

Managing Crop Diseases with **Seed Treatments**

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Seed treatment fungicides are used in various agricultural crops and are useful tools in promoting stand establishment and seedling vigor. Seed treatments may also help preserve yield potential and prevent quality losses in grain by preventing development of seed and soil-borne diseases. Seed treatments addressed in this guide are those consisting of fungicides or fungicides in combination with insecticides for use in managing disease-causing organisms (pathogens). The development of effective seed treatments can be noted as one of the most significant advancements in plant disease management.

In general, fungicidal seed treatments are used for three primary reasons: (1) To control soil-borne fungal disease organisms such as those causing seed rots, damping-off, or seedling blights in many crops, as well as the agents of root rot complex, smuts, bunts, or downy mildews. (2) To control diseases caused by seed surface-borne fungal pathogens (e.g., covered smuts of barley and oats, bunt of wheat, safflower rust, and *Ascochyta* of legumes). (3) To manage diseases caused by seed-borne fungi, such as loose smut of cereals. Fungicide seed treatments are not effective against bacterial pathogens or in managing viral diseases. Most seed treatment products do not control all types of fungal pathogens.

Disease Management Using Seed Treatments

Disease management in agricultural crops requires a multi-faceted approach as part of an integrated pest management (IPM) program. Effective components of an integrated plant disease management program include the following:

- Crop rotation, including rotation to non-host crops to reduce pathogen load.
- Residue and volunteer management for reduction of residue-borne and overwintering diseases.
- Use of high quality, disease-free seed to prevent the spread of seed-borne diseases and promote healthy stand establishment.
- Proper variety selection for host resistance and adaptation to the growing region.
- Proper plant health management. Healthy plants are more able to resist or tolerate the development of plant

diseases.

- Judicious use of plant protectant products such as herbicides, insecticides, and fungicides to reduce losses, promote healthy plants, and prevent quality losses in seed.

Field history is a key component of the decision-making process for managing diseases with seed treatments. Keeping in mind the cropping sequence and the history of major disease or insect pests within the field can be important factors in seed treatment decisions. Proper identification of disease agents is also important. Local county Extension agronomy educators or the Plant Disease Diagnostic Clinic at SDSU can assist producers in identifying plant health problems throughout the growing season.

Effectiveness of control will vary with seed treatment product, rate, environmental conditions, and pests present. Seed treatments may provide some level of control for early season diseases as well as control seedling blights and seed- or soil-borne diseases.

Newly Opened Land- A Special Consideration

Newly opened land, such as CRP being returned to crop production, may present a special consideration and most certainly will be a situation where seed treatments should be considered. For example, small grains planted into these areas can be at high risk for the development of diseases and insect pests. Diseases such as root and crown rots, as well as seedling blights, can often be more severe when certain crops are planted into these high-residue situations. Also, insect pressure on newly cultivated lands may differ from a typical cropping situation.

Classification of Fungicidal Seed Treatments

Fungicidal seed treatments can be classified based on movement of the seed treatment product in relation to the seed. Fungicides used as protectants (contacts) are effective only on the seed surface, providing protection against seed surface-borne pathogens and providing some level of control of soil-borne pathogens. These products generally have a relatively short residual. Protectant fungicides such as captan,

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maneb, PCNB, thiram, or fludioxonil help control most types of soil-borne pathogens, with the exception of the root rotting organisms. Systemic seed treatment fungicides are absorbed into the emerging seedling and inhibit or kill the fungus inside host plant tissues. Systemic fungicides used for seed treatment include the following: azoxystrobin, carboxin, mefenoxam, metalaxyl, thiabendazole, trifloxystrobin, and various triazole fungicides, including difenoconazole, tebuconazole, and triticonazole. Mefenoxam and metalaxyl are primarily used to target the water mold fungi *Pythium* and *Phytophthora*. Biological agents as seed treatments are also available and may provide some level of protectant activity. Not all fungicides are available as seed treatments for every crop, and not all fungicides have activity against the same range of organisms. Refer to the specific crop-pest combinations listed in the text for product-use recommendations. Always read and follow label directions.

Proper Application and Use Precautions

Fungicide seed treatment products vary in formulation type, packaging, and use requirements. Products may be dry or liquid and in concentrate or ready-to-use formulations. While many seed treatments may be applied on-farm, several products are limited to use only by commercial applicators using closed application systems. Caution should be used when handling or working with seed treatment products. Fungicide seed treatments can be highly poisonous and many are irritants, so proper handling precautions must be taken when handling seed treatment chemicals, and producers or applicators must strictly adhere to all label directions regarding safe handling, mixing, storage, and disposal. Using personal protection, including an approved chemical respirator, goggles, and pesticide-resistant gloves, is recommended even if not specifically required by the fungicide label. Follow label rates, as over-application may result in unintentional damage to the seed, and under-application may reduce the effectiveness of products.

Properly calibrate all application equipment to assure uniform coverage. Uniform coverage of the seed is critical to optimize effectiveness of the seed treatment. Several seed treatment methods are available, though not all are appropriate for every situation. Commercial application or application through dedicated seed treatment equipment will likely provide the most uniform coverage. Grain auger-mounted

treatment equipment is available, and may provide adequate coverage in an on-farm situation; however, an auger that has been used to treat seed may be unusable for moving grain intended for food or feed. Likewise, treated seed should not be allowed to contaminate equipment used to transport or store food or feed grains. Use caution when considering planter-applied (planter-box) seed treatments. Good disease control depends on uniform fungicide coverage of the seed, and this more difficult to accomplish in planter-applied situations.

Always read and follow label directions. Understand the product-specific guidelines for proper application: how and when to apply, pre-harvest intervals, feeding or grazing restrictions, as well as important safety precautions. Always dispose of pesticide containers properly.

Seed Treatments and Legume Inoculants

Seed treatments containing fungicides or fungicide/insecticide combinations may adversely affect microbial inoculants applied to legume seed, such as soybeans. Producers should carefully read and follow any label instructions and limitations for both the pesticide seed treatment and the inoculant. Liquid fungicides or fungicide/insecticide combinations should not be directly mixed with liquid inoculants prior to application, and care should be taken to limit the time that inoculants and pesticide seed treatments are in direct contact.

Do Not Use Treated Seed for Food or Feed!!

Following are the seed treatments fungicides or fungicide/insecticide combinations currently labeled for use in South Dakota. The list is dynamic and prone to frequent modifications. Always check the list of products currently registered with the South Dakota Department of Agriculture for legality of use in the state.



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SEED TREATMENTS FOR WHEAT

Diseases listed on label									
Common Bunt/ Covered Smut	Loose Smut	Seed & Seedling Rots	Common Root Rot	Fusarium root diseases	Rhizoctonia root diseases	Seed Treatment Products	Application Rate	Special Notes	
		X			X	azoxystrobin Dynasty	0.153-0.382 fl oz/cwt		
		X				captan Captan 400 Captan 400-C	1.5-4 fl oz/cwt		
X	X	X				captan + carboxin Enhance	4 oz/cwt		
X	X	X	X	X	X	captan + carboxin + imidacloprid Enhance AW	4 oz/cwt	Do not graze or feed livestock on treated areas for 45 days after planting.	
X	X					carboxin Vitavax-34	2-3 oz/cwt	Do not graze or feed livestock on treated areas for 6 weeks after planting.	
X	X				X	carboxin + PCNB + metalaxyl Prevail	1.5-3 oz/bu	Do not graze or feed livestock on treated areas for 6 weeks after planting.	
X	X	X		X	X	carboxin + thiram RTU-Vitavax-Thiram Vitaflo-280 Vitavax CT	5-6.8 fl oz/cwt 3.5-5.0 fl oz/cwt 9-12 fl oz/cwt (Use the higher rate where smuts and bunt are severe.)	Do not graze or feed livestock on treated areas for 6 weeks after planting.	
X	X					carboxin + thiram + molybdenum Vitavax M	9-12 fl oz/cwt (Use the higher rate under conditions of heavy disease pressure.)	Do not graze or feed livestock on treated areas for 6 weeks after planting.	

SEED TREATMENTS FOR WHEAT (continued)

Diseases listed on label

Common Bunt/ Covered Smut	Loose Smut	Seed & Seedling Rots	Common Root Rot	Fusarium root diseases	Rhizoctonia root diseases	Seed Treatment Products	Application Rate	Special Notes
X	X	X	X	X	X	difenoconazole + mefenoxam Dividend XL RTA Incentive RTA	2.5 fl oz/cwt plus control of Fusarium seed scab. 5 fl oz/cwt plus control of Fusarium seed scab and partial control of common root rot. 10 fl oz/cwt plus control of Fusarium seed scab and partial control of take-all and common root rot.	Green wheat forage may not be grazed until 55 days after planting. Do not plant any crop other than wheat or barley within 30 days to fields in which treated seeds were planted.
X	X	X	X	X	X	difenoconazole + mefenoxam Dividend Extreme	1 fl oz/cwt plus control of Fusarium seed scab 2 fl oz/cwt plus control of Fusarium seed scab and early season control of common root rot 4 fl oz/cwt plus control of Fusarium seed scab and early season control of take all and common root rot	Green wheat forage may not be grazed until 55 days after planting. Do not plant any crop other than wheat or barley within 30 days to fields in which treated seeds were planted.
		X		X	X	fludioxonil Maxim 4 FS	0.08-0.16 fl oz/cwt	Do not graze forage until 30 days after planting.
X		X		X	X	fludioxonil + mefenoxam Maxim XL	0.167-0.334 fl oz/cwt	
X		X				mancozeb Dithane M45	2.2-3.3 oz/cwt	
X		X				mancozeb + surfactant Dithane DF Rainshield Grain Guard	2.3-3.5 oz/cwt 2 oz/bu	
X		X				Manzate Pro-Stick mancozeb + surfactant + copper ManKocide	2.2-3.3 oz/cwt 4 oz/cwt	

SEED TREATMENTS FOR WHEAT (continued)

Diseases listed on label

Common Bunt/ Covered Smut	Loose Smut	Seed & Seedling Rots	Common Root Rot	Fusarium root diseases	Rhizoctonia root diseases	Seed Treatment Products	Application Rate	Special Notes
X		X				maneb Manex	3.5-5.2 fl oz/cwt	
		X				mefenoxam Apron XL	0.0425-0.085 fl oz/cwt for Pythium damping off	Use the higher rate when the disease pressure is expected to be high.
X	X	X		X		mefenoxam + difenoconazole + thiamethoxam Cruiser Maxx Cereals	5 fl oz/cwt plus suppression of common root rot and take all	Do not graze or feed livestock on treated areas for 45 days after planting.
		X				metalaxyl Aquire	0.75 fl oz/cwt	For control of Pythium damping-off only.
						Allegiance Dry	1.5-2.0 oz/cwt	
						Allegiance FL	0.75 fl oz/cwt	
						MetaStar ST	0.75 fl oz/cwt	
X	X		X	X	X	metalaxyl + tebuconazole + imidacloprid Gaucho XT Flowable	3.4 fl oz/cwt	Do not graze or feed livestock on treated areas for 45 days after planting.
		X			X	pyraclostrobin Stamina	0.38-0.76 fl oz/cwt Use the higher rates when disease pressure is expected to be high.	
		X	X	X	X	tebuconazole + metalaxyl Dyna-Shield	5-6.5 fl oz/cwt	Wheat forage may be grazed or harvested for hay 31 days after seeding.
X	X	X	X	X	X	Raxil MD	5-6.5 fl oz/cwt plus early season control of common root rot	
						Raxil XT	0.16-0.20 oz /cwt plus early season control of common root rot	
X	X	X	X	X	X	tebuconazole + metalaxyl + imazalil Raxil MD Extra	5 fl oz/cwt plus early season control of common root rot	Do not graze or feed livestock on treated areas for 6 weeks after planting.

SEED TREATMENTS FOR WHEAT (continued)

Diseases listed on label									
Common Bunt/ Covered Smut	Loose Smut	Seed & Seedling Rots	Common Root Rot	Fusarium root diseases	Rhizoctonia root diseases	Seed Treatment Products	Application Rate	Special Notes	
X	X	X	X	X	X	tebuconazole + metalaxyl + imazalil + imidacloprid Raxil MD Extra W	5.14 fl oz/cwt plus early season control of common root rot	Do not graze or feed livestock on treated areas for 45 days after planting.	
X	X	X	X	X	X	tebuconazole + metalaxyl + imidacloprid Raxil MD W	5 fl oz/cwt plus early season control of common root rot	Do not graze or feed livestock on treated areas for 45 days after planting.	
X	X	X	X	X	X	tebuconazole + thiram Raxil-Thiram	3.5-4.6 fl oz/cwt plus early season control of common root rot and control of Fusarium seed scab	Use low rate under dryland or low rainfall conditions. Wheat green forage may be grazed or harvested for hay 31 days after seeding.	
X	X			X		triticonazole Charter	3.1 fl oz/cwt plus suppression of common root rot and Rhizoctonia root rot.	Do not plant any crop not listed on the label in soil treated with Charter within 30 days after planting treated seed.	
X	X	X	X	X	X	triticonazole + metalaxyl Charter + Acquire	3.1 fl oz/cwt (Charter) + 0.15 fl oz/cwt (Acquire)		
X	X	X	X	X	X	triticonazole + thiram Charter PB	5.5 fl oz/cwt plus suppression of Rhizoctonia root rot	Do not plant any crop not listed on the label within 30 days after planting.	

SEED TREATMENTS FOR BARLEY

Diseases listed on label							Application Rate	Special Notes
Covered Smut	Loose Smut	Seed & Seedling Rots	Fusarium root diseases	Rhizoctonia root diseases	Seed Treatment Products			
		X		X	azoxystrobin Dynasty	0.10-3.75 fl oz/cwt		
		X			captan Captan 400 Captan 400-C	2-3 fl oz/cwt 2-3 fl oz/cwt		
X	X	X			captan + carboxin Enhance	4 oz/cwt		
X	X	X	X	X	captan + carboxin + imidacloprid Enhance AW	4 oz/cwt	Do not graze or feed livestock on treated areas for 45 days after planting.	
X	X				carboxin Vitavax-34	2-3 oz/cwt	Do not graze or feed livestock on treated areas for 6 weeks after planting.	
X	X			X	carboxin + PCNB + metalaxyl Prevail	1-2 oz/bu	Do not graze or feed livestock on treated areas for 6 weeks after planting.	
X	X	X	X		carboxin + thiram RTU-Vitavax-Thiram Vitaflo-280 Vitavax CT	5-6.8 fl oz/cwt 3.5-5.0 fl oz/cwt 9-12 fl oz/cwt (Use the higher rate where smuts and bunt are severe.)	Do not graze or feed livestock on treated areas for 6 weeks after planting.	
X	X	X			carboxin + thiram + molybdenum Vitavax M	9-12 fl oz/cwt (Use the higher rate under conditions of heavy disease pressure.)	Do not graze or feed livestock on treated areas for 6 weeks after planting.	

SEED TREATMENTS FOR BARLEY (continued)

Diseases listed on label

Covered Smut	Loose Smut	Seed & Seedling Rots	Fusarium root diseases	Rhizoctonia root diseases	Seed Treatment Products	Application Rate	Special Notes
X		X	X	X	difenoconazole + mefenoxam Dividend Extreme	2 fl oz/cwt plus partial control of Fusarium seed scab and common root rot. 4 fl oz/cwt plus partial control of Fusarium seed scab, take-all and common root rot. 5 fl oz/cwt plus partial control of Fusarium seed scab and common root rot.	Do not graze barley forage until 30 days after planting. Do not plant any other crop than wheat or barley within 30 days to fields in which treated seeds were planted.
					Dividend XL RTA	10 fl oz/cwt plus partial control of Fusarium seed scab, take-all and common root rot.	
					Incentive RTA	5 fl oz/cwt plus partial control of Fusarium seed scab and common root rot. 10 fl oz/cwt plus partial control of Fusarium root rot, take all and common root rot.	
		X	X	X	fludioxonil Maxim 4FS	0.08-0.16 fl oz/cwt	Cereal forage may not be grazed until 30 days after planting.
		X	X	X	fludioxonil + mefenoxam Maxim XL	0.167-0.334 fl oz/cwt	
X	X	X			mancozeb Dithane M-45	2.7-4.2 oz/cwt	
X	X	X			mancozeb + surfactant Dithane DF Rainshield	2.9-4.5 oz/cwt	
					Grain Guard	2 oz/bu	
					Manzate Pro-Stick	2.7-4.2 oz/cwt	
X	X	X			mancozeb + surfactant + copper ManKocide	4 oz/cwt	
X	X	X			maneb Manex	4.3-6.7 fl oz/cwt	
		X			mefenoxam Apron XL	0.0425-0.085 fl oz/cwt for Pythium damping off	Use the higher rates when the disease pressure is expected to be high.

SEED TREATMENTS FOR BARLEY (continued)

Diseases listed on label

Covered Smut	Loose Smut	Seed & Seedling Rots	Fusarium root diseases	Rhizoctonia root diseases	Seed Treatment Products	Application Rate	Special Notes
X	X	X	X		mefenoxam + difenoconazole + thiamethoxam Cruiser Maxx Cereals	5 fl oz/cwt plus suppression of common root rot and take all	Do not graze or feed livestock on treated areas for 45 days after planting.
		X			metalaxyl Aquire Allegiance Dry Allegiance FL MetaStar ST	0.75 fl oz/cwt 1.5-2.0 oz/cwt 0.75 fl oz/cwt 0.75 fl oz/cwt	For control of Pythium damping-off only.
X	X	X	X	X	metalaxyl + tebuconazole + imidacloprid Gaucho XT Flowable	3.4 fl oz/cwt	Do not graze or feed livestock on treated areas for 45 days after planting.
		X		X	pyraclostrobin Stamina	0.38-0.76 fl oz/cwt Use the higher rates when disease pressure is expected to be high.	
X	X	X	X	X	tebuconazole + metalaxyl Dyna-Shield Raxil MD Raxil XT	5-6.5 fl oz/cwt 5-6.5 fl oz/cwt plus early season control of common root rot 0.16-0.20 oz /cwt plus early season control of common root rot	Barley forage may be grazed or harvested for hay 31 days after seeding
X	X	X	X	X	tebuconazole + metalaxyl + imazalil Raxil MD Extra	5 fl oz/cwt plus early season control of common root rot.	Do not graze or feed livestock on treated areas for 6 weeks after planting.
X	X	X	X	X	tebuconazole + metalaxyl + imazalil + imidacloprid Raxil MD Extra W	5.14 fl oz/cwt plus early season control of common root rot.	Do not graze or feed livestock on treated areas for 45 days after planting.
X	X	X	X	X	tebuconazole + metalaxyl + imidacloprid Raxil MD W	5 fl oz/cwt plus early season control of common root rot.	Do not graze or feed livestock on treated areas for 45 days after planting.
X	X	X	X	X	tebuconazole + thiram Raxil-Thiram	3.5-4.6 fl oz/cwt	Use low rate under dryland or low rainfall conditions. Barley forage may be grazed or harvested for hay 31 days after seeding.

SEED TREATMENTS FOR BARLEY (continued)

Diseases listed on label							
Covered Smut	Loose Smut	Seed & Seedling Rots	Fusarium root diseases	Rhizoctonia root diseases	Seed Treatment Products	Application Rate	Special Notes
X	X		X		triconazole Charter	3.1 fl oz/cwt plus suppression of common root rot and Rhizoctonia root rot.	Do not plant any crop not listed on the label in soil treated with Charter within 30 days after planting treated seed.
X	X	X	X	X	triconazole + metalaxyl Charter + Acquire	3.1 fl oz/cwt (Charter) + 0.15 fl oz/cwt (Acquire)	
X	X	X	X	X	triconazole + thiram Charter PB	5.5 fl oz/cwt plus suppression of Rhizoctonia root rot	Do not plant any crop not listed on the label within 30 days after planting.

SEED TREATMENTS FOR OATS

Diseases listed on label							
Covered Smut	Loose Smut	Seed & Seedling Rots	Fusarium root diseases	Rhizoctonia root diseases	Seed Treatment Products	Application Rate	Special Notes
		X			captan Captan 400	2-4 fl oz/cwt	
X	X	X			captan + carboxin Enhance	2-4 fl oz/cwt	
X	X	X	X	X	captan + carboxin + imidacloprid Enhance AW	4 oz/cwt	Do not graze or feed livestock on treated areas for 45 days after planting.
X	X				carboxin Vitavax-34	4 oz/cwt	Do not graze or feed livestock on treated areas for 6 weeks after planting.
X		X		X	carboxin + PCNB + metalaxyl Prevail	1-2 oz/bu	Do not graze or feed livestock on treated areas for 6 weeks after planting.
X	X	X			carboxin + thiram RTU-Vitavax-Thiram	5-6.8 fl oz/cwt	Do not graze or feed livestock on treated areas for 6 weeks after planting.
					Vitaflo-280	5.0 fl oz/cwt	
					Vitavax CT	9-12 fl oz/cwt	
X	X				carboxin + thiram + molybdenum Vitavax M	9-12 fl oz/cwt (Use the higher rate under conditions of heavy disease pressure.)	Do not graze or feed livestock on treated areas for 6 weeks after planting.

SEED TREATMENTS FOR OATS (continued)

Diseases listed on label							Special Notes
Covered Smut	Loose Smut	Seed & Seedling Rots	Fusarium root diseases	Rhizoctonia root diseases	Seed Treatment Products	Application Rate	
		X	X	X	fludioxonil Maxim 4FS	0.08-0.16 fl oz/cwt	Cereal forage may not be grazed until 30 days after planting.
		X	X	X	fludioxonil + mefenoxam Maxim XL	0.167-0.334 fl oz/cwt	
X	X	X			mancozeb Dithane M-45	4.0-6.3 oz/cwt	
X		X			mancozeb + surfactant Dithane DF Rainshield	4.3-6.7 oz/cwt	
					Grain Guard	2 oz/bu	
					Manzate Pro-Stick	4.0-6.3 oz/cwt	
X	X	X			maneb Manex	6.4-10 fl oz/cwt	
		X			mefenoxam Apron XL	0.0425-0.085 fl oz/cwt for Pythium damping off	Use the higher rates when the disease pressure is expected to be high.
		X			metalaxyl Aquire	0.75 fl oz/cwt	For control of Pythium damping-off only.
					Allegiance Dry	1.5-2.0 oz/cwt	
					Allegiance FL	0.75 fl oz/cwt	
					MetaStar ST	1.5 fl oz/cwt	
X	X	X	X	X	metalaxyl+ tebuconazole + imidacloprid Gaucho XT Flowable	3.4 fl oz/cwt	Do not graze or feed livestock on treated areas for 45 days after seeding.
	X	X	X	X	tebuconazole + metalaxyl Dyna-Shield	5-6.5 fl oz/cwt	Oat forage may be grazed or harvested for hay 31 days after seeding.
					Raxil MD	5-6.5 fl oz/cwt	
					Raxil XT	0.16-0.20 oz /cwt	
	X	X	X	X	tebuconazole + thiram Raxil-Thiram	3.5-4.6 fl oz/cwt	Use low rate under dryland or low rainfall conditions. Oat forage may be grazed or harvested for hay 31 days after seeding.

SEED TREATMENTS FOR RYE

Diseases listed on label

Common Bunt/ Covered Smut	Loose Smut	Seed & Seedling Rots	Fusarium root diseases	Rhizoctonia root diseases	Seed Treatment Products	Application Rate	Special Notes
		X			captan Captan 400 Captan 400-C	2-3 fl oz/cwt 2-3 fl oz/cwt	
		X			fludioxonil Maxim 4 FS	0.08-0.16 fl oz/cwt	Cereal forage may not be grazed until 30 days after planting.
		X	X	X	fludioxonil + mefenoxam Maxim XL	0.167-0.334 fl oz/cwt	
X		X			mancozeb Dithane M45	2.3-3.6 oz/cwt	
X		X			mancozeb + surfactant Dithane DF Rainshield Grain Guard Manzate Pro-Stick	2.5-3.8 oz/cwt 2 oz/bu 2.3-3.6 oz/cwt	
		X			maneb Manex	3.6-5.7 fl oz/cwt	
		X			mefenoxam Apron XL	0.0425-0.085 fl oz/cwt for Pythium damping off	Use the higher rates when the disease pressure is expected to be high.
		X			metalaxyl Aquire Allegiance Dry Allegiance FL MetaStar ST	0.75 fl oz/cwt 1.5-2.0 oz/cwt 0.75 fl oz/cwt 0.75 fl oz/cwt	For control of Pythium damping-off only.
X	X	X	X	X	metalaxyl + tebuconazole Gaucho XT Flowable	3.4 fl oz/cwt	Do not graze or feed livestock on treated areas for 45 days after seeding.
		X		X	pyraclostrobin Stamina	0.38-0.76 fl oz/cwt Use the higher rates when disease pressure is expected to be high.	

SEED TREATMENTS FOR CORN

		Diseases listed on label				Special Notes
Head Smut	Seed & Seedling Rots	Fusarium root diseases	Rhizoctonia root diseases	Seed Treatment Products	Application Rate	
				abamectin + thiamethoxam Avicta Duo Corn	See product label	For control of Corn nematodes.
				azoxystrobin, fludioxonil, mefenoxam and thiamethoxam. Avicta Complete Corn	See product label	For control of Corn nematodes.
	X		X	azoxystrobin Dynasty	0.153 fl oz/cwt (0.0025 mg ai/kernel)	Use Dynasty only in combination with labeled rates of Maxim® and Apron XL LS products.
	X			Bacillus subtilis GB03 Kodiak HB	4 oz/cwt	For suppression of Fusarium and Pythium root diseases.
	X			captan Captan 400	1.25-2.375 fl oz/cwt	
				Captan 400-C	1.25-2.375 fl oz/cwt	
X	X		X	carboxin Vitavax-34	2-4 oz/cwt	Do not graze or feed livestock on treated areas for 6 weeks after planting.
	X		X	carboxin + metalaxyl + imidacloprid Latitude	1.5 oz/42 lbs	
	X		X	carboxin + PCNB + metalaxyl Prevail	1.5-3 oz/bu	Do not graze or feed livestock on treated areas for 6 weeks after planting.
	X			carboxin + permethrin Kernel Guard Supreme	1.5 oz/42lbs	Do not graze or feed livestock on treated areas for 6 weeks after planting.
	X	X	X	fludioxonil Maxim 4FS	0.08-0.16 fl oz/cwt (0.0064-0.128 mg ai/kernel)	Green forage may not be grazed until 30 days after planting.
	X	X	X	fludioxonil + mefenoxam Maxim XL	0.167-0.334 fl oz/cwt (0.009-0.018 mg ai/kernel)	
	X	X	X	fludioxonil + mefenoxam + azoxystrobin + thiamethoxam Cruiser Extreme	See product label	Forage may not be grazed until 30 days after planting.
	X	X	X	ipconazole Vortex	0.044 fl oz/cwt	
	X	X	X	mancozeb Dithane M45	2.7-5.4 oz/cwt	

SEED TREATMENTS FOR CORN (continued)

		Diseases listed on label				Special Notes
Head Smut	Seed & Seedling Rots	Fusarium root diseases	Rhizoctonia root diseases	Seed Treatment Products	Application Rate	
	X			mancozeb + surfactant Dithane DF Rainshield Dithane F-45 Manzate Pro-Stick	2.9-5.8 oz/cwt 4.3-8.6 fl oz/cwt 2.7-5.4 oz/cwt	
	X			maneb Manex	4.3-8.6 fl oz/cwt	
	X			mefenoxam Apron XL	0.0425-0.085 fl oz/cwt (0.0025-0.005 mg ai/kernel)	For control of Pythium damping-off only.
	X			metalaxyl Aquire Allegiance Dry Allegiance FL MetaStar ST	0.75 fl oz/cwt 1.5-2.0 oz/cwt 0.75 fl oz/cwt 0.75 fl oz/cwt	For control of Pythium damping-off only.
	X			metalaxyl + imidacloprid Concur	1.5 oz/42 lbs	For control of Pythium seedling diseases.
	X		X	pyraclostrobin Stamina	0.38-0.76 fl oz/cwt Use the higher rates when disease pressure is expected to be high.	
	X	X	X	trifloxystrobin Trilex	0.32-0.64 fl oz/cwt	
	X	X	X	trifloxystrobin + metalaxyl Trilex 2000	0.5 fl oz/cwt	

SEED TREATMENTS FOR SOYBEANS

Diseases listed on label							Special Notes
Seed & Seedling Rots	Fusarium root diseases	Pythium root diseases	Rhizoctonia root diseases	Seed Treatment Products	Application Rate		
X		X	X	azoxystrobin Dynasty	0.153-0.459/cwt plus suppression of white mold.	Do not plant other crops within 45 days after previous planting.	
X				captan Captan 400 Captan 400-C	1.5-2.5 fl oz/cwt 1.5-2.5 fl oz/cwt		
X				captan + carboxin Enhance Vitavax M DC	5 oz/bu 2 oz/bu		
X	X	X	X	captan + carboxin + imidacloprid Enhance AW	5 oz/cwt	Do not graze or feed livestock on soybean forage or hay.	
X		X	X	captan + carboxin + metalaxyl Bean Guard Allegiance	2 oz/bu		
X				captan + molybdenum Hi Moly/Captan D	3.3 oz/cwt		
X				carboxin Vitavax-34	3-4 fl oz/cwt	Do not graze or feed livestock on forage or hay grown from treated seed.	
X				carboxin + metalaxyl Latitude	4 oz/cwt	Do not graze or feed livestock on forage and hay on treated areas for 6 weeks after planting.	
		X	X	carboxin + PCNB + metalaxyl Prevail	2-4 oz/bu	Do not graze or feed livestock on forage or hay grown from treated seed.	
X			X	carboxin + permethrin Kernel Guard Supreme	1.5 oz/50 lbs	Do not graze or feed livestock on treated areas for 6 weeks after planting.	
	X	X	X	carboxin + thiram RTU-Vitavax-Thiram Vitavax CT	6.8 fl oz/cwt 12 fl oz/cwt	Do not graze or feed livestock on forage or hay grown from treated seed.	
			X	carboxin + thiram + molybdenum Vitavax M	12 fl oz/cwt	Do not graze or feed livestock on forage or hay grown from treated seed.	
X			X	fluidoxonil Maxim 4FS	0.08-0.16 fl oz/cwt		
		X		mefenoxam Apron XL	0.16-0.64 fl oz/cwt (Use the higher rate for best early season Phytophthora protection.)		

SEED TREATMENTS FOR SOYBEANS (continued)

Diseases listed on label					Special Notes
Seed & Seedling Rots	Fusarium root diseases	Pythium root diseases	Rhizoctonia root diseases	Seed Treatment Products	
X	X	X	X	mefenoxam + fludioxonil ApronMaxx RFC ApronMaxx RTA Maxim XL Warden RTA	1.5 fl oz/cwt plus suppression of seedborne Sclerotinia. 5 fl oz/cwt plus control of early season Phytophthora and suppression of seedborne Sclerotinia. 0.167-0.334 fl oz/cwt plus early season Phytophthora control. 5 fl oz/cwt plus control of early season Phytophthora and suppression of seedborne Sclerotinia.
X	X	X	X	mefenoxam + fludioxonil + thiamethoxam Cruiser Maxx Warden CZ	3 fl oz/cwt 3.2 fl oz/cwt
				metalaxyl Aquire Allegiance Dry Allegiance FL MetaStar ST	0.75-1.5 fl oz/cwt plus early season control of Phytophthora. 1.5-2.0 oz/cwt plus early season control of Phytophthora. 0.2-1.5 fl oz/cwt plus early season control of Phytophthora. 0.75-1.5 fl oz/cwt plus early season control of Phytophthora.
X				thiabendazole Mertect 340-F	0.08-0.16 fl oz/cwt for control of pod and stem blight.
		X	X	thiram + metalaxyl + molybdenum Protector-L-Allegiance	6.7 fl oz/cwt
X				thiram + molybdenum Protector-D	2 oz/bu

SEED TREATMENTS FOR SOYBEANS (continued)

Diseases listed on label						
Seed & Seedling Rots	Fusarium root diseases	Pythium root diseases	Rhizoctonia root diseases	Seed Treatment Products	Application Rate	Special Notes
X	X		X	trifloxystrobin Trilex	0.32 fl oz/cwt	Do not plant any other crop without trifloxystrobin tolerances until 30 days after planting.
X	X	X	X	trifloxystrobin + metalaxyl Trilex 2000 Trilex AL Flowable	1 fl oz/cwt 5.7 fl oz/cwt	Do not plant any other crop without trifloxystrobin tolerances until 30 days after planting.

SEED TREATMENTS FOR SUNFLOWERS

Diseases listed on label						
Seed & Seedling Rots	Systemic Downy mildew	Seed Treatment Products	Application Rate	Application Rate	Special Notes	
X	X	azoxystrobin Dynasty	3.75-37.5 fl oz/cwt (0.025-0.1 mg ai/kernel)		For suppression of downy mildew.	
X		captan Captan 400 Captan 400-C	2-4 fl oz/cwt 2-4 fl oz/cwt			
X		fludioxonil Maxim 4FS	0.08-0.16 fl oz/cwt			
X		fludioxonil + mefenoxam Maxim XL	0.167-0.334 fl oz/cwt			
	X	mefenoxam Apron XL	1.28 fl oz/cwt (0.029 mg ai/seed)			
	X	metalaxyl Aquire Allegiance Dry Allegiance FL MetaStar ST	1.5-3.0 fl oz/cwt 4.0 oz/cwt 1.5-3.0 fl oz/cwt 1.5-3.0 fl oz/cwt			

SEED TREATMENTS FOR SAFFLOWER				
Diseases listed on label				
Seed & Seedling Rots	Seedborne Rust	Seed Treatment Products	Application Rate	Special Notes
X		carboxin Vitavax-34	2 fl oz/cwt	
X		fludioxonil Maxim 4FS	0.08-0.16 fl oz/cwt	
	X	mancozeb Dithane M/45	2.0 oz/cwt	
X		mancozeb + surfactant Dithane F-45	3.2 fl oz/cwt for control of seedborne rust only.	
	X	Dithane DF Rainshield	2.1 oz/cwt for control of seedborne rust only.	
		Grain Guard	3 oz/cwt	
		Manzate Pro-Stick	2 oz/cwt for control of seedborne rust only.	
	X	maneb Manex	3.2 fl oz/cwt	

SEED TREATMENTS FOR CHICKPEA

Diseases listed on label				
Seed & Seedling Rots	Seed borne Ascochyta blight	Seed Treatment Products	Application Rate	Special Notes
X		azoxystrobin Dynasty	0.153-0.765 fl oz/cwt	Do not plant other crops within 45 days after previous planting.
X		captan + carboxin + imidacloprid Enhance AW	5 oz/cwt	Do not allow livestock to graze or feed on forage until 60 days after planting.
X		fludioxonil Maxim 4FS	0.08-0.16 fl oz/cwt	
X		fludioxonil + mefenoxam ApronMaxx RFC Maxim XL	1.5 fl oz/cwt 0.167-0.334 fl oz/cwt plus early season Phytophthora control.	
X		mefenoxam Apron XL	0.16-0.64 fl oz/cwt	For Pythium damping-off protection.
X		mefenoxam + fludioxonil + thiamethoxam Cruiser Maxx	3.0 fl oz/cwt	
X		metalaxyl Allegiance Dry Allegiance FL MetaStar ST	2 oz/cwt 0.75fl oz/cwt for early season control of Phytophthora and the 1.5 fl oz/cwt for Pythium damping-off. 0.75 fl oz/cwt	For Pythium damping-off and early season Phytophthora control.
	X	thiabendazole Mertect® 430-F	2.04 fl oz/cwt	Mix with an equal amount of water to provide adequate coverage.
X		trifloxystrobin Trilex	0.32 fl oz/cwt	Do not plant any other crop without trifloxystrobin tolerances until 30 days after planting.
X		trifloxystrobin + metalaxyl Trilex 2000 Trilex AL Flowable	1 fl oz/cwt 5.7 fl oz/cwt	Do not plant any other crop without trifloxystrobin tolerances until 30 days after planting.

SEED TREATMENTS FOR FIELD PEA

Diseases listed on label					
Seed & Seedling Rots	Seed borne Ascochyta blight	Seed Treatment Products	Application Rate	Special Notes	
X		captan + carboxin + imidacloprid Enhance AW	5 oz/cwt	Do not allow livestock to graze or feed on forage until 60 days after planting.	
X		fludioxonil Maxim 4FS	0.08-0.16 fl oz/cwt		
X		fludioxonil + mefenoxam ApronMaxx RFC Maxim XL	1.5 fl oz/cwt 0.167-0.334 plus early season Phytophthora control.		
X		mefenoxam Apron XL	0.16-0.64 fl oz/cwt	For Pythium damping-off protection.	
X		mefenoxam + fludioxonil + thiamethoxam Cruiser Maxx	1.5 fl oz/cwt		
X		metalaxyl Allegiance Dry Allegiance FL MetaStar ST	2 oz/cwt 0.75fl oz/cwt for early season control of Phytophthora and the 1.5 fl oz/cwt for Pythium damping off. 0.75 fl oz/cwt for early season control of Phytophthora and the 1.5 fl oz/cwt for Pythium damping off.	For Pythium damping-off and early season Phytophthora control.	
	X	thiabendazole Mertect® 430-F	1.02 fl oz/cwt		
X		trifloxystrobin Trilex	0.32 fl oz/cwt	Do not plant any other crop without trifloxystrobin tolerances until 30 days after planting.	
X		trifloxystrobin + metalaxyl Trilex 2000 Trilex AL Flowable	1 fl oz/cwt 5.7 fl oz/cwt	Do not plant any other crop without trifloxystrobin tolerances until 30 days after planting.	