

EFFECT OF IMPERFECT WHEAT STANDS ON YIELD

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A perfect wheat stand is the goal in producing wheat. It is felt that an optimum, uniform stand is needed to achieve a high yield potential. However, stands are usually not perfect. This is especially true for no-till wheat. In fact, this is one of the reasons that some producers have not adopted no-till wheat. Often the stand looks irregular, and it is believed that yield potential is probably reduced.

But is this true? Many farmers use tramlines in their wheat, and studies indicate that yields are not reduced. The rows on each side of the tramline seem to compensate for the loss of stand in the skipped rows. If this is true, then a certain amount of stand loss in a wheat field can be tolerated. The question is how much?

METHODS:

In order to better understand the effects of imperfect stands (within row skips having no plants) on wheat yield, five studies were initiated in the last 4 years. All studies were planted using tillage. Soon after wheat emergence, plants were removed (skips were established) to simulate imperfect stands. In 1999-2000, the skips were 6, 12, or 18 inches long and in 2000-2001, 2001-2002 and 2002-2003 all skips were 12 inches in length. Varying the number of skips resulted in 5, 10, 15, or 20% of the area within plots having skips (no plants). The trials were planted at 35 seeds/ft² with some treatments planted at 25 seeds/ft² in 2000-01, 2001-02 and 2002-03. The trials were located at the Research and Education Center in Princeton (1999-00; 2000-01; 2001-02; 2002-03) or in Fulton County (1999-00). Each year, two varieties were

compared that differed in tillering potential. Pioneer 25R26 (1999-00; 2000-01 and 2001-02) and Pioneer 25R37 (2002-03) were the varieties used that had greater tillering potential. Pioneer 2552 was used all four years as the less prolific tillering variety.

RESULTS:

The yields were very high all four years (above 90 bu/acre), resulting in a good test for this type of study.

Length of Skip

Table 1 shows wheat yields at different skip lengths in 1999-00. The length of the skip (18 inches or less in this study) did not seem to have an effect on the yield. When the percent of area skipped (i.e. containing no plants) remained the same but the length of the skip increased (up to 18 inches) there was no significant change in the yield. Skip lengths greater than 18 inches were not included in this study, so it is not known if longer skips would have reduced yield, irregardless of the percent of area skipped. Based on the results in Table 1, a uniform skip length of 12 inches was used in the remaining three years of the study (Tables 2 and 3).

Percent of Area Skipped

The percent of area skipped refers to the percent of the area that had no plants due to skips. The percentage of the area skipped definitely had an effect on the yield (Tables 1, 2 and 3). The effect depended on the variety and the year. Pioneer 2552 did not show a yield reduction when compared to the check (0% skips) any of the 4 years when up to 10% of the area had skips

(Tables 1 and 2). However, Pioneer 2552, which tillers less prolifically, showed lower yields in 3 of the 4 years (Tables 1 and 2) when 15% or more of the area was skipped. The exception occurred in 2001-02 (Table 2) when yield was not significantly reduced for Pioneer 2552 when 15% or 20% of the area was skipped. Pioneer 25R26 and 25R37, more prolific tillering varieties, did not show a yield reduction when compared to the check (0%) skips) in 3 of the 4 years even when as much as 15% or 20% of the area was skipped (Tables 1 and 3). The exception occurred in 2002-03 (Table 3) for Pioneer 25R37 when yield was significantly reduced when 15% and 20% of the area was skipped. Considering both varieties it appears that 10% of the area could have skips (of at least 12 inches in length) without having an effect on the yield. It also appears that varieties with greater tillering potential can tolerate skipped areas as high as 15% to 20% without a yield reduction better than non-prolific tillering varieties.

Seeding Rate

The seeding rate can have an effect on the yield when skips are present and may be somewhat dependent on the tillering capacity of the variety. In Tables 2 and 3, seeding rates of 35 and 25 seeds/ft² were compared in the treatment that had 20% of the area skipped. When 20% of the area was in skips, yield was less affected by seeding rate in the more prolific tillering varieties (Pioneer 25R26 and 25R37) (Table 3). Yields for these varieties were equivalent for both seeding rates in 2 of the 3 years (2000-01 and 2002-03). The exception occurred in

2001-02 when lower yields occurred at the 25 seeds/ft² seeding rate. With the less prolific tillering Pioneer 2552 variety, yield was less at the lower seeding rate (25 seeds/ft²) all 3 years (Table 2) when 20% of the area was in skips.

Yield Compensation

In order for yield to remain the same when stand loss (due to skips containing no plants) occurs, the yield of plants around the skip must increase. The compensation of the wheat plants surrounding the skips can come from more heads, more grains per head or more weight per grain. Head counts made near harvest in 1999-00 (data not shown) indicated that the compensation was not due to more heads (increased tillering). However, head counts made in 2000-01, 2001-02 and 2002-03 (Table 4) showed more heads (increased tillering) for the plants surrounding the skipped areas. The increases were in the order of 35 to 50% more heads/ft².

SUMMARY:

After four years of this study, it appears that the length of a skip (up to 18 inches in these studies) did not affect yield. However, the % of area skipped did have an effect on yield. When the amount of area skipped is 10% or less, there is no effect on yield regardless of variety. There is also less effect on yield with varieties that tiller prolifically if the area skipped is as high as 20%. However, yields may be reduced at lower seeding rates if the percent area skipped is large (20%), particularly with less prolific tillering varieties.

TABLE 1. EFFECT OF IMPERFECT WHEAT STANDS (SKIPS WITHIN THE ROW) ON WHEAT YIELD (1999-2000)			
Area Skipped (%)	Length of Skip (inches)	Wheat Yield (Bu/Ac)	
		Pioneer 25R26	Pioneer 2552
FULTON COUNTY			
0	0	110.3 a*	107.0 ab*
5	12	109.0 a	102.3 bc
10	12	104.5 a	108.0 a
10	18	108.0a	107.5 ab
15	12	109.1 a	100.6 c
15	18	105.8 a	100.6 c
PRINCETON			
0	0	-	107.5 b*
5	6	-	111.5 ab
5	12	-	113.0 a
5	18	-	108.3 ab
10	6	-	108.5 ab
10	12	-	110.9 ab
*Means followed by the same letter in individual columns indicate no true differences according to a statistical analysis.			

TABLE 2. EFFECT OF IMPERFECT WHEAT STANDS (SKIPS WITHIN THE ROW) ON WHEAT YIELD FOR A VARIETY WITH LESS TILLERING POTENTIAL (2001-2003).						
Area Skipped (%)	Length of Skip (Inches)	Seeding Rate (Seeds/ft²)	WHEAT YIELD (Bushels/Acre) Wheat Variety = Pioneer 2552¹			
			2000-01	2001-02	2002-03	3 Yr. Avg.
0	0	35	92.0a ²	94.8a ²	102.5a ²	96.4a ²
5	12	35	89.2ab	94.7a	102.6a	95.5ab
10	12	35	91.0ab	94.1a	99.6ab	94.9ab
15	12	35	85.9bc	93.6a	98.2b	92.6ab
20	12	35	87.1abc	90.8a	97.2b	91.7b
20	12	25	82.5c	77.4b	92.8c	84.2c
¹ Considered to have average tillering potential.						
² Means followed by the same letter in individual columns indicate no true difference according to a statistical analysis.						

TABLE 3. EFFECT OF IMPERFECT WHEAT STANDS (SKIPS WITHIN THE ROW) ON WHEAT YIELD FOR A VARIETY(S) WITH GREATER TILLERING POTENTIAL (2001-2003).						
Area Skipped (%)	Length of Skip (Inches)	Seeding Rate (Seeds/ft ²)	WHEAT YIELD (Bushels/Acre)			
			Wheat Variety(s) = Pioneer 25R26 ¹ Pioneer 25R37 ¹			
			2000-01	2001-02	2002-03	3 Yr. Avg.
0	0	35	97.2a ²	96.2a ²	104.8a ²	99.4a ²
5	12	35	92.7a	-----	101.6ab	95.0abc
10	12	35	94.6a	93.8a	104.2a	97.6ab
15	12	35	97.9a	97.0a	96.5b	97.1ab
20	12	35	92.4a	89.9a	97.0b	93.1bc
20	12	25	95.6a	80.2b	97.5b	91.0c

¹ Both varieties are considered to have above average tillering potential. Pioneer 25R26 (2000-01, 2001-02); Pioneer 25R37 (2002-03).
² Means followed by the same letter in individual columns indicate no true difference according to a statistical analysis.

TABLE 4. EFFECT OF SKIPS ON WHEAT HEAD COUNTS (2001-2003).							
Variety	Seeding Rate (Seeds/ft ²)	WHEAT HEAD COUNTS (Heads/ft ²)					
		2000-2001		2001-2002		2002-2003	
		No Skips	Beside 12" Skips	No Skips	Beside 12" Skips	No Skips	Beside 12" Skips
Pioneer ¹ 25R26	35	54.2	78.7	49.7	69.4	56.0	69.4
	25	51.8	71.6	56.4	80.2	48.5	69.7
Pioneer 2552	35	45.9	72.2	52.0	79.6	53.3	81.1
	25	47.8	70.7	46.6	64.8	44.8	72.2

¹ Pioneer 25R37 was used in 2002-03.