IMPLICATIONS OF OFF-TARGET HERBICIDES NEAR SPECIALTY CROPS

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The introduction of new agronomic crop herbicides in recent years that are active at low doses, as well as the pending introduction of crop traits conferring resistance to additional herbicides, have spurred an interest among specialty crop producers in knowing more about the potential off-target implications of these tools. While pesticide drift remains a concern, our recent work has focused more on implications of potential spray tank contamination when specialty crops are sprayed after agronomic crops, such as corn, soybean or small grains. We recently completed a replicated study in snap bean and potato in this subject area and have also completed the first repetition of a 2-year study looking at the implications of potato seed crop exposure to herbicides on daughter tuber germination and growth.

In 2011 and 2012 our research focused on the implications of off-target synthetic auxin and glyphosate herbicides on snap bean and potato production. The overall goal of this research was to describe the relationship between visually estimated crop injury and snap bean and potato yield and quality. In snap bean in 2011, injury from dicamba 7 DAT (days after treatment) ranged from 19% at the 1.2 g ae ha^{-1} application rate to 45% at the 7.0 g ha^{-1} application rate. By 28 DAT in 2011, injury from 2,4-D was similar to the nontreated control. However, early-season injury in 2011 delayed snap bean flowering and reduced crop yield compared to the nontreated control for all treatments except where the 1.4 g ae ha^{-1} rate of 2,4-D and glyphosate at 7.0 g ae ha^{-1} were applied. Snap bean injury from dicamba was greater than that from 2,4-D at all rating timings in 2011 and two of three rating timings in 2012, and crop yield was reduced compared to where 2,4-D was applied and the nontreated control in both years. Potato tuber size distribution was variable and total yield did not differ among treatments and the nontreated control in 2011. In 2012, tuber size distribution was again variable, but more non-marketable cull potatoes were harvested when dicamba was applied to 25 cm potato plants at the 7.0 g ha^{-1} rate compared to any other treatment. Snap bean injury observations about three weeks prior to harvest were strongly correlated with crop yield ($r = -0.84$ and -0.88 in 2011 and 2012 respectively), allowing time to make informed harvest decisions relative to crop quality. In contrast, the relationship between potato injury and tuber yield was poor and highly variable in both years [2].

In 2013 we initiated the first replication of a 2-year study investigating the implications of potato seed crop exposure to off-target herbicides (such as through tank contamination) on daughter tuber germination, growth and yield. Thirteen herbicides commonly used in agronomic and non-crop areas nearby potato seed production were evaluated at 1% of the commercial use rate applied at potato tuber initiation. Glyphosate was also evaluated at 2 and 4% of typical use rates. In the seed crop production year (2013), potato injury visually estimated 5 DAT was greatest where mesotrione was applied. By 28 DAT, potato injury differed from the nontreated check only where dicamba or aminopyralid were applied. Other than the aforementioned herbicides, injury from other herbicides was 5% or less at all visual evaluation timings. Total potato tuber yield and individual potato grade class weights were similar among herbicide treatments and the nontreated check. Additionally, non-marketable and misshapen cull tuber weight did not differ among treatments. Seed from the mother plants was stored and planted in

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[2] Adapted from a 2014 Weed Technology article (in press) by the same authors.

the 2014 growing season. Injury was observed in some cases from the 2013 herbicide application, but statistical analyses of these data were not available at the proceedings deadline. Interestingly, the injury was sporadically observed among plants within a plot, where affected potato plants were often surrounded by healthy plants. A repetition of this study was initiated in 2014 and subsequent seed potatoes will be planted in 2015.