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## Corn Seed Survival: The importance of seed fungicides and insecticides

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The soils and climate of Wisconsin are challenging and cause much anxiety among farmers immediately after corn planting. Many new seed treatment technologies and products are available to farmers to overcome these challenges and achieve an adequate stand. This year corn emergence has been slow and extended. Now is a good time to evaluate how your seed treatment is performing, and evaluate seed treatments you are considering for next year.

*What different fungicides and insecticides are available for use on corn seed?*

Most producers take it for granted that the corn seed they buy has been treated with an effective fungicide to help prevent seedling diseases. Corn seed treatments are effective and necessary. Currently, most seed is treated with Maxim or Maxim+Apron.

<b>Table 1. Corn seed treatments (chemical and common names) available to farmers.</b>	
<b>Fungicides</b>	<b>Insecticides</b>
Captan	Organophosphates Chlorpyrifos: Lorsban Pirimiphos-methyl: Actellic, Nu-Gro
Metalaxyl: Apron FL, Allegiance	
Mefenoxam (Metalaxyl-M): Apron XL	
Fludioxonil: Maxim	Neonicotinoids Clothianidin: Poncho250, Poncho1250 Imidacloprid: Gaucho Thiamethoxam: Cruiser
Fludioxonil+Mefenoxam: Maxim XL	
Strobilurins: Dynasty, ProTect, Quadris, Trilex	
	Synthetic pyrethroids Permethrin: Assult, Baracuda

**Captan** is a broad-spectrum contact fungicide that has been used on corn seed since the 1950s. It is usually dyed pink and leaves a pink dust in the seed bag and planter box. It is very effective against a broad range of soil fungi, but its effectiveness against *Pythium* is fair.

The active ingredient in **Apron** is metalaxyl, which is a narrow-spectrum, locally systemic fungicide with excellent activity against *Pythium*. In recent years, it has become standard practice to include this fungicide on corn in combination with a broad-spectrum fungicide like Captan or Maxim. **Apron XL** is a new product that contains a more active isomer of metalaxyl (mefenoxam), and it is used at about half the rate of Apron. The active ingredient in **Allegiance** is also metalaxyl and is marketed by Gustafson.

The active ingredient in **Maxim** is fludioxonil, a broad-spectrum contact fungicide developed by Syngenta. Like Captan, it is effective against soil fungi, but not against *Pythium*. It is usually used in combination Apron. Maxim-treated seeds do not lose as much dust off the seed as Captan.

**Dynasty, Prothioconazole, Quadris, and Trilex** (strobilurins) are a relatively new group of compounds that control fungi by inhibiting fungal respiration. These compounds are antifungal antibiotics derived from a naturally growing fungus (*Strobilurus tenacellus*) on pine trees.

**Lorsban** (chlorpyrifos) and **Actellic/Nu-Gro** (pirimiphos-methyl) are organophosphate insecticides. Like other organophosphates, its insecticidal action is due to the inhibition of the enzyme acetylcholinesterase, resulting in the accumulation of the neurotransmitter, acetylcholine, at nerve endings.

**Gaucho** (imidacloprid), **Poncho 250 and Poncho 1250** (clothianidin) are systemic insecticides belonging to the nicotinoid insecticides. They work by blocking elements of the insect nervous system. It protects against damage from a broad spectrum of early season sucking and chewing insects. **Cruiser** (thiamethoxam) is a second generation neonicotinoid insecticide

**Assult** and **Baracuda** (permethrin), like all synthetic pyrethroids, are neurotoxins. Permethrin is referred to as a synthetic pyrethroid insecticide because, while manmade, it resembles naturally-occurring chemicals with insecticidal properties, called pyrethroids, found especially in chrysanthemums. Pyrethroids are one of the oldest classes of organic insecticides known. They work by quickly paralyzing the nervous systems of insects.

#### *Other seed treatments*

There are several planter-box seed treatments available for corn that can be used in addition to the commercially applied fungicides. Most planter-box treatments are a combination of an insecticide (usually lindane) and a fungicide, and their best use is for the control of wireworms or seed corn maggots. These products include Kernel Guard, Germate Plus, Agrox, and others. The additional fungicide can sometimes improve stand, but usually this effect is not statistically significant. Kernel Guard Supreme uses permethrin instead of lindane as the insecticide component.

#### *How do the different products affect corn seed survival?*

Corn seed survival was measured by counting the number of plants that had emerged by V3-V6 for two rows, divided by the number of seeds planted for each row and multiplied by 100. In all years multiple locations were planted.

It is clear that the some sort of fungicide is needed on corn seed in Wisconsin (Table 2). In only one of five years (2000) did the untreated check result in similar survival to other seed treatments. Seed survival of ApronXL+Maxim treatments increased 16% (range 10 to 31%) over the untreated checks. Similar results were seen for the years that Allegiance+Captan was used. The addition of Gaucho and Poncho250 improved corn seed survival over ApronXL+Maxim. The use of strobilurins and Cruiser did not improve corn seed survival over that of ApronXL+Maxim seed treatments.

Overall, corn seed survival in the field is not different between Maxim+Apron and Captan+Apron. So why the predominance of Maxim? The answer is in ease and safety of handling. Maxim is used at a much lower rate than Captan (about 25 times lower), and dust is reported to be 80 percent less than with Captan. These characteristics make Maxim easier and safer to handle in seed production operations, and on the farm.

Yield results are not shown in this article because yield results for seed treatment trials should be interpreted cautiously, especially when differences are not statistically significant. **What is important is the stand that results after using a seed treatment.** Many factors influence yield in between the time when stand counts are made and the plants are harvested. Yields do not always correlate well with stands, and it is uncertain to what extent seed treatments can influence yield aside from their effect on stand. One hypothesis is that untreated seed may exhibit good survival, however, diseases may infect at the seedling stage and not show symptoms, but predispose plants so that when later stresses occur the disease develops and symptoms appear, i.e. stalk rots causing lodging after maturity. Fungicide seed treatments protect the plant from these early infections.

*What else will increase seedling survival?*

Planting high-quality, fungicide-treated seed is key to improving corn seed survival. Nevertheless, other practices can help, too. Crop rotation has can decrease corn seedling diseases. Reducing the amount of corn residue over the seed row also is helpful. Planting conditions are important. Do not try to "mud in" your crop just for the sake of planting early. Well-drained soils will have the least risk of seedling disease. Soil temperatures lower than 50°F are conducive to seedling disease development, but not corn development. Herbicide stress can contribute towards disease development.

**Table 2. Effect of seed treatments (fungicides and insecticides) on corn seed survival (n= 9 to 24 plots depending upon year).**

Seed treatment	2004 Arlington, Marshfield, Seymour	2003 Arlington, Fond du Lac, Janesville, Marshfield, Seymour	2002 Arlington, Marshfield, Valders	2001 Arlington, Fond du Lac, Marshfield, Seymour, Valders	2000 Marshfield, Seymour, Valders
Untreated check	75	64	80	81	84
ApronXL+Maxim	85	84	89	89	84
Allegiance+Captan	--	--	87	89	84
Allegiance+Captan+Gaucho	--	89	--	--	--
Allegiance+Captan+Poncho250	90	--	--	--	--
ApronXL+MaximXL+Poncho250	--	--	93	--	--
ApronXL+Dynasty+MaximXL	92	--	--	--	--
ApronXL+Cruiser+Dynasty+MaximXL	87	--	--	--	--
ApronXL+Trilex	87	--	--	--	--
Cruiser+MaximXL	85	81	--	--	--
LSD(0.05)	4	5	4	6	NS



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