

Field Trials of Condensed Quebracho Tannins as a White-tailed Deer Repellent in Soybeans

Ethan Marburger

North Carolina State University

Important Information

The statistical analysis and results reported here are currently undergoing verification. Readers should therefore remain cautious when interpreting the information provided in this memo as they are subject to change.

Introduction

- The National Agricultural Statistics Service (2002) reported that crop losses to wildlife in the United States during 2001 totaled US\$619 million with 48% of agricultural operations reporting losses from wildlife damage.
- Damage solely by deer has been projected to exceed US\$100 million annually (Conover 2002).
- On a farm in southwestern Ohio, USA Begley-Miller and Cady (2015) reported 43 percent income loss to deer from soybean depredation.
- In a study involving captive white-tailed deer (*Odocoileus virginianus*), researchers at South Dakota State University determined that condensed quebracho tannins had a negative influence on intake rate and probability of consumption.
- Monteith et al. (2019) determined that an application of a solution containing 10% concentration of condensed quebracho tannins during summer resulted in a 72%

reduction in probability of feeding by deer. Additionally, Monteith et al. reported that the probability of deer avoiding a treated plot was 79% two days after tannin application.

Objectives

- To explore the efficacy of condensed quebracho tannins in a field setting, we hypothesized that an application of a solution consisting of 10% tannins to soybeans would provide a nonlethal method to reduce crop depredation by white-tailed deer.
 - Our objectives were to evaluate the use of condensed quebracho tannins in a field setting to reduce or eliminate browsing by white-tailed deer on soybeans in North Carolina.
-

Methods

- To test the efficacy of our repellent, we used 20 plots ($n = 20$), each approximately 0.2 hectares (0.5 acres), randomly assigned as a treatment factor ($n = 10$) or control ($n = 10$).
- During the growing season, treated fields received a single application of a solution containing 10% concentration of condensed quebracho tannins and water. Our carrier volume was applied at 37.8 liters (10 gallons) per acre.
- We placed camera traps in each field to document white-tailed deer use and foraging behavior.
- We conducted weekly measurements of soybean height and browsing damage during the early soybean growth stages. Additionally, Heights of plants in experimental plots, both with and without tannin application, were compared to plants from the same plot completely protected from deer browsing.
- Yield was recorded at the end of the growing season.

Initial Results

- There was no significant difference in soybean height between treated and untreated plots ($p = 0.230$).
- Plants inside enclosures were significantly taller than plants unprotected from browsing ($p < 0.001$) in both treatment and control plots.
- On a weekly basis, plants in treated plots experienced significantly less browsing ($37\% \pm 13$; $p = 0.003$) than plants from control plots ($p < 0.001$).
- Differences in mean browsing damage for treated and untreated plants were largest within the first two weeks after repellent application; indicating effectiveness at reducing browsing over time.
- There was no significant difference in the number of white-tailed deer observed displaying feeding behavior between treated and control plots ($p = 0.126$).
- There was no significant difference in estimated yields (bushels/acre) between treated and control plots ($p = 0.714$).
- The average yield estimate for plants harvested in treated plots was 60.61 bushels/acre, while plants in control plots resulted in an average of 61.60 bushels/acre.

Tentative Conclusion

- Our results suggest that a single application of condensed quebracho tannins is able to reduce—but not eliminate—deer browsing.
- The level of depredation that plants in treated plots sustained throughout our experiment—even with reduction in browsing during the first two weeks after repellent application—outweighed the protective benefits provided by our repellent.
- In areas with similar moderate–high deer densities, condensed quebracho tannins may need to be applied multiple times to achieve the level of reduced depredation recorded by Monteith et al (2019).
- In our study, repellent effectiveness was greatest in the first two weeks after application. After week two we started to see similar trends in browsing pressure

among plots. These results coincide with the timeline for observing physical evidence of tannins on plants.

- These initial results suggest that farmers struggling from deer depredation in areas with moderate–high deer densities should apply tannins at least twice over the span of two weeks. Additional applications may be necessary.