

KANSAS COOPERATIVE PLANT DISEASE SURVEY REPORT

PRELIMINARY 2017 KANSAS WHEAT DISEASE LOSS ESTIMATES

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HIGHLIGHTS

The NATIONAL AGRICULTURAL STATISTICS SERVICE July forecast of 324.3 million bushels represented an expected harvest of 6.9 million acres of wheat with an average of 47.0 bushels per acre yield. This is a decrease of 10 bushels per acre compared to 2016's harvest, and overall 31% decrease in harvested bushels statewide. In addition, acres harvested were down 16%.

The cumulative disease loss estimate for the 2017 wheat crop was 17.6% or 69.3 million bushels. The potential yield of the crop without diseases was calculated at 393.6 million bushels, or 57.0 bushels per acre.

In 2017, Kansas wheat producers' yields and test weights were decreased as a result of disease pressure. The most important diseases statewide in 2017 were stripe rust (8.6% loss), wheat streak mosaic complex (5.6% loss), barley yellow dwarf virus (0.9% loss), tan spot (0.9% loss), and leaf rust (0.8% loss). All crop reporting districts suffered significant losses but severity of loss due to any specific disease varied between districts due to the variety in crop environment from East to West.

Peaks and valleys which are correlated with weather patterns and disease epidemics mark loss estimates and are based on data collected yearly since 1976 (Figure 1). 2017 was a slightly above average year for wheat disease.

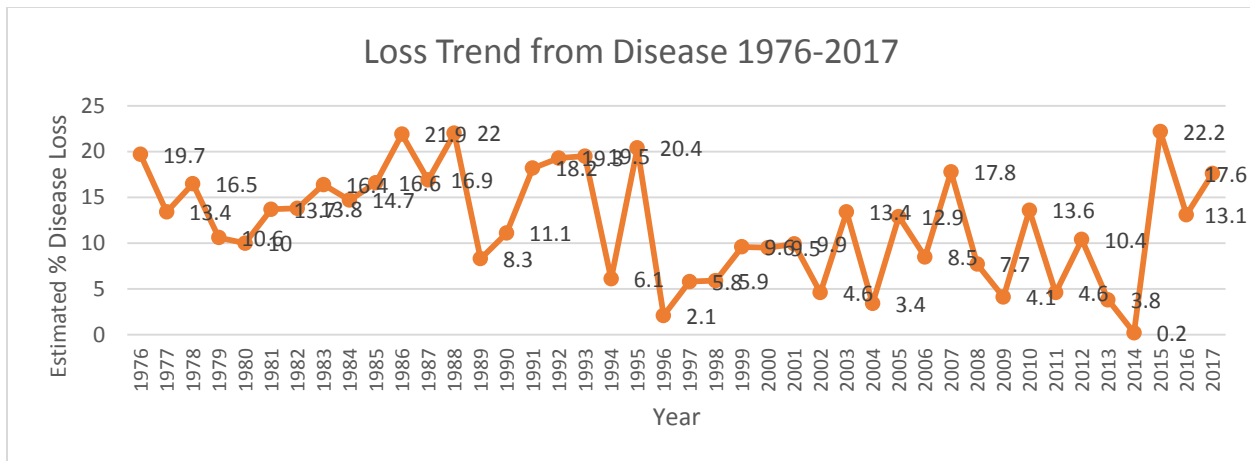


Figure 1. Trend graph of estimated wheat yield loss due to disease from 1976 to 2017, excluding yield loss due to root lesion nematodes. Lesion nematode estimation data were only collected from 2010 to 2015 and in 2017 so it was left out for presentation purposes.

DISEASES

The most important disease in wheat in 2017 was **stripe rust**, following a trend of recent years. Percent yield loss this year was 8.6%, which is lower than both 2016 (9.1%) and 2015 (15.4%) but still well above the 5-, 10-, and 20-year averages (6.63%, 4.92%, and 3.77%, respectively). This continued slight decrease in yield loss due to stripe rust may be a continuation of the foliar fungicide practices that occurred last year, which growers used considerably in response to the very high yield loss suffered in 2015. This may have managed to keep the fungus at bay and minimize losses for a second year in a row.

Stripe rust was favored by cool temperatures and moderately frequent rainfall throughout the spring and summer in 2017. Many of the most commonly-planted wheat varieties in Kansas are susceptible to stripe rust. Stripe rust caused a loss of 30.6 million bushels of wheat statewide.

Stripe rust caused yield loss in all nine crop reporting districts in 2017. In susceptible varieties, the minimum estimated yield loss was 3%, in Northeast and East Central districts and the maximum was 21%, in Northwest district (Figure 2). As expected, the Western districts suffered from increased yield loss compared to the Eastern districts. In spite of the wetter conditions in the East compared to the West, nighttime temperatures in the West are cooler due to higher elevation, leading to a temperature more conducive to stripe rust growth and spread.

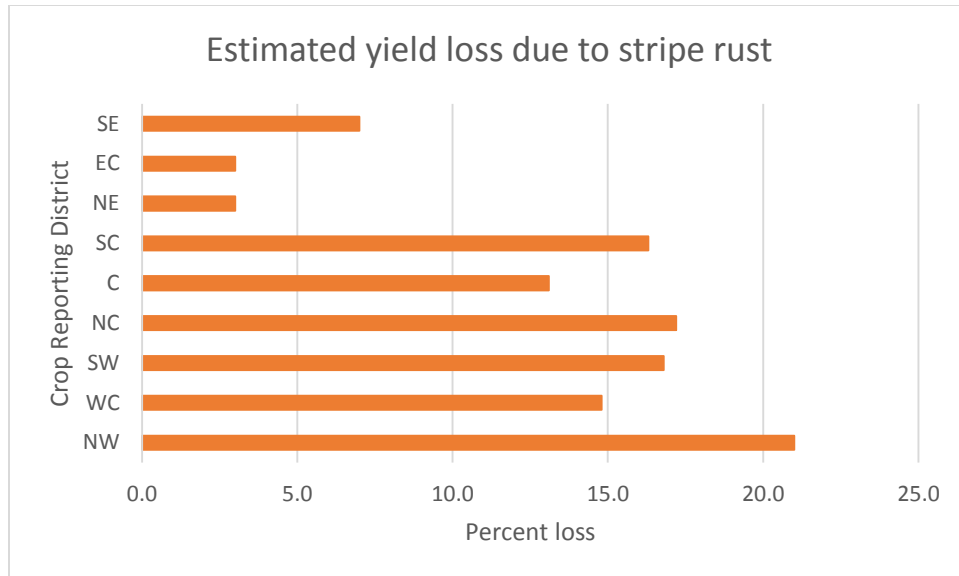


Figure 2. Estimated yield loss due to stripe rust in susceptible varieties ranged from 3% to 21% in crop reporting districts but was most severe in Central and Western districts.

Wheat streak mosaic virus complex (WSM) was the second most important disease of 2017, at 5.6% estimated loss statewide, or 19.3 million bushels. This is the highest yield loss due to this disease since 2006, when there was an estimated 7% loss, and much higher than the 5-, 10-, and 20-year averages (1.92%, 1.27%, and 1.33%, respectively).

Wheat streak mosaic virus complex is comprised of wheat streak mosaic virus, transmitted by wheat curl mites, high plains virus, and *Triticum* mosaic virus. Heavy germination of volunteer wheat in late summer and early fall 2016 created a “green bridge” upon which the wheat curl mite was able to survive between 2016 harvest and 2017 planting. It was then able to wreak havoc on the planted winter wheat crop. The fall of 2016 was also uncharacteristically warm, with freezes arriving late, allowing fall development of the disease in newly emerging seedlings. Up to 100% potential loss was observed by Kansas State University in some very severely affected fields.

WSM caused yield loss in all 9 crop reporting districts, ranging from 0.1% in each of the Eastern districts to 21.3% in West Central district (Figure 3). Losses were much lower in the Eastern districts than in the West due to much less of a conducive environment for growth and spread of WSM.

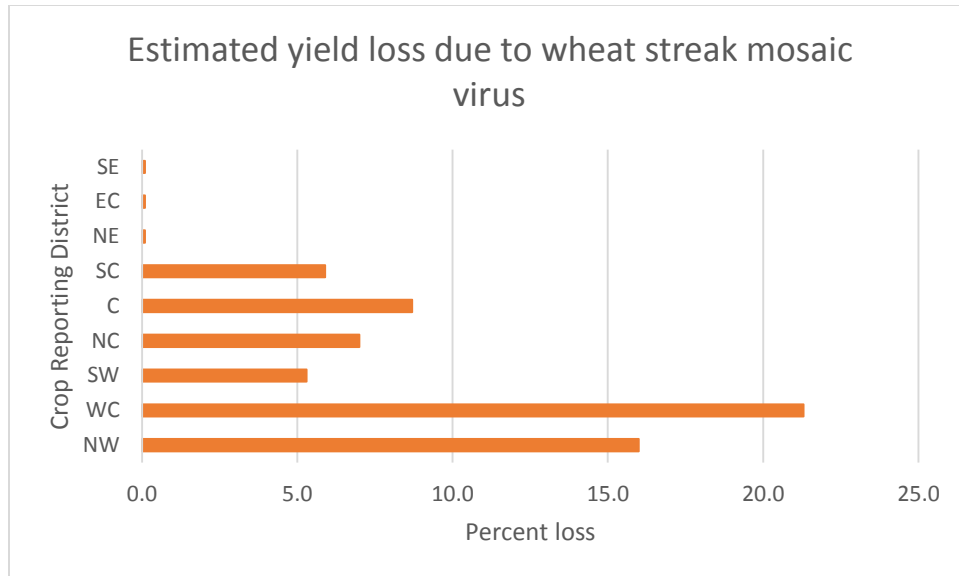


Figure 3. Estimated yield loss due to wheat streak mosaic virus in susceptible varieties ranged from 0.1% to 21.3% in crop reporting districts but was most severe in Western districts.

Barley yellow dwarf virus (BYDV) was an additional important disease in 2017, with 0.9% estimated loss, or about 3 million bushels. This was an average year of loss for BYDV. It was most prevalent in Eastern Kansas, with pockets of more severe disease scattered in Central and Western Kansas.

Tan spot also had a 0.9% estimated loss, or about 3 million bushels. This yield loss was above the 20-year average for tan spot. Tan spot was most prevalent in Central Kansas, while it barely affected the Western districts.

Leaf rust was another disease of interest in 2017, with a 0.8% estimated loss, or 2.7 million bushels. Although severe leaf rust occurred in some areas, the disease appeared late in the development of the crop. This late development of leaf rust likely reduced the damage caused this year. The 2017 loss to leaf rust was lower than the estimated loss in 2016, which was 1.3%. It was a below-average estimated loss for the ninth year in a row, in comparison to the slightly higher 10- and 20-year averages (1.07% and 1.98% losses, respectively). The five-year average was 0.52%. Leaf rust was of most concern in Western and Central Kansas, while causing only slight losses in the East. Losses in South-Central Kansas were estimated highest at 2.5% loss, while all Eastern districts showed only a 0.1% loss each. This may be due to a continued high percentage of the wheat variety ‘Everest, which is highly resistant to leaf rust, being planted in the Eastern third of the state, as much as 58.6% of the acreage of Eastern crop reporting districts.

Other diseases of interest in 2017 were **Septoria complex** (0.4% estimated loss), **Fusarium head scab** (0.3% estimated loss), and **powdery mildew** (0.05% estimated loss). In addition, **flag smut** was detected in 5 counties during the annual survey. Three of these counties, Cheyenne, Rawlins, and Thomas counties, were new counties confirmed this year. It was also found in Scott county and Ellis county, both confirmed positive in 2015. Flag smut reappeared in Kansas in 2015 after

a 70-year absence and has now been confirmed positive in 26 counties in Kansas over the past 3 years. A **Karnal bunt** survey was also conducted post-harvest in 2017. Karnal bunt was not detected in Kansas. This survey has been conducted yearly since 1993 with no positive finds.

Root lesion nematode data collection resumed in 2017 after a one-year absence in 2016. Thirty-seven fields were sampled across 22 counties in Central and Western Kansas for nematode populations (Figure 4). Estimated yield loss due to root lesion nematode was 0.6% or 1.95 million bushels, which is by far the lowest estimated yield loss since root lesion nematode data collection commenced in 2010. The lower populations are likely due simply to the randomness of sampling, but could also have been caused by late emergence of the crop following dry planting conditions in 2016. The estimate compares to a 7-year average of 1.8% loss.

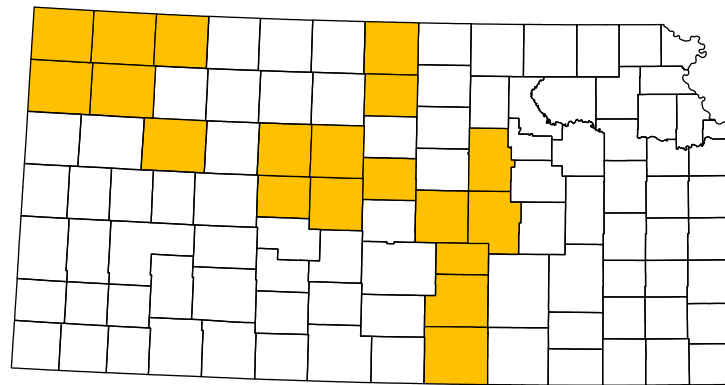


Figure 4. The 22 counties targeted in the 2017 wheat root lesion nematode survey.

The yield loss table from the past 20 years shows how each year is unique (Figure 5). Factors such as weather, crop rotation, variety selection, and cultural practices can all have a significant impact on which diseases may thrive and which may be suppressed in any given year. Stripe rust continues to be the most important wheat disease in Kansas, having surpassed leaf rust in recent years due to introduction of a new race of the pathogen capable of tolerating the hotter temperatures of the Great Plains. However, this year saw a tremendous increase in wheat streak mosaic complex, likely due to above normal populations of volunteer wheat.

										5-YR	10-YR	20-YR	
2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	AVE	AVE	AVE	DISEASE
0.01	0.01	10.3	0.05	5.7	0.03	0	15.4	9.1	8.6	6.63	4.92	3.77	STRIPE RUST
4.72	1.37	1	0.01	1	0.01	0.001	0.5	1.3	0.8	0.52	1.07	1.98	LEAF RUST
0.02	0.001	0.2	1.7	1.2	1.2	0.05	2.7	0.05	5.6	1.92	1.27	1.33	WHEAT STREAK MOSAIC COMPLEX
0.01	0.44	0.3	2.74	2.3	0.25	0.001	0.001	1.3	0.9	0.49	0.82	0.92	BARLEY YELLOW DWARF
0.45	0.26	0.2	0.01	0.01	0.5	0.1	0.01	0.9	0.9	0.48	0.33	0.63	TAN SPOT
0.5	1	1.1	0.01	0.01	1.7	0	0.1	0.3	0.4	0.50	0.51	0.43	SEPTORIA COMPLEX
1.9	0.9	0.3	0.01	0.001	0.05	0.02	3.4	0.1	0.3	0.77	0.70	0.37	SCAB
0.001	0.001	0.1	0.01	0.01	0.01	0.001	0.01	0	0	0.00	0.01	0.04	SOILBORNE & SPINDLE STREAK
0.03	0.02	0.1	0.01	0.001	0.01	0.001	0.001	0.05	0.05	0.02	0.03	0.08	POWDERY MILDEW

0.001	0.001	0.01	0.01	0.1	0.01	0.01	0.001	0	0	0.00	0.01	0.02	ROOT & CROWN ROT
0.01	0.04	0.03	0.01	0.05	0.01	0.001	0.001	0.01	0.01	0.01	0.02	0.02	BUNT, LOOSE SMUT, FLAG SMUT
0.001	0.01	0.001	0	0	0	0.001	0	0	0	0.00	0.00	0.01	TAKE-ALL
0	0	0	0	0	0	0	0	0	0.01	0.00	0.00	0.02	STRAWBREAKER
0.03	0.04	0	0.01	0.03	0.03	0.01	0.03	0	0	0.01	0.02	0.01	BACTERIAL LEAF COMPLEX
0.001	0.001	0.001	0.01	0.01	0	0.001	0.001	0	0	0.00	0.00	0.00	STEM RUST
0.001	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	SNOW MOLD*
0	0.001	0.001	0.001	0	0	0.001	0	0	0	0.00	0.00	0.00	CEPHALOSPORIUM STRIPE
0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	AMERICAN WHEAT STRIATE*
		2.0	1.6	2.3	2.4	1.0	2.6	-	0.6	1.65	--	--	LESION NEMATODES*
7.7	4.1	13.6	4.6	10.4	3.8	0.2	22.2	13.1	17.6	11.4	9.7	9.6	TOTAL

Figure 5. Yield loss estimates from Kansas production 2008-2017 with 5-, 10-, and 20-year averages.

- Estimates were prepared by Kansas State University, Kansas Department of Agriculture, and USDA-ARS personnel. Estimates are based on expert opinions, not statistically designed.
- Estimates use a disease survey, variety resistance, variety acreages, crop district yield estimates, and loss functions 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 aid in surveying and disease diagnosis. Without their contributions, this paper would not be possible.
- *Lesion nematode estimates were begun in 2008-2010. The 2010 estimate is an average based upon 3 years of sampling. In total, over 2100 fields at a rate of 1 location/sample (2-3 acres) per 4800 acres of planted production acreages per county (NASS) were taken over the three-year period. After 2010, a preservation survey based upon a small number of samples (25-30/state annually) has been used for loss estimates to extend the 2008-2010 foundation survey. No data were collected in 2016.