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Seed Treatment Decisions for Use on Winter Wheat

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The decision to treat wheat seed should be based on several factors that will vary between farms and individuals. There are many variables involved when making this decision. These include seed cost, cost associate with treating, crop value, field/crop history, seed quality, soil condition, tillage practices, planting date, anticipated disease and insect pressure, and an individual's tolerance to risk. Most of us look at seed treatments as "insurance". Seed treatments can be a means of preventing or reducing the risks from a number of soilborne and seedborne pathogens or insects. Seedling diseases tend to be more severe if poor quality seed is used and if conditions at planting are not favorable for quick germination and stand establishment. Seed treatments can improve stand establishment under poor growing conditions. If seed is to be used that was harvested from a field with common bunt or loose smut, a fungicide seed treatment should be strongly considered. Similarly, any seed that is going to be planted in a field with a history of common bunt is a good candidate for seed treatment. The following table is a partial list of those seed treatments that should be readily available in the Texas High Plains. Check your local distributors to determine which products are available in your area and at what cost. The cost of adding these products will increase your cost from $2 up to $9, depending on applicator cost. If you do decide to treat your seed with any insecticide, please read the label for possible grazing restrictions.

Which diseases are we concerned about?

Seed and head diseases, as well as wheat root rots, are caused by several different fungi Root-rot fungi invade and colonize the roots and crown tissue of wheat seedlings and plants. In affected plants, the crown and root tissues may be destroyed and water and nutrient uptake restricted. This is more apparent in years when high temperatures and drought occur around heading. Diseased plants prematurely appear as white headed areas long before expected normal times for maturation. Most problems resulting from seed-borne diseases have been eliminated by highly effective seed-treatment fungicides. Several seed-borne diseases are of concern to wheat growers.

Loose smut, Black loose smut - *Ustilago tritici*
The fungus that causes loose smut survives as dormant mycelia (fungal threads) **within the embryo** of an infested wheat seed. When the seed germinates, the fungus resumes growth along with the wheat shoot apex. Loose smut spores are released from the heads of infected wheat plants, spread to the flowering heads of healthy wheat and infect *developing* kernels. Light rains or heavy dew and moderate temperature, 60 to 71^{o}F favor infection. The spore germinates on the stigma (female receptive portion of wheat flower) of a healthy wheat head and colonizes the developing wheat seed embryo. The colonized seed appears healthy **but carries the dormant smut fungus within** to start the cycle over again with the planting of the seed.
Loose smut reduces yield in proportion to the percentage of smutted heads in the field.

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Common Bunt, Stinking Smut, Covered smut - *Tilletia tritici* (syn. *T. caries*); *Tilletia laevis* (*Tilletia caries* and *Tilletia foetida*)
The disease starts at the time of seed germination or seedling emergence. The fungi infect the shoots of wheat seedlings before the plants emerge from the soil. Most infection results from spores carried into the field as contamination on seeds, but in areas where spores over summer in the soil, infection of winter wheat can also result from soil borne spores. The spores germinate best when soil of seedbed temperatures are in the range of 40 - 60 F. The fungus then grows within the growing cycle by taking over the ovaries and forming smut balls in place of kernels. Spore masses burst during harvest, spreading spores to healthy grain and to the soil. The fungi survive from one season to the next on the surface of infested seed or in the soil.

Soil-borne spores of common bunt remain infective in areas where the soil remains relatively dry from the time of harvest until after seeding. The fungus is carried on the seed or in the soil. Bunted spores can survive up to 2 years. The spores germinate best when soil temperatures of the seedbed are cool, 40 – 60^{o}F.

Karnal bunt - *Tilletia indica*
Spores (teliospores) in or on soil germinate and produce a different spore type (primary sporidia) which are wind/rain blown to leaves or heads. Conditions that are favorable for KB infection and development include moderate temperatures (60-70^{o}F), high relative humidity (> 80%), cloudy/overcast, rainfall during heading and flowering.

Others
Rhizoctonia Spring Blight - *Rhizoctonia cerealis*
Take-all - *Gaeumannomyces graminis var. tritici*
Scab (Head blight) - *Fusarium graminearum*
Black Point - *Alternaria, Helminthosporium, and Fusarium spp*
Sharp Eyespot and Rhizoctonia Root Rot - *Rhizoctonia solani*
Common Root Rot, Foot Rot, and Crown Rot - *Helminthosporium*, *Fusarium*, and *Pythium* spp.

Which insects are we concerned about?

False and True Wireworm, several species in Tenebrionidae and Elateridae families
Wireworms destroy planted seed and feed on seedling roots reducing stands and plant vigor. Wireworm damage potential is reduced when wheat is planted in enough moisture to stimulate rapid germination. Wireworms become active again in the spring but cause very little injury.

Greenbug, *Schizaphis graminum*
Greenbugs are also carriers of the virus that causes barley yellow dwarf disease.
Wheat leaves react to a substance in greenbug saliva, causing young leaves to turn yellow and older leaves to develop orange-red spots. Greenbugs often occur in concentrated patches within a field, damaging small circular patches that radiate from dead spots. When abundant, greenbugs can stunt plants and eventually kill them. If seedlings are infested in the fall, they seem to be more susceptible to winter kill.

Russian Wheat Aphid, *Diuraphis noxia*
Russian wheat aphids feed on the newest growth on the plant and effectively cause cessation of chlorophyll production in those leaves. As it feeds, the Russian wheat aphid causes the leaf to curl and creates an enclosure that protects the insect from climate, natural enemies, and insecticides. Damage symptoms include white, yellow, or purple

longitudinal streaks on the leaf and prostrate growth of the plant. These insect are 1/16 inch long, light green, spindle-shaped with short antennae and no prominent cornicles. It has a projection above the hind end that gives it a double-tail appearance.

Hessian Fly, *Mayetiola destructor*

The adult fly is tiny, fragile and mosquito-like and measures 1/8 inches. The legless maggot-like larvae are reddish or orange when newly hatched, but become whitish-green as they feed. When they are ready to pupate, they form a dark brown puparium, which is called a flax seed, which are normally inserted into the crown or just above the joint of a stem. This is normally the most common sign of Hessian fly infestations.

Injury is caused by larval feeding on stem tissue at the crown of young plants, or just above the nodes of jointed wheat. Young plants suffer the most serious injury, as plants become stunted, and secondary tillers that are infested fail to develop. Young plants that are infested are actually a darker green to bluish-green color, and the leaves are thicker. When larvae feed on jointed stems, they become weakened and lodge.

Bird Cherry-oat Aphid, *Rhopalosiphum padi*

They are very efficient vectors of barley yellow dwarf virus.
It does not cause visible injury symptoms. Heavy infestations will cause plants to become sticky with honeydew, the liquid waste that is excreted by aphids as they feed.

English Grain Aphid, *Sitobion avenae*

This aphid causes the most direct damage by feeding on heads of maturing grain. The life cycle of the English grain aphid is keyed to cereal development. Eggs are deposited in the autumn on leaves of early-planted winter cereal crops, and hatch in mid-April. After several generations of asexual reproduction, winged forms are produced that disperse to spring planted wheat and late-planted winter wheat. Yield loss results from reduced number of grains per head. Spring wheat is more susceptible to English grain aphid damage because it is in an earlier stage of development than winter wheat at the time of high aphid numbers.

Winter Grain Mite, *Penthaleus major*

Mites are not true insects, but are closely related to ticks and spiders. Dark-brown, with orange-red legs and an orange or red spot on the upper abdomen. There are two generations of winter grain mite each year. The first begins in the fall, as over-summering eggs hatch. The second generation begins sometime in January, and reaches peak numbers in March. These mites feed on the leaf sheaths and shoots near the ground. They move up the plant at night and on cloudy days. Leaves take on a silvery gray color when injured and leaf tips may turn brown.

White grub, Phyllophaga spp. & Cyclocephala spp.

White grubs are the larval stage of May or June beetles. Larvae are "c-shaped" with white bodies and tan to brown heads. Larvae feed on roots and may cause stand loss. As soil temperature decreases in the fall, white grub feeding decreases, and larvae migrate deeper in the soil. Delayed planting may improve establishment.

Common seed treatment fungicides and insecticides labeled for use on winter wheat.

Trade Name Company	**Common Chemical name**	**% Active Ingredient**	**Rate**	**Additional label Information**
Dividend XL RTA Syngenta	difenoconazole mefenoxam	3.21% 0.27%	2.5 fl oz per 100lb of seed OR 5.0 fl oz per 100lb of seed OR 10.0 fl oz per 100lb of seed	**Disease control**: The 1.0 fl oz rate of Dividend Extreme and the 2.5 fl oz rate of Dividend XL RTA are for control of common bunt and loose smut. The 5.0 fl oz of Dividend XL RTA and the 2.0 fl oz rate of Dividend Extreme are for control of common bunt, dwarf bunt, flag smut, seed-borne *Septoria*, loose smut, general seed rots, *Fusarium* seed scab and *Pythium* damping-off and for early season control of common root rot and *Rhizoctonia* root rot. The 10.0 fl oz rate of Dividend XL RTA and the 4.0 fl oz rate of Dividend Extreme are for control of common blunt, dwarf bunt, flag smut, seed-borne *Septoria*, loose smut, general seed rots, *Fusarium* seed scab and Pythium damping off and for early season control of common root rot, *Fusarium* root rot, Fusarium crown rot, take-all and *Rhizoctonia* root rot as well as fall season powdery mildew, leaf rust and *Septoria* leaf blotch. Green wheat forage may not be grazed until 55 days after planting. Apply Dividend Extreme as water-based slurry through standard slurry or mist-type seed treatment equipment. Dividend XL RTA is especially formulated for on-farm treatment, using standard mechanical slurry- or mist-type seed treatment equipment.
Dividend Extreme Syngenta	difenoconazole mefenoxam	7.73% 1.87%	1.0 fl oz per 100lb of seed OR 2.0 fl oz per 100lb of seed OR 4.0 fl oz per 100lb of seed	
Cruiser 5FS Syngenta	thiamethoxam	47.6%	1.0 fl oz. / 100 lb. of seed	**Insect control:** Early season protection of seedlings against injury by Aphids (including Bird cherry-oat, English grain, Greenbug, and Russian wheat aphid) Wireworms and Hessian fly. While there are no registered insecticides for white grub control in wheat, limited field tests suggest that Cruiser® seed treatments are effective.
Gaucho XT Gustafson LLC	imidacloprid metalaxyl tebuconazole	12.70% 0.82% 0.62%	3.4 fl oz per 100lb of seed	**Disease control**: Early season disease control of *Pythium* damping-off, stinking smut, flag smut, loose smut, early season *Septoria* disease complex, early season Rhizoctonia root rot, early season common root rot, early season *Fusarium* root rot, early season suppression of leaf rust as well as control of certain insects. DO NOT graze or feed livestock on treated areas for 45 days after planting. See label for rotational crop restrictions. Apply as a slurry treatment prior to planting. **Insect control:** Early season protection of seedlings against injury by Aphids (including Bird cherry-oat, English grain, Greenbug, and Russian wheat aphid) Wireworms and Hessian fly. While there are no registered insecticides for white grub control in wheat, limited field tests suggest that Gaucho® seed treatments are effective.
Grain Guard Trace Chemicals LLC	mancozeb	50.00%	2.0 oz. per bushel of seed	**Disease control**: For control of bunt of wheat, and damping-off and seedling blights. Treat only those seeds needed for immediate use, minimizing the interval between treatments and planting. DO NOT store excess treated seeds beyond planting time. Apply as a drill-box treatment mixing thoroughly so all seeds are covered.
Raxil MD Gustafson LLC	tebuconazole metalaxyl	0.48% 0.64%	5.0 to 6.5 fl oz per 100 lb of seed	**Disease control**: Aids in the control or suppression of the following seed, seedling and soilborne diseases of wheat: stinking smut, flag smut, loose smut, early season *Septoria* disease complex, general seed rots, *Pythium* damping-off, early season *Rhizoctonia* root rot, early season common root rot, seedborne *Fusarium* scab, early season *Fusarium* foot rot, early season suppression of powdery mildew and rust. Wheat green forage may be grazed or harvested for hay 31 days after seeding. Applications should be made using standard slurry or mist-type seed treatment equipment. This product is for commercial or on-farm application. This is not intended for direct application into a planter box.
Raxil MD-W Gustafson LLC	imidacloprid metalaxyl tebuconazole	1.538% 0.461% 0.615%	5.0 fl oz per 100lb of seed	Aids in the control or suppression of the following seed, seedling and soilborne diseases of wheat: stinking smut, flag smut, loose smut, early season *Septoria* disease complex, general seed rots, *Pythium* damping-off, early season *Rhizoctonia* root rot, early season common root rot, seedborne *Fusarium* scab, early season *Fusarium* foot rot, early season suppression of powdery mildew and rust. DO NOT graze or feed livestock on treated areas for 45 days after plating. See label for rotational crop restrictions. Applications should be made using standard slurry or mist-type seed treatment equipment. This product is for commercial or on-farm application. This product is not intended for direct application into a planter box. **Insect control:** Imidacloprid offers suppression of wireworm activity on seed and young seedlings. While there are no registered insecticides for white grub control in wheat, limited field tests suggest that Gaucho ® (imidacloprid) seed treatments are effective.