

Evaluation of Insecticides and Repellents for Suppression of Feeding Injury by Deer
in South Carolina Soybeans

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Overview

This project focused on identifying effective deer repellents for prevention and/or reduction of damage to South Carolina's soybean crop. During the 2016 SC Soybean Board funded deer repellent study we analyzed 10 chemistries for their effectiveness at deterring deer damage. The 2017 SC Soybean Board funded study focused on determining application timing and frequencies of previously identified effective chemistries for cost efficient deer repellency. The 2017 study consisted of 5 study sites from 3 geographic regions of the state. Study sites were located at Mr. Tommy Bozard's farm in Orangeburg, Edisto REC in Blackville, Sandhill REC in Columbia, Starkey Swine Center in Pendleton, and Simpson REC in Pendleton. Study plots were managed under common soybean production practices in South Carolina (herbicides and insecticides). The 2017 study analyzed both at plant treatments and foliar repellents, as well as the combination of at-plant and foliar treatments. Weekly damage ratings were recorded from each study site. Trials at Edisto, Orangeburg and Pendleton were harvested to gain respective yields. Yield and damage ratings were analyzed to identify differences among treatments. Several cost effective repellent strategies were identified in this study. Findings and deliverables from this study will be described in the paragraphs below.

Description of Trials and Results by Location

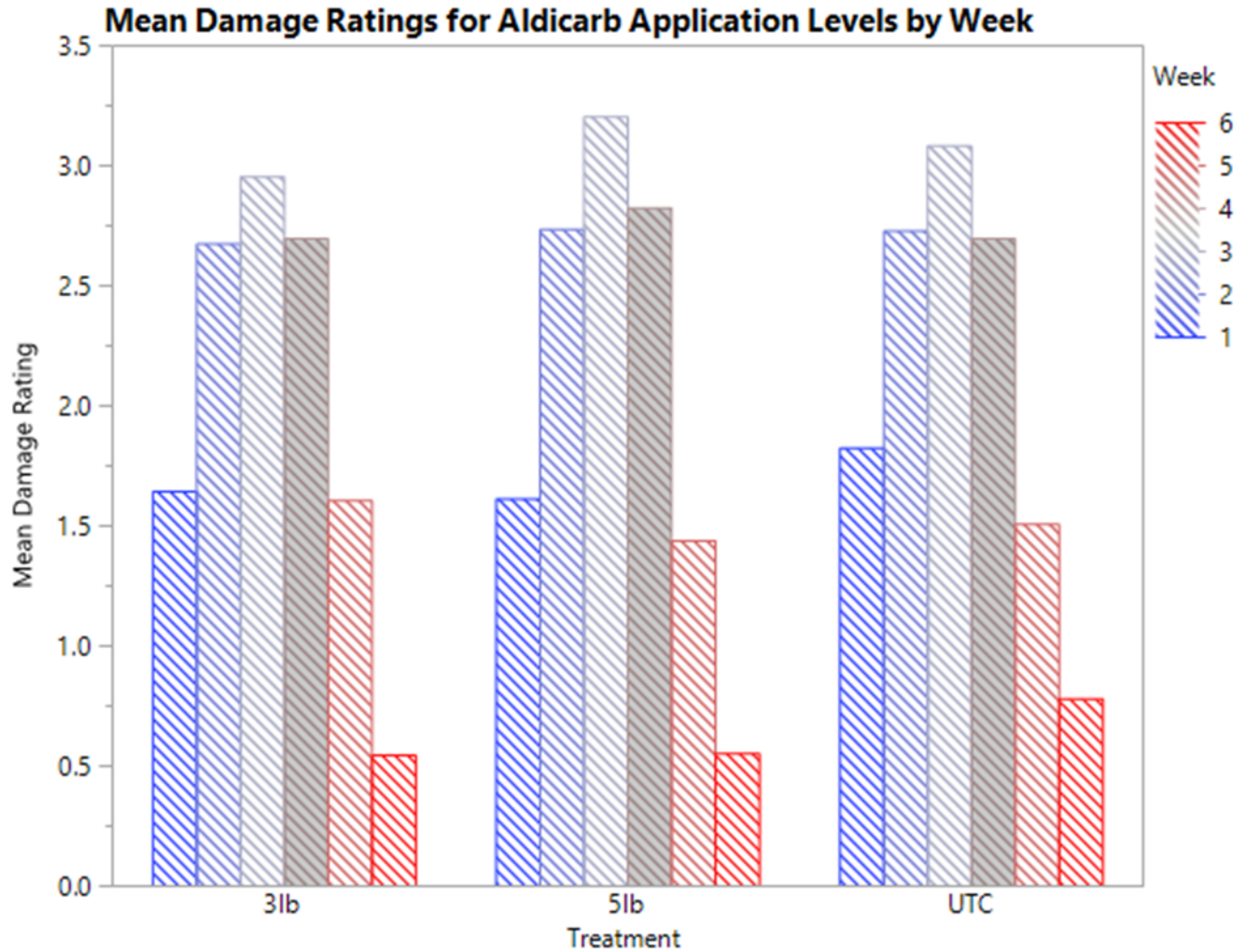
Orangeburg

The Orangeburg site (Bozard's Farm) was selected to test at-plant applications of aldicarb. Aldicarb was identified as an effective chemistry in the 2016 trials. The 2017 study looked at 0, 3 and 5 pounds of aldicarb per acre at planting. An 8-row

planter with insecticide boxes was used to plant trials. The first 4 boxes were calibrated at 3 lbs/acre. The other 4 boxes were calibrated at 5 lbs/acre. Boxes were cut off on return passes to provide 8 rows of 0 lbs/acre. This was replicated across the entire field (32 replications). Aldicarb was applied in-furrow with no additional repellent applications throughout the growing season. Crop condition was monitored weekly from emergence to full bloom. Damage ratings were assigned to each plot using a 0 to 5 scale. Mean damage ratings were as follows: 1.85 (0 lbs/acre), 1.76 (3 lbs/acre), and 1.80 (5 lbs/acre). Statistically, there were no differences in damage levels between treatments. This trial was carried to harvest. Yields were as follows: 49.14 (0 lbs/acre), 49.94 (3 lbs/acre), and 50.36 (5 lbs/acre). Yields were not statistically different among treatments. However, yields observed in this study were significantly better than historical soybean yields in this field. Soil moisture was questionable for planting at time of planting. This was followed by several weeks of continued dry weather. Rains arrived 3 weeks after the crop emerged. From that point forward deer feeding injury dramatically decreased. We suspect dry soil conditions prevented the crop from taking up and moving aldicarb in the plant.

Results from Orangeburg Trials

Rate	Mean Damage Rating	Yield
0 lbs/ac	1.85	49.14 bu/ac
3 lbs/ac	1.76	49.94 bu/ac
5 lbs/ac	1.80	50.36 bu/ac



Edisto REC

Edisto REC (Blackville) was selected for combination trials to investigate the use of at-plant treatments with foliar repellent applications. This study investigated 5 lbs/acre at-plant rates of aldicarb and phorate both alone and in combination with foliar repellent applications of Deer Pro Ag, Deer Pro Summer, Deer Pro Winter, Hinder, Insecticidal Soap, Bobbex Deer Repellent and Millers Hot Sauce. Foliar applications consisted of a single application at two weeks post emergence and a

double application, once at 2 weeks post emergence and again at 4 weeks post emergence.

The field selected for this study was long and narrow with wooded areas around the full perimeter of the field. The layout of the field should have provided equal opportunity/distribution of deer feeding activity across its entirety. However, deer damage was not equally distributed across the field. As such, we feel it would be irresponsible to report findings from the trial.

Sandhill REC

Sandhill REC (Columbia) was selected for foliar repellent trials. We tested the following repellents: Hinder, Insecticidal Soap, Deer Pro Ag, Deer Pro Summer and Deer Pro Winter. Repellents were further divided into single and double applications. Single applications were applied at 2 weeks post crop emergence, and double applications were applied at 2 and 4 weeks post crop emergence. This provided a total of 10 treatments that were replicated 4 times. This trial was a partial field study. The following crops were planted in the remainder of the field: corn, sorghum, sunflower, millet (pearl, proso and brown-top).

Deer feeding injury was minimal throughout the study. Damage was recorded in every plot. However, levels were not believed to have had significant impacts on yield. Drought like conditions on the deep sandy soils were believed to have been the significant factor in yields. Yield levels did not support harvest.

Sandhill REC - Columbia

Repellent	Applications	Mean Damage Rating
Deer Pro Ag	2 and 4 weeks	0.26
Deer Pro Summer	2 weeks	0.19
Deer Pro Summer	2 and 4 weeks	0.28
Deer Pro Winter	2 weeks	0.20
Deer Pro Winter	2 and 4 weeks	0.30
Hinder	2 weeks	0.18
Hinder	2 and 4 weeks	0.17
Insecticidal Soap	2 weeks	0.25
Insecticidal Soap	2 and 4 weeks	0.31
Untreated Control		0.25

Simpson REC

Simpson REC (Pendleton) was selected for foliar repellent trials. We tested the following repellents: Hinder, Insecticidal Soap, Deer Pro Ag, Deer Pro Summer and Deer Pro Winter. Repellents were further divided into single and double applications. Single applications were applied at 2 weeks post crop emergence, and double applications were applied at 2 and 4 weeks post crop emergence. This provided a total of 10 treatments that were replicated 4 times. This trial was conducted in a field cove that served as a “pseudo” whole field study.

Deer damage was monitored throughout the full growing cycle at this site. Mean damage levels were lowest in plots receiving two applications of Hinder (0.73) or Insecticidal Soap (0.65). Statistical analysis indicated there were no differences

among treatments for the full length of the study. There were statistical differences in damage levels during the first 6 weeks of the study, where double applications (2 and 4 weeks post emergence) of Deer Pro Summer, Hinder and Insecticidal Soap were the top performers.

Trials at Simpson REC were carried to harvest. Yields were highest in plots receiving two applications of Hinder (15.01 bu/acre). A single application of Hinder and double applications of Insecticidal Soap and Deer Pro Winter all produced yields of approximately 12 bu/acre. Statistically there were no differences in yield among treatments.

Simpson REC – Pendleton

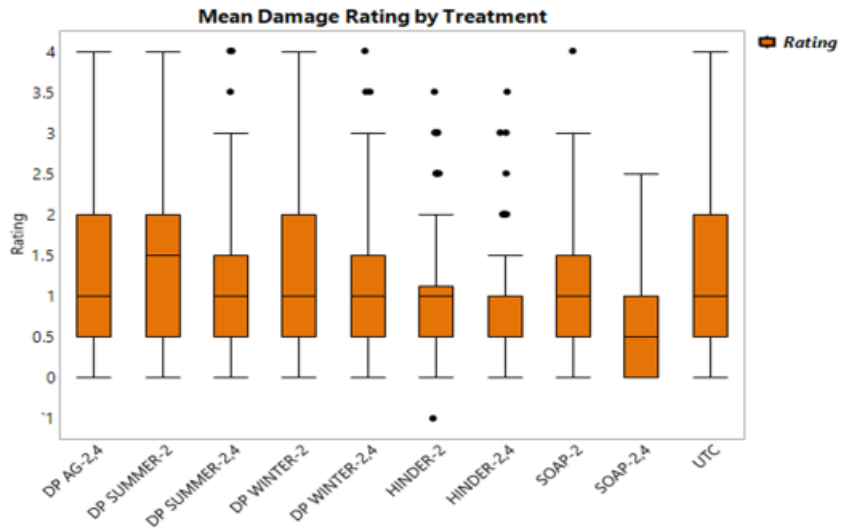
Repellent	Application	Mean Damage	Yield
Deer Pro Ag	2 and 4 weeks	1.22	7.75 bu/ac
Deer Pro Summer	2 weeks	1.49	7.04 bu/ac
Deer Pro Summer	2 and 4 weeks	1.07	9.94 bu/ac
Deer Pro Winter	2 weeks	1.32	7.45 bu/ac
Deer Pro Winter	2 and 4 weeks	1.05	12.06 bu/ac
Hinder	2 weeks	1.00	12.11 bu/ac
Hinder	2 and 4 weeks	0.73	15.01 bu/ac
Insecticidal Soap	2 weeks	1.04	9.39 bu/ac
Insecticidal Soap	2 and 4 weeks	0.65	12.23 bu/ac
Untreated Control		1.38	6.28 bu/ac

First 6 Weeks – Damage Levels

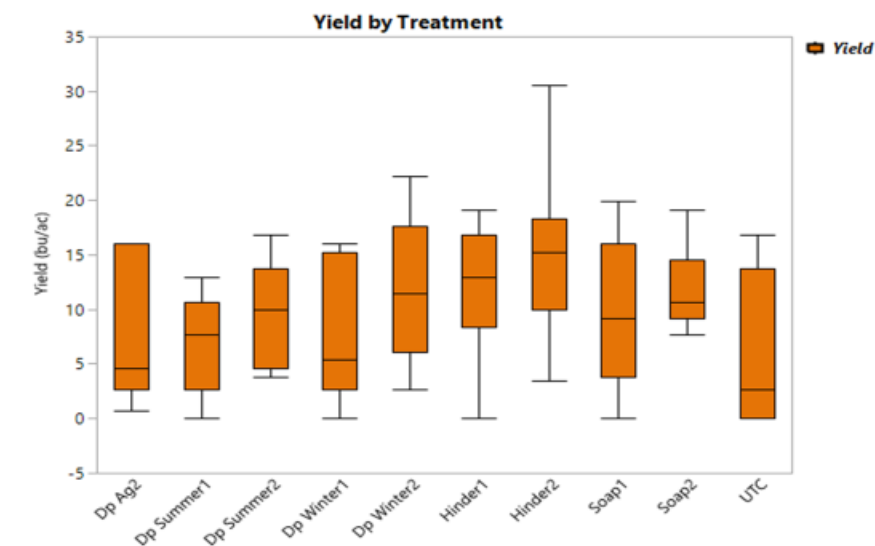
Level		Least Sq Mean
UTC	A	0.97619048
Dp Summer1	A B	0.95238095
Soap1	A B C	0.76190476
Dp Ag2	A B C	0.70238095
Dp Winter1	B C	0.67857143
Dp Winter2	C D	0.61904762
Hinder1	C D	0.61904762
Dp Summer2	C D E	0.50000000
Hinder2	D E	0.35365854
Soap2	E	0.22619048

Levels not connected by same letter are significantly different.

Simpson REC – Mean Damage Rating



Simpson REC - Yields



Starkey Swine Center

Starkey Swine Center (Pendleton) was selected for foliar repellent trials. We tested the following repellents: Hinder, Insecticidal Soap, Deer Pro Ag, Deer Pro Summer and Deer Pro Winter. Repellents were further divided into single and double applications. Single applications were applied at 2 weeks post crop emergence, and double applications were applied at 2 and 4 weeks post crop emergence. This provided a total of 10 treatments that were replicated 4 times. This trial was conducted in a field cove that served as a "pseudo" whole field study.

Deer damage was monitored throughout the full growing cycle at this site. Deer feeding injury was minimal at this study site. Deer were likely feeding in nearby

alfalfa plantings. As a result, minimal injury was observed to the crop and no statistical differences were observed.

Starkey Swine Center

Repellent	Applications	Mean Damage Rating
Deer Pro Ag	2 and 4 weeks	0.39
Deer Pro Summer	2 weeks	0.32
Deer Pro Summer	2 and 4 weeks	0.34
Deer Pro Winter	2 weeks	0.45
Deer Pro Winter	2 and 4 weeks	0.41
Hinder	2 weeks	0.34
Hinder	2 and 4 weeks	0.44
Insecticidal Soap	2 weeks	0.35
Insecticidal Soap	2 and 4 weeks	0.47
Untreated Control		0.51

Presentations

Findings of the 2016 and 2017 studies have been presented throughout the SC and several other states. Below is a list of presentations that delivered information derived from this study.

- South Carolina Certified Crop Advisors – Santee, SC
- Southeastern Deer Study Group Meeting – St. Louis, MO
- SC Plantation Managers Association – Beaufort, SC
- Simpson REC Row Crop Field Day (2) – Pendleton, SC
- Upstate Row Crop Meeting – Anderson, SC
- Upstate Row Crop Meeting – Clemson, SC
- Georgia Soybean Short Course – Statesboro, GA

Conclusion

Results from this 2-year study suggest farmers who experience extensive deer feeding injury to their soybean crops may benefit from at-plant applications of aldicarb. Our findings indicate that both 3 lb and 5 lb application rates provide acceptable suppression. Additionally, farmers may elect to further reduce application cost by applying to every other row or every third row. Farmers who do not have the ability to apply aldicarb may be able to achieve satisfactory suppression of feeding injury through applications of Hinder or Insecticidal Soap. Other repellents have shown promise at individual locations, but Hinder and Insecticidal Soap produced similar levels of control throughout both years and all locations in this study.

Finally, we would like to thank the SC Soybean Board and the soybean growers of SC for funding this project. It has been an absolute pleasure to conduct this project and to share the results with growers. We hope this project will allow growers to improve bean production in areas where deer have presented problems.