

# Corn Production Trials - 2001 Crops Day

Corn | Corn Trial Report

## Corn Production in Southwestern North Dakota

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Corn production using narrow row techniques and high plant populations is the current trend throughout much of the corn growing regions of the U.S. Interest has also been increasing throughout North Dakota. Limited studies on row spacing were conducted in the early 1970's and mid 80's in eastern and northwestern North Dakota. In western North Dakota where moisture tends to be a limiting factor, wider row spacings and/or lower plant populations may be more conducive to grain production than narrow row, high population practices.

The **objectives** of this project were to determine optimal management factors (row spacing, plant populations and hybrid maturities) and to better understand the relationships between these factors for grain corn production in southwestern North Dakota.

The trial was conducted at Hettinger in 1998, 1999 and 2001 using a randomized complete block design with a split-split plot arrangement and three replications. Row spacing was the main plot factor with plant population as the subplot factor and hybrid maturities as the sub-subplot factor. Row spacings were 14 inches, 28 inches and 42 inches. Four plant populations were utilized; 12,000, 18,000, 24,000 and 30,000 plants per acre. Plant populations were achieved by over planting and then by hand thinning to exact populations. Three hybrids were utilized; Pioneer 3963, Pioneer 3921 and Pioneer 3861 with 79, 86 and 93 day relative maturities, respectively. All combinations of row spacing by plant population by hybrid were evaluated for ear height (distance from soil surface to the shank of the ear), test weight and grain yield.

The trial was planted on May 5, 1998, on May 3, 1999 and on May 2, 2001 and harvested on September 29, 1998, on October 14, 1999, and on October 11, 2001. The 1998 trial was grown under conventional tillage practices on ground that was fallow the previous year. The 1999 trial was grown under conventional tillage practices on ground that was in canola the previous year, and the 2001 trial was grown under no-till on ground that was in buckwheat the previous year. Growing conditions at Hettinger during 1998 started out cool and dry, warming up in August and ending up with about 13 ½ inches of precipitation for the season. Corn growing degree units for the season was 2397. Growing conditions during 1999 was generally ideal with above normal precipitation in June, July and August and totaling over 22 ½ inches for the season. Air temperatures were generally mild with cooler than normal temps during May, June, August and September and an accumulation of 2009 corn growing degree units for the season. Growing conditions during 2001 was again ideal for corn production with generally warm and moist conditions. A severe hail storm on June 18 shredded the trial almost to the soil surface, however, the trial recovered very nicely with very little stand loss. Precipitation was above normal for the season with the month of July receiving almost 4 ½ inches, over 2 inches above normal. Monthly air temperatures were generally above normal except for June. August and September were hot and dry. Total corn growing degree units for the season was 2387.

On average, plant population had the most variability followed by relative maturity and finally, row spacing. Significant differences between plant populations were observed for ear height and grain yield. Both ear height and grain yields tended to increase with increasing population and optimum yields were achieved at 24,000 plants per acre. Weeds became more prevalent as plant populations decreased (personal observation). Significant differences between relative maturities (hybrids) were observed for ear height, test weight and grain yield. The early maturing hybrid had a shorter ear height, a heavier test weight and was lower yielding than the later maturing hybrids. The 86 and 93 day maturing hybrids had similar ear height and grain yield. Test weight for the 93 day hybrid was 53.9 pounds per bushel vs. 57.0 pounds per bushel for the 86 day hybrid and 58.0 pounds per bushel for the 79 day hybrid. Grain yields were similar between hybrids in 1998 and 1999, but the 79 day hybrid had significantly lower yields in 2001. The optimum relative maturity for this area was for the 86 day hybrid. Significant differences between row spacing was observed for ear height and grain yield. Ear height tended to increase with increasing row spacing. Grain yield tended to increase slightly from the 14 inch to the 28 inch row spacing and then leveled off with the 42 inch row spacing. Row spacing had a greater effect on grain yield during the dry year (1998) then on relatively wet years (1999 and 2001) with increasing yields as row spacing increased. Weeds tended to be more prevalent with wider row spacings (personal observation). Wider row spacings tend to favor optimum grain yields. Row spacing and plant population interactions were observed with grain yields tending to increase with higher populations grown under wider row spacings.

In conclusion, corn production practices in southwestern North Dakota should focus on achieving a relatively heavy plant stand with an adapted hybrid, and wider row spacings favor higher grain yields, especially during dry years.

Plant Population Combined Means						
Plant Pop.	Ear Height	Test Weight	----- Grain Yield -----			
			1998	1999	2001	Avg.
plants/A	cm	lbs/bu	----- bushels per acre -----			
12,000	74	56.0	42.9	58.0	51.5	50.8
18,000	75	56.4	34.5	58.7	51.4	48.2
24,000	78	56.4	49.5	67.8	56.9	58.1
30,000	76	56.3	46.5	72.8	52.6	57.3
LSD .05	2	NS	8.9	7.5	1.5	1.8

Relative Maturity (hybrid) Combined Means

Relative Maturity	Ear Height	Test Weight	----- Grain Yield -----			
			1998	1999	2001	Avg.
*	cm	lbs/bu	----- bushels per acre -----			
79	71	58.0	42.9	62.8	34.0	46.6
86	78	57.0	43.2	67.6	59.8	56.9
93	79	53.9	44.0	62.6	65.5	57.4
LSD .05	7	3.3	NS	NS	10.6	2.3

Row Spacing Combined Means

Row Spacing	Ear Height	Test Weight	----- Grain Yield -----			
			1998	1999	2001	Avg.
Inches	cm	lbs/bu	----- bushels per acre -----			
14	73	56.1	31.8	63.7	53.7	49.7
28	76	56.7	44.7	64.7	56.3	55.2
42	79	56.2	53.5	64.5	49.2	55.7
LSD .05	5	NS	15.2	NS	5.9	3.9

Row Spacing X Plant Population Combined Means

Row Spacing	Plant Pop.	Ear Height	Test Weight	----- Grain Yield -----			
				1998	1999	2001	Avg.
Inches	plants/A	cm	lbs/bu	----- bushels per acre -----			
14	12,000	70	55.7	25.6	62.5	40.7	42.9

	18,000	72	56.3	16.8	53.8	52.2	40.9
	24,000	75	56.2	41.4	61.1	61.8	54.8
	30,000	73	56.0	43.5	77.5	54.7	58.6
28	12,000	74	56.6	45.7	55.8	63.6	55.0
	18,000	75	56.7	38.9	64.5	48.9	50.8
	24,000	76	56.5	46.8	69.6	65.6	60.7
	30,000	77	56.8	47.4	69.0	54.7	57.0
42	12,000	78	55.7	57.2	55.7	49.3	54.1
	18,000	78	56.3	47.9	57.7	46.5	50.7
	24,000	82	56.4	60.2	72.7	52.8	61.9
	30,000	79	56.2	48.6	71.9	48.6	56.4
LSD .05		NS	NS	19.8	NS	12.2	13.0

Grain Corn Production at Hettinger, ND 1998 - 2001 Combined Means

Row Spacing	Plant Pop.	RelativeMaturity	Ear Height	Test Weight	----- Grain Yield -----			
					1998	1999	2001	Avg.
Inches	plants/A	*	cm	lbs/bu	----- bushels per acre -----			
14	12,000	79	66	57.4	22.0	58.5	28.0	36.2
		86	70	56.0	28.2	65.0	44.7	46.0
		93	75	53.8	26.7	63.9	49.4	46.7

	18,000	79	68	58.1	22.9	58.8	23.4	35.0
		86	75	56.9	14.6	52.6	65.6	44.3
		93	74	53.8	12.8	50.0	67.6	43.5
	24,000	79	68	57.7	40.7	57.6	32.3	43.5
		86	80	57.3	37.9	72.6	75.2	61.9
		93	78	53.8	45.6	53.2	77.8	58.9
	30,000	79	70	57.6	38.9	77.4	30.4	48.9
		86	72	56.9	44.5	82.7	72.2	66.5
		93	79	53.5	47.0	72.4	61.6	60.3
28	12,000	79	70	58.2	41.4	53.2	36.6	43.7
		86	75	57.1	49.3	56.8	74.2	60.1
		93	78	54.5	46.5	57.5	79.9	61.3
	18,000	79	69	58.5	40.7	59.8	23.7	41.4
		86	76	57.4	40.7	64.5	61.9	55.7
		93	80	54.2	35.4	69.2	61.0	55.2
	24,000	79	69	57.8	52.5	63.8	37.1	51.1
		86	80	57.3	46.1	72.4	77.2	65.2
		93	80	54.3	41.9	72.5	82.4	65.6
	30,000	79	70	58.3	47.4	69.2	35.1	50.6
		86	80	57.7	46.4	72.0	64.4	60.9
		93	80	54.4	48.5	65.8	64.6	59.6
42	12,000	79	74	57.2	53.6	54.7	40.0	49.4
		86	77	56.4	59.0	55.8	41.3	55.4

		93	83	53.6	59.0	56.4	56.7	57.4
	18,000	79	77	57.7	48.8	51.0	27.7	42.5
		86	78	57.3	46.2	65.8	54.5	55.5
		93	80	53.8	48.7	56.3	57.2	54.1
	24,000	79	77	58.2	56.7	74.3	37.0	56.0
		86	84	57.4	59.6	73.8	56.3	63.2
		93	84	53.7	64.4	70.0	65.2	66.5
	30,000	79	74	58.0	48.8	74.8	32.2	51.9
		86	80	57.0	45.4	76.6	56.1	59.4
		93	83	53.5	51.6	64.3	57.4	57.8
C.V. %			11.5	2.3	19.5	14.4	12.5	33
LSD .05			2	0.3	13.9	15.2	10.9	4.9

Yields are adjusted to 13.5% moisture.

NS = no statistical difference.

\*RM Hybrid

79 = P3963

86 = P3921

93 = P3861

Seed provided by Pioneer Hi-Bred International, Inc.