# KANSAS COOPERATIVE PLANT DISEASE SURVEY REPORT

# PRELIMINARY 2013 KANSAS WHEAT DISEASE LOSS ESTIMATES

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https://agriculture.ks.gov/docs/default-source/pp-disease-reports-2012/kansas-cooperative-plant-disease-2013.pdf?sfvrsn=2

## HIGHLIGHTS

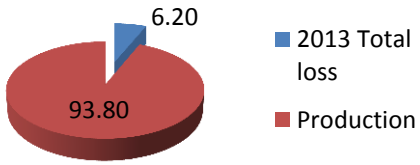



**Figure1. Comparison of disease loss % (blue) to production % (red).**

The KANSAS AGRICULTURAL STATISTICS SERVICE July forecast of 328 million bushels represented an expected harvest of 8.2 million acres of wheat with an average yield of 40 bushels per acre. The harvested acreage was 10 per cent less than 2012 and reflected loss of acreage primarily in western Kansas to drought and several spring freezes. The three western crop reporting districts had over 25 per cent fewer acres harvested than in 2012 and cumulative yields of about 50 per cent of the previous year.

The cumulative disease loss estimate for the 2013 wheat crop was 6.2 per cent or 21.7 million bushels. The potential yield of the crop without diseases was calculated at almost 350 million bushels. This 6.2 per cent loss is equivalent to 2011 when drought caused abandonment of large acreages in western Kansas and kept many of the important fungal diseases at low levels.

The most important diseases to wheat production were the root lesion nematodes followed by the *Septoria* leaf disease complex and wheat streak mosaic. This was the first year that lesion nematodes were ranked as the number one issue to growers although their damage and subsequent loss largely goes unnoticed. *Septoria* leaf disease was markedly up from recent years and associated with frequent precipitation in the southeast quarter of the state. The influence of wheat streak on yield was noted throughout much of central Kansas and occasionally into eastern Kansas.

Peaks and valleys associated with epidemics and weather influences have marked the loss estimates that began in 1976 (Figure 2). The trend is a steady decline in losses. The loss in 2013 was a below average year.

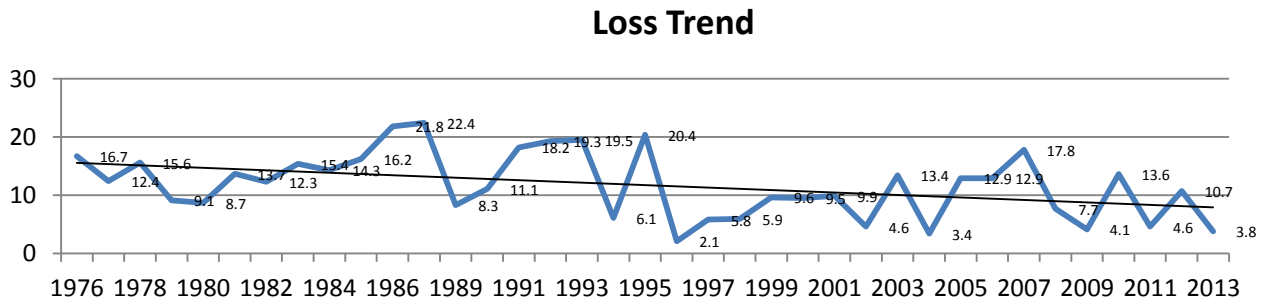
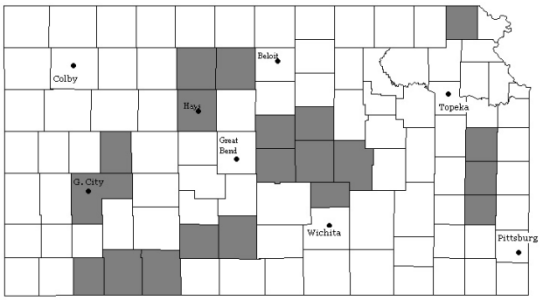



**Figure 2. Line graph of loss estimates since 1976 with linear trend line.**

***The lesion nematode (LN) loss estimates are not included in the comparison of 2010-2013 loss to the historical estimates and trend line. The LN estimate is recent although nematodes have been historically present in Kansas wheat production.**

# DISEASES

**Figure 3. Counties where fields were sampled for lesion nematodes**




Twenty nine wheat fields in 20 counties across the state were sampled for **Lesion nematode** populations. The percentage of infested fields was 83% and similar to 2012 and 2011 survey and slightly larger than historical average (base line study 2008-10 of over 2100 samples) of 77 per cent incidence. Nematode counts were up substantially this year from the previous two years at about the same stage of wheat. Some explanation of the increase in population of nematodes may be explained by the delay in maturity of the crop allowing nematodes to feed and reproduce longer on the root systems and simply randomness of sampling locations surrounded by the difficulty in accurately quantify soil pathogens. Estimated loss after accounting for crop growth was set at 2.4 per cent or 8.4 million bushels based upon Kansas population counts and loss estimates for lesion nematodes made by scientists in other wheat production areas. The estimate compares to a 2% (2008-2011) average loss.

***Septoria* leaf disease complex** was second in importance to wheat production in the state. The disease complex was common to many fields in the southeast quarter of the state where rainfall was plentiful this spring. Severities often exceeded over half of the leaf area at dough stage. A 10 per cent loss was associated with production in east central and southeast crop reporting districts and a 0.05-.06 per cent loss in south central, northeast, central, and north central districts.

The 1.7 per cent loss from the *Septoria* complex was almost double the 20 year average of 0.9 per cent. Production losses for the state were put at 5.9 million bushels.

**Wheat streak mosaic complex** (curl mite transmitted wheat streak mosaic, High Plains, and *Triticum* mosaic) ranked number 3 in importance. WSM has been of significance the last three years ranking between second and fourth in importance. This trend may be explained in part by studies indicating dry weather pattern favors the wheat curl mite. We also considered in understanding the trend observations from past surveys that growers are sometimes hesitant to manage volunteer in struggling summer row crops where the margin for profit is small and weather conditions can limit grower's ability to control volunteer before planting.

The WSM state loss estimate was 1.2% for 2013 equaling the 2012 estimate. The central crop reporting district sustained a 3.8 per cent loss highest among the districts. The 20 and 5 year state average are 1 per cent and 0.9 per cent for wheat streak mosaic complex, respectively.

**Tan Spot** like the *Septoria* complex was of increased importance as a result of frequent and sometimes heavy precipitation in the southeast quarter of the state. In 2013, the loss estimate was put at 0.5 per cent. This estimate is the highest since 2007 loss of 1.3 per cent. Leaf severities were greatest in counties such as Cowley, Marion, Sumner, Sedgwick, Harvey and also some notable observations in Allen, Chautauqua, and Montgomery.

The 20 year average for tan spot loss is 0.7 per cent and represents notable losses in the 1980's to the disease. The more recent trend with improved cultivars is 0.3 per cent (10 year avg.).

**Barley yellow dwarf** was not as prevalent in the crop as the previous two years. Almost all significant reports (20-50% incidence within fields) came out of the southeast crop reporting district where annually BYD has been an issue to production. The statewide estimate was put at 0.25 per cent and compares to 5 and 20 year averages of 1.2 and 1.1 per cent, respectively.

**Leaf rust** is historically the most important disease to Kansas production but was again down for the fifth year in a row when compared to the 20-year average of 2.3 per cent. The loss estimate of 2013 was set at an

extremely low 0.01 per cent. The 2013 loss is the lowest since 1980. The disease was absent because of drought and freeze damage in Kansas but more importantly the same conditions limited leaf rust in production areas to the south where inoculum historically blows in. Genetic resistance is also holding up in Everest (highest acreage at 14.3%) for the time being. **Stripe rust** like leaf rust was nearly absent to production in Kansas with a 0.03 per cent loss and similar to losses of 2006-2009. Stripe rust has an average loss over 20 years of 2.1 per cent. Two other diseases that did make it on the locator for losses were ***Fusarium* head scab** and ***Xanthomonas* bacterial leaf blight**. Low levels of scab were reported in northeast Kansas and bacterial leaf blight a problem in central Kansas. Overall loss was estimated from scab of 0.05 per cent and bacterial leaf blight of 0.03 per cent. Other diseases noted were **powdery mildew** and **common bunt** (in harvest samples) but losses were insignificant to statewide production.

In summary of disease impact on wheat production we present the top 5 statewide diseases within each crop reporting district (Figure 4) and a table of the last ten years of estimated losses (Figure 5).

The southeast crop reporting district (CRD) experienced the greatest crop loss with more than 15 per cent primarily from *Septoria* and losses from lesion nematodes, barley yellow dwarf and tan spot. The east central district was second with *Septoria* again the major problem but much less barley yellow dwarf. For the central third of the state, the central crop district loss was highest because of greater pressure from wheat streak mosaic. The western districts had little disease pressure except for notable lesion nematode populations.

The yield loss table of the last 10 years (Fig. 5) demonstrates the variability that weather, cultivars, and cropping practices have on disease incidence and subsequent losses.

**Figure 4. Yield losses by crop reporting districts with the five most important diseases in 2013**

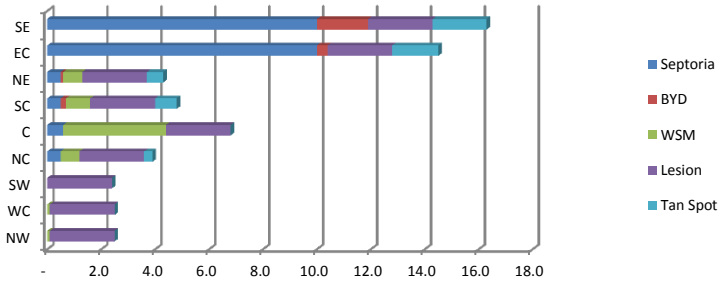



**Figure 5. Yield loss estimates of the last ten years and five, ten, and twenty year averages**

| | | | | | | | | | | 5-YR | 10-YR | 20-YR | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | AVE | AVE | AVE | DISEASE |
| 14 | 2 | 0.1 | 13.9 | 4.72 | 1.37 | 1 | 0.01 | 1 | 0.01 | 0.68 | 2.55 | 2.34 | LEAF RUST |
| 0.01 | 8 | 0.001 | 0.15 | 0.01 | 0.01 | 10.3 | 0.05 | 5.7 | 0.03 | 3.22 | 2.43 | 2.11 | STRIPE RUST |
| | | | | | | 2.0 | 1.6 | 2.3 | 2.4 | 2.08 | -- | -- | LESION NEMATODES* |
| 0.2 | 0.01 | 0.8 | 0.19 | 0.01 | 0.44 | 0.3 | 2.74 | 2.3 | 0.25 | 1.21 | 0.72 | 1.09 | BARLEY YELLOW DWARF |
| 0.05 | 0.1 | 0.001 | 1.8 | 0.5 | 1 | 1.1 | 0.01 | 0.01 | 1.7 | 0.76 | 0.63 | 0.87 | SEPTORIA COMPLEX |
| 0.4 | 2 | 7 | 0.01 | 0.02 | 0.001 | 0.2 | 1.7 | 1.2 | 1.2 | 0.86 | 1.37 | 1.01 | WHEAT STREAK MOSAIC COMPLEX |
| 0.3 | 0.6 | 0.2 | 1.3 | 0.45 | 0.26 | 0.2 | 0.01 | 0.01 | 0.5 | 0.20 | 0.38 | 0.72 | TAN SPOT |
| 0.01 | 0.001 | 0.001 | 0.16 | 1.9 | 0.9 | 0.3 | 0.01 | 0.001 | 0.05 | 0.25 | 0.33 | 0.24 | SCAB |
| 0.001 | 0.05 | 0.05 | 0.01 | 0.001 | 0.001 | 0.1 | 0.01 | 0.01 | 0.01 | 0.03 | 0.02 | 0.12 | SOILBORNE & SPINDLE STREAK |
| 0.8 | 0.1 | 0.1 | 0.21 | 0.03 | 0.02 | 0.1 | 0.01 | 0.001 | 0.01 | 0.03 | 0.14 | 0.09 | POWDERY MILDEW |
| 0.2 | 0.001 | 0.05 | 0.001 | 0.001 | 0.01 | 0.001 | 0 | 0 | 0 | 0.00 | 0.03 | 0.03 | TAKE-ALL |
| 0.01 | 0.01 | 0.1 | 0.01 | 0.001 | 0.001 | 0.01 | 0.01 | 0.1 | 0.01 | 0.03 | 0.03 | 0.04 | ROOT & CROWN ROT |
| 0 | 0 | 0.001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.02 | STRAWBREAKER |
| 0.02 | 0.01 | 0.05 | 0.02 | 0.01 | 0.04 | 0.03 | 0.01 | 0.05 | 0.01 | 0.03 | 0.03 | 0.02 | BUNT & LOOSE SMUT |
| 0.001 | 0 | 0 | 0 | 0.001 | 0.001 | 0.001 | 0.01 | 0.01 | 0 | 0.00 | 0.00 | 0.01 | STEM RUST |
| 0.001 | 0.001 | 0.001 | 0.001 | 0.03 | 0.04 | 0 | 0.01 | 0.03 | 0.03 | 0.02 | 0.01 | 0.01 | BACTERIAL LEAF COMPLEX |
| 0 | 0 | 0 | 0.01 | 0.001 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | SNOW MOLD* |
| 0 | 0 | 0.001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | AMERICAN WHEAT STRIATE* |
| 0 | 0.001 | 0 | 0 | 0 | 0.001 | 0.001 | 0.001 | 0 | 0 | 0.00 | 0.00 | 0.00 | CEPHALOSPORIUM STRIPE |
| **3.4** | **12.9** | **8.5** | **17.8** | **7.7** | **4.1** | **15.6** | **6.2** | **12.7** | **6.2** | **9.39** | **8.68** | **8.70** | **TOTAL** |

*Insufficient data to make 20 year estimates

- Estimates prepared by Kansas State University, Kansas Department of Agriculture and USDA-ARS personnel. Estimates are based on expert opinions, but are not statistically designed.
- Estimates utilize a disease survey, variety resistance, variety acreages, crop district yield estimates, and loss functions or estimates for each disease. NASS/Kansas Agricultural Statistics provided information for variety acreages and crop district yield estimates.
- Special thanks to the staff at the Great Plains Diagnostic Laboratory, Kansas State University and the Plant Protection & Weed Control Program, Kansas Department of Agriculture for their help in survey and diagnosis of wheat diseases. Without their contribution, this paper would not be possible.