

Soybean Seed Treatments

Cool, wet, poorly drained soils can be typical conditions during spring planting and crop emergence. These conditions favor the development of fungal pathogens that cause soybean seedling diseases, which can slow germination and plant growth. Early season insect pests may also damage soybean seeds and seedlings, causing adverse affects on plant growth. Acceleron® Fungicide and Insecticide Seed Treatment Products for soybeans can help protect seed and seedlings from pests, resulting in more uniform plant stands, better yield potential, and ultimately increase return on the investment.

Benefits of Seed Treatment

Early planting is highly recommended for high yield soybean production. Reduced tillage and narrow row spacing are also key factors for obtaining maximum production. These are also situations where seed treatment can help manage disease and insect problems that may reduce yield potential. Many times, early season conditions such as cool, wet soils can slow germination and establishment of soybeans. In many northern states, soil conditions can turn wet and cold overnight. Under these cool (less than 60° F) and wet soils, soybean seeds can germinate and emerge very slowly, making them more susceptible to attack by seed and seedling pathogens. A key to improving soybean yield is to improve root health and seedling vigor.¹ Soybean yield potential is compromised by environmental stresses and a complex of soil-borne pathogens.¹ These pathogens invade plant roots causing tissue decay, a reduction in the number of root tips, a decrease in nodule size and loss of root function. *Pythium* species cause seed decay, pre-emergence damping off, and early post-emergence seedling death. Seed infected with *Pythium* species may decay before germination and become soft and rotted. *Phytophthora sojae* also causes a soft, wet rot of the seed or seedling tissue similar to that of *Pythium*. Infected seedlings may die prior to emerging from the soil or shortly thereafter. Symptoms of *Rhizoctonia solani* infection appear on seedlings as dry, dark reddish-brown lesions just above the soil surface.

The unpredictability of early season planting conditions can be reduced using Acceleron® Soybean Seed Treatment Products for disease and insect protection (Table 1). The protection provided by Acceleron® Soybean Seed Treatment Products can result in more rapid and increased emergence of soybean seedlings under certain cold conditions. The greatest payback from seed treatments can occur with one or more of the following conditions: early planting, reduced tillage, poorly drained or high clay content soils in fields with tight crop rotations or a history of disease. A number of reports from

Midwestern universities have shown positive responses and yield protection from seed treatments under unpredictable environmental and pest conditions. Seed treatments are a good safeguard against the risk of early season stress and pest damage.

Acceleron® Seed Treatment Products

Acceleron® Seed Treatment Products have been selected to complement Genuity® Roundup Ready 2 Yield® and Roundup Ready® soybeans to help protect soybean seeds and seedlings from disease and insect damage. In the past, most seeds were treated with one or two active ingredients, which primarily controlled seedling diseases. Acceleron® Soybean Seed Treatment Products utilize multiple modes of action to provide broad spectrum control of diseases and insects (Table 1). Soybean seed with Acceleron® Fungicide Seed Treatment Products can be protected from diseases for up to 30 days after planting. Under normal conditions, soybeans can emerge in 7 to 14 days, but soil compaction, soil moisture and temperature can delay emergence, exposing seeds and seedlings to soil borne pathogens or insects.

Acceleron® Fungicide and Insecticide Seed Treatment Products for soybeans can be paired with Poncho®/VOTiVO® to help provide maximum protection, including a biological

Key Diseases	Key Insects
<i>Pythium</i>	Bean leaf beetle
<i>Phytophthora</i>	Soybean aphid
<i>Fusarium</i>	Seedcorn maggots
<i>Rhizoctonia</i>	Wireworms
	Grape colaspis

Table 1. Key pests controlled by Acceleron® Fungicide and Insecticide Soybean Seed Treatment Products.

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Soybean Seed Treatments

► Continued from page 1

mode of action for soybean cyst (SCN) and other nematodes. Poncho®/VOTIVO® can be used with SCN-resistant and other soybean varieties to manage nematodes in newly infested fields or fields with established infestations.

Disease and Plant Health Benefits

Acceleron® Fungicide Soybean Seed Treatment Products provide excellent control of *Rhizoctonia*, *Pythium*, *Fusarium*, and *Phytophthora* using an exclusive fungicide combination featuring fluxapyroxad, pyraclostrobin, and metalaxyl. Fluxapyroxad adds an additional fungicide mode of action for more complete, consistent protection from *Rhizoctonia* and *Fusarium*. This additive protection against *Rhizoctonia* is demonstrated in the side by side comparison of the same Acceleron® Fungicide Soybean Seed Treatment Products under heavy disease pressure (soil inoculated with *Rhizoctonia*) versus no *Rhizoctonia* pressure (non-inoculated soil) (Figure 3). Acceleron® Fungicide Seed Treatment Products with Poncho®/VOTIVO® provide additional protection against soybean cyst (SCN) and other nematodes versus Acceleron® Fungicide and Insecticide Seed Treatment Products (Figure 4).

Insecticide Benefits

Insecticidal seed treatments can play a key role in managing several early season insects. Acceleron® Insecticide Seed Treatment Products include imidacloprid, a neonicotinoid insecticide, that provides above ground protection from early season insect pests, such as bean leaf beetle (BLB), and soybean aphids (SBA), and below ground protection from seed corn maggot, wireworm, and white grub. Protecting soybean against attack by BLB and SBA is a good tactic to prevent virus diseases and yield reduction. The overwintered and first generation of BLB can transmit bean pod mottle virus (BPMV). Early infection is the greatest risk to soybeans. BPMV can reduce yield by 3 to 52%.² University results across the Midwest have shown good performance against SBA during the vegetative stages of soybean. SBA can transmit soybean mosaic virus.

Acceleron® Seed Treatment Products

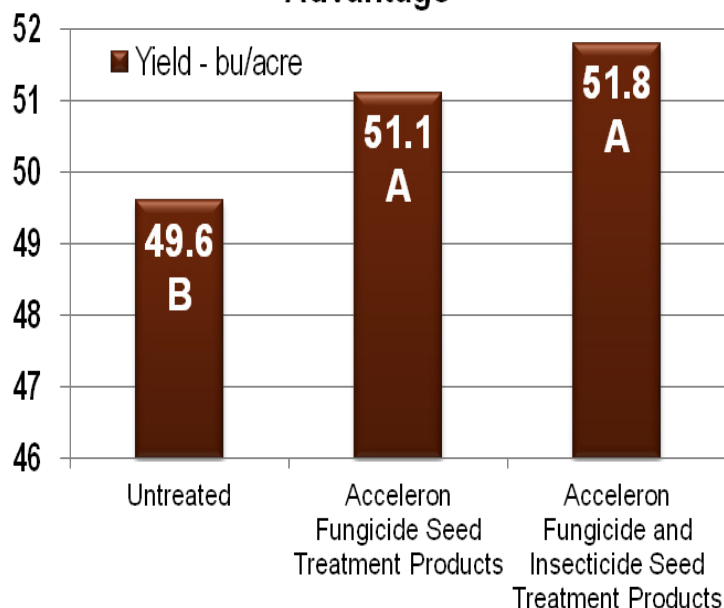
Performance

In Monsanto Technology Development trials in 2012, conducted throughout the soybean production area with diverse pest and environmental conditions, Acceleron® Fungicide Seed Treatment Products showed a yield advantage of 1.5 bu/acre versus the untreated check, and using Acceleron® Fungicide and Insecticide

Seed Treatment Products provided a 2.2 bu/acre yield advantage versus the untreated check (Figure 1). In two years of testing in Monsanto Technology Development trials at sites with nematode infestations demonstrate that the inclusion of Poncho®/VOTIVO® with Acceleron® Fungicide and Insecticide Seed Treatment Products provided a 1.2 bu/acre yield advantage over Acceleron® Fungicide and Insecticide Seed Treatment Products alone, which equates to a 3.4 bu/A advantage versus untreated SCN varieties under heavy nematode pressure (Figure 2).

Seed treatments used in conjunction with foliar insecticides and fungicides applied at economic thresholds, are an integral part of high yield soybean management. Acceleron® Soybean Seed Treatment Products, in combination with other management practices, can help protect against damaging seedling diseases, insects, and nematodes, enabling farmers to achieve more uniform stands, higher yield potential, and better return on investment.

2012 Seed Treatment Yield Advantage



Source: 2012 Internal Monsanto Technology Development Trials. Means followed by the same letter are not significantly different; $\alpha = 0.05$.

Figure 1. Comparison of Acceleron® Soybean Seed Treatment Products versus an untreated check in 2012 Monsanto Technology Development trials.

Soybean Seed Treatments

Continued from page 1

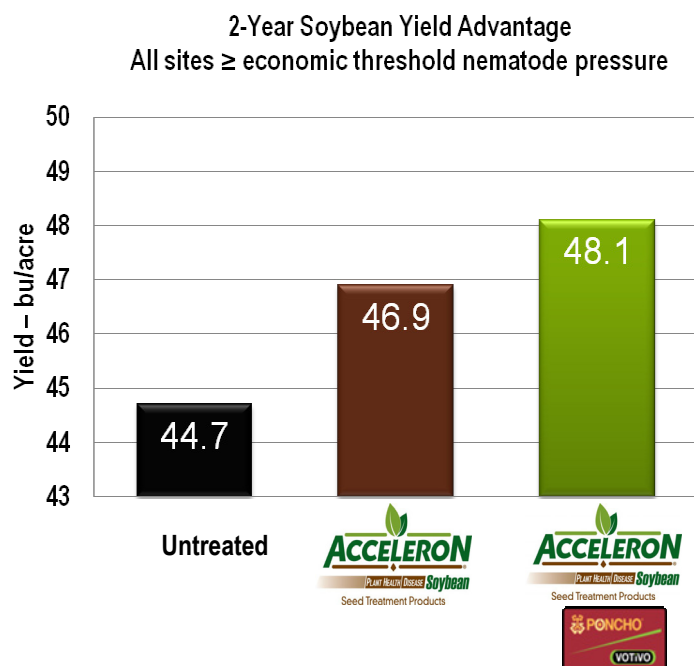


Figure 2. Comparison of Acceleron® Fungicide and Insecticide Soybean Seed Treatment Products versus Acceleron® Fungicide Soybean Seed Treatment Products with Poncho®/VOTIVO®.



With Enhanced Disease Protection



Soil inoculated with *Rhizoctonia*

Non-inoculated soil

Figure 3. Soybean treated with Acceleron® Fungicide and Insecticide Seed Treatment Products comparing plots with soil inoculation for *Rhizoctonia* versus no soil inoculation.

Source: Seed Treatment Fungicide Evaluation, Southern Illinois University, July 2011.



Figure 4. Nematode management comparison with Acceleron® Fungicide and Insecticide Seed Treatment Products and Acceleron® Fungicide Seed Treatment Products with Poncho®/VOTIVO®. Source: Monsanto 2012-01-69-02 Trials; Same soybean variety (AG4630).

Sources: ¹ Higher Soybean Yield Begins with Improving Root Health. Soybean Plant Health Initiative - <http://www.planthealth.info> (verified 9/19/2012). ² Gergerich, R. C. 1999. Comoviruses: Bean pod mottle comovirus. p. 61 - 62 in Compendium of Soybean Diseases, 4th edition, Hartman, G. L., et. al. American Phytopathological Society. St. Paul, MN.

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