Corn Production in Clump Planting Patterns

Simple Observations from Colby, Kansas, 2006

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Introduction

Planting crops in hills or clumps has received renewed interest for crop production under extremely limited water availability. The technique is to plant 3 or 4 seeds together in one "clump" rather than intersperse them evenly down the crop row. This simple observation trial from 2006 at Colby, Kansas for corn is intended to just provide supplementary information to more comprehensive studies being conducted by West Texas A&M University and USDA-ARS Conservation Production Research Laboratory.

Trial Methods and Procedures

The corn (Pioneer Hybrid 35P12) was planted into a deep silt loam soil on April 27, 2006. The normally row planted corn was seeded at a resultant plant population of 19,166 plants/acre in 30-inch spaced corn rows with a standard corn planter. The clumps were hand planted in 4 ft increments along the 30-inch spaced corn rows with the clumping beginning point in each row offset 2 ft from the adjacent row. This planting arrangement for the clumps resulted in a plant population of 16,880 plants/acre, considering that 31 of 32 planted plants emerged. Additional clumps were planted as buffers around the plants that were sampled at harvest. Because the observational clumps were inserted into another research study already in progress, it was not possible to exactly match plant populations for the two planting arrangements. Emergence was on May 18 and physiological maturity was reached on September 11.

The plot area received extremely limited subsurface drip irrigation (SDI) with 1 inch being applied on June 13 (approximately 9th leaf stage, lay-by, or 18 inches tall) and 2 inches on July 14 (corn silking). Precipitation during the period May 18 through September 11 totaled 8.88 inches which is approximately 3.5 inches below normal. Fully irrigated corn evapotranspiration during the period was calculated as 21.91 inches which is about 1.2 inches below normal. Soil water depletion was not measured in the clumping observation, but was measured in the normally planted corn as approximately 5.8 inches. Total observed water use (irrigation + precipitation + soil water depletion) was approximately 17.57 inches.

The normally planted corn was hand harvested as a bulk 20 ft of row within the plot with no references being recorded to individual ear location. Each ear was individually hand shelled for determination of grain weight and number of kernels. Ear girth or the number of kernel rows around the circumference was determined from 5 consecutive ears down the row. The number of rows down the length of the ear was determined from algebra by dividing the ear kernel number by the ear girth. Kernel weight adjusted to the standard 15.5% wet basis was determined from total grain weight divided by kernel number. Grain yield was also adjusted to 15.5% wet basis.

Eight individual corn clumps were harvested with all clumps except one containing 4 plants. Ear grain weight, girth and kernel numbers was measured for each ear from each clump. The number of rows down the length of the ear was determined from algebra by dividing the ear kernel number by the ear girth. Both grain yield and kernel weight were adjusted to 15.5% wet basis.

Results and Discussion

Although hot (97 to 104° F) and dry (no precipitation) conditions existed during the pollination period (July 13 through July 20) there were relatively light wind conditions averaging 3.7 mph at the two ft anemometer height. As a result the corn pollinated well with the exception of a few ears on plants that apparently germinated late. These late plants tend to get shaded or crowded to the point where they are very unproductive. There were two of the 22 normally planted plants that had ear grain weight less than 100 g with one plant missing an ear (Table 1).

Table 1. Results for normally planted corn.

Ear	Ear Grain, 15.5% wb, grams/ear	Kernels /Ear	Kernel Rows/Ear	Kernel Wt. g/100 krnl	Yield bu/a	Yield Mg/ha
1	146.6	385	28	38.1	111	6.94
2	113.4	316	23	35.9	86	5.37
3	179.6	470	34	38.2	136	8.51
4	130.0	376	27	34.6	98	6.16
5	179.4	464	33	38.7	135	8.50
6	204.4	454	32	45.0	154	9.68
7	158.4	421	30	37.6	120	7.50
8	159.1	406	29	39.2	120	7.53
9	210.9	501	36	42.1	159	9.99
10	186.4	527	38	35.4	141	8.83
11	178.6	443	32	40.3	135	8.46
12	157.5	436	31	36.1	119	7.46
13	103.4	309	22	33.5	78	4.90
14	110.6	346	25	32.0	83	5.24
15	159.4	432	31	36.9	120	7.55
16	61.8	169	12	36.6	47	2.93
17	150.9	423	30	35.7	114	7.14
18	140.7	406	29	34.7	106	6.66
19	99.3	306	22	32.5	75	4.70
20	100.7	310	22	32.5	76	4.77
21	124.5	358	26	34.8	94	5.90
Avg.	***145.5***	***393***	***28***	***36.7***	***110***	***6.89***

There were 6 plants for the 8 clumps (31 plants) that had less than 100 g of grain/ear. (Table 2) One clump only had 3 plants that germinated. It is very possible the small ears in the clumping observation were late germinating plants caused by the irregular hand

planting used for the clumps. One clump had the grain ear within the corn tassel, a phenomenon that tends to express itself under limited water availability and very low plant population. Ear expression at the tassel is generally poor production because of desiccation of the kernels.

There was no large differences in grain yield, kernels ear, or kernel weight for the two planting arrangements. The measured grain yield was slightly higher for the normally planted corn, but that planting arrangement had approximately 2290 more plants/acre. Yield was decreased considerably for the few clumps that had some individually poor ears, once again probably due to late germination. Kernel number and kernel weight appeared to be quite good and quite good for the clumps that did not have the late germinating plant(s). Greatest individual ear grain and kernel weights occurred for the clumped plants. This may reflect better pollination and grain filling provided by the plant protection provided in the clump, but also could be a result caused by the different plant populations for the two planting arrangements.

The results should be viewed as simple observations but do indicate that this may be a viable planting arrangement under extremely limited water availability.

Corn in clump planting arrangement at Colby, Kansas on September 11, 2006.

Table 2. Results from the clumped planted corn.								
Clump	Ear	Ear Grain grams/ear	Kernels /Ear	Ear Girth	Kernel Rows/Ear	Kernel Wt. g/100 krnl	Yield bu/a	Yield Mg/ha
1	1	201.8	510	14	36	39.6	134	8.42
	2	186.8	542	16	34	34.5	114	7.79
	3	171.3	404	14	29	42.4	114	7.14
	4	251.3	590	14	42	42.6	167	10.48
	Avg.	**202.8**	**512**	**15**	**35**	**39.8**	**132**	**8.46**
2	1	172.2	435	14	31	39.6	114	7.18
	2	192.9	523	14	37	36.9	128	8.04
	3	136.5	387	14	28	35.3	91	5.69
	4	197.8	565	14	40	35.0	131	8.25
	Avg.	**174.9**	**478**	**14**	**34**	**36.7**	**116**	**7.29**
3	1	176.3	450	14	32	39.2	117	7.35
	2	150.2	428	12	36	35.1	100	6.26
	3	241.2	629	16	39	38.3	160	10.06
	4	81.4	242	14	17	33.6	54	3.40
	Avg.	**162.3**	**437**	**14**	**31**	**36.6**	**108**	**6.77**
4	1	196.8	473	12	39	41.6	131	8.21
	2	199.6	524	14	37	38.1	133	8.32
	3	168.4	418	14	30	40.3	112	7.02
	4	151.4	433	14	31	35.0	101	6.31
	Avg.	**179.0**	**462**	**14**	**34**	**38.7**	**119**	**7.47**
5	1	172.0	456	14	33	37.7	114	7.17
	2	1.2	4	8	1	30.5	1	0.05
	3	203.7	554	16	35	36.8	135	8.49
	4	155.3	417	16	26	37.2	103	6.48
	Avg.	**133.0**	**358**	**14**	**23**	**35.5**	**88**	**5.55**
6	1	35.7	128	12	11	27.9	24	1.49
	2	3.3	16	8	2	20.6	2	0.14
	3	250.5	559	14	40	44.8	166	10.45
	4	170.3	500	14	36	34.1	113	7.10
	Avg.	**115.0**	**301**	**12**	**22**	**31.8**	**76**	**4.79**
7	1	206.2	495	14	35	41.7	137	8.60
	2	161.5	427	14	31	37.8	107	6.74
	3	218.2	578	14	41	37.7	145	9.10
	4	17.2	73	12	6	23.6	11	0.72
	Avg.	**150.8**	**393**	**14**	**28**	**35.2**	**100**	**6.29**
8	1	0.0	0	8	0	0.0	0	0.00
	2	210.0	549	14	39	38.3	140	8.76
	3	52.6	179	12	15	29.4	35	2.20
	4	No Plant	-	-	-	-	-	-
	Avg.	**87.6**	**243**	**11**	**18**	**22.6**	**44**	**2.74**
Mean all Clumps		***150.7***	***398***	***13***	***28***	***34.6***	***98***	***6.17***