

Effect of Planting Date on Wheat Yield

By Bill Wiebold

With corn and soybean harvest slowed by uncooperative weather, wheat planting is also delayed. Missouri farmers will need to decide soon (if they have not already) whether or not to plant wheat this fall. An important piece of information needed to make that decision is the effect of planting date on wheat yield. Wheat yield greatly affects profitability, and low prices for soft red winter wheat had already put downward pressure on wheat planting intentions in Missouri.

Predicting the response of wheat yield to planting date is complicated because seedling emergence and grain filling occur in two different years separated by a winter dormant period. For corn and soybean, we can accurately predict that delayed planting will move grain filling of these two crops later into the season. Decreased sun energy and more adverse weather conditions during grain filling will often reduce corn and soybean yields. Delaying wheat planting may have little effect on the timing of grain fill. Instead, the effect of planting date on wheat yield is much less direct and highly dependent on weather conditions between planting and establishment of dormancy.

Wheat is a cool season grass with a minimum temperature for growth of 40°F or slightly cooler. But, wheat grows very slowly near this minimum temperature. To maximize yield, we depend on wheat plants to accomplish three things during the autumn growth period. First, it must develop a root system that will resist heaving. Heaving occurs when water freezes and thaws underneath the wheat crown. The expanding ice raises the plant upward and can completely jack the plant out of the soil. If this happens, the plants desiccate and die. Second, sugars are stored in the wheat crown. These sugars are needed to feed early growth in spring, but also help protect the growing point from freezing during the winter. With low concentrations of sugars and other solutes, wheat plants are vulnerable to winter kill. Third, wheat plants produce tillers (branches) in the fall. These tillers will produce grain heads the next spring. Wheat yield is severely decreased by inadequate tillering. Wheat plants can tiller in the spring, but it is unlikely that spring tillering can produce enough tillers to maintain yield potential.

These processes require active plant growth that is diminished if temperatures are too low or the time between emergence and dormancy is short. Since growth rate is so tightly linked to temperature, temperature after planting will greatly affect winter survival and the

number of tillers. In turn, winter survival and the number of tillers will affect yield the next year.

Few data exist that can be used to predict wheat yield responses to planting date. I found data collected in Ohio and Kentucky, and those data will be the focus the following discussion. The best place to begin a discussion on wheat planting date is with the fly free date. Table 1 presents the fly free dates for Missouri. The female Hessian fly lays eggs on wheat seedlings. The maggots that hatch from those eggs feed by rasping leaf surfaces and drinking plant juices. The adult flies die in early fall. The timing of fly death is affected by cooling weather, thus, the fly free date in Missouri ranges from September 28 along the Iowa border to October 17 in the bootheel.

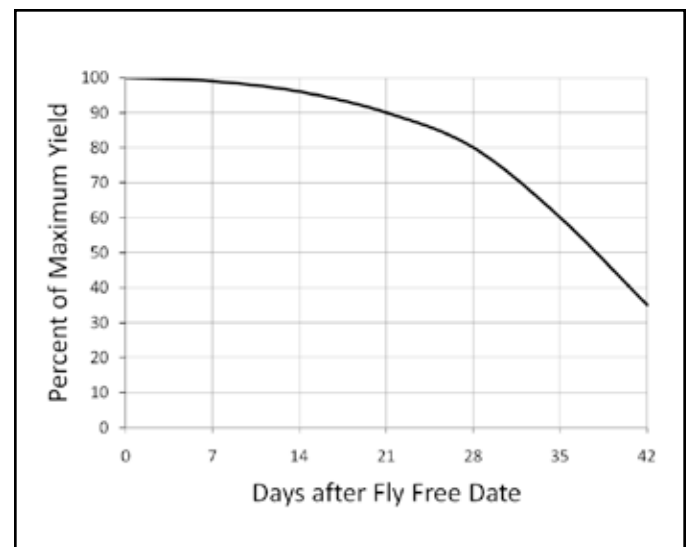
Even if Hessian fly did not exist, the fly free date is recognized as the optimum date for planting wheat. Figure 2 presents the effect of planting date on wheat yield. These data are expressed as the percentage of normal maximum yield that would have occurred if wheat had been planted on the fly free date. The x-axis is the number of days after the fly free date so the graph can be used throughout Missouri. However, I suspect if we had been able to use Missouri data, the curve would be slightly flatter for southern Missouri and slightly steeper for northern Missouri. When using the graph to predict yield lost from delayed wheat planting, remember the importance of fall weather. The data used for the graph come from two states to the east of Missouri so their fall weather

patterns might differ from Missouri. The data are averages for several years and experiments and years differ, greatly for weather and yield responses. Warmer than normal temperatures will allow additional wheat plant growth, so the yield loss would be less. Cooler than

Table 1. Hessian Fly Free Dates



Table 2. Effect of Planting Date on Wheat Yield



normal temperatures will decrease growth and yield loss could be greater than depicted in the graph.

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