Soybean Dicamba Tolerance Varies by Variety

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This past summer, PGR (plant growth regulator) symptoms showed up in many soybean fields. A lot of confusion ensued regarding the cause of the symptoms and whether there would be yield loss as a result. In many cases, dicamba drift was the likely cause of the PGR symptoms being expressed. Even though the new dicamba formulations were designed to have less volatility, it is clear that there were issues with vapor (volatility) drift, more so than particle drift. Dicamba is one of the older chemistries used, so why was there so much more drift than in the past? The application rate of dicamba to dicamba-tolerant soybeans is four times the rate applied to cereals in the past. Soybeans are also the leading crop by acres in North Dakota and the most sensitive to dicamba. Soybeans are about 10 times more sensitive to dicamba than grapes are to 2,4-D. The increased acreage, and increased rates, coupled with an extremely sensitive crop, have led us to the current point of widespread PGR symptom expression.

While some instances of drift injury were clear, with severe stunting, delayed maturity, and reduced yields, many instances were less severe, with leaf cupping and alligator skin, but no growing-point damage. The difficult task this winter will be for many people to determine if there was any yield damage due to the less severe symptoms. Several factors have made this challenging, including whole fields with symptom expression, possible multiple dicamba exposures, and differences in variety tolerance to dicamba. This latter factor was surprising to learn and may not be noticed outside of variety trials. At the CREC there was a great opportunity to observe varietal differences in PGR symptoms. In 2017 there were irrigated and dryland versions of conventional, Liberty Link, and Roundup Ready® (plus dicamba tolerant) trials. Each plot in these trials was given a rating of 0-9 based on the severity of PGR symptoms observed in mid-August. A 0 indicated a perfectly healthy plant, while a 9 indicated severe growing-point damage. In these trials, damage was relatively light in most cases, with only a handful of varieties reaching a score of up to 5. At a 5, there was severe leaf cupping, along with some leaf necrosis along the edges, but no growing-point damage.

None of the irrigated trials displayed more than very minor leaf cupping. There was not any correlation between symptoms and yield in those trials. The dryland trials had more symptoms. In each trial, there were several plot and varieties with no symptoms. The highest percent of PGR-affected plots was in the Liberty Link trial, where 83% of plots displayed symptoms, compared to the low of 66% of plots in the conventional trial. Roughly half of all plots which had symptoms were categorized as having only minor leaf cupping (a score of 1).

It is difficult to estimate the effects of symptoms on soybean yields by only looking at a single year. In Figure 1 it appears that yield is gradually increasing as the severity of symptoms increases. This initially indicates that the expression of symptoms has caused a yield increase. However, a more accurate method to test the effects of symptoms would be to compare 2017 to historical data. There were several varieties tested in 2016 and 2017. For each year we compared a variety's mean performance with the trial average (to get a % yield). We then determined if the performance increased or decreased compared to the trial mean. This was plotted against symptom severity in 2017 (Figure 2). With this comparison, there was no relationship between symptom severity and change in yield. If anything, there are more varieties with lower relative performance than increased performance. But statistically, this indicates that varieties that had more symptoms did not perform different than varieties without symptoms. In Figure 1, yields seemed to increase with symptom severity, but this could be linked to inherent production potential. Varieties that were more affected by PGR symptoms may have been varieties that were growing more vigorously at the time of symptom expression, thus more prone to any factor causing a PGR response. Essentially, dicamba exposure was not increasing yields but rather

varieties with higher yield potential were more susceptible to the effects of dicamba and the level of injury was not enough to decrease yield.

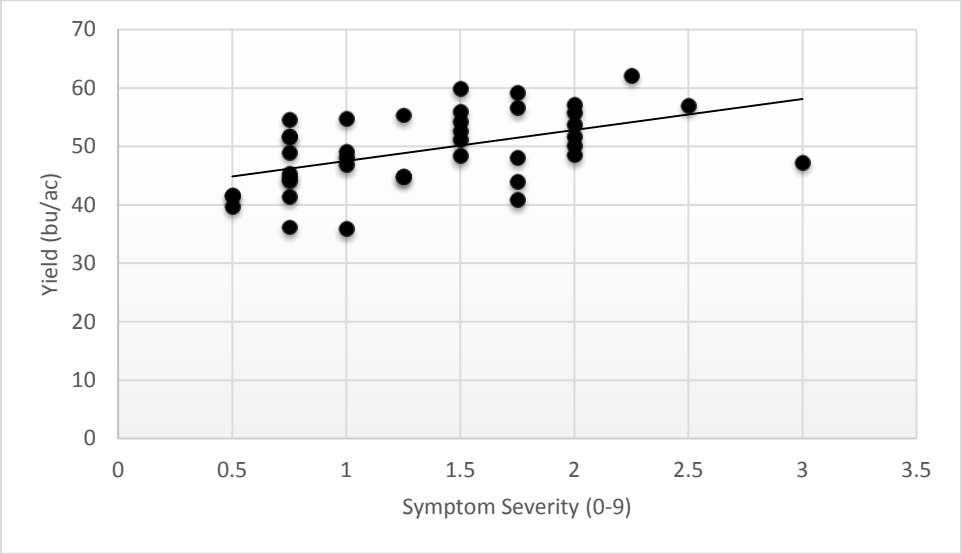

Figure 1. Soybean variety performance compared to plant growth regulator (PGR) symptom severity.

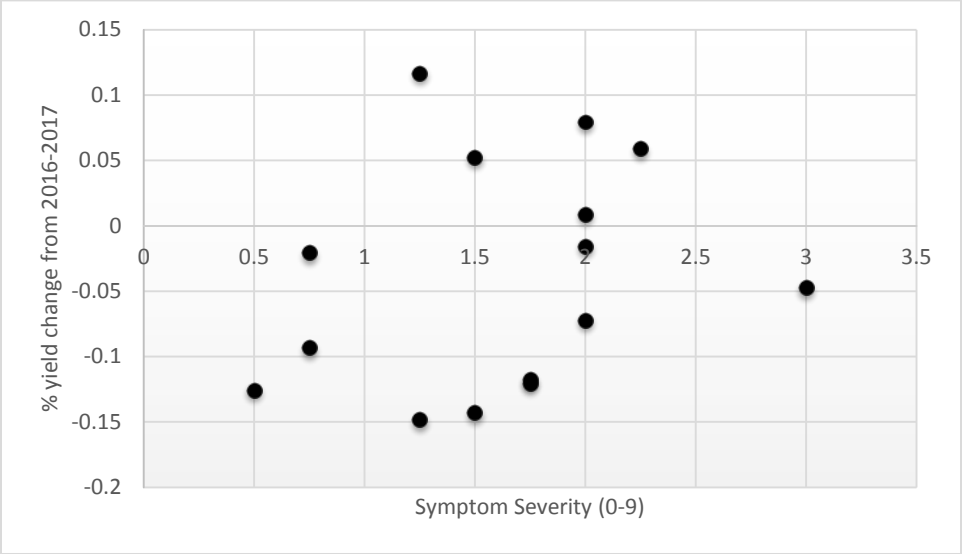

Figure 2. Year to year change in variety performance based on PGR symptom expression.

If dicamba symptoms were more severe, such as plants with growing-point injury and/or stunted growth, yields would surely decline. Even though varieties in our trials differed in the expression of PGR symptoms, with only leaf cupping and blistering, there did not appear to be any consistent positive or negative yield response based on variety.

Two Liberty Link soybean varieties. The variety on the left was more susceptible to dicamba than the one on the right.