PSB R2018-P01

Pennsylvania Soybean Board Final Report

Evaluating Deer Damage on Current PA Soybean Varieties

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The objectives of this project were to establish a field method for evaluating soybeans for deer tolerance, evaluate 28 current Pennsylvania soybean varieties for deer tolerance and to give college students hands on experience with field research. Deer tolerance in soybeans, as measured by change in yield or lack thereof with and without deer pressure, could be based on deer preference for varieties or rapid regrowth after grazing. Deer pressure at the field site tested was too high, estimated 8 deer per acre, resulting in no yield for all 28 varieties of soybeans without deer fence. Results are inconclusive for preference between these varieties, but clearly show deer preference for beans over corn. The method of fencing beans and using game cameras to verify deer time spent within varieties and damage from deer may have potential as tools for deer tolerance trials, but would need modification for future trials to distinguish variation between soybean lines in areas with high deer pressure. Six students were involved in field management and sophomore Julia Van Sciver tracked weekly growth and development and presented her results at a community field day on September 16, 2019 and at the national Agronomy Society of America conference in Baltimore, MD on November 4, 2019. Van Skiver's talk generated more audience questions than all talks in her section.

Figure 1. Left: Soybean trial community tour in September. Exposed soybeans in the foreground with protected soybeans behind the group. Exposed beans did not grow above 15 cm and flowered, a common stress response, before the protected soybeans. Right: Julia Van Sciver, sophomore crop science major, presented research at the American Society of Agronomy national meeting in Baltimore, MD in November.

Methods: The Delaware Valley University (DelVal) deer tolerance soybean trial was planted on Farm 7 (N40.2853, W75.1720) surrounded by corn and woodlands. 28 varieties of soybeans from 5 sources were planted on June 26th in 30" rows at 160,000 seed per acre. The complete list of varieties is below. Three rows of each variety were planted in triplicates for a total field plot of 60' x 630'. Planter bins were vacuumed between passes to prevent seed contamination between rows.

On July 30th deer exclusion fencing (8' T-posts and plastic mesh fencing with zip ties) was placed around half of the plots (25' x 63'). Large row numbers were placed on the fence as markers so that the game camera images could be used to distinguish movement in particular plots. There was constant deer pressure in the chosen field. Ten game cameras were placed 50' in front of the deer fence and 63' apart from each other to record animal movement in the field.

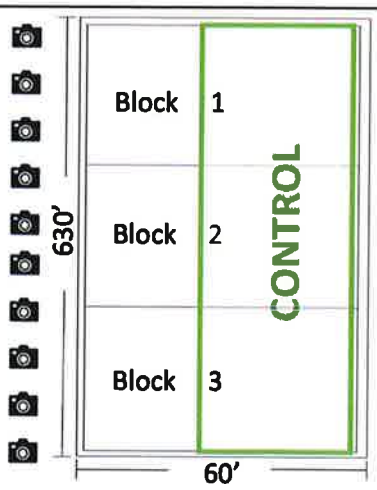

Figure 2. Field layout. Green box indicates deer exclusion fence which protected half of each row. Came cameras were place facing the plots on the unprotected side.

Weekly monitoring was done to measure height and development of beans on the center of each triple row both inside and outside of the protective deer fence. Images from cameras were transferred to a computer weekly. Deer population was estimated based on the ratio of the repeated images of the same bucks relative to the total number of images taken over a 10 day period.

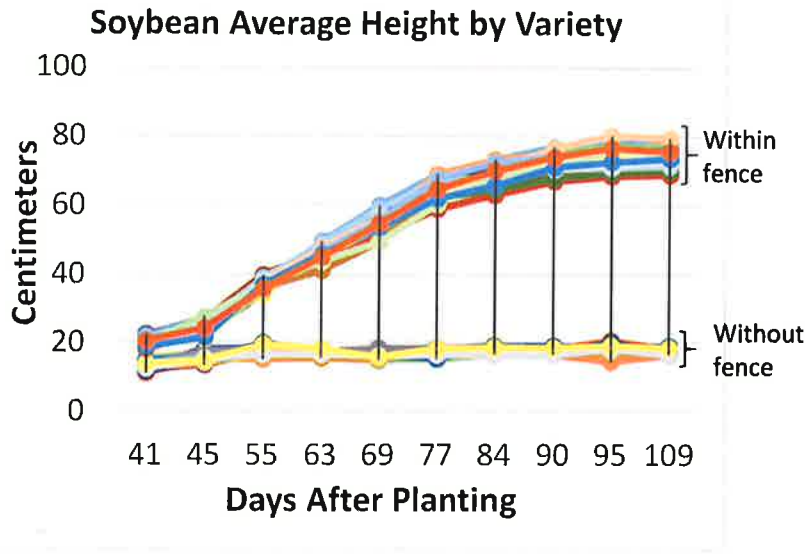

Figure 3. Height of plants tracked inside and outside of the deer exclusion fence

Results of Trial: All exposed bean varieties were destroyed by the deer pressure. The exposed beans flowered before the protected beans as is common during stress. There was no significant yield from any variety.

Discussion: Because of the wet spring, all steps of our research were delayed including field preparation, planting,

fence placement and weed control. We resorted to Roundup for weed management, which surprising did not appear to harm the non-Roundup resistant lines we planted.

The delay in weed management appeared to give protection to the soybeans. A single herbicide pass had burned down weeds on a border strip of the experiment and this strip had the first soybean shoots eaten, while the beans which were hidden below the weeds went relatively untouched by the deer until the later herbicide application exposed them. Based on this observation delaying weed burn down or planting into cover crops may potentially protect soybeans from some deer damage early in the season. There were much less weed in the area protected by the deer fence because the soybean canopy closed out weed competition. Soybean canopy never developed with deer pressure.

In order to distinguish deer tolerance in soybeans with high deer pressure like what was seen in the research field, sequential fencing could be placed around beans or removed from beans to see if early or late damage is more critical. Though not practical for production, this may show variation in bean traits which could be used for breeding improved deer tolerant varieties or help researchers understand why some varieties have less herbivory damage.

There is also potential to test a wider variety of genetics from the USDA soy bean germplasm collection held at Urbana, IL including wild soybeans. Though this collection would not likely flower or yield seeds in Pennsylvania growing conditions with wider genetics may come wider phenotypes including harrier leaves or secondary chemicals that are distasteful to mammals such as deer. If there were known wild soybean plants that were tolerant to deer pressure in Pennsylvania, these could be crossed to breeding lines in the future to add the wild-tolerance to the cultivated-high yielding lines.

Though we did not distinguish any varieties with improved deer tolerance from the 28 varieties tested, the students involved in the project had the opportunity to learn more about soybean management and to share their knowledge with the local and national community. Having an efficient reliable method for to evaluate deer preference and tolerance in soybeans may make it easier for researchers to develop improved bean varieties for growers in regions of Pennsylvania and other areas which have high deer pressure in their agriculture fields.

Figure 4. Delaware Valley University students planting the trials and putting up the deer exclusion fence. Game camera image distinguishes between rows in the foreground, but cannot read row number in deer post.

List of soybean varieties planted June 26, 2018

	Company	Variety
1	Asgrow	AG30x8
2	Asgrow	AG32x8
3	Asgrow	AG33x8
4	Asgrow	AG39x7
5	Hi Soy	HS33x70
6	Hi Soy	HS37x70
7	Hi Soy	HS38x70
8	Hi Soy	HS39T60
9	Local Seed	TS3629GTS
10	Local Seed	TS3759R2
11	Local Seed	TS3969R2x
12	Local Seed	TS3979R2x
13	Seedway	SG2816
14	Seedway	SG3000XT
15	Seedway	SG3416XT
16	Seedway	SG3555
17	Seedway	SG3783XT
18	Stine	24RH62
19	Stine	28BA02
20	Stine	29RI32
21	Stine	32RF02
22	Syngenta	S33 D7X
23	Syngenta	S35 K9X
24	Syngenta	S37 H5X
25	Syngenta	S39 C4 (not RR)
26	Syngenta	S39 P5X
27	Syngenta	S39 T3 (not RR)
28	Syngenta	S39R9X