# FOLIAR FUNGICIDES AND WHEAT PRODUCTION IN OKLAHOMA

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**Question:** How is wheat growth described?
**Answer:** The Feekes scale. This scale, which is named after the person that developed it, describes the stages of wheat with a numerical scale. This is the most commonly used descriptor in recommendations for pesticide applications.

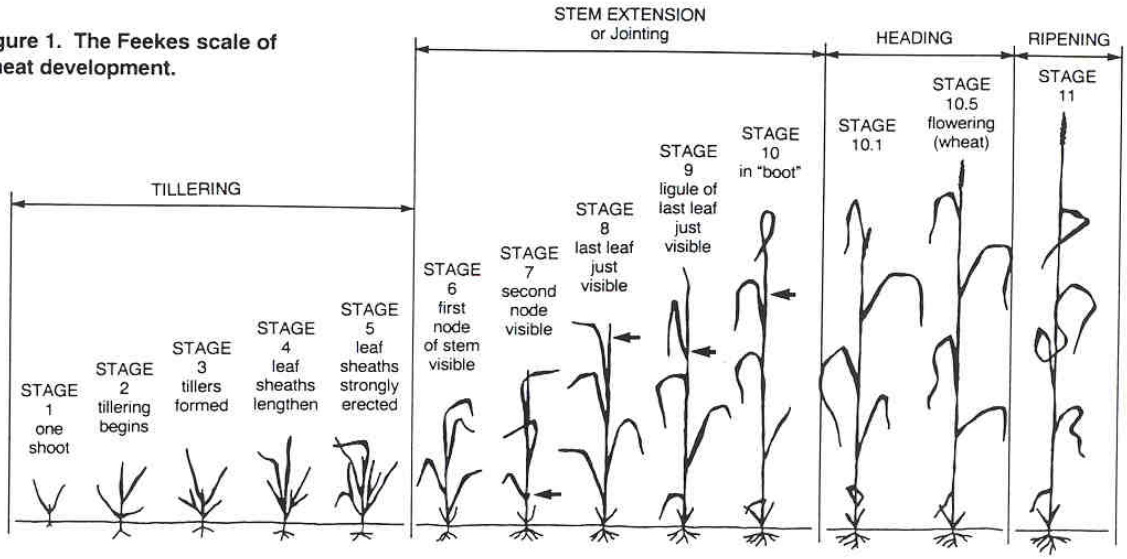


**Figure 1. The Feekes scale of wheat development.**

Large, E.C. 1954. Growth stages in cereals: Illustration of the Feekes scale. Plant Pathology 3:128-129.

**Question:** How much damage can a foliar disease such as leaf rust cause on wheat?
**Answer:** A foliar disease such as leaf rust generally causes the most damage when high severities occur at early growth stages such as heading, flowering or milk (see table below).

**Table 1. Approximate percent loss of yield caused by leaf rust at combinations of leaf rust severity and growth stage of wheat.**

| | Severity (%) of leaf rust on the flag leaf | | | | |
|---|---|---|---|---|---|
| **Growth stage** | **10** | **25** | **40** | **65** | **100** |
| Flowering | 10 | 15 | 20 | 30 | 35 |
| Milk | 2 | 5 | 8 | 14 | 20 |
| Soft dough | 1 | 3 | 4 | 7 | 10 |
| Hard dough | 1 | 1 | 1 | 3 | 5 |

**Question:** Does it pay to use a fungicide to control a foliar disease?
**Answer:** Fungicide trials conducted for 20 years in Oklahoma have indicated an average yield increase of 10% from sprayed as compared to non-sprayed plots. Such an increase justifies the expense for the fungicide especially if the yield potential of the field is high (≥40 bu/acre) and the price of wheat is at least $3.00/bu. See Table 2 for an example of disease control using fungicides in Oklahoma in 2002.

**Question:** When should I apply a fungicide?
**Answer:** All the fungicides listed in Tables 2 & 3 can be applied up to growth stage 10.5, which is when heads are completely emerged. However, applying a fungicide at 10.5 usually is later than needed in order to receive the maximum benefit from the fungicide (again, refer to Table 2). In most years, the optimum period for application is between growth stages 9 (flag leaf fully emerged) to 10 (full boot). Application at this time will provide protection during the critical times of flowering and milk (Table 1).

**Table 2. Effect of Foliar Fungicides on Grain Yield and Test Weight–2002**

| | Growth stage* | Test weight | Yield (bu/acre) | Leaf rust severity | Septoria complex severity |
|---|---|---|---|---|---|
| **HASKELL:** | | | | | |
| No treatment | ----- | 53.2 | 59 | 21.3 | 23.8 |
| Tilt 3.6 EC (4 fl oz) | 8 | 54.6 | 60 | 7.5 | 15.0 |
| Tilt 3.6 EC (4 fl oz) | 10 | 57.7 | 62 | 1.5 | 12.5 |
| Quadris 2.08 F (9.2 fl oz) | 9 | 56.1 | 65 | 0.0 | 7.5 |
| Stratego 250 EC (10 fl oz) | 8 | 54.5 | 55 | 5.0 | 17.5 |
| Stratego 250 EC | 10 | 56.3 | 66 | 0.5 | 15.0 |
| Headline 2.09 EC (6.1 fl oz) | 9 | 56.3 | 73 | 0.3 | 10.0 |
| LSD 0.05 | | NS | NS | 2.8 | 7.5 |
| **STILLWATER:** | | | | | |
| No treatment | ----- | 52.5 | 58 | 75.0 | 21.3 |
| Tilt 3.6 EC | 8 | 53.7 | 68 | 48.8 | 6.5 |
| Tilt 3.6 EC | 10 | 53.5 | 68 | 25.0 | 8.7 |
| Quadris 2.08 F | 9 | 54.4 | 75 | 5.5 | 1.8 |
| Stratego 250 EC | 8 | 53.1 | 72 | 46.3 | 7.5 |
| Stratego 250 EC | 10 | 54.3 | 70 | 22.5 | 4.0 |
| Headline 2.09 EC (6.1 fl oz) | 9 | 55.0 | 78 | 8.0 | 3.0 |
| LSD 0.05 | | NS | 8 | 7.5 | 5.0 |

*Growth stage (GS) 8=flag leaf just visible; GS 9=flag leaf emerged; GS 10.0 = boot.

**Question:** What fungicides are available for use in Oklahoma?
**Answer:** Currently there are five fungicides most commonly mentioned in relation to controlling foliar wheat diseases. These include Tilt (Syngenta), Quadris (Syngenta), Headline (BASF), Stratego (Bayer), and Quilt (Syngenta). A brief comparison of these fungicides is presented in Table 3. Please realize that costs of fungicides are estimates **REMEMBER** to consult the label for the most current and accurate information.

## Table 3. Fungicide efficacy for control foliar wheat diseases.

[**This information is provided only as a guide. It is the responsibility of the pesticide applicator by law to read and follow all current label directions. No endorsement is intended for products listed, nor is criticism meant for products not listed**].

| Product & (Company) | Fungicide type | Rate/acre (fl oz) | PHI[A] (days) | Approx cost/oz[B] | Approx cost/A[B] | Leaf rust | Stripe rust[C] | Powdery mildew | Septoria complex | Tan spot |
|---|---|---|---|---|---|---|---|---|---|---|
| **Tilt**..... (Syngenta) | triazole | 4.0 | 40 | 2.88 | 11.52 | G[D] | VG | E | VG | G |
| **Quadris**..... (Syngenta) | strobilurin | 6.2-10.8 | 45 | 2.14 | 13.27-23.96 | E | E | G | VG | VG |
| **Headline** ..... (BASF) | strobilurin | 6.0-9.0 | 14[A] (hay) | 2.03 | 12.18-18.27 | E | E | G | VG | VG |
| **Stratego** ..... (Bayer) | triazole + strobilurin | 10.0 | 35 | 1.25 | 12.50 | VG | VG | E | VG | G |
| **Quilt** ..... (Syngenta) | triazole + strobilurin | 14.0 | 45 | 0.88 | 12.32 | VG | VG | E | VG | VG |

[A]PHI = pre-harvest interval, that is the number of days required between last application & grain harvest (or in the case of Headline, hay harvest).
[B]These are estimates and may vary with time, dealer, rebate offers, etc.
[C]Efficacy ratings for stripe rust control based on information obtained from the North Central Regional Committee on Management of Small Grains Diseases
[D]=excellent; VG=very good; G=good; F=fair; P=poor.

**Question:** What is the potential benefit from using a foliar fungicide?
**Answer:** Twenty years of fungicide trials including years with little or no disease and several years with high disease pressure have documented an average yield increase of 10% from using fungicides. Such an increase justifies fungicide use if the yield potential and price of wheat is high. Hence, consider the following to assist in deciding whether to apply a fungicide to control a foliar disease:

- What is the yield potential of the wheat? This should be 40-50 bu/acre at a minimum, but can go up or down depending on the price of wheat.
- What is the price of wheat? $3.00-3.50/bu or more is desirable.
- What is the growth stage of the wheat? Foliar diseases do the most harm when infection severities are high at stages such as heading, flowering and milk.
- What disease is present? Be sure it is a foliar fungal disease.
- What is the disease reaction of the variety? Refer to the O.S.U. Variety Characteristic Chart by selecting "Variety Info" on the web site (http://www.wit.okstate.edu/). Some pathogens (e.g., the pathogen that causes wheat leaf rust) can adapt to resistance genes, and hence, a resistant variety may become susceptible when a new race appears.
- What is the weather forecast? Hot and dry conditions inhibit further disease development and hasten ripening, while cool and moist conditions promote disease and lengthen the period of time for grain development and filling.

►The above considerations can be used to help determine the potential value of a fungicide application, that is, a simple cost-benefit evaluation. For example:

**Grain production at $3.50/bu:**

| 10% | X | 50 bu/A | X | $3.50/bu | – | $16.00/A | = | $1.50/A |
|---|---|---|---|---|---|---|---|---|
| Expected increase | | Expected yield goal | | Expected selling price | | Fungicide application cost | | Expected net profit |

**Seed production (e.g. certified seed) at $8.00/bu:**

| 10% | X | 50 bu/A | X | $8.00/bu | – | $16.00/A | = | $24.00/A |
|---|---|---|---|---|---|---|---|---|
| Expected increase | | Expected yield goal | | Expected selling price | | Fungicide application cost | | Expected net profit |

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