge and preserve long-term efficacy of resistance without compromising yield.
 - Any addition of reniform resistant varieties to the mix improved cotton lint yields.
- Crop rotation with non-host species is essential to maintain genetic resistance

Research trials were coordinated at Wall and College Station, TX to assess the impacts of cotton seeding rate and genetic resistance on cotton growth rate, nematode density, and ultimate cotton production, and explore the concept of inter-seeding susceptible and resistant cotton to simultaneously maintain production and nematode susceptibility to our current host-plant resistance. This concept is informed by the practice of susceptible refuge being used as a form of insect resistance management in Bt crops to reduce selection pressure and maintain susceptibility to the resistant crops. Seeding rate may also affect the available food source per acre for the nematodes, ultimately influencing level of reproduction and degree of damage to current and future cotton crops.

- Locations: Wall, Texas (2024-2025) & Snook, Texas (2025)
- Treatments:
 - Varieties: PHY 332 W3FE (resistant, REN) & PHY 300 W3FE (susceptible, SUS)
 - Mixes: 100% REN, 75% REN & 25% SUS, 50% REN & 50% SUS, 25% REN & 75% SUS, & 100% SUS
 - Seeding Rate: 44,000 & 25,000 seeds/ac
- Analysis: RCBD with 4 replications, mixed model analysis with rep as random
- Measurements: Stand establishment, gravity fed reniform nematode densities (at planting & before harvest), root & shoot measurements, & cotton lint yield

Analyses were combined across years and locations when applicable, Snook lint yield has not been analyzed yet. Across both years in Wall, any addition of the resistant variety to the mix improved cotton lint yields compared to the 100% susceptible ($p=0.013$) (Figure 1). Across all site years the higher seeding rate supported greater reniform nematode densities (220% larger) ($p=0.0002$) than the lower seeding rate. The higher seeding rate also decreased root mass (17%) and shoot mass (19%) per plant, but increased root mass per acre by 68%, aligning the observed greater nematode densities with a larger food source. Treatments with the greatest concentration of resistant cotton also had the greatest root mass per acre while the 100% susceptible had the lowest. Across site years combined, the 100% REN treatment had lower reniform nematode densities than any other treatment.

These findings demonstrate the capacity for reniform nematode resistant cotton to result in greater yield with fewer nematodes and support the concept that manipulating root mass per acre directly effects reniform nematode densities. Adding susceptible cotton to a mix with resistant cotton increased nematode densities, but did not significantly impact cotton lint yield, suggesting potential suitability as refuge.

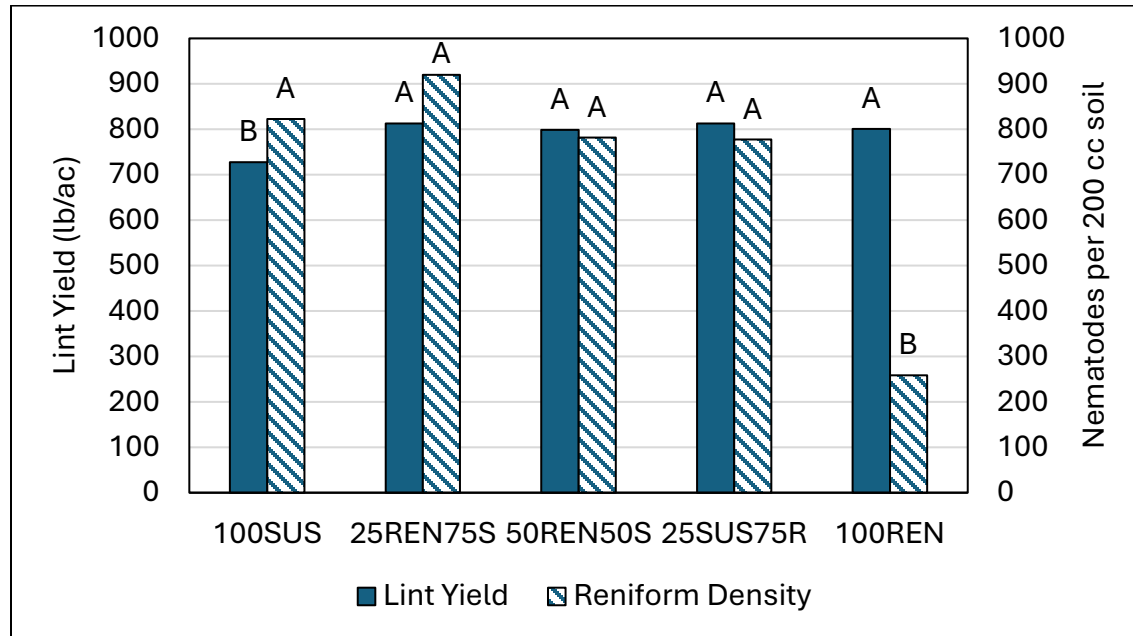


Figure 1. Effect of variety composition on cotton lint yield ($p=0.013$) and reniform nematode densities ($p=0.0494$) at Wall, TX in 2024 and 2025.

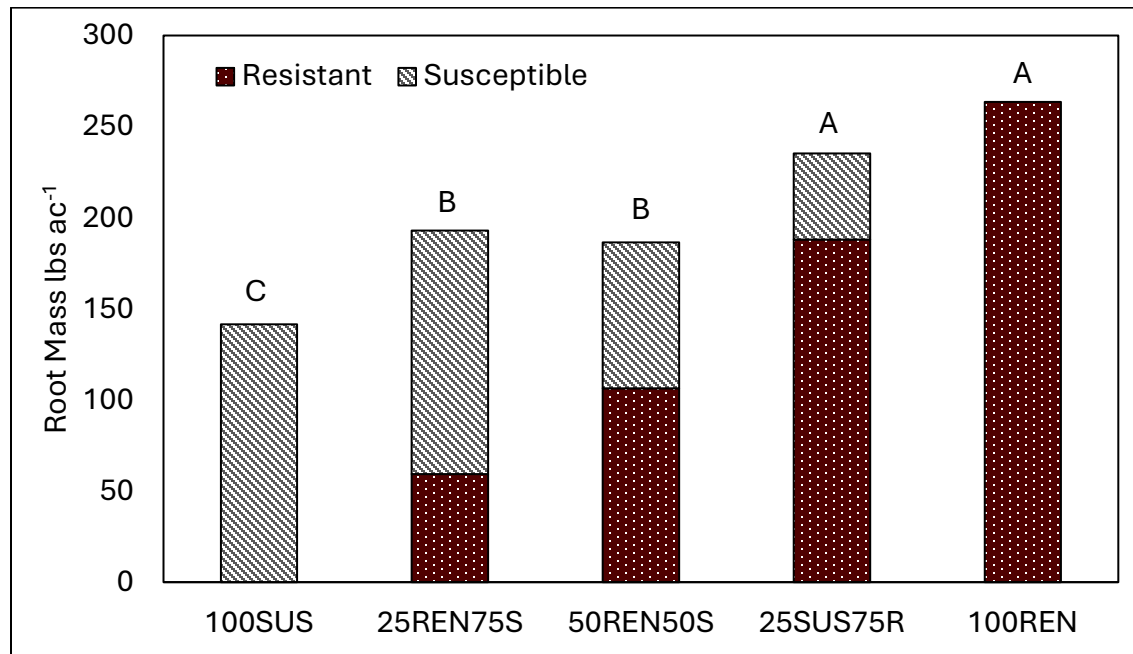


Figure 2. Effect of variety composition on cotton root mass per acre ($p < .0001$). Colors within bars illustrate extrapolated contributions of REN vs SUS root mass.

Effects of Aldicarb on Reniform Nematode Populations and Crop Yield in Susceptible and Resistant Cotton

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Highlights

- Aldicarb at 5 lb ac⁻¹ increased lint yield of the susceptible variety by 18% compared to the control and the 3.5 lb ac⁻¹.
- Aldicarb application did not influence the lint yield of the resistant variety but did reduce lint turnout on resistant and susceptible varieties.
- Aldicarb application provided the greatest benefit to susceptible cotton in the presence of reniform nematodes whereas host-plant resistance was sufficient to optimize yield for the resistant variety.

Reniform nematodes are a semi-endoparasite that negatively impact the growth and yield performance of cotton plants. Historically, reniform nematode management has relied on nematicides and rotation with non-host crops. Aldicarb, a common carbamate nematicide, disorients adult nematodes and disrupts the hatching cycle of nematodes. Recently, reniform nematode resistant (REN) cotton varieties have become the most effective management tool, but overuse of host-plant resistance may risk a reduced efficacy over time. Cumulative effects of integrating nematicides with REN versus susceptible (SUS) varieties have not been sufficiently quantified in the Southern Rolling Plains of Texas. The efficacy and implications of using nematicides in resistant cotton require greater understanding in West Central Texas.

- Location: Wall, Texas
- Planting Date: June 20, 2025
- Treatments:
 - Varieties: Phytogen 443 W3FE (resistant, REN) & Phytogen 415 W3FE* (susceptible, SUS)
 - AgLogic® Rates: applied in-furrow at planting, 0 lb ac⁻¹, 3.5 lb ac⁻¹, & 5 lb ac⁻¹
- Analysis: 2 × 3 factorial with 4 replications
- Measurements: Stand establishment, gravity fed reniform nematode densities (8-14-2025), & cotton lint yield

*PHY 415 W3FE was selected as a susceptible variety with similar maturity to PHY 433 W3FE. We were later informed that PHY 415 W3FE segregates for reniform nematode resistance, such that half of the plants are resistant and half are susceptible. This is an important context to consider when interpreting the findings.

Cotton lint yield

Cotton lint yield was affected by variety and the interaction between variety and aldicarb application (Table 1). Lint turnout was affected only by aldicarb applications while late-season nematode density was affected solely by cotton variety. Regarding variety performance, the resistant variety produced 13% more lint and resulted in 65% fewer nematodes than the susceptible variety (Figure 1). This finding is consistent with previous research, highlighting the

efficacy of host-plant resistance to suppress nematode reproduction, but also demonstrates the capacity for reniform nematodes to reproduce on resistant plants. Aldicarb applied at 5 lb ac⁻¹ increased lint yield in the susceptible variety by 18% compared to the control and 3.5 lb⁻¹ rate (Figure 2). Within the resistant variety, aldicarb application did not influence lint yield (Figure 2).

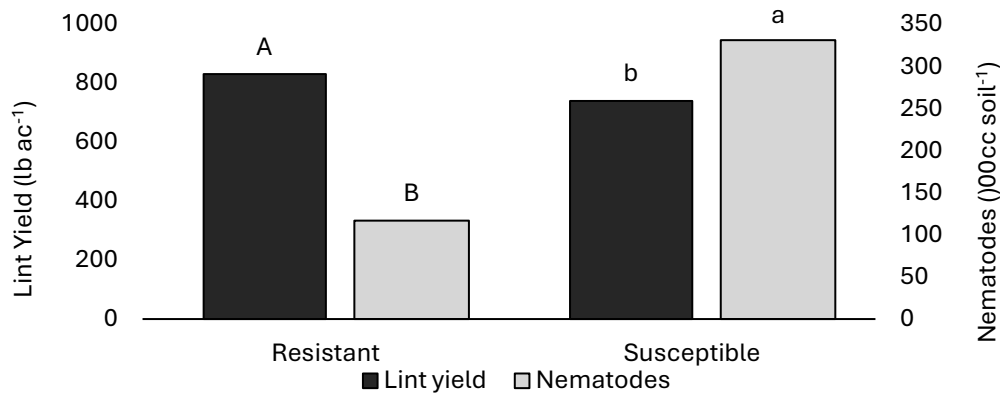


Figure 1. Cotton variety effects on lint yield and nematode density.

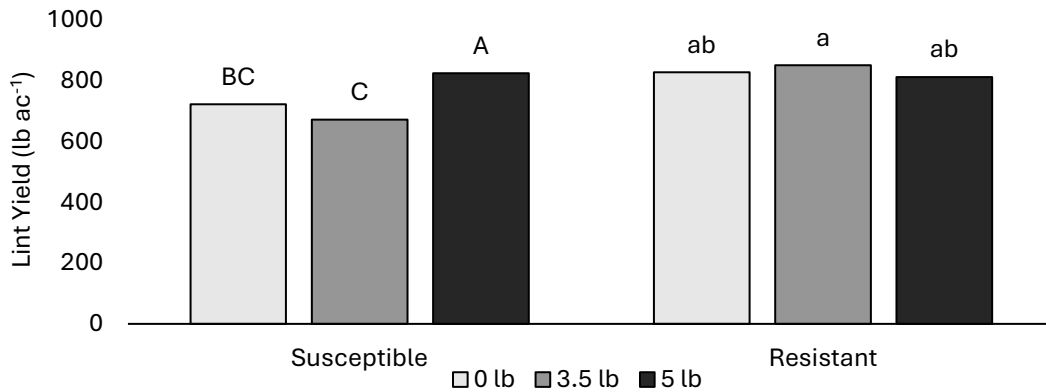


Figure 2. Interaction between aldicarb applications and cotton variety effects on lint yield.

Lint turnout

Aldicarb application reduced lint turnout across varieties, possibly as a function of increased seed size (Figure 3). Lint turnout was negatively correlated with both lint yield and nematode density among susceptible treatments with aldicarb (Figure 4). This aligns with aldicarb application improving yield for the susceptible variety but reducing the overall lint turnout (Figure 3), suggesting that aldicarb may have increased plant growth and seed size, consequently reducing lint percentage. Further analyses are needed to better understand these relationships.

In this yield environment, genetic resistance was an adequate management option against reniform nematodes. These results suggest that producers may consider using an in-furrow nematicide when planting susceptible varieties in known nematode-populated locations.

Acknowledgement

This work was supported by AgLogic Chemical.