

Potential Herbicides to Control Problem Weeds in Snap Bean

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Introduction

Pennsylvania, Delaware, Maryland, New Jersey, and New York combined produce over 46,000 acres of snap beans (NASS, 2017). Management of weeds is a major concern to snap bean producers and a critical component to provide optimal crop yield. Some major weeds of concern in snap bean production in the region include foxtail, crabgrass, lambsquarters, smooth pigweed, common ragweed, nightshade, velvetleaf, horsenettle, and yellow nutsedge. However, within the past five years, species such as Palmer amaranth, waterhemp, and annual morningglory are become more prevalent in the area and there are indications that these aggressive species will further spread in both agronomic and horticultural cropping systems. These new weeds can be especially difficult to manage with the current snap bean herbicide options available. Furthermore, only a limited number of herbicides are currently available for snap beans, with a heavy reliance on ALS-inhibiting herbicides (Pursuit, Raptor, and Sandea) for broadleaf weed control. Several herbicide-resistant weed biotypes have been selected due to the over reliance on ALS-inhibiting herbicides, not only in snap beans but in many rotational crops as well. The number of fields infested with herbicide-resistant biotypes is increasing in the Mid-Atlantic region.

PPO-inhibiting herbicide products such as Valor, Spartan, Reflex, and Cobra have provided control of these weeds in soybean and there is potentially a fit to use them in snap bean production. Except for Reflex, only limited field data is available on the utility of the PPO-inhibiting herbicides in snap bean.

Objectives

To evaluate herbicide effectiveness of these potential herbicides when used in combination with herbicides as compared to current standards. Also, to determine the effect of these herbicide treatments on snap bean stand, injury, and yield. This study is being conducted at the Western Maryland Research & Education Center in Keedysville, MD, the Penn State Research & Education Center in Rock Springs, PA, and at the University of Delaware Research & Education Center in Georgetown, DE.

Methods

The field was tilled prior to planting. Snap beans were planted on 30 inch rows at a population of 180,000 plants per acre on May 30. Fourteen treatments, including an untreated control, were evaluated (Table 1), with three replications of each treatment. Preemergence herbicides were applied on May 31, and postemergence herbicides were applied on June 26 when the snap beans had two trifoliolate leaves. Crop injury and weed control were visually evaluated throughout the season. Plots were harvested by hand on July 26.

Results

Carpetweed, oxalis, pigweed, morningglory, foxtail, and crabgrass were the most common weeds present. Herbicide treatments provided 87 to 99 percent control of carpetweed, 93 to 99 percent control of pigweed, 76 to 99 percent control of foxtail, and 75 to 93 percent control of crabgrass (Figure 1). Spartan (7.7 fl oz) + Dual and Sandea + Dual provided the best control of oxalis (86 and 91%, respectively). The following treatments provided 91, 99, and 99 percent control of morningglory: Spartan (7.7 fl oz) + Dual; Valor + Dual fb Basagran + Reflex; and Spartan + Dual fb Basagran + Reflex.

A handful of marestalk plants were scattered throughout the plots; this was not enough to evaluate all treatments on marestalk control. However, if the marestalk was smaller than four inches, the

postemergence herbicide was able to control it. If the marestalk was taller than four inches, the postemergence herbicide only burned it, and regrowth occurred.

The treatment which included Collide resulted in 57% crop injury four weeks after planting. By harvest, it was reduced to 5% injury. The treatments which included Valor (2 oz) + Dual preemergence showed an average of 10% crop injury four weeks after planting, but by harvest, the beans had outgrown it and showed no signs of injury.

Yield ranged from 4,503 lbs/A (untreated) to 9,263 lbs/A (Valor (1 oz) + Dual). However, yield was quite variable across the three replications (Table 2). All treatments excepted for the untreated control had more than 1,000 lbs/A difference in yield across the three replications. This difference could be due to variability in the field and human error during harvest.

In general, the PPO herbicides (Spartan, Reflex, Valor, Cobra, and Collide) provided good weed control and could be a fit in snap bean production. Valor, Cobra, and Collide are currently not labeled, but this could be a possibility. Although, the crop injury from Collide and Valor and its impact on yield need to be investigated further.

Table 1. Snap bean herbicide treatment list.

Treatment	Herbicide(s)*	Rate/A	Application timing**
1	Untreated		
2	Valor + Dual Magnum	1 oz + 1.5 pt	PRE
3	Valor + Dual Magnum	2 oz + 1.5 pt	PRE
4	Spartan + Dual Magnum	3.85 fl oz + 1.5 pt	PRE
5	Spartan + Dual Magnum	7.7 fl oz + 1.5 pt	PRE
6	Cobra + Dual Magnum	12 fl oz + 1.5 pt	PRE
7	Collide + Dual Magnum	1 pt + 1.5 pt	PRE
8	Reflex + Dual Magnum	1.25 pt + 1.5 pt	PRE
9	Sandea + Dual Magnum	0.67 oz+ 1.5 pt	PRE
10	Valor + Dual Magnum fb Basagran + Reflex + NIS	2 oz + 1.5 pt 1.5 pt + 0.75 pt	PRE fb POST
11	Spartan + Dual Magnum fb Basagran + Reflex + NIS	7.7 fl oz + 1.5 pt 1.5 pt + 0.75 pt	PRE fb POST
12	Cobra + Dual Magnum fb Basagran + Reflex + NIS	12 fl oz + 1.5 pt 1.5 pt + 0.75 pt	PRE fb POST
13	Sandea+ Dual Magnum fb Basagran + Reflex + NIS	0.67 oz+ 1.5 pt 1.5 pt + 0.75 pt	PRE fb POST
14	Sandea+ Dual Magnum fb Basagran + Raptor + NIS	0.67 oz+ 1.5 pt 1.5 pt + 4 fl oz	PRE fb POST

*fb = followed by; NIS=nonionic surfactant

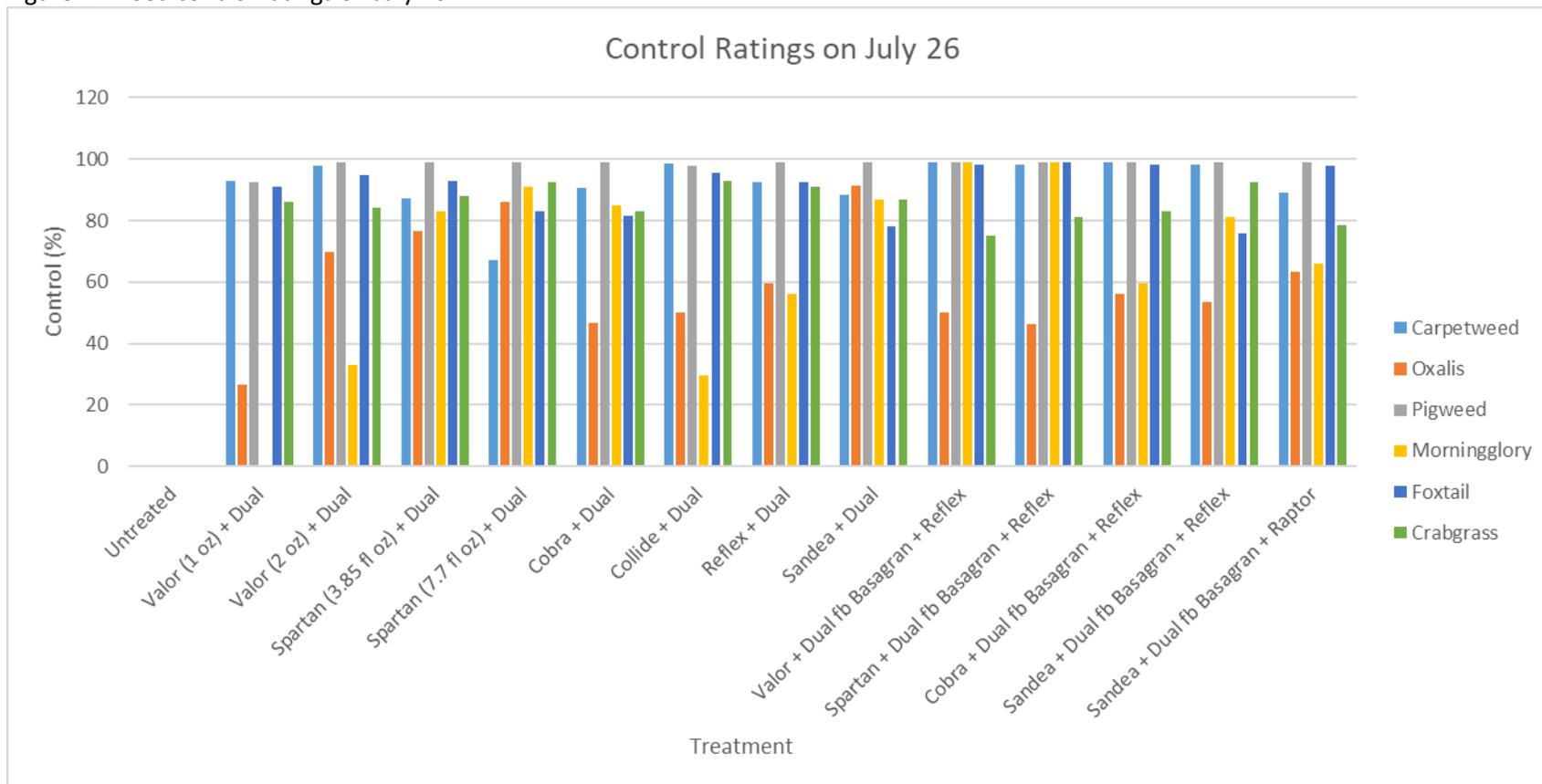
**PRE = preemergence/soil-applied; POST = postemergence

Table 2. Snap bean yield and variability.

<u>Treatment</u>	<u>Yield (lbs/A)</u>		
	<u>Average</u>	<u>Lowest Rep*</u>	<u>Highest Rep</u>
Untreated	4,503	4,087	4,808
Valor (1 oz) + Dual	9,263	8,654	10,385
Valor (2 oz) + Dual	9,087	6,923	10,481
Spartan (3.85 fl oz) + Dual	6,026	5,529	6,539
Spartan (7.7 fl oz + Dual)	8,238	7,356	9,856
Cobra + Dual	5,353	3,894	6,827
Collide + Dual	7,500	5,914	8,895
Reflex + Dual	7,260	5,337	8,606
Sandea + Dual	8,318	7,164	9,231
Valor + Dual fb Basagran + Reflex	7,789	6,058	10,818
Spartan + Dual fb Basagran + Reflex	6,923	4,616	8,174
Cobra + Dual fb Basagran + Reflex	7,436	3,077	12,020
Sandea + Dual fb Basagran + Reflex	8,414	7,068	10,001
Sandea + Dual fb Basagran + Raptor	6,731	4,712	9,183

*Rep = replication (Each treatment had three replications.)

Figure 1. Weed control ratings on July 26



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