Agronomic Spotlight

Seminis grow forward

Understanding Seed Treatments For Sweet Corn

- Seed treatments protect sweet corn seed and seedlings from soilborne and seedborne pathogens and insect pests.
- Seed treatments are especially important for supersweet (SH2) hybrids.
- A range of fungicides is needed to control a variety of sweet corn pathogens.

Recommendations for treating sweet corn seed date back as far as 1926,[1] and seed treatments are still a very effective means of protecting seeds and seedlings from soilborne and seedborne pathogens and insect pests. They also help increase rapid emergence, optimize stand establishment, and promote strong root growth. Seed treatments are especially beneficial for supersweet (SH2) hybrids because these hybrids tend to germinate more slowly and grow less vigorously than those of standard-sugary (su) hybrids.[2]

Seed and Seedling Diseases

Soilborne and seedborne pathogens can infect sweet corn seeds and seedlings, resulting in reduced stands and seedling vigor. Seedborne pathogens include the fungi Fusarium moniliforme, Penicillium oxalicum, and species of Rhizopus.[2] Soilborne pathogens include Pythium ultimum, Rhizoctonia solani, and several species of Fusarium. Infection by these pathogens often results in pre- or post-emergence damping off. Damping-off is favored by cool, wet conditions that slow germination and seedling growth.

Standard Sweet Corn Seed Treatments

The International Sweet Corn Development Association (ISCDA) Seed Treatment Committee was formed in the early 1990s to help the sweet corn industry identify the best performing seed treatments for sweet corn through coordinated trials carried out at locations across the United States. These trials have shown that effective seed treatments should include one or more broad-spectrum fungicides, systemic fungicides with activity against seedborne Penicillium and Fusarium, and a fungicide with activity against Oomycete pathogens such as Pythium and Phytophthora. In locations where insect pests are present, the inclusion of an insecticide is also beneficial.[3]

The Need for Fungicides

In a 2012 ISCDA coordinated study, 19 seed treatment combinations, were evaluated at 16 different locations.[2] The study included two product combinations representing industry standard treatments; standard treatment 1 (Dividend Extreme®, Apron® XL, Maxim® 4FS, Vitavax® -34) and standard treatment 2 (captan, thiram, Dividend Extreme®, Apron® XL, Vitavax® -34). In this study, stand counts and seedling vigor were significantly higher in plots planted to seed treated with either of the two standard combinations as compared to plots planted with non-treated seed (Figure 1). In locations with cool, wet soil conditions, the two standard combinations performed equally well, but in locations with warmer, drier conditions, the combination containing captan and thiram resulted in higher stand counts and levels of seedling vigor (Table 1).

Table 1. Effects of standard seed treatments and a non-treated control treatment for stand establishment and seedling vigor of sweet corn.[2]

	Group 1 trials (cool, wet at planting)		Group 2 trials (normal conditions)	
Seed Treatment	Stand Count (%)	Vigor*	Stand Count (%)	Vigor
Non-treated control	34.2 b **	2.53 b	57.9 c	2.95 b
Standard treatment 1: Dividend Extreme® Apron® XL, Maxim® 4FS, Vitavax® -34	71.1 a	3.64 a	69.0 b	3.53 a
Standard treatment 2: captan, thiram, Dividend Extreme®, Apron® XL, Vitavax® -34	73.7 a	3.55 a	74.1 a	3.77 a

* Plant vigor was rated on a scale from 1 to 5 at the 5-6 leaf stage.
** Values followed by the same letter within a column are not significantly different.
The data presented here is a subset of a larger set of results reported in the referenced article.[2]

Damping-off caused by Pythium can be a significant problem with sweet corn. As a result, most sweet corn seed is treated with fungicides that contain metalaxyl or mefenoxam. The widespread use of this fungicide class increases the likelihood of the development of Pythium strains that are resistant to these chemicals. In recent years, metalaxyl-resistant isolates of Pythium ultimum have been found in the Pacific Northwest. This emphasizes the need for the availability of products with different modes of action against oomycete pathogens. For the past several years the ISCDA trials have evaluated the efficacy of fungicides for their activity against organisms such as Pythium in order to identify alternate products that could be used instead of metalaxyl/mefanoxam. Ethaboxam (Intego™ Solo Fungicide) is a newer fungicide that was found to be effective against Pythium damping-off in recent ISCDA seed treatment trials.[2]

The Need for Insecticides

Soil insects, such as wireworm, seedcorn maggot, white grub, and grape colaspis, can feed on seed kernels and destroy germinating seeds. These insects can be especially problematic when sweet corn is planted in weedy fields previously fallow

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Table 2. Fungicide and insecticide products found in Seminis® sweet corn seed treatments and the diseases and pests controlled.

Product (active ingredient)	Protects against	Treatments*				
		Conventional			Performance Series®	
		S	P	AP	PSS	PSP
Apron XL® (mefenoxam)	damping-off caused by *Pythium* and *Phytophthora*	✓	✓	✓	✓	✓
Dividend Extreme® (mefenoxam + difenoconozole)	damping-off caused by *Pythium, Phytophthora,* and seedborne *Penicillium*	✓	✓	✓	✓	✓
42-S Thiram	a broad-spectrum fungicide: protects from several soilborne fungi	✓	✓	✓	✓	✓
Vitavax®-34 (carboxin)	seedborne head smut, seed decay, and damping-off fungi, including *Rhizoctonia solani*	✓	✓	✓	✓	✓
Maxim® 4FS (fludioxonil)	seedborne and soilborne fungi that cause seed decay and damping-off , including *Rhizoctonia solani* and several species of *Fusarium*	✓	✓	✓	✓	✓
Dynasty® (azoxystrobin)	seedborne and soilborne fungi that cause decay, damping-off and seedling blight, including species of *Rhizoctonia, Penicillium,* and *Pythium,* and some protection from seedborne head smut		✓		✓	
Poncho®600 (clothianidin)	chinch bug, corn flea beetle, corn leaf aphid, cutworm, grape colaspis, seedcorn maggot, southern corn leaf beetle, southern corn rootworm, southern green stinkbug, sugarcane beetle, white grub, thrips, and wireworms		✓		✓	
Cruiser®5FS (thiamethoxam)	wireworm, seed corn maggot, leaf beetle, white grub, black cutworm, thrips, green stinkbug, seed corn beetle, corn leaf aphid, sugarcane beetle, corn rootworm, and billbug			✓		✓

* Seminis seed treatment options: Conventional refers to treatments available for conventional sweet corn hybrids; Performance Series® refers to treatments available on Performance® Series sweet corn. S=Standard (conventional), P=Premium (conventional), AP=Alternate Premium (conventional), PSS=Standard (Performance Series®), PSP=Premium (Performance Series®)

or planted to turf. Under these conditions, insecticide seed treatments can be beneficial.

The insecticides used most commonly for seed treatment in sweet corn belong to the neonic (short for nitroguanidine neonicotinoid) class of insecticides. These are systemic insecticides that are effective against a wide range of insect pests, but they are less toxic to birds and mammals than organophosphate and carbamate insecticides. Neonic products used in seed treatments include clothianidin (Poncho® 600), imidacloprid (Gaucho® 600), and thiamethoxam (Cruiser® 5FS).

If populations of soil insect pests are at or above threshold levels, soil applied insecticides (e.g. phorate, terbufos, chlorpyrifos, ethoprop) may be needed in addition to the insecticide seed treatment to provide adequate control.[4]

In addition to controlling insect pests, seed treatment insecticides can also reduce levels of insect-vectored diseases, such as Stewart's wilt, a bacterial disease vectored by corn flea beetles.[5]

SEMINIS SEED TREATMENT OPTIONS

Seminis currently offers several sweet corn seed treatments containing various combinations of products used to control fungal pathogens and insect pests. Table 2 lists the fungicide and insecticide products and describes what they are intended to control.

Sources:

[1] Reddy, C.S., Holbert, J.R., and Erwin, A.T. 1926. Seed treatments for sweet-corn diseases. Journal of Agricultural Research 33:769-779. [2] Wohleb, C.H. 2014. Evaluation of fungicide seed treatments for sweet corn. Journal of the NACAA Volume 7. [3] Wohleb, C.H. 2013. The ISCDA multi-location seed treatment trials for sweet corn. Pacific Northwest Vegetable Conference November 13, 2013. [4] Mossler, M.A. 2014. Crop profile for sweet corn in Florida. University of Florida IFAS Extension. CIR1233. [5] Pataky, J.K., Michener, P.M., Freeman, N.D., Weinzierl, R.A., and Teyker, R.H. 2000. Control of Stewart's wilt in sweet corn with seed treatment insecticides. Plant Dis. 84:1104-1108.

IMPORTANT: Produce Marketing and Stewardship Requirements: This product has been approved for import into key export markets with functioning regulatory systems. Any crop or material produced from this product can only be exported to, or used, processed or sold in countries where all necessary regulatory approvals have been granted. It is a violation of national and international law to move material containing biotech traits across boundaries into nations where import is not permitted. It is the grower's responsibility to talk to their produce handler or purchaser to confirm their buying position for this produce so that the marketing requirements can be met.

Herbicide Information for Performance Series® sweet corn: Roundup PowerMAX®, Roundup PowerMAX® II and Roundup WeatherMAX® herbicides are approved for use on Performance Series® sweet corn (containing the Roundup Ready® trait) in all U.S. states, the District of Colombia and Puerto Rico. If the directions for use on sweet corn with Roundup Ready® 2 Technology (which includes Performance Series® sweet corn) are not listed in the product label that is attached to the product you purchased, contact your Monsanto Company representative.

Performance Series® sweet corn Insect Resistance Management (IRM) – Post-Harvest Requirements: Crop destruction must occur no later than 30 days following harvest, but preferably within 14 days. The allowed crop destruction methods are: rotary mowing, discing, or plowing down. Crop destruction methods should destroy any surviving resistant insects.

B.t. products may not yet be registered in all states. Check with your Monsanto representative for the registration status in your state.

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