

The Pennsylvania Vegetable Marketing and Research Program

Evaluating Burndown Options for No-till Snap Bean

Mark VanGessel, University of Delaware

John Wallace and Dwight Lingenfelter, Penn State, Department of Plant Science

Lynn Sosnoskie, Cornell University

Many farmers are interested in growing snap beans with no or limited tillage for many reasons, including soil health, time savings, fuel savings, and moisture conservation. However, effective “burndown” herbicide options are essential in order to control existing vegetation so snap beans are planted into a “clean” field. These herbicides need to provide excellent weed control for winter annual weeds and early-emerging summer annual weeds. In addition, these herbicides cannot cause injury to the snap bean crop. Glyphosate has been used extensively for this purpose but with the spread of glyphosate-resistant weeds (i.e. horseweed, Palmer amaranth, and common ragweed) as well as presence of species less susceptible to glyphosate (i.e. primrose, mustards, filaree), requires additional control options. Grain farmers have not replaced glyphosate, rather are including tank-mix partners to improve control. Three herbicides have been used routinely with glyphosate for this purpose, Liberty, Sharpen, and Elevore. None of these herbicides are currently labeled for this use and research is needed to demonstrate the crop safety.

The objective of this trial is to evaluate potential burndown herbicides for no-till snap bean production. This experiment will focus on snap bean safety since the herbicides included in this trial have been used extensively in agronomic research, so their weed control attributes are well established.

Materials and Methods: A field trial was conducted in 2021, at University of Delaware’s Carvel Research and Education Center in Georgetown (DE), Cornell’s AgriTech Experiment Station in Geneva (NY), and Penn State Horticultural Research Farm in Rock Springs (PA). Soil type at the sites were sandy loam (DE), loam (NY), and silt loam (PA).

Herbicide treatments were Liberty 280 (glufosinate) at 1 qt/A, Sharpen (saflufenacil) at 1.5 fl oz/A, and Elevore (halauxifen) at 1 fl oz/A. Herbicides were applied at either 10 or 3 days prior to planting snap beans. Applications were made with CO₂-pressurized backpack sprayers calibrated to deliver 20 GPA to plots that were two or four rows wide and 20 to 30 feet in length. Untreated plots were included as a comparison for ratings. New York was not able to include Elevore treatments. All treatments were replicated three to four times at each site.

Snap beans were seeded at 65,000 to 110,000 seeds/A depending on the site. Snap bean varieties were ‘Caprice’ in Delaware, ‘Huntington’ in New York, and Delaware planted lima beans (‘Cypress’) as well as snap beans. Injury ratings (stunting and necrosis) on a scale of 0% (no injury) to 100% (complete plant death) were made at weekly intervals at each location. Stand counts were collected in DE and NY, although at different stage of the bean crop. Snap

bean biomass was collected in DE, and yield data was collected in NY.

Results: Plots were rated 2, 3, and 4 weeks after planting (WAP). However, by 4 WAP stunting was often confounded with herbicide injury and summer annual weed competition.

Liberty applied 10 days prior to planting had the least amount of injury of all the treatments evaluated. Across the three locations, less than 5% injury was observed at 2 and 3 WAP. If Liberty was applied 3 days before planting, injury was more likely to occur and ranged from 0 to 27% at 2 WAP and 3 to 15% at 3 WAP.

Stunting from Elevore applied 10 days prior to planting ranged from 8 to 15% at 2 WAP and 0 to 10% at 3 WAP. Elevore applied 3 days prior to planting ranged from 23 to 53% injury at 2 and 3 WAP. Substantial injury from Elevore applied 3 days prior to planting occurred at all locations and plants were slow to recover.

Sharpen was the most injurious herbicide treatment. Delaying the time between the application and planting improved safety; however, injury was not acceptable and ranged from 35 to 99% when rated at 2 and 3 WAP.

Snap bean injury at 2 and 3 weeks after planting (WAP), averaged over three locations.

| Herbicide | Days before planting | Injury 2 WAP* | | | Injury 3 WAP* | | |
|------------|----------------------|----------------------|-------|------|----------------------|-------|-------|
| | | DE | NY | PA | DE | NY | PA |
| | | ----- % injury ----- | | | ----- % injury ----- | | |
| Elevore | 10d | 15 e | - | 8 f | 0 i | - | 10 gh |
| Elevore | 3d | 53 b | - | 23 d | 23 f | - | 40 d |
| Liberty | 10d | 0 h | 3 g | 0 h | 2 i | 5 hi | 0 i |
| Liberty | 3d | 27 d | 10 ef | 0 h | 15 g | 13 g | 3 hi |
| Sharpen | 10d | 60 b | 99 a | 42 c | 35 de | 99 a | 67 c |
| Sharpen | 3d | 100 a | 99 a | 87 a | 99 ab | 100 a | 92 b |
| LSD P=0.05 | | 6.89 | | | 7.50 | | |
| Std. Dev. | | 4.99 | | | 5.43 | | |
| CV | | 13.27 | | | 15.27 | | |

Values followed by the same letter within sampling dates are not significantly different.

Snap bean stand counts in Delaware 5 WAP were similar for the untreated check and both timings of Liberty application. Stand count was significantly lower for Elevore and Sharpen compared to the untreated check. In addition, weight per plant was similar for both Liberty timings and the untreated check.

In New York, stand counts at harvest and yield were not significantly different from the untreated check except Sharpen applied 3 days before planting (note Elevore was not included

at the NY site).

Lima beans in Delaware responded similarly to snap beans for all the treatments.

Summary and Outreach: Liberty maybe an option for preplant herbicide applications in snap beans, provided there is a delay between application and planting. In this trial, a 10 day delay resulted in little to no observable injury. Applications only 3 days before planting resulted in at least 10% injury in two of the three locations, and stunting was observed for at least three weeks after planting. Additional research should identify if 5 to 7 days was provide sufficient crop safety.

Future research should include a longer waiting period after application of Elevore. Ten days resulted in much less injury than 3 days, but the average was over 10% injury. Sharpen was too injurious for use in snap bean without a much longer delay between application and planting.

This data has been shared with USDA IR-4 Project, which focuses on registering pesticides for specialty crops and BASF, the manufacturer of Liberty. Information has been discussed at the Delaware Ag Week (annual research and extension update for farmers) and the 2022 Mid-Atlantic Fruit and Vegetable Convention.

