

## Non-Foliar Yield Enhancements

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There are many non-foliar yield enhancement products available to N.C. soybean producers. Profit margins are currently narrow for soybeans and the potential yield advantages and associated costs of using these products should be considered. Over the last five years, the NCSU has used checkoff funding to evaluate the efficacy of these products with N.C. State Extension.

This test was conducted across 15 environments from 2014 – 2018. Products in this trial have varied from year-to-year, but have generally included seed treatments, in-furrow applications and broadcast applications. Products tested include insecticides, fungicides, nematicides, inoculants, biologicals and fertilizer. The number of environments in which a product was evaluated is included in the graph at right, with only products tested multiple years reported. Confidence in the results increases the more times and environments a product has been tested.

### FUNGICIDE SEED TREATMENTS

Across all environments, **the use of a fungicidal seed treatment did not significantly impact soybean yield.** However, most of these trials were planted in June or July and it is possible that fungicidal seed treatments would have more impact at earlier soybean planting dates when

conditions are generally cooler and wetter, which can intensify seedling diseases. Fungicidal seed treatments may be more important in years where there is low seed quality and limited seed quantities of some varieties, making it more important to prevent the possibility of replanting.

### INSECTICIDAL/BIOLOGICAL SEED TREATMENTS

The Poncho/Votivo seed treatment was evaluated over eight environments and had no impact on soybean yield. Insecticidal or nematicidal seed treatments were not comprehensively evaluated in this trial, but other tests by Dr. Dominic Reisig have **consistently shown no yield advantage to using an insecticidal seed treatment on soybeans in N.C.** In addition to a lack of yield response, the use of an insecticidal seed treatment in soybeans can intensify resistance development to these seed treatments used in other crops, like cotton, where they are needed.

In other studies, nematicide seed treatments show inconsistent results for reducing damage from nematodes. Given the inconsistency in yield response from nematicidal seed treatments, their use appears to be best placed in systems with moderate nematode populations and are probably not economical in nematode environments with high or low populations.

### INOCULANT SEED TREATMENTS

Soybeans can fix their own nitrogen through a symbiotic relationship with bacteria (*Bradyrhizobia japonicum*) that can convert atmospheric nitrogen (N<sup>2</sup>) into a plant usable form. For this reason, soybeans are often not fertilized with any additional N fertilizer and farmers generally depend on N-fixation and residual soil N to fulfill soybean N demand. There has been interest in the value of inoculating soybeans with appropriate bacteria to promote N-fixation. Two seed applied inoculants were evaluated in this trial, Optimize LCO XC and TagTeam LCO XC. Both provided a slight yield advantage from the nontreated control (+1.1 bu/A). Previous work by Dr. Jim Dunphy indicated that in-furrow inoculants are generally more effective than seed-applied inoculants. It is generally believed that inoculating soybeans is more valuable on a field that has not produced soybeans for four to five years, than one in which soybeans have consistently been in rotation.

### BIOLOGICAL SEED TREATMENTS

BioForge is a biological plant growth promoter that claims to promote early root growth by reducing stress. This product was evaluated as a seed application and did not significantly impact soybean yield. Other research has found that BioForge, applied both as a seed treatment and a foliar



treatment, was more effective at impacting soybean yield than when used as a seed treatment alone.

### IN-FURROW FUNGICIDES

The use of Quadris, Proline and Headline did not impact soybean yield across environments, however Priaxor did increase soybean yield (+1.6 bu/A). The trials were generally planted in June and July, and a larger impact on soybean yield may have been observed at earlier soybean planting dates when environmental conditions might be more conducive for disease development. In-furrow fungicides are best used in environments with high disease risk (cool, wet soils) since fungicide resistance develops rapidly in soilborne fungi populations. Caution should be taken not to use the same fungicide chemistry on a continued basis, as it could result in fungicide resistance, making future disease management more challenging.

### IN-FURROW MICROBIAL STIMULANTS

Agzyme and Environoc 401 are both microbial stimulant products that claim to enhance microbial activity. Both had approximately a 1.5 bu/A increase on soybean yield when evaluated in this trial.

### FERTILIZER APPLICATIONS

There is a question about the necessity of adding additional N fertilizer to soybeans as yields are pushed higher. The evaluation of both ESN and ammonium sulfate applications in soybeans was of interest to growers in North Carolina. In this trial, the use of ESN or ammonium sulfate at planting or pre-bloom did not impact yield. There have been many field experiments conducted in N.C. showing that inorganic N fertilizer applications to effectively

nodulated soybeans are rarely profitable. A recent nationwide study found there was a **minimal effect of N fertilizer application on soybean yield in most environments and the practice would rarely be profitable.**

Over the years the non-foliar yield enhancement products evaluated in this project have provided modest soybean yield increases, if any. The evaluation of these products across 15 environments is context-specific to late May through early July planting and these results may be different if earlier planting dates were evaluated. Many of these products are relatively inexpensive, however **growers should consider if the modest increases in soybean yield coupled with the risk of resistance development would justify investment.**

