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Growth Regulator Injury and Interactions with Soybean POST Applications

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Soybean leaf straping due to 2,4-D injury.

Every summer, a number of soybean exhibit leaf cupping, puckering, and strapping. These are all symptoms that often appear when they come in contact with growth regulator herbicides. Soybean is sensitive to growth regulator herbicides, such as dicamba (Banvel, Clarity, Sterling, and Oracle), 2,4-D (many different products), and clobpyralid (Curtail and Stinger). However, the above symptoms don't always result in negative yield responses.

Soybean can come in contact with growth regulator herbicides a couple of ways. Growth regulator herbicides are effective broadleaf herbicides used POST on corn. In some cases applications of growth regulator herbicides can drift from one field onto another. Drift can occur as particulate drift – where small droplets released by the sprayer move in air currents onto the sensitive crop. The smaller the droplet, the farther it can travel. In a 3 mph wind, a 100 micron droplet can travel 44 feet (Proost, Boerboom, and Schmidt. 2004). In the same wind, a 400 micron droplet may move only 9 feet. Another way in which drift can occur is as vapor drift. This is where the growth regulator is applied, volatilizes, and moves off site in the form of vapor. The potential for volatilization increases when temperature increases and when the relative humidity decreases.

Another way in which soybean can come in contact with soybean is through tank contamination. This is a situation where trace amounts of a growth regulator remain in the spray tank or the plumbing of the application rig. Trace amounts of growth regulators have been detected even after the tank has been cleaned properly. Some large commercial application companies and producers separate the equipment out by crop to avoid the possibility of growth regulator contamination.

One question that could be asked, is if the use of soybean POST products on soybean make soybean more susceptible to the effects of growth regulators. A recently published study by University of Illinois in Weed Science (Kelley et al. 2005) investigated injury to soybean from growth regulator herbicides and the interactions between growth regulator injury on soybean and soybean POST herbicides.

Rates of growth regulators were selected to simulate a drift situation where yields were reduced. Dicamba and dicamba plus diflufenzopyr were applied at 0.1% and 1% of the labeled corn rate. The herbicide 2,4-D was applied at 10% and 32% and clopyralid was applied at 1 and 3.2% or the labeled corn rate. Applications were applied to soybean V3, V7, and R2 growth stages.

By 4 to 7 weeks after treatment, injury symptoms from the lower rates of dicamba, dicamba + diflufenzopyr, 2,4-D started to disappear in the new growth. Injury from clopyralid and the higher rates of the above herbicides was more persistent (Kelly et al. 2005).

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When dicamba was combined with POST applications of labeled soybean herbicides, imazethapyr (Pursuit), imazamox (Raptor), and fomesafen (Flexstar) some synergistic effects on injury were reported. Injury was reported to increase when dicamba was combined with imazethapyr, imazamox, and fomesafen from the injury seen from drift dicamba alone (Kelly et al. 2005). When combining glyphosate and dicamba drift rates together a synergistic effect on injury was seen in one out of the two years the study was conducted.

Typically, injury occurring in the reproductive stage of soybean has a higher probability of having a yield effect at lower rates of growth regulator. This is suspected by the recovery often seen in young soybean from the injury and from check plots often taken on fields that have experienced a drift response. However, in the study from Illinois, application in the V3 soybean growth stage tended to have lower yields than those where treatments were applied at the R2 growth stage (Kelly et al. 2005). Soybean yield was 14% less when Dicamba (1% of labeled corn rate) applied at the V3 stage as compared to when the application was done in the R2 stage. This same soybean plot had a 37% injury rating 2 weeks after application of dicamba. This synergistic effect was seen in reducing yield in imazethapyr and imazamox with dicamba one out of two years. The synergistic effect in reducing yield with fomesafen and dicamba was seen two out of two years, but not seen with glyphosate + dicamba.

When viewing a soybean field that has been exposed to growth regulator drift, it is difficult to impossible to predict yield response. Far too many factors come into play in such a scenario. Not least of which the environmental conditions from the time of exposure to harvest. However, this study would suggest that growth regulator injury from drift may interact with the above POST soybean herbicides to increase injury and possibly reduce yields.

Kelly, K.B., L.M. Wax, A.G. Hager, and D.E. Riechers. 2005. Soybean response to plant growth regulator herbicides is affected by other postemergence herbicides. Weed Sci. 53:101-112

Proost, R., C. Boerboom, R. Schmidt. 2004. Dicamba Injury to Soybeans. Nutrient and Pest Management, University of Wiscounsin-Madison. R-10-2004 7.5M (http://ipcm.wisc.edu/pubs/pdf/dicamba2004.pdf)

Information listed here is based on research and outreach extension programming at Purdue University and elsewhere.

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