Effect of Sowing Date on Growth and Yield of Local and Imported Maize Varieties (*Zea mays* L.)

M. A. EL-SHARKAWY, F. A. SOROUR, K. SGAIER AND M. E. YOUSEF[1]

ABSTRACT

A field trial was conducted in 1972 and 1973 on the effect of sowing date on growth and yield of imported and local maize varieties in Tripolitania. Planting dates from April to the middle of July were tested. Total grain yield of both local and imported varieties were greatly reduced by late sowing. The Early American variety yielded from 0.840 to 1.074 tons/ha more than the local variety in both years. Also a significant reduction in yield components and growth parameters was observed in both varieties as a result of late sowing. The local variety was significantly inferior to the Early American in respect to all growth and yield components tested.

INTRODUCTION

The response of growth and yield of maize to time of planting has been extensively reported in the literature (1,2,3,4,6,7). In Egypt, it was reported that the recommended sowing date ranges from early May to late July (3,5,8). In Italy, planting maize as early as the end of April produced higher yield than late sowing (7). Jain (2) found that photosynthetic efficiency of maize plants grown in India was highest in crops sown on early May than later dates.

No information is available on the effect of sowing date on maize in the Libyan Arab Republic. Because of the severe shortage in animal feed, it became important to investigate the possibility of growing maize as a potential source for concentrate. Therefore, the present study was initiated to obtain information on the effect of sowing date on the vegetative growth and grain yield of local as well as imported maize varieties.

MATERIALS AND METHODS

A field trial was carried out in 1972 and 1973 at the Faculty of Agriculture farm in Tripoli. In 1972 season, the experiment consisted of 4 sowing dates: 1 May, 25 May, 20

[1] *Agronomists, and Research Assistant, respectively. Plant Production Department, Faculty of Agriculture, University of Tripoli, Libya.*

June and 15 July in 4 replications. The local yellow-kernel variety and the open-pollinated Early American variety, commonly grown in Egypt, were used. In 1973 season, the same sowing dates were repeated in addition to another date 5th of April.

The experimental plot was 4 × 4 m containing 6 rows 70 cm apart. Each row consisted of 11 hills at 40 cm distance. After stand was completely established, plants were thinned to one plant per hill. Fertilizer was added in the form of 12–24–12 at the rate of 500 kg/ha in two applications after planting. Sprinkler irrigation was followed whenever needed. Growth parameters were estimated on 5 plants, whereas the yield was obtained from the 4 middle rows.

RESULTS AND DISCUSSION

Table 1 shows the grain yield of both varieties as function of sowing date within two years. The grain yield of the Early American variety was significantly higher in both years. As an average of all sowing dates, the Early American variety outyielded the local one by 1.074 tons/ha in 1972 and 0.840 tons/ha in 1973.

Date of sowing significantly affected the grain yield of both varieties. The highest grain yield was obtained from the earliest sowing dates of May first 1972 and April 5, 1973. There was a continuous reduction in yield with delay in planting date. The percentage reduction in grain yield of the latest date as compared with earliest date were 46% and 48% for the local variety; 57% and 63% for the Early American variety in 1972 and 1973, respectively. Since both varieties were highly responsive to planting date, it might be concluded that the optimum sowing date of maize in Tripolitania lies between the first of April and the first of May.

The effects of sowing date on size of kernel were significant in both years (Table 2). The delay in sowing significantly reduced size of kernel in both varieties. Compared with the earliest date, the size of kernel of local variety at the latest date was 21% and 26% less in 1972 and 1973. On the other hand, the kernel size of the Early American variety at the latest dates of 1972 and 1973 were 26 and 46% smaller than the earliest date. From this result it appears that size of kernel is greatly sensitive to time of planting and the later the planting the smaller the kernel produced. Such effect is reflected on reduction of yield.

Compared with the local variety, the Early American was more sensitive to sowing date in respect to kernel size. The reduction in size of kernel with delay in planting was greater in the case of Early American variety than the local (average 36% reduction over two years compared with 23%).

As shown in Table 3, the length of the topmost ear in both varieties over the two years test was greatly reduced by late sowing. The percentage reductions in ear length between the earliest and latest sowing dates were 25 and 32% in 1972 and 1973. This reduction in ear length due to late planting could account, at least in part, for the reduction in grain yield.

Compared with the local variety, the Early American did not differ significantly in respect of ear length at the late planting; whereas its ear was significantly longer at the earliest sowing date. As an average of all sowing dates the ear of the Early American was significantly longer in both years by 5.4 and 4.2 cm.

The response of ear diameter to sowing date is shown in Table 4. In 1972 experiment, the reduction in ear diameter between the earliest and the latest date was 28 and 26% for the local and the Early American varieties. The percentage reduction in ear diameter due to late sowing was greater in 1973; 36 and 37% for the local and the Early American. It appears from this result that the reduction in grain yield by late planting (Table 1) could be partially attributed to the reduction in ear diameter.

Table 1 Effect of Sowing date on grain yield of the local and the Early American varieties of maize (tons/ha).

Sowing date	1972				1973			
	Local variety	Early American	Difference between varieties	Average of sowing dates	Local variety	Early American	Difference between varieties	Average of sowing dates
April 5	—	—	—	—	5.803	7.500	1.697[1]	6.651
May First	4.732	6.071	1.339[1]	5.401	4.821	6.071	1.250[1]	5.44
May 25	4.330	5.634	1.304[1]	4.982	4.107	5.357	1.250[1]	4.732
June 20	2.982	4.553	1.571[1]	3.767	3.660	3.928	0.268[N.S.]	3.794
July 15	2.553	2.634	0.081[N.S.]	2.593	3.036	2.768	−0.268[N.S.]	2.902
Average of varieties	3.649	4.723	—	—	4.285	5.125	—	—
Difference between varieties irrespective of dates		1.074[2]	—	—		0.840[2]	—	—
L.S.D. at 5% for dates irrespective of varieties		—	—	0.543		—	—	0.488

[1] = Significant at 5%
[2] = Significant at 1%
N.S. = Not significant
L.S.D. at 5% for dates × varieties (1973) = 0.690 tons/ha.

Table 2 Effect of sowing date on kernel size of the local and the Early American varieties of maize (g/1,000 kernel).

Sowing date	1972				1973			
	Local variety	Early American	Difference between varieties	Average of sowing dates	Local variety	Early American	Difference between varieties	Average of sowing dates
April 5	—	—	—	—	246.3	415.0	168.7[2]	330.7
May First	242.5	360.0	117.5[1]	301.3	241.3	378.8	137.5[2]	310.0
May 25	220.0	352.5	132.5[2]	286.3	208.8	348.8	140.0[1]	278.8
June 20	191.3	293.8	102.5[2]	242.6	190.0	257.5	67.5[2]	223.8
July 15	192.5	265.0	72.5[2]	228.8	182.5	225.0	42.5[1]	203.8
Average of varieties	211.58	317.80	—	—	213.8	325.0	—	—
Difference between varieties irrespective of dates	106.22[2]		—	—	111.2[2]		—	—
L.S.D. at 5% for dates irrespective of varieties	—	—	—	28.7	—	—	—	24.7

[1] = Significant at 5%
[2] = Significant at 1%
L.S.D. at 5% for dates × varieties: 1972 = 40.5 g/1,000 kernels
1973 = 34.9 g/1,000 kernels

Table 3 Effect of sowing date on the topmost ear length of the local and the Early American varieties of maize (cm).

Sowing date	1972				1973			
	Local variety	Early American	Difference between varieties	Average of sowing dates	Local variety	Early American	Difference between varieties	Average of sowing dates
April 5	—	—	—	—	19.6	23.8	4.2[2]	21.7
May First	17.3	23.2	5.9[1]	20.3	19.7	24.6	4.9[2]	22.2
May 25	15.7	22.6	6.9[2]	19.2	19.0	23.4	4.4[2]	21.2
June 20	14.3	19.6	5.3[1]	17.0	14.2	18.5	4.3[N.S.]	16.4
July 15	13.6	16.9	3.3[N.S.]	15.3	13.2	16.1	2.9[N.S.]	14.7
Average of varieties	15.2	20.6	—	—	17.1	21.3	—	—
Difference between varieties irrespective of dates	5.4[2]		—	—	4.2[2]		—	—
L.S.D. at 5% for dates irrespective of varieties	—		—	1.8	—		—	1.5

[1] = Significant at 5%
[2] = Significant at 1%

Table 4 Effect of sowing date on the topmost ear diameter of the local and the Early American varieties of maize (cm).

Sowing date	1972				1973			
	Local variety	Early American	Difference between varieties	Average of sowing dates	Local variety	Early American	Difference between varieties	Average of sowing dates
April 5	—	—	—	—	4.4	5.2	0.8[1]	4.8
May First	3.9	4.7	0.8[1]	4.3	4.6	5.5	0.9[2]	5.1
May 25	3.4	4.2	0.8	3.8	4.1	5.0	0.9[2]	4.6
June 20	2.9	3.8	0.9[2]	3.4	3.0	3.8	0.8[1]	3.4
July 15	2.8	3.5	0.7[1]	3.2	2.8	3.3	0.5[N.S.]	3.1
Average of varieties	3.3	4.1	—	—	3.8	4.6	—	—
Difference between varieties irrespective of dates		0.8[2]	—	—		0.8[2]	—	—
L.S.D. at 5% for dates irrespective of varieties		—	—	0.2		—	—	0.3

[1] = Significant at 5%
[2] = Significant at 1%
N.S. = Not significant

Table 5 Effect of sowing date on the topmost ear height of the local and the Early American varieties of maize (cm).

Sowing date	1972				1973			
	Local variety	Early American	Difference between varieties	Average of sowing dates	Local variety	Early American	Difference between varieties	Average of sowing dates
April 5	—	—	—	—	127.5	171.3	43.8[2]	149.4
May first	131.3	158.8	27.5[2]	145.1	113.8	155.0	41.2[2]	134.4
May 25	126.3	150.0	23.7[2]	138.2	102.5	137.5	35.0[2]	120.0
June 20	116.3	140.0	23.7[1]	128.2	90.0	135.0	45.0[2]	112.5
July 15	95.0	132.5	37.5[2]	113.8	78.8	120.0	41.2[1]	99.4
Average of varieties	117.2	145.3	—	—	102.5	143.8	—	—
Differences between varieties irrespective of dates	28.1[2]		—	—	41.3[2]		—	—
L.S.D. at 5% for dates irrespective of varieties	—		—	6.2	—		—	7.3

[1]= Significant at 5%
[2]= Significant at 1%

Table 6 Effect of sowing date on plant height of the local and the Early American varieties of maize (cm).

Sowing date	1972				1973			
	Local variety	Early American	Difference between varieties	Average of sowing dates	Local variety	Early American	Difference between varieties	Average of sowing dates
April 5	—	—	—	—	236.3	316.3	80.0[1]	276.3
May First	233.8	332.5	98.7[1]	283.2	217.5	298.8	81.3[1]	258.2
May 25	223.8	320.0	96.2[1]	271.9	193.8	275.0	81.2[1]	234.4
June 20	213.8	303.8	90.0[1]	258.8	167.5	246.3	78.8[1]	206.9
July 15	191.3	275.0	83.7[1]	233.2	143.8	230.0	86.2[1]	186.9
Average of varieties	215.7	307.8	—	—	191.8	273.3	—	—
Differences between varieties irrespective of dates	92.1[2]		—	—	81.5[1]		—	—
L.S.D. at 5% for dates irrespective of varieties	—		—	14.3	—		—	17.0

[1] = Significant at 1%

The difference in ear diameter between the two varieties was significant in both years, with the Early American possessing the larger ear diameter. Such difference in ear diameter could account, at least in part, for the superiority of the Early American in grain yield.

As indicated in Table 5, there was a significant reduction in height of topmost ear by late sowing in both years. However, the reduction was more in 1973 reaching 38 and 30 %, compared with 28 and 17 % in 1972 for local and the Early American. As an average of both varieties, late planting reduced the ear height by 22 and 33 % compared with early planting in 1972 and 1973.

The topmost ear of the Early American was significantly higher than the local variety at all sowing dates in both years.

Plant height of both varieties was reduced by delay in sowing in the two-years experiment (Table 6). The percentage reduction in plant height between the earliest and latest date was 18 and 17 % in 1972 and 39 and 27 % in 1973 for the local and the Early American. From this finding it appears that the vegetative growth, as measured by plant height, declined by late planting. Since grain yield and its components were significantly reduced by delay in planting, it can be concluded that the adverse effect of late sowing on vegetative growth is reflected upon grain yield. The Early American variety was superior in vegetative growth, as measured by plant height, at all sowing dates in both years. Such superiority led to a higher yielding capacity than the local variety.

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