Corn for Grain at Yuma

E.B. Jackson, Don E. Howell and R.E. Dennis

DATE OF PLANTING

Corn for grain can be worked into the cropping system at Yuma but planting must be timed to avoid pollination in mid summer when temperatures are too high. Although we don't know just what "too high" is, experience with date-of-planting experiments has indicated that whenever the pollination period occurs in June, July or August pollination is sporadic and yields are reduced. Records kept by the US Weather Bureau at Yuma show that daily temperatures normally reach or exceed 100°F from mid June to mid September, and they reach or exceed 105° from the first of July to the middle of August.

For full season varieties which do well at Yuma, it takes approximately 60 days from planting to the beginning of pollination. Therefore, if pollination is to be completed before mid June, the corn should be planted by April 1. This assumption is supported by the data shown in Tables 1, 2 and 3.

Plantings delayed until August 1 normally begin pollinating at the end of September, after the weather has moderated sufficiently to be more favorable for full pollination (Tables 1, 3 and 4).

In a 1977 experiment six varieties, selected to cover a range of maturity classes, were planted in moist soil on July 28. The pollination periods began with first silks between September 14 and 20 and lasted for an average of 12 days -- approximately the end of September. All varieties were judged mature by the first week of November and allowed to dry in the field until November 28 when they were harvested with an average grain moisture content of 8.9% (Table 4).

Tables 1, 2 and 3 show that in previous years corn planted in August was not harvested until January. Apparently, the 1977 season was better than average for drying the grain in the field. If the grain fails to dry down to an acceptable moisture content following maturity, there would be little advantage in being able to grow a fall crop of corn except for ensilage. Future experiments with August plantings will be directed toward achieving early harvest.

Table 1. Effects of variety and date of planting on the yield of shelled corn. Yuma Valley Station. 1972[1/].

Brand	Variety	Date of Planting				
		March 15	April 15	May 15	June 15	Aug. 15
		LB./A	LB./A	LB./A	LB./A	LB./A
DeKalb	XL72A	6708 A	3528 A	784 A	2875 B	7479 A[2/]
Asgrow	ASX404	6403 AB	3746 A	828 A	3441 B	5332 B
Acco	UC4600	5663 BC	2962 AB	44 B	261 C	8451 A
Northrup King	1130	5140 CD	2788 AB	915 A	2788 B	5663 B
Funk's	G4949	4356 D	2352 B	566 AB	4530 A	4966 B
Pioneer	3773	5924 ABC	3790 A	131 B	87 C	5924 B
Average [3/]		5699	3194	545	2330	6353
		B	C	E	D	A
Harvest date		July 19	Aug. 28	Oct. 26	Oct. 26	Jan. 31
Avg. Moisture (%)		9.7	4.7	9.0	12.4	16.2

[1/] Data are averages of four replications, corrected to 8% moisture.

[2/] Within each column, means followed by the same letter are not significantly different at the .05 level.

[3/] Dates of planting means are all significantly different at the .05 level.

Fertilizer applied: 100 lb. N during seedbed preparation.
Irrigation: Preirrigation and subsequent irrigations as needed.
Soil type: Glenbar silty clay loam.

Table 2. Effects of variety and date of planting on the yield of shelled corn. Yuma Valley Station. 1973.

Brand	Variety	Date of Planting						
		Feb. 15	Mar. 15	Apr. 15	May 15	June 15	July 15	Aug. 15
		LB./A	LB/A	LB/A	LB/A	LB/A	LB/A	LB/A
Acco	UC4600	5098 BC[1/]						
Funks	G4949	4804 BC	5196	3627	5098 B	3497		
Pioneer	3773	4248 C	5392					
N.K.	1130	5947 AB	5555	3431	4967 B	4477	2614 B	2287[2/] ABC
Asgrow	ASX404	6960 A	6763	4771				
DeKalb	XL72A	5523 ABC	4869	4804	3072 C	3366	2385 B	1863 BC
Asgrow	ATC403W				6568 A	4150	5215 A	2876 A
Funk's	G4949							
Acco	UC6601				4902 B	4542	2680 B	
Acco	UC2901							
Acco	UC8801		5032	2810				
Acco	UC3301							2124 ABC
Pioneer	3780			4477	4575 B	3170	1961 C	
Funk's	G4761						2255 B	2582 AB
Pioneer	3932A							1340 C
Harvest date		July 16	July 22	Aug. 10	Sept. 5	Oct. 11	Nov. 5	Jan. 14
Avg. Moisture (%)		4.3	4.0	3.8	7.0	5.8	9.5	4.6

1. Within each column, entries followed by the same letter or entries followed by no letters are not significantly different at the .05 level.
Yields are averages of four replicates, corrected to 8% moisture.
Fertilizer applied: 150 pounds N during seedbed preparation.
Irrigation: Preirrigation and subsequent irrigations as needed.
Soil type: Glenbar silty clay loam.

Table 3. Effects of variety and date of planting on the yield of shelled corn. Yuma Valley Station. 1974.

Brand	Variety	Date of Planting					
		Feb. 11	Mar. 4	Apr. 1	Apr. 30	Aug. 1	Aug. 15
		LB/acre	LB/acre	LB/acre	LB/acre	LB/acre	LB/acre
Acco	1586	3230 BC[1/]					
Funks	G4949	3350 BC	3070 CD				
Pioneer	3773	2220 C	2660 D				
N.K.	1130	3150 BC					
Asgrow	X404	5860 A	6600 A				
DeKalb	XL72A	4440 AB	3510 CD	2010 C	390 B		
Acco	8801		4440 BC				
Acco	3301			4350 A	2450 A	3630 C	
Pioneer	3780			4700 A	2140 A	4520 B	
N.K.	1541		5760 AB			5890 A	5390 AB
Asgrow	RX140			960 D	880 B	5650 A	4130 C
N.K.	PX50A			4440 A	2610 A	4330 BC	
Funks	G4808			3230 B	3120 A	5880 A	5260 B
N.K.	737						5080 B
Asgrow	RX450A						5130 B
Asgrow	AX404						5690 A
Harvest date		July 5	July 15	Aug. 5	Aug. 15	Jan. 8	Jan. 8
Avg. moisture (percent)		4.9	5.3	5.1	5.3	8.1	9.5

1. Within each column, entries followed by the same letter are not significantly different at the .05 level.
Yields are averages of four replicates, corrected to 8% moisture.
Fertilizer applied: 150 lb. N during seedbed preparation.
Irrigation: Preirrigation and subsequent irrigations as needed
Soil type: Glenbar silty clay loam.

Table 4. Growth and production of six corn hybrids planted July 28, 1977 on The University of Arizona Farm in the Yuma Valley[1].

Brand	Variety	Date of Occurrence [2] First Tassels	First Silks	90% Silking	Mature	Harvest	Moisture %	Grain[2] Yield Lb/Ac.
Funk's	G-4507	Sept. 14	Sept. 19	Sept. 25	Nov. 4	Nov. 28	9.4	6024
NK	PX74	Sept. 13	Sept. 19	Sept. 25	Nov. 1	Nov. 28	9.3	5833
Ferry Morse	X770	Sept. 12	Sept. 17	Sept. 28	Oct. 27	Nov. 28	8.8	5965
Acco	UC-6601	Sept. 13	Sept. 20	Sept. 27	Oct. 31	Nov. 28	8.8	5550
Acco	UC-3301	Sept. 8	Sept. 14	Sept. 26	Oct. 26	Nov. 28	8.8	6217
Acco	UC-2901	Sept. 8	Sept. 14	Sept. 26	Oct. 26	Nov. 28	8.2	5445

1. Dates are averages of 4 replications.
2. Grain yields adjusted to 8% moisture.

GRAIN PRODUCTION

In 1970, two experiments were conducted to study the interaction of irrigation intensity, nitrogen application, and soil type in the production of corn grain. One was on the Yuma mesa and the other was in the valley.

YUMA MESA

The soil of the experimental site is classified as Superstition loamy fine sand with a water holding capacity of 7.3 percent and a permanent wilting point of 4.2 percent. The range of 3.1 percent between the soil water at wilting point and that at field capacity was divided into five irrigation treatments. Thus, when the soil moisture was depleted to 6.7, 6.2, 5.7, 5.1 and 4.5 percent, enough water was metered into the level basin plots to replace the water used and bring the soil back to field capacity to a depth of 3 feet.

Funks variety G-4384 field corn was planted in moist soil on March 3, and irrigated lightly on March 6, 9, and 19, and April 22 for stand establishment. The irrigation treatments were begun at this point, and continued until July 8. The applied water figures in Table 5 include the irrigation for stand establishment and all subsequent irrigations.

The experimental area received a uniform application of 100 pounds of P_2O_5 and 25 pounds of N per acre during seedbed preparation, and another 50 pounds of N per acre in the irrigation water on April 22. The nitrogen variables were begun at this point by estimating the number of irrigations remaining and dividing the fertilizer accordingly for inclusion in the irrigation water. Adjustments were made as it became apparent that more or fewer irrigations would be applied.

The corn was mature by July 8, but was allowed to dry in the field until approximately July 15 before it was harvested.

Yields of shelled corn as influenced by soil type irrigation treatment and nitrogen level are shown in Table 5.

YUMA VALLEY

The soil of the Yuma Valley site is classified as Glenbar silty clay loam with approximately 30 inches of topsoil over varying layers of sand silt and clay. The field capacity is approximately 30 percent by weight with a permanent wilting point around 14 percent.

As described above, the irrigation treatments were based upon the percent of available water in the top 3 feet and were applied whenever the soil moisture was depleted to the level specified for each treatment: 22.8, 21.2, 19.6, 18.0, and 16.4 percent.

On March 2, the experimental area was irrigated with nine inches of water to saturate the soil to a depth of approximately four feet. On March 16, Funks G4384 field corn was planted in moist soil under a dry mulch. On April 24, a uniform irrigation of 3.5 inches was applied following the first side dressing of nitrogen fertilizer. The irrigation treatments were begun at this point and continued until the corn was mature. There were 3, 4, 5, and 6 irrigations per treatment including the preplant irrigation and the irrigation to activate the nitrogen. (Table 6).

One hundred pounds per acre of P_2O_5 but no nitrogen was applied during seedbed preparation. The nitrogen treatments were 0, 80, 160, 240, and 320 pounds of N per acre. The 80 and 100 pounds per acre treatments received all of the fertilizer on April 24. The 240 and 300 pounds per acre treatments

were split. Each received 160 pounds on April 24 and the remainder on March 25. The grain was mature by July 20 and harvested about July 24.

Yields of shelled corn as influenced by soil type, irrigation treatment and nitrogen level are shown in Table 6.

Table 5. Summary of treatment combinations and corresponding yields of shelled corn. Yuma Mesa. 1970.

Percent soil moisture when irrigated[1]	Number of irrigations[2]	Applied water in./acre[2]	Applied nitrogen lb./acre	Number of replicates	Yield in pounds per acre at 8.0 percent moisture[3] Average	Range
4.5	10	29.1	75	6	3071	2666 - 4030
5.6	15	35.0	75	6	3962	3496 - 4214
6.7	14	32.0	75	6	4463	4113 - 4724
5.1	13	32.3	150	3	4564	4174 - 5239
6.2	15	34.1	150	3	3598	3457 - 3686
4.5	12	31.4	225	6	3864	3784 - 4274
5.6	13	30.9	225	6	4443	4056 - 4684
6.7	15	34.6	225	6	4704	4364 - 4957
5.1	12	30.9	300	3	3202	2848 - 3723
6.2	16	36.9	300	3	3699	3496 - 3861
4.5	11	30.9	375	6	3534	3161 - 4114
5.6	14	32.7	375	6	4272	4089 - 4765
6.7	14	34.1	375	6	4898	4554 - 5284

1. Wilting point: 4.2%, Field capacity: 7.3% (1/10 atmosphere).
2. Includes 11.3 inches applied in four uniform irrigations for stand establishment.
3. Seeding rate: 40" rows; 8" seed spacing within the row.

Table 6. Summary of treatment combinations and corresponding yields of shelled corn. Yuma Valley. 1970.

Percent soil moisture when irrigated[1]	Number of irrigations[2]	Applied water in./acre[2]	Applied nitrogen lb./acre	Number of replicated	Yield in pounds per acre at 8.0 percent moisture[3] Average	Range
16.0	3	18.5	0	6	5004	3354 - 6400
19.6	5	30.5	0	6	5797	4805 - 6430
22.8	6	31.7	0	6	7225	5926 - 8216
18.0	4	25.0	80	3	7224	6782 - 7737
21.2	5	29.5	80	3	7742	7055 - 8279
16.0	3	17.5	160	6	6809	5694 - 7596
19.6	5	29.0	160	6	7287	6887 - 7449
22.8	6	32.4	160	6	8094	7734 - 8588
18.0	4	25.0	240	3	7835	7060 - 8242
21.2	5	27.5	240	3	8334	7806 - 8706
16.0	4	24.5	320	6	5952	5025 - 6965
19.6	5	29.5	320	6	8010	7619 - 8527
22.8	6	31.6	320	6	8626	8158 - 9316

1. Wilting point: 14%, Field capacity: 30%.
2. Includes 9.0 in. preplant irrigation and 3.5 in. uniform irrigation following the first nitrogen application.
3. Seeding rate: 40" rows; 8" seed spacing within the row.