

## The EPA Soybean Report – A Different Perspective

### Summary of EPA Soybean Report

The Environmental Protection Agency (EPA) recently issued a report on the benefits of neonicotinoid seed treatments in U.S. soybean production. The report concluded these products provide negligible benefits to growers and are not needed for soybean pest management. The report claims there are no differences in yield when seed treatments are compared to non-treated seed and noted that foliar insecticides are effective alternatives for use when pests reach economic treatment thresholds.

### A Different Conclusion

A further examination of the EPA report finds their conclusions are not supported by the university data from which the report was generated, nor do they reflect the current reality of soybean production in the United States. When the data used by the EPA are analyzed properly, it is clear that neonicotinoid seed treatments provide significant benefits to soybean growers, including increases in yield.

### What's wrong with EPA's Analysis?

Basing its conclusions on individual field trials (as the EPA report did), makes it extremely unlikely to find relatively modest differences in yields due to the statistical variability inherent in small plot testing, especially where the key research focus is pest control, not yield determination.

### Evaluating EPA's Data using Meta-Analysis

Although the EPA used a limited set of studies taken mainly from Midwestern university trials, the database is sufficient for meaningful results – if evaluated properly. The use of a meta-analytical approach reduces the variability associated with small plot testing by pooling data from each study to generate one large data set. The larger data set provides more statistical power to identify trends and differences that may not be obvious in individual trials. Evaluating the same data set used by the EPA from a meta-analysis perspective reveals a completely different result.

### Comparing EPA's Analysis with a Meta-Approach

The EPA report included multiple types of seed treatments, including fungicides and nematicides, in addition to neonicotinoid insecticides. Since these non-insecticidal components can have a direct impact on yield and potentially overestimate the value of paired comparisons, the meta-analysis used a more conservative approach to ensure only “apples to apples” comparisons were made. For example, insecticide seed treatment alone was compared to untreated seed, and insecticide + fungicide treated seed was compared to fungicide alone treated seed. Despite this more conservative approach, the difference between the meta-analysis and the EPA analysis is striking, as shown in the table below:

EPA Analysis	Meta-Analysis
101 observations individually evaluated from 29 studies <ul style="list-style-type: none"><li>• 13 – Positive increase in yield</li><li>• 0 – Negative increase in yield</li><li>• 88 – No statistical differences in yield</li></ul>	101 observations collectively evaluated from 29 studies <ul style="list-style-type: none"><li>• 2.6 bu/acre average increase using seed treatment</li><li>• 82% of observations with positive yield response</li><li>• Results are extremely significant (<math>P &lt; 0.0001</math>)</li></ul>

As the meta-analysis shows, use of neonicotinoid seed treatments resulted in positive yield responses in 82% of the observations, with a statistically significant average increase of 2.6 bushels per acre.

### Foliar Sprays versus Neonicotinoid Seed Treatments

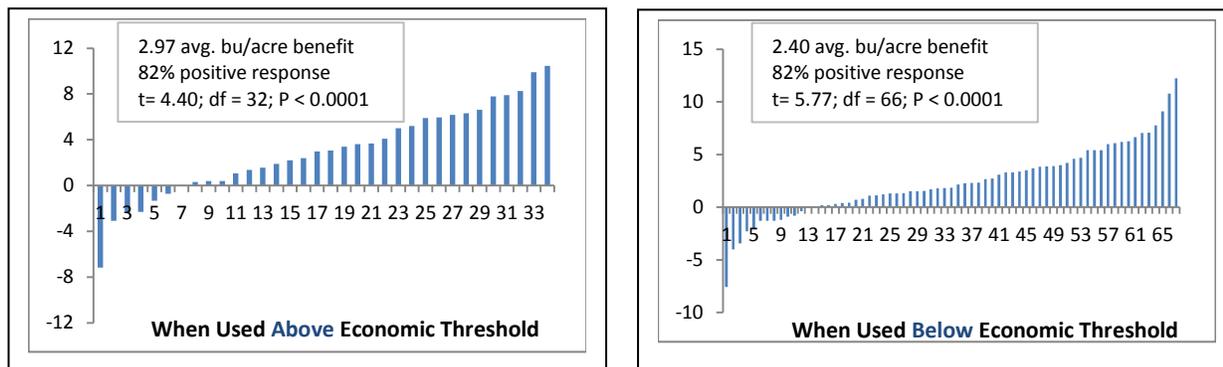
The EPA claims that foliar insecticides, applied according to economic thresholds, could replace the use of insecticidal seed treatments without adverse economic consequences for soybean farmers. While this is clearly incorrect for soil-dwelling pests, how does it apply to foliar insects? If EPA's assertions are true, then there should be no benefit to using a neonicotinoid seed treatment in addition to a foliar

insecticide. However, using meta-analysis on the same studies cited by the EPA report, the use of a neonicotinoid seed treatment along with a foliar insecticide returned a statistically significant average yield increase of 3.3 bushels per acre, when compared to a foliar spray alone.

### Implications for Soybean Pest Management

The significant increase in yields seen with seed-applied insecticides followed by foliar insecticides calls into question the ability of today's economic thresholds to capture the value of neonicotinoid seed treatments for soybean pest management. When the same set of data used by EPA is examined using meta-analysis, the results show that neonicotinoid seed treatments significantly increased soybean yields *regardless* of whether the pest levels were above or below the recommended injury thresholds (see chart below). This suggests that current pest management thresholds do not accurately predict the value of insecticidal seed treatments.

### Yield Response to Neonicotinoid Seed Treatment (bushels/Acre)



### Conclusion: Neonicotinoid Seed Treatments Increase Soybean Yields

The EPA's cursory analysis of the published studies cited in their report fails to accurately portray the true benefit of neonicotinoid seed treatments for soybean production. Using the same data set and a more appropriate analytical method, soybean yields increased an average of 2.6 bushels per acre when seed-applied insecticides were used. Moreover, these results compare favorably with studies beyond the limited scope reviewed by the EPA. University extension entomologists from the Mid-South recently conducted a meta-analysis of their own data set and found a positive yield response in 73% of trials with an average yield increase of 2.5 bushels per acre from neonicotinoid seed treatments.<sup>1</sup>

Contrary to the EPA's conclusion that "soybean growers derive limited to no benefit from neonicotinoid seed treatments," a more appropriate analysis shows the exact opposite is true. Even when using the EPA's inflated grower cost estimate for a neonicotinoid seed treatment (\$7.50 per unit), based on current soybean market prices (approximately \$10 per bushel), the average yield increase of 2.6 bushels per acre delivers more than a three to one return on investment to the grower.

*"In [EPA's] assessment, it is stated that soil pests have not historically driven pesticide usage in soybeans, but we note that until growers had neonicotinoid seed treatments they simply endured the losses, as there was no way to determine injury until the seed treatments kept them off plants." - Gus Lorenz, Ph.D., University of Arkansas, Cooperative Extension Service*

*"The EPA report also suggests there are suitable alternative foliar treatments. This is certainly not true for soil insects that feed below ground. It also shows a fundamental lack of understanding of real-world capabilities of pest management (weather limitation, logistical issues, scouting availability and capabilities, etc.), and not all injury can be undone once the pest is found." - Scott Stewart, Ph.D., IPM Extension Specialist, University of Tennessee*

### Citation

<sup>1</sup>Catchot, A., J. Gore, D. Cook and F. Musser. 2014. Do neonicotinoid seed treatments have value regionally in soybeans. Mississippi Crop Situation 31 Oct. 2014. <http://www.mississippi-crops.com/2014/10/31/do-neonicotinoid-seed-treatments-have-value-regionally-in-soybeans/>