Have you ever wondered how the level of winterkilling affects wheat yields?

A two-year, wheat winterkill simulation study was established at the Southwest Research-Extension Center near Garden City to address this question. The site was a Ulysses silt loam soil and in a wheat-fallow rotation. To develop a range of winterkill levels, four treatments were used: 0 (check); 25%; 50%; and 75% winterkill. In the first year wheat plants were hoed out to the appropriate levels in February. The second year, a beardless spring wheat variety was mixed at planting with the winter wheat varieties at the desired winterkill treatment levels. The spring wheat died during the winter which resulted in the appropriate levels of winterkill damage. Two winter wheat varieties, TAM 107 and Trego, were used.

The average yield for the check treatment (0% winterkill) in the first year was about 59 bushels per acre. The yield for the 25% winterkill treatment was 55.3 bushels per acre or about a 6.5% yield loss. With the 50% winterkill treatment the yield was 50.7 bushels per acre or about a 14% yield loss and for the 75% winterkill treatment the yield was 46.8 bushels per acre or about a 21% yield loss.

Average yields in the second year of the study were lower because growing conditions during grain-filling were not as good. The check or 0% winterkill treatment yielded 46 bushels per acre. The 25% winterkill treatment yielded 39 bushels per acre or about a 15% yield loss. The average yield for the 50% winterkill treatment was 32.5 bushels per acre (29.5% yield loss) and the average yield for the 75% winterkill treatment was 18.5 bushels per acre or a 59% yield loss.

In both years the most severe winterkill treatment resulted in a delay in the heading date. This is a common occurrence and probably would be more pronounced in a field situation were there was winterkill in the pure stand of winter wheat instead of just killing the spring wheat of the spring-winter wheat mixture that was used in this experiment. Also, it is common to observe a reduction in test weights with the delayed heading dates. The first year there was only a small reduction in test weights, while in the second year, with less conducive growing conditions, there was a 3.5 pound per bushel reduction in test weight from the 0% winterkill treatment to the 75% winterkill treatment.

What's the bottom line?

Contrary to what some people think, a percentage winterkill loss does not result in the same percentage yield loss. Also, growing conditions during the early spring when tillering is occuring and during the grain-filling period when kernel numbers and kernel size is being determined affects the extent at which the winterkill damage expresses itself. Thus, 25% winterkill damage in one year may not be as damaging as the same percent winterkill in another year.

This is an excellent study that gives us a range of expected yield losses over a range of winterkill damage, but a limitation of this study is the fact that winterkill damage was distributed uniformly over the study area and that doesn't normally occur in a field-wide situation. Generally, winterkill damage occurs on terraces and elevated areas of the field where soils tend to be drier and it can be large areas of the field with little chance for the surviving plants to compensate.

For more details about this research see:
Field Day 2002 Southwest Research-Extension Center. Report of Progress 895. P. 65. K-State Research and Extension.
Field Day 2003 Southwest Research-Extension Center. Report of Progress 910. P. 37-38. K-State Research and Extension.

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