9/84 = 4,000

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# Combating Take-All Root Rot of Winter Wheat in Western Oregon

Take-all root rot of wheat *(Gaeumannomyces graminis* var. *tritici)* has increased in western Oregon with the increased frequency of wheat in rotations. Take-all produces a black, infected root system and lower stem; plants may be stunted and yellow, and may produce white heads with few kernels. Effective fungicide treatments are not available, and there are no varieties with resistance to this disease.

Oregon State University research has shown that *careful management can reduce damage and crop loss* from take-all.

## Factors That Increase Disease Severity

★ Planting wheat following wheat or after crops that are hosts for the take-all fungus, makes soils conducive for attack of wheat roots.

★ Early planting favors active fall infection and establishment of the fungus on the root system, and lengthens the period of time favorable for attack.

★ Any N, P, K, S, or other nutrient deficiency during fall seedling growth or before spring fertilization—N stress may be most critical.

★ Soil pH values of 5.8 and higher.

★ Liming moderately acid soils (pH 5.4 to 5.6) has increased take-all.

★ Wet soils, especially in the spring, favor fungus spread throughout the root system.

★ Uptake of $NO_3$-N (nitrate) by wheat.

★ Leaving infected crowns and roots in the seedbed at planting time.

★ Mild winters and cool springs.

## Factors That Decrease Disease Severity

★ Planting wheat following crops that *are not* hosts for take-all fungus and/or make soils suppressive for attack by the wheat take-all fungus.

★ Adequate N, P, K, and S during fall and winter growth (no nutritional stress).

★ Soil pH values of 5.4 to 5.6.

★ Late planting (when soils are cool) delays the onset of initial infection on the root system and shortens the time favorable for attack.

★ Chopping stubble followed by deep plowing, 10 to 11 inches deep, places inoculum below seedling roots and reduces inoculum size and efficiency.

★ Liming severely acid soils (pH less than 5.3) has reduced take-all. Decreased P uptake and possible manganese and aluminum toxicity in these soils makes plants more susceptible to take-all.

★ Uptake of $NH_4$-N (ammonium) by wheat plants.

★ Banding of phosphate (P) fertilizer with the seed increases root growth and vigor in wet-cool soils.

★ Banding chloride (Cl) fertilizers plus $NH_4$-N with or near the seed at planting.

★ Fall and spring application of Cl fertilizers.

★ Cold winter temperatures followed by warm spring temperatures.

## Assessing Potential for Take-All

*High risk of take-all:*

- Wheat after wheat with evidence of take-all infected roots in previous crops.
- Second and third consecutive wheat crop following a wheat-row crop or legume rotation, especially where N is deficient.
- Wheat following crops where there is a high incidence of quackgrass, brome grass, bentgrass, or other grasses that host the fungus and make the soil conducive to take-all. (Barley acts like wheat in crop rotation sequences.)

*Moderate risk of take-all:*

- Second consecutive wheat crop following a clean legume seed crop. The risk is greater following red clover, where grass was present in clover and where wheat has been produced 4 or more years in the last 8.
- Second consecutive wheat crop following ryegrass where quackgrass or other grasses conducive to take-all were not present.

*Low risk of take-all:*

- First wheat crop following oats in a wheat-oats rotation.
- First wheat crop following a row crop or grass-free legume.
- Wheat following clean summer fallow.
- Wheat following clean ryegrass or orchardgrass.
- Wheat following oilseed crops.
- Wheat following wheat where take-all decline (TAD) has been established. This usually takes 4 or more years of continuous wheat. TAD is a biological system that sup-

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presses the activity of the take-all fungus. *Many factors affect TAD. Experience on individual farms is important in predicting TAD.*

## Planting and Tillage Recommendations

*Planting time and rate:*

★ Plant between Oct. 15 and 25. *Late planting reduces the risk of crop loss for all wheat diseases in western Oregon.*

***However, late planting followed by heavy rains increases water damage during the 2- to 4-leaf growth stage. There is also a possibility of being rained out with late planting.***

★ Increase seedling rates to 120 to 125 lbs per acre where wheat follows wheat planted after Oct. 15.

*Planting sequence for different fields:*

1. First year wheat on poorly drained soils with low take-all risk. *Plant first.*
2. First year wheat on well-drained soils with low take-all risk.
3. Two or more wheat crops on soils with restricted drainage.
4. Wheat following a row crop.
5. Continuous wheat on well-drained soils where disease severity has been reduced by establishment of TAD.
6. Second, third, or fourth wheat crop on well drained soils. High risk take-all crop sequences. *Plant last.*

*Tillage programs to follow:*

★ Wheat following wheat, oats, barley, or ryegrass—flail chop stubble after harvest, disc to mix some soil with straw, plow just before planting. *Moisture from fall rains drains into the subsoil on unplowed fields and reduces the risk of late plowing and planting.*

★ Plow 9 to 10 inches deep at top speed for your plow to achieve maximum cover of infected crown roots from last year's wheat or barley crop. Infected stubble left in the seedbed increases take-all.

★ ***Planting on ridges plus surface leveling to reduce water accumulation around the crown of plants will reduce adverse effects of water. Do not make ridges on hill soils.***

## Fall Fertilizer Recommendations

★ *N fertilizer before discing straw.* Where wheat follows wheat, barley, oats, or grass seed with 3 to 5 tons of straw per acre to plow down, adding N will increase stubble decomposition and reduce fall and winter N stress.

- Apply 40 to 60 lbs $NH_4$-N per acre on the stubble immediately before discing. A fertilizer solution that wets the stubble may be preferable.

★ *Fertilizing at planting. Band fertilizer with the seed.* Seedbed soil moisture is generally adequate by Oct. 15 to minimize salt damage when banding fertilizer with the seed. With normal Willamette Valley soil moisture and temperatures for October, band fertilizer with seed as follows:

- 20 to 30 lbs ammonium ($NH_4$-N) per acre
- 40 to 50 lbs phosphate ($P_2O_5$) per acre
- 35 to 40 lbs of chloride (Cl) per acre†
- 8 to 10 + lbs of sulfur (S) per acre
- 30 to 40 lbs of potash ($K_2O$) per acre as potassium chloride *where soil tests indicate* K needed and to supply chloride.

*Specific materials to apply at planting:*

Alternative No. 1

- 60 lbs of ammonium chloride per acre
- 30 lbs of ammonium sulfate per acre
- 80 lbs of monoammonium phosphate (11-48-0, 11-52-0, or 11-55-0) per acre

Alternative No. 2

- 60 lbs of ammonium chloride per acre
- 25 lbs of ammonium sulfate per acre
- 100 lbs of conc. superphosphate per acre

Alternative No. 3

- 150 lbs ammonium phosphate-sulfate (16-20-0) per acre
- 75 lbs potassium chloride per acre

Alternative No. 4

- Mixed fertilizer like 10-20-20 or 10-20-22 to supply 20 lbs of N, 40 lbs $P_2O_5$, 40 lbs $K_2O$ as potassium chloride.

Alternatives No. 1 and No. 2 give less salt effect per pound of N and Cl applied.

- *Banding any fertilizer salt with the seed at planting time can delay emergence and reduce stands.* Low soil moisture, high fertilizer salt index, high temperatures, sandy soils, and high rates of fertilizer application will increase the risk of delayed emergence and stand reduction.
- *Do not band* urea, diammonium phosphate, or ammonium nitrate in mixtures with the seed at planting.
- Including nitrification inhibitors with fall-applied $NH_4$-N (ammonium) may be beneficial.

## Spring Fertilizer Recommendations

★ Where wheat follows wheat or barley with a heavy crop of stubble plowed down and $NH_4$-N was not applied with the stubble, apply about 30 lbs N per acre between Feb. 15 and Feb 28. Apply 90 to 120 lbs more N per acre plus 80 lb Cl in mid- to late March but before growth increases so that wheeled vehicle traffic will not permanently damage stalks of wheat.†

★ Where good tillering has developed by Feb. 15, make one spring application of 120 to 150 lbs N per acre and 80 lb Cl per acre between Mar. 1 and 15.

★ Reduce this rate of N on shallow soils that have 80- to 90-bu yield potential.

★ Apply 10 to 20 lbs S per acre with the first spring N if less than 25 lbs S was fall-applied.

★ Combinations of fertilizers, herbicides, and fungicides will reduce application costs. *Be sure to follow application rates and safety directions on the label for any herbicides or fungicides you add to the fertilizers.*

† Sources of chloride (Cl) fertilizers applied in Oregon: ammonium chloride, 66% Cl; potassium chloride, 47% Cl; sodium chloride, 60% Cl; calcium chloride, 65% Cl; magnesium chloride, 74% Cl. A chloride fertilizer is not a fungicide.

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**Note:** Where take-all is *not* expected, follow OSU *Fertilizer Guide* 9.