KANSAS COOPERATIVE PLANT DISEASE SURVEY REPORT

PRELIMINARY 2012 KANSAS WHEAT DISEASE LOSS ESTIMATES

AUGUST 20, 2012

Jon A. Appel, Erick DeWolf, William W. Bockus, and Timothy Todd

Plant Pathologist, Plant Protection Program, Kansas Department of Agriculture, Topeka, 66619; Extension Specialist, Plant Pathology, Kansas State University, Manhattan 66506; Professor, Plant Pathology, Kansas State University, 66506; Instructor/nematologist, Plant Pathology, Kansas State University 66506.

This article was posted to the following website:
http://www.ksda.gov/includes/document_center/plant_protection/Plant_Disease_Reports/2012KSWheatDiseaseLossEstimates.pdf

HIGHLIGHTS

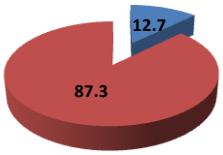

Figure1. Comparison of disease loss % (blue) to production % (red).

The KANSAS AGRICULTURAL STATISTICS SERVICE July forecast of 396,000 million bushels represented an expected harvest of 9 million acres of wheat with an average yield of 44 bushels per acre. Harvested acres were the largest since 2006. This increase was mostly associated with the southwestern and west central crop reporting districts (CRD) where nearly 700,000 additional acres were harvested relative to 2011. The crop matured two to three weeks earlier than normal across much of the state allowing a record early harvest. This early harvest saved much of the already stressed crop from maturing during higher temperatures and dry conditions that would have further reduced productivity.

The cumulative disease loss estimate for the 2012 wheat crop was 12.7 per cent or 57.6 million bushels. The potential yield of the crop without diseases was calculated at 453 million bushels.

Stripe rust was the dominant disease of 2012 with a loss estimate of 5.7%. Barley yellow dwarf virus and root infesting nematodes again as in 2011 finished in the top three of importance. The loss was calculated at 2.3% each. All other diseases accounted for cumulative 2.4% loss. Wheat streak mosaic and leaf rust accounted for nearly all of the entire remaining estimate

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 2012 was an above average year.

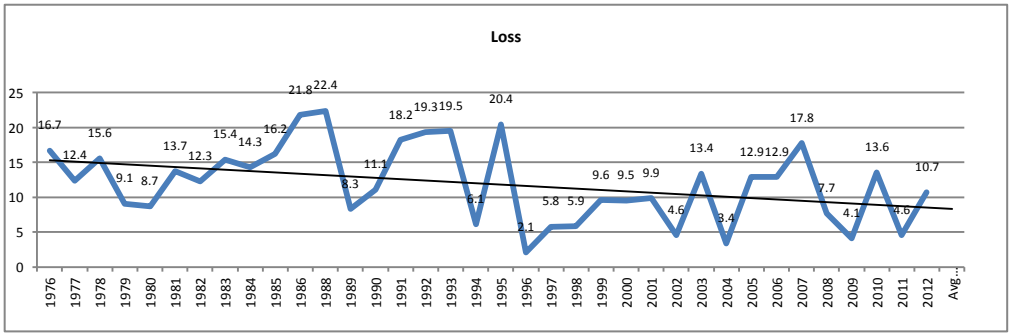

Figure 2. Line graph of loss estimates since 1976 with linear trend line.

***The lesion nematode (LN) loss estimates are not included in the comparison of 2010-2012 loss to the historical estimates and trend line. The LN estimate is recent although nematodes have been historically present in Kansas wheat production.**

DISEASES

A major **Stripe rust** epidemic was averted in 2012 because of widespread applications of fungicides and higher than optimum temperatures for infection during grain fill. Stripe rust is a cool-season rust. This wheat rust is most active at temperatures from 50-60 degrees F. Infections tend to slow and die out when temperatures exceed 72-75 degree F. In late winter and early spring, the disease was reported as active with new pustules in several areas of the state. Many feared a widespread epidemic since over half of the acreage of the state had susceptible varieties. Providentially, temperatures rose into the mid 80 degree to low 90 F temperature range in late March and early April and infection slowed to a crawl in much of the area where rust was active. Growers did apply fungicides near heading over large acreages (many areas exceeded 50% of acreage treated) because of uncertainty about future weather conditions. In the end, unseasonably warm temperatures returned in May during grain fill further limiting stripe rust infection.

Fungicide efficacy trials, variety resistance studies, and grower reports consistently demonstrated a reduction in yield from the stripe rust. The best estimate of yield loss when considering fungicide applications and varietal resistance was 5.7%. South central and central districts losses exceeded 10% of the yield (Figure 3).

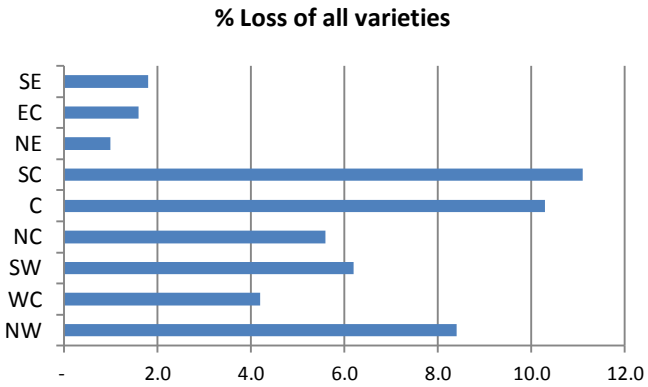

Figure 3. Stripe rust loss estimates for crop reporting districts

The loss estimate of 5.7% compares to a 3.2 % loss estimate over the past five years and a 0.05% loss in 2011 and 10.3% loss in 2010. The loss was 25.9 million bushels of wheat statewide.

Barley yellow dwarf virus was a large component to yield losses for the second year in a row. In 2011, the loss estimate was 2.7 % and in 2012, the estimate was 2.3%. BYD in 2011 had losses exceeding 5% in the south central, southeast, and central districts and very little disease in western Kansas. In 2012, the aphid transmitted virus exceeded 1% in all districts and over 3% in northwest and north central Kansas. Incidences were generally lower than 2011 but the virus affected a much greater area likely because of aphid migrations. Observations from two independent surveys of production and experimental plots found 9-10% average incidences of symptoms in fields for 2012. A few scattered fields across the state had incidences above 50%.

Historically, the BYD loss estimate averages about 1%. In 2012, the loss more than doubled this historical average and resulted in about a 10.4 million bushel loss in production.

Sampling of root and soil samples from wheat fields in 14 counties of central and western Kansas found 86% with detectable **Lesion nematode** populations. The percentage of infested fields was similar to 2011 survey and slightly larger than historical average of 77% infestation. Estimated loss was set at 2.3% from population counts, field incidence, and loss estimates in other production areas worldwide. The estimate compares to a 2% (2008-2011) average loss. Like barley yellow dwarf, production losses were 10.4 million bushels of wheat.

Wheat streak mosaic complex was a setback to production in some of the counties in central and northeast Kansas. Observations of WSM in Rice, Russell, Dickinson, McPherson counties found the disease common to many fields and caused the abandonment of considerable acreage. Incidences greater than 80% were assessed in many fields. WSM was linked in part to volunteer wheat situations associated with double cropping of sunflower into wheat production fields of 2011. The volunteer wheat provided that bridge for the disease from the previous crop to the new crop. WSM also had gained a foothold in northeast Kansas fields with reports of high incidence in some Marshall, Nemaha, and Brown fields during early April and spilling over into neighboring Washington county in NC Kansas. In other regions of the state, WSM was observed through the spring growing season at the 1-3% level within fields when present.

The WSM state loss estimate was 1.2% for 2012 or 5.4 million bushels. Central crop reporting district lost almost 4 million bushels of the 5.4 million statewide estimate or 5.6% of the region's production. The 20-year state average is 1% for wheat streak mosaic complex.

Leaf rust is historically the most important disease to Kansas production but was again down for the fourth year in a row when compared to the 20-year average. The loss estimate of 2012 was set at 1% and compares to the historical average of 2.9%. Leaf rust did not get started in Kansas early in the season and a lot of fungicide spraying followed by dry weather kept the disease in check. South central Kansas had some production affected by the disease. Western Kansas also had rust late in the season at moderate amounts and losses were more common to northern fields of that large production area.

Three diseases of minor importance to production were common bunt or "stinking smut", bacterial leaf streak (*Xanthomonas translucens*), and dryland foot rot. Common bunt reports were numerous during harvest and many grain elevators rejected loads due to the disease or sorted and docked loads of wheat coming into the elevator. The loss estimate for common bunt was adjusted to .05% from the historical average of 0.01% because of the load rejections and dockings magnifying the severity. Bacterial leaf disease had scattered reports in central districts as late rainfalls favored this disease. Bacterial exudates or shiny films on the leaves, water-soaked lesions, and lab tests for bacterial streaming were used to identify the disease from other foliar pathogens. Dryland foot rot (*Fusarium*) was noted in a few central and western Kansas fields. Plants died out as crowns browned up and formed patches of 5-30 acres of affected plants.

Scab, *Septoria* foliar diseases, tan spot, soil-borne and spindle streak viruses, take all, powdery mildew were negligible in causing yield losses this year. The unseasonably warm dry weather of much of April and May played an important part in keeping many of these diseases in check.

In summary of disease impact on wheat production, we examined geographical concerns (Figure 4). The central crop reporting district (CRD) had more than 20% loss from a combination primarily of stripe rust and wheat streak mosaic. The south central district loss of 16.3% was mostly attributable to stripe rust. Northwest CRD loss of 15% reflected stripe rust losses and barley yellow dwarf. Loss estimates for lesion nematodes and leaf rust were more consistent across all CRD's than other diseases.

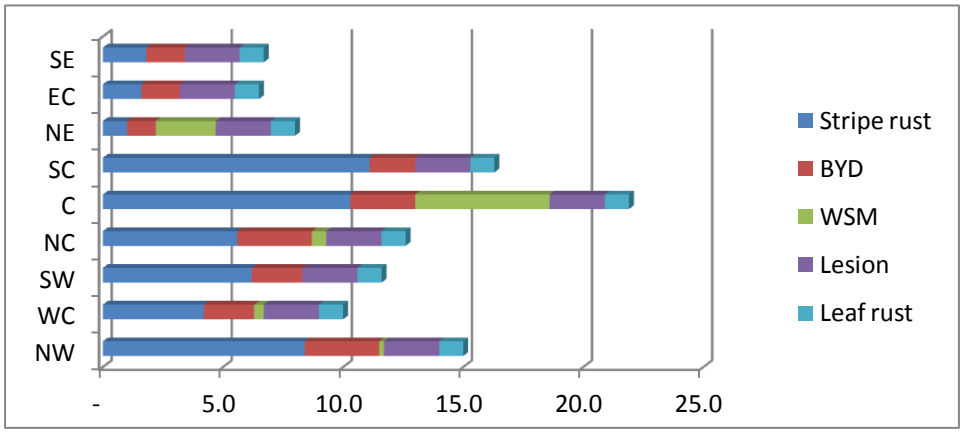

Figure 4. Wheat production losses by crop reporting district.

- 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.