Number 131
March 21, 2008

1. Skip-row corn research in western Kansas

We have been testing dryland skip-row corn for several years at the Southwest Research-Extension Center in Tribune. In 2007, we tested only one skip-row pattern (plant 2 / skip 2) at one population (14,000 for corn; 30,000 for grain sorghum). In previous years, we tested three skip-row patterns and three populations.

2007 Skip-row Research: Southwest Research-Extension Center Tribune		
Row spacing	Corn Yield (bu/acre)	Grain Sorghum Yield (bu/acre)
Every row	43	58
Plant 2/Skip 2	49	69

Corn Population = 14,000 Grain Sorghum Population = 30,000

2006 Skip-row Corn Research: Southwest Research-Extension Center Tribune		
Row Spacing	Population	Corn Yield (bu/acre)
Every row	10,000	37
	15,000	48
	20,000	29
Plant 1/Skip 1	10,000	46
	15,000	40
	20,000	23
Plant 2/Skip 1	10,000	48
	15,000	22
	20,000	46
Plant 2/Skip 2	10,000	48
	15,000	43
	20,000	41

It appears from the research at Tribune, and at Garden City and Colby, that skip-row corn might have a yield advantage over conventional row patterns in low-yield environments (less than 50-60 bushels per acre). In higher yield environments, planting corn in conventional 30-inch rows has an advantage.

In 2007, grain sorghum had higher yields in skip-rows in our first test with this crop. We used Lumax for weed control, and were fortunate enough to receive enough moisture to activate the herbicide. In practical terms, getting adequate weed control would be a major concern with skip-row grain sorghum most years.

The theory behind skip-row planting is that in dry years, the crop roots will not fully expand into the moisture zone in the extra-wide row middles until the crop is tasseling, thus maintaining moisture to the crop at least through this critical growth stage. In conventional row spacing, the roots may deplete the entire profile of moisture earlier than that, leaving the crop under stress at the tasseling stage.

Producers planning to use skip-row planting should discuss this with their crop insurance agent and the local Farm Service Agency before doing so. Producers should also make sure they use Roundup Ready corn for skip-row planting. Otherwise, weed control could become a problem. Even with Roundup Ready corn, it is a good idea to plan on using at least a reduced-rate of a residual herbicide at planting time.

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2. Soybean Populations

Soybean yield depends on a number of factors: plants per acre, pods per plant, seeds per pod, and seed weight. Seeds per pod and seed weight most often depend on variety, but can change depending on moisture levels or other environmental factors. The number of pods per plant is more sensitive to environment and can change more than two-fold depending on available space, light, and water resources.

Plants per acre is the factor most readily controlled by the soybean grower and is always a source of interest, especially as seed costs continue to increase.

During the past two years, county agents, Extension specialists, and researchers from K-State have conducted 26 experiments examining soybean seeding rates, primarily in central and northeast Kansas. Sites were located from Butler and Harvey Counties in the south to Republic, Nemaha, and Riley Counties in the north, and west to Saline County. This data set does not include any sites from southeast Kansas, and did not include any late Group IV or Group V determinate-type soybean varieties.

Five experiments were located on university research sites and 21 were on producers' fields, using their planting and harvesting equipment. Some of the research sites on producers' fields had replicated plots, and some did not. Most were in rotational, no-till cropping systems. Three experiments were irrigated and 23 were rain-fed. These studies encompassed a wide range of production practices (row spacings, full-season, double-crop, etc.), environmental conditions, and productivity. The average test yield ranged from 12 to 78 bushels per acre.

Yield results from these studies were standardized to percent of the test average to enable comparisons across the wide range of yields. Yields tended to increase in response to increasing population, but only up to a point. After that optimum population level, increasing the number of plants per acre had no effect on yield one way or the other. Results have been summarized by yield level to determine if the optimal population would change depending on the yield environment.

Yield Range	Number of Tests	Average Yield	Number of Plants Per Acre Needed to Maximize Yield
Less than 30 bu/a	6	24	72,000
30 to 40 bu/a	7	36	80,000
40 to 50 bu/a	6	43	120,000
More than 50 bu/a	7	68	105,000

These results are not very different from the current soybean seeding rate recommendations in our recently updated Soybean Production Handbook (C-449), http://www.oznet.ksu.edu/library/crpsl2/c449.pdf. Usually, a population of 100,000 plants per acre is sufficient to maximize yield, even at yields greater than 70 bushels per acre.

In very low-yield environments, yields plateau at a population of about 70,000 to 80,000 plants per acre, but at those population levels, producers may run the risk of missing out on greater yields if conditions are better than expected.

In very high-yielding situations, producers may need more plants per acre to maximize yields, although that is not indicated in this data set. Some of the highest yields (close to 80 bushels per acre) were achieved at an irrigated location in which yields leveled out at a seeding rate of 105,000 seeds per acre.

Soybeans adjust to different population levels by increasing or decreasing the amount of branching and the number of pods per plant. When populations are higher than the optimum level, the plants simply produce fewer pods per plant. The total number of pods per acre, however, stays about the same.

If producers aim for a population of about 100,000, what seeding rate should they use? The following chart shows how to calculate the number of seeds per acre, or seeds per foot of row, in different row spacings to achieve the desired population.

Row Spacing (inches)	Seeds Per Foot	Plants Per Foot	Seeds Per Acre*	Plants Per Acre
30	7.5	6	130,680	104,544
20	5	4	130,680	104,544
10	2.5	2	130,680	104,544
7.5	1.875	1.5	130,680	104,544

*Assumes 80% field emergence.

Note the difference between the number of plants per acre and seeds per acre. This table assumes 80% field emergence. Results from the 26 tests mentioned above indicate that field emergence is highly variable and can range from less than 50% to near 100%. At seeding rates less than 150,000 seeds per acre, field emergence averaged close to 80%. When more than 150,000 seeds per acre were planted, emergence was actually reduced to an average of 75%. This seems to run counter to the conventional wisdom that producers need to use higher seeding rates to get better germination – one emerging seed helping adjacent seeds push up through the soil.

The emergence rate on soybeans depends on equipment limitations as well soil and weather conditions at and soon after planting. Be sure to plant enough seeds to result in the desired population, given your expectations regarding field emergence.

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3. WRAPS projects update

Kansas WRAPS (Watershed Restoration and Protection Strategy) projects are moving into more watersheds. Several projects are currently being developed, and Kansas State University will likely be involved in a number of them, although nothing has been finalized yet.

Two of the watersheds that K-State is currently working with are the Little Arkansas River watershed and the Lower Smoky Hill watershed. In the Little Arkansas River watershed, which is located in southcentral Kansas, most of the land is cropland. K-State is working to improve pesticide runoff (primarily atrazine), and noticeable success has been seen in the past two years. Soon, we will be attempting to reduce sediment loading in the surface waters in the watershed. This will require meeting with stakeholders and encouraging local farmers to implement best management practices (BMPs) to reduce runoff. There are two BMP demonstration sites along the river that show the positive results of BMPs. We also have installed a surface monitoring system in the Little Arkansas to evaluate water quality improvements.

The Lower Smoky River, which runs from Kanopolis to Solomon, is another area K-State is working with. This WRAPS project is still in the development process. We hope to complete the WRAPS implementation plan this spring. Also, we are developing a riparian restoration demonstration that should be ready this year.

WRAPS is a planning process to identify all the water quality protection and restoration needs of a watershed. WRAPS serves to integrate TMDL implementation, water quality restoration, water quality protection, source water protection, and wellhead protection activities required under the Safe Drinking Water Act and habitat restoration and protection activities.

WRAPS was unveiled in 2005 as the new framework for watershed planning and management in Kansas. WRAPS is a locally-driven process of engaging watershed residents to determine the condition of water and other natural resources; identify sources impacting these resources; establish restoration and protection goals; identify restoration and protection measures (BMPs and other actions); and to develop an action plan to implement selected measures.

The overall goals are to restore and protect the health of water and other natural resources in a watershed; better coordinate local, state, and federal restoration and protection efforts; and to more efficiently target technical and financial assistance programs within watersheds. Many K-State Research and Extension faculty, staff, and county agents are currently involved in supporting WRAPS projects around the state. Other agencies cooperating in WRAPS projects include KDHE, Kansas Water Office, State Conservation Commission, USDA-NRCS, and others.

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4. Triticum Mosaic Virus in Kansas

In the summer of 2007, a newly discovered virus affecting wheat was officially recognized and named Triticum Mosaic Virus. The discovery of this virus was made by Dallas Seifers, plant pathologist, and Joe Martin, wheat breeder, at the KSU Agricultural Research Center-Hays.

Triticum Mosaic Virus is now considered to be one of three virus diseases affecting wheat in approximately the same manner – the other two being Wheat Streak Mosaic virus and High Plains Virus. All of these virus diseases are vectored, with varying degrees of efficiency, by the wheat curl mite. In addition, the disease symptoms of all three diseases are virtually identical.

Although some initial observations have been made, many aspects of Triticum Mosaic Virus remain largely unknown at this point, including varietal reaction, distribution within Kansas, and yield loss potential.

Varietal reaction. Although there has been no conclusive varietal screening for Triticum Mosaic Virus alone yet, it is known that RonL is susceptible. This is important because RonL is the first variety to have true genetic resistance to Wheat Streak Mosaic, at least under cool temperature conditions. If RonL seems to show Wheat Streak Mosaic symptoms, and temperatures have been cool, then Triticum Mosaic Virus should be suspected. Otherwise, the effect of Triticum Mosaic Virus alone on varieties is not known.

Distribution within Kansas. To date, Triticum Mosaic Virus has been confirmed in Cheyenne, Ellis, Ford, Ness, Osborne, Pawnee, and Thomas counties in Kansas. These are the only locations where samples have been taken for testing, and all have been positive to this point.

Yield loss potential: Research indicates that if Triticum Mosaic Virus is present along with Wheat Streak Mosaic virus, there is a greater effect on yield loss than if any of these diseases occurs alone. Whether Triticum Mosaic Virus has a greater or lesser effect on yield than Wheat Streak Mosaic if the two occur separately or together is not known.

At this point, there is no reason for producers to be unduly alarmed by the detection of this new virus disease on wheat. Triticum Mosaic Virus may have been present at low levels for many years in the High Plains, and was only now detected when disease symptoms appeared on RonL, which is known to be resistant to Wheat Streak Mosaic under most conditions. It is also possible that Triticum Mosaic Virus is new to the High Plains, but there is no way to know for sure.

Because Triticum Mosaic Virus is vectored in the same manner as Wheat Streak Mosaic and High Plains Virus, producers should take the same preventive measures against the disease: control volunteer wheat and plant after the Hessian fly-free date. There will be no practical way for producers to distinguish Triticum Mosaic Virus symptoms from the symptoms of Wheat Streak Mosaic – unless the symptoms occur on RonL. Moreover, there is no immediate need to distinguish among the three virus diseases. Control measures are the same for all three (with the exception of using RonL, which can protect against Wheat Streak Mosaic but not Triticum Mosaic Virus).

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These e-Updates are a regular weekly item from K-State Extension Agronomy and Steve Watson, Agronomy e-Update Editor. All of the Research and Extension faculty in Agronomy will be involved as sources from time to time. If you have any questions or suggestions for topics you'd like to have us address in this weekly update, contact Steve Watson, 785-532-7105 swatson@ksu.edu, or Jim Shroyer, Research and Extension Crop Production Specialist and State Extension Agronomy Leader 785-532-0397 jshroyer@ksu.edu