RESPONSE OF SOME EGYPTIAN GENOTYPES TO VARIED CLIMATIC MEASUREMENTS OVER VARIED ENVIRONMENTS

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Abstract

The response of three Egyptian cotton cultivars to three measurements (maximum, minimum and average) of three climatic variables (air temperature, soil temperature and relative humidity) was studied. Significant and negative correlation coefficients between lint yield of Giza 89 cultivar and mean of daily maximum air temperature were noticed over five periods. The five periods were middle of June, beginning of July, middle of August, last of August and last of September. For Giza 83 and Giza 85 cultivars, correlation coefficient between lint yield and mean of daily maximum air temperature, at last of September, was negative and significant. The correlation coefficient between lint yield of Giza 89 and average of daily minimum relative humidity was significant and positive over all periods except the three intervals of May and last of July.

The contribution percentage of maximum air temperature to lint yield variance revealed that Giza 85 cultivar showed the highest response during the last third of August. Giza 83, which is adapted to high temperature, showed low response to the maximum air temperature during the beginning of April. Meanwhile, it showed the highest response to the minimum air temperature during beginning of May, last of June and last of July. For maximum soil temperature, at 20 cm. depth, Giza 85 showed the highest response during last of April, last of May and beginning of July. Giza 83 showed the highest response to the minimum soil temperature during beginning of May, beginning of August and middle of September. Giza 89 showed the highest response to the minimum relative humidity during beginning of April, middle of June, beginning of July, middle of August and middle of September.

Introduction

Thompson (1986) studied relationship between climate and relative performance of cotton. He noticed that some cultivars showed a strong significant linear association of performance with one or more of the climatic indices measured. They were either more or less advantaged by warm dry conditions than the standard and vice versa for cool wet conditions. Reddy *et .al.* (1991) reported that the optimum day / night temperature for bolls and squares development was 20 / 30 degrees C. Slower development was noticed at the lower temperature than 20 / 30 degrees C. Above this temperature most of squares and bolls were aborted. Reddy *et. al.* (1992) studied the effect of varied day / night temperatures on growth traits of cotton. They found that all squares abscised from plants grown at 40 / 32 degrees C. All bolls and squares were retained at 30 / 22 degrees C during the early productive period while a 10 bolls and squares loss was observed at 35 / 27 degrees C.

In 1998 season, the temperature was higher than usual. The high temperature was accompanied with a reduction in the yield. The cultivars grown in middle and upper Egypt (which are adapted to high temp- erature) were not affected seriously like those grown over Nile Delta of Egypt. Therefore this investigation was designed to compare the response of three cultivars (Giza 89,Giza 85 and Giza 83) to three climatic variables (air temperature, soil temperature and relative humidity). Among the three cultivars, only Giza 83 is adapted to high temperature.

Materials and Methods

Three Egyptian cotton cultivars (Giza 89, Giza 85 and Giza 83) were grown at seven locations over two seasons (1998 and 1997). Both Giza 89 and Giza 85 cultivars are a long staple cultivars and they are adapted for the Nile Delta of Egypt where the temperature is relatively lower than Middle and Upper Egypt. Giza 83 is a long staple cultivar, which is adapted to high temperature at Upper Egypt. The seven locations were Damyeta, El-Bhera, El-Gharbia, El-Menofya, El-Fayoum, El-Menia and Sohag. Four locations (Damyeta, El-Bhera, El-Gharbia and El-Menofya) were distributed over the Nile Delta of Egypt. Two locations (El-Fayoum and El-Menia) were located in Middle Egypt. The last location (Sohag) was located in Upper Egypt.

The effect of three climatic variables (air temperature, soil temperature and relative humidity) on lint yield of the three cultivars was studied. Three measurements (maximum , minimum and average) were recorded as a mean over three intervals for each month . The time of each interval is a third of month. The three intervals were beginning of the month (B), middle of the month (M) and last of the month (L). Six months (April, May, June, July, August and September) were studied over the growing season. The effect was studied for each month separately.

The relationship between lint yield and each measurement of the three climatic variables was studied by the simple correlation coefficient (Steel and Torrie 1980). The response of the cultivars and the regression equations were studied by stepwise regression analysis (Draper and Smith 1966).

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 1:553-560 (2000)
National Cotton Council, Memphis TN

Results and Discussion

1- Effect of Air Temperature:

a) Daily Maximum Air Temperature (DMAT):

Table 1 shows the correlation coefficient between lint yield and mean of DMAT for the three cultivars. The results showed that Giza 89 exhibited negative and significant (p=0.01 and 0.05) correlation coefficient over five intervals . The five intervals were middle of June, beginning of July, middle of August, last of August and last of September. Negative and significant (p=0.05) correlation coefficient was noticed for Giza 85 at the last of September only. Giza 83 showed negative and significant (p=0.05) correlation coefficient at two intervals (last of August and September). These results may indicate that increasing the maximum air temperature was more harmful for Giza 89 cultivar than Giza 85 and Giza 83 cultivars.

The percentage contribution of DMAT mean to lint yield variance is shown in Fig. 1. The results showed that the maximum contribution (68.4%) was for Giza 85 at the last of August interval. For Giza 83, the DMAT had slight contribution to the variance of its lint yield at the beginning of April only. Similar results was obtained for Giza 89 at the beginning of April and last of August. These results may lead to the conclusion that DMAT had very slight effect on lint yield of Giza 83 (which is adapted to the high temperature).

b) Daily Minimum Air Temperature (DNAT):

The simple correlation coefficient between lint yield and DNAT is shows in Table 2. Both Giza 89 and Giza 85 showed significant (p=0.05) and negative correlation coefficient at the beginning of June only. Giza 83 showed different trend where the negative correlation coefficient, between lint yield and DNAT, was significant at the middle of August only. The results obtained may indicate that increasing the DNAT, at the beginning of June, caused a reduction in lint yield of Giza 89 and Giza 85. Meanwhile, Giza 83 tolerated this harmful effect till the middle of August.

Fig. 2 shows the percentage contribution of DNAT to lint yield variance. The results showed that the DNAT contributed to the variance of lint yield of Giza 85 at five intervals (middle of May, last of May, beginning of June, middle of June and last of July). The maximum contribution (30.07%) was at the beginning of June. For Giza 89 cultivar, the maximum contribution (24.09%) was at middle of May. The maximum contribution (27.88%) for lint yield of Giza 83 was at the beginning of May. These results may indicate that DNAT is more important for the variance of lint yield than DMAT, especially for the cultivars, which showed slight response to DMAT (Giza 89 and Giza 83).

c) Daily Average of Air Temperature (DAAT):

Table 3 shows the correlation coefficient between DAAT and lint yield for the three cultivars. The results exhibited that Giza 89 showed negative and significant (p=0.01 and 0.05) correlation coefficient at six intervals (beginning of June, middle of June, beginning of July, middle of August, last of August and last of September). The negative correlation coefficient between lint yield and DAAT was significant (p=0.01 and 0.05) at the last of September only for Giza 85 and Giza 83. These results may lead to conclude that increasing the air temperature (maximum or average) through the flowering or fruiting periods caused a reduction in lint yield of Giza 89 cultivar. This result may attributed to the harmful effect of the high temperature on boll set, boll retention, boll opening and maturity. Both of Giza 83 and Giza 85 were affected at the end of the season only through affecting both boll opening and maturity.

The percentage contribution of DAAT to lint yield is presented in Fig. 3. The results showed that the DAAT exhibited the maximum contribution to the variance of each of the three cultivars at last of September. The results obtained for DAAT were mostly similar to that obtained for DMAT.

2- Effect of Soil Temperature:

a) Daily Maximum Soil Temperature (DMST):

The correlation coefficient between DMST and lint yield is presented in Table 4. The results showed that all cultivars exhibited insignificant correlation coefficient over all intervals.

The percentage contribution of DMST to lint yield of Giza 85 was higher than both Giza 89 and Giza 83 (Fig. 4). The lint yield variance of Giza 83 seems to be less affected by DMST than the other two cultivars.

b) Daily Minimum Soil Temperature (DNST):

The correlation coefficient between DNST and lint yield is presented in Table 5. The results showed that all cultivars exhibited insignificant correlation coefficient over all intervals.

The percentage contribution of DNST to lint yield of Giza 83 was higher than both Giza 89 and Giza 85 (Fig. 5). This result was noticed over four intervals (beginning of May, beginning of August, last of August and middle of September). The lint yield variance of Giza 83 seems to be less affected by DMST than the other two cultivars. The results obtained for Giza 83 were similar to that obtained for air temperature where it responded slightly to maximum temperature while its response to minimum temperature was higher.

c) Daily Average of Soil Temperature (DAST):
The correlation coefficient between DAST and lint yield is presented in Table 6. The results showed that all cultivars exhibited insignificant correlation coefficient over all intervals.

The percentage contribution of DAST to lint yield of Giza 83 (at the last of April) and Giza 89 (at the beginning of August) was higher than Giza 85 (Fig. 4). The lint yield variance of Giza 85 seems to be less affected by DMST than the other two cultivars.

3- Effect of Daily Relative Humidity:

a) Daily Maximum Relative Humidity (DMRH):
The correlation coefficient between lint yield and DMRH was insignificant for all cultivars over all periods (Table 7). The percentage contribution of DMRH to lint yield of Giza 83 was 15.79% at the beginning of September only (Fig. 7). The percentage contribution of DMRH to lint yield of Giza 85 was 9.13% at the last of September only. The lint yield of Giza 89 was not affected by DMRH.

b) Daily Minimum Relative Humidity (DNRH):
Significant (p=0.01 and 0.05) and positive correlation coefficient between lint yield of Giza 89 was obtained over all intervals except the three intervals of May and last of July. Similar result was obtained for Giza 85 and Giza 83 over beginning of April and middle and last of September and for Giza 83 over middle of April (Table 8).

Fig. 8 showed that lint yield of Giza 89 exhibited the highest response to DNRH over five intervals (beginning of April, middle of June, middle of August and middle of September). Lint yield of Giza 85 showed high response over three intervals (beginning of April, beginning of June and beginning of July). Giza 83 showed high response over middle of April, last of April and beginning of June. These results may indicate that the minimum relative humidity was important for lint yield than maximum relative humidity.

c) Daily Average Relative Humidity (DARH):
Significant (p=0.01 and 0.05) and positive correlation coefficient between lint yield of Giza 89 was obtained over all intervals except the three intervals of May, beginning of June and last of July. Similar result was obtained for Giza 85 over middle of April. and for Giza 83 over beginning of April, middle of April and middle of September (Table 9).

Lint yield of Giza 83 showed the highest response to DARH over middle of July and last of September. Slight response was shown by Giza 85 at the middle of June. Lint yield of Giza 89 was not affected by DARH (Fig. 9).

Regression Equations:

1) For Giza 85 Cultivar:

In April, two variables were responsible for 60.79% of the total variance of lint yield. The two variables were minimum relative humidity at the beginning of the month (X_5) maximum soil temperature at the end of the month (X_{25}). The regression equation was :

$$\hat{y} = - 49.38 + 0.53 X_5 + 1.81 X_{25}$$

In May, three variables were responsible for 73.93% of the total variance of lint yield. The three variables were minimum air temperature at the middle of the month (X_{11}), maximum soil temperature at the end of the month (X_{25})and minimum air temperature at the middle of the month (X_{20}). The regression equation was :

$$\hat{y} = 22.93 - 2.14 X_{11} + 1.89 X_{25} - 1.69 X_{20}$$

In June, five variables accounted for 87.72% of the total variance of lint yield. The five variables were minimum air temperature at the beginning of the month (X_2), maximum soil temperature at the end of the month (X_{25}), minimum relative humidity at the beginning of the month (X_5), minimum air temperature at the middle of the month (X_{11}) and average relative humidity at the middle of month (X_{15}). The regression equation was:

$\hat{y}$ = -56.79 – 6.76 X_2 +2.78 X_{25} + 0.67 X_5 + 5.21 X_{11} – 0.31 X_{15}

In July, three variables accounted for 75.53% of the total variance of lint yield. The three variables were minimum relative humidity at the beginning of the month (X_5), maximum soil temperature at the last of the month (X_7) and minimum air temperature at the middle of the month (X_{20}). The regression equation was:

$$\hat{y} = -30.25 + 0.36 X_5 + 1.99 X_7 - 1.56 X_{20}$$

In August, three variables accounted for 75.41% of the total variance of lint yield. The three variables were minimum soil temperature at the beginning of the month (X_8), maximum air temperature at the last of the month (X_{19}) and minimum soil temperature at the last of the month (X_{20}). The regression equation was:

$$\hat{y} = 13.47 + 2.57 X_8 - 1.73 X_{19} - 0.72 X_{27}$$

In September, four variables were responsible for 84.09% of the total variance of lint yield. The four variables were average air temperature at the last of the month (X_{21}), maximum relative humidity at the last of the month (X_{22}), average soil temperature at the middle of the month (X_{18}) and minimum soil temperature at the last of the month (X_{26}).

$$\hat{y} = 19.31 – 3.45 X_{21} + 0.41 X_{22} + 3.13 X_{18} – 1.88 X_{26}$$

2- <u>For Giza 89 Cultivar:</u>

In April, three variables were responsible for 69.50% of the total variance of lint yield. The three variables were minimum relative humidity at the beginning of the month (X_5), average soil temperature at the end of the month (X_{27}) and maximum air temperature at beginning of the month (X_1). The regression equation was:

$$\hat{y} = - 20.34 + 0.30 X_5 + 1.82 X_{27} – 0.91 X_1$$

In May, three variables were responsible for 73.29% of the total variance of lint yield. The three variables were minimum air temperature at the middle of the month (X_{11}), maximum soil temperature at the end of the month (X_{25}). and average air temperature at the last of the month (X_{21}). The regression equation was:

$$\hat{y} = 20.75 – 1.73 X_{11} + 2.07 X_{25} – 1.62 X_{21}$$

In June, four variables accounted for 81.33% of the total variance of lint yield. The four variables were minimum relative humidity at the middle of the month (X_{14}), maximum soil temperature at the end of the month (X_{25}), minimum air temperature at the beginning of the month (X_2) and minimum air temperature at the middle of the month (X_{11}). The regression equation was:

$$\hat{y} = -44.3 + 0.39 X_{14} + 1.84 X_{25} - 3.84 X_2 + 1.81 X_{11}$$

In July, two variables accounted for 71.5% of the total variance of lint yield. The two variables were minimum relative humidity at the beginning of the month (X_5) and maximum soil temperature at the middle of the month (X_{16}). The regression equation was:

$$\hat{y} = -57.65 + 051 X_5 + 139 X_{16}$$

In August, three variables accounted for 84.34% of the total variance of lint yield. The three variables were minimum relative humidity at the middle of the month (X_{14}), average soil temperature at the beginning of the month (X_9) and maximum air temperature at the last of the month (X_{19}) and. The regression equation was:

$$\hat{y} = -14.82 + 0.23 X_{14} + 1.94 X_9 - 1.37 X_{19}$$

In September, three variables were responsible for 79.16% of the total variance of lint yield. The three variables were average air temperature at the last of the month (X_{21}), average soil temperature at the middle of the month (X_{18}) and minimum relative humidity at the middle of the month (X14).

$$\hat{y} = 35.19 – 2.78 X_{21} + 1.24 X_{17} + 0.20 X_{14}$$

3- <u>For Giza 83 Cultivar:</u>

In April, four variables were responsible for 80.15% of the total variance of lint yield. The four variables were minimum relative humidity at the middle of the month (X_{14}), maximum soil temperature at the last of the month (X_{25}), maximum air temperature at the beginning of the month (X_1) and minimum relative humidity at last of the month (X_{23}). The regression equation was:

$$\hat{y} = -17.31 + 0.96 X_{14} + 2.01 X_{225} – 1.15 X_1 – 0.64 X_{23}$$

In May, two variables were responsible for 53.61% of the total variance of lint yield. The two variables were minimum air temperature at the beginning of the month (X_2) and minimum soil temperature at the beginning of the month (X_8). The regression equation was:

$$\hat{y} = 8.40 – 1.58 X_2 + 1.26 X_8$$

In June, three variables accounted for 65.54% of the total variance of lint yield. The four variables were minimum relative humidity at the beginning of the month (X_5), maximum soil temperature at the end of the month (X_{25}) and minimum air temperature at the last of the month (X_{20}). The regression equation was:

$$\hat{y} = -23.49 + 0.53\ X_5 + 1.92X_{25}\ -1.87\ X_{20}$$

In July, three variables accounted for 70.46% of the total variance of lint yield. The three variables were average relative humidity at the middle of the month (X_{15}), maximum soil temperature at the beginning of the month (X_7) and minimum air temperature at the last of the month (X_{20}). The regression equation was:

$$\hat{y} = -21.07 + 0.41\ X_{15} + 1.58\ X_7\ -1.92\ X_{20}$$

In August, four variables accounted for 82.44% of the total variance of lint yield. The four variables were average of air temperature at the middle of the month (X_{12}), minimum soil temperature at the beginning of the month (X_8), average soil temperature at the beginning of the month (X_9) and minimum soil temperature at the middle of the month (X_{17}). The regression equation was:

a) $$\hat{y} = 30.16 - 2.58\ X_{12} + 5.02\ X_8 - 4.47\ X_9 + 1.39\ X_{17}$$

In September, three variables were responsible for 74.20% of the total variance of lint yield. The three variables were average air temperature at the last of the month (X_{21}), minimum soil temperature at the middle of the month (X_{17}) and maximum relative humidity at the begining of the month (X_4).

$$\hat{y} = 35.82 - 3.37\ X_{21} + 1.12\ X_{17} + 0.32\ X_4$$

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Table 1. Correlation coefficients between maximum air temperature and lint yield of Giza 89, Giza 85 and Giza 83 cultivars.

Period	Giza 89	Giza 85	Giza 83
April (B)	-0.528	-0.423	-0.458
April (M)	-0.441	-0.355	-0.466
April (L)	-0.433	-0.324	-0.257
May (B)	-0.365	-0.225	-0.198
May (M)	-0.270	-0.128	-0.019
May (L)	-0.212	-0.050	0.017
June (B)	-0.475	-0.313	-0.278
June (M)	-0.556 *	-0.387	-0.398
June (L)	-0.437	-0.263	-0.163
July (B)	-0.560 *	-0.394	-0.339
July (M)	-0.486	-0.313	-0.290
July (L)	-0.478	-0.296	-0.323
Aug. (B)	-0.509	-0.380	-0.442
Aug. (M)	-0.627 *	-0.475	-0.518
Aug. (L)	-0.637 *	-0.493	-0.540 *
Sep. (B)	-0.427	-0.280	-0.359
Sep. (M)	-0.530	-0.379	-0.430
Sep. (L)	-0.724 **	-0.609 *	-0.615 *

*, ** Significant at p = 0.05 and p = 0.01, respectively.

Table 2. Correlation coefficients between mean of daily minimum air temperature and lint yield of the three cultivars.

Period	Giza 89	Giza 85	Giza 83
April (B)	-0.116	-0.073	-0.109
April (M)	-0.376	-0.304	-0.427
April (L)	-0.361	-0.441	-0.406
May (B)	-0.475	-0.418	-0.507
May (M)	-0.491	-0.461	-0.457
May (L)	-0.434	-0.343	-0.317
June (B)	-0.616 *	-0.548 *	-0.524
June (M)	-0.493	-0.424	-0.481
June (L)	-0.336	-0.332	-0.321
July (B)	-0.360	-0.312	-0.358
July (M)	-0.314	-0.227	-0.271
July (L)	-0.242	-0.233	-0.448
Aug. (B)	-0.336	-0.249	-0.452
Aug. (M)	-0.476	-0.417	-0.555 *
Aug. (L)	-0.237	-0.174	-0.338
Sep. (B)	-0.434	-0.381	-0.489
Sep. (M)	-0.269	-0.230	-0.348
Sep. (L)	-0.418	-0.358	-0.431

*, ** Significant at p = 0.05 and p = 0.01, respectively.

Table 3. Correlation coefficients between mean of daily average air temperature and lint yield of the three cultivars.

Period	Giza 89	Giza 85	Giza 83
April (B)	-0.496	-0.391	-0.435
April (M)	-0.424	-0.342	-0.458
April (L)	-0.461	-0.392	-0.328
May (B)	-0.426	-0.313	-0.331
May (M)	-0.344	-0.221	-0.133
May (L)	-0.305	-0.158	-0.101
June (B)	-0.567 *	-0.424	-0.389
June (M)	-0.574 *	-0.421	-0.445
June (L)	-0.474	-0.320	-0.231
July (B)	-0.580 *	-0.423	-0.391
July (M)	-0.498	-0.325	-0.315
July (L)	-0.480	-0.322	-0.410
Aug. (B)	-0.498	-0.372	-0.501
Aug. (M)	-0.629 *	-0.496	-0.581
Aug. (L)	-0.557 *	-0.426	-0.535
Sep. (B)	-0.459	-0.344	-0.442
Sep. (M)	-0.474	-0.354	-0.440
Sep. (L)	-0.734 **	-0.622 *	-0.661 **

*, ** Significant at p = 0.05 and p = 0.01, respectively.

Table 4. Correlation coefficients between mean of daily maximum soil temperature and lint yield of the three cultivars.

Period	Giza 89	Giza 85	Giza 83
April (B)	-0.275	-0.213	-0.254
April (M)	-0.263	-0.156	-0.251
April (L)	-0.092	0.041	-0.004
May (B)	-0.099	0.024	-0.004
May (M)	0.148	0.292	0.317
May (L)	0.248	0.339	0.324
June (B)	-0.066	0.066	0
June (M)	-0.064	0.053	-0.059
June (L)	0.122	0.224	0.155
July (B)	0.279	0.415	0.328
July (M)	-0.025	0.076	-0.003
July (L)	-0.025	0.100	0.035
Aug. (B)	-0.076	0.023	-0.065
Aug. (M)	-0.272	-0.140	-0.206
Aug. (L)	-0.314	-0.208	-0.247
Sep. (B)	-0.310	-0.219	-0.308
Sep. (M)	-0.296	-0.194	-0.286
Sep. (L)	-0.467	-0.421	-0.408

*, ** Significant at p = 0.05 and p = 0.01, respectively.

Table 5. Correlation coefficients between mean of daily minimum soil temperature and lint yield of the three cultivars.

Period	Giza 89	Giza 85	Giza 83
April (B)	-0.364	-0.288	-0.295
April (M)	-0.329	-0.226	-0.313
April (L)	-0.050	0.071	0.023
May (B)	-0.053	0.062	0.016
May (M)	0.048	0.179	0.196
May (L)	0.262	0.374	0.368
June (B)	-0.040	0.099	0.054
June (M)	-0.024	0.091	-0.038
June (L)	0.142	0.249	0.171
July (B)	0.055	0.168	0.059
July (M)	0.040	0.160	0.065
July (L)	-0.009	0.119	0.009
Aug. (B)	0.087	0.223	0.109
Aug. (M)	-0.172	-0.037	-0.046
Aug. (L)	-0.258	-0.143	-0.163
Sep. (B)	-0.323	-0.216	-0.284
Sep. (M)	-0.250	-0.133	-0.195
Sep. (L)	-0.430	-0.334	-0.294

*, ** Significant at p = 0.05 and p = 0.01, respectively.

Table 6. Correlation coefficients between mean of daily average soil temperature and lint yield of the three cultivars.

Period	Giza 89	Giza 85	Giza 83
April (B)	-0.322	-0.253	-0.276
April (M)	-0.299	-0.194	-0.286
April (L)	-0.027	0.091	0.042
May (B)	-0.076	0.043	0.007
May (M)	0.099	0.237	0.259
May (L)	0.256	0.359	0.349
June (B)	-0.057	0.081	0.024
June (M)	-0.047	0.072	-0.050
June (L)	-0.127	0.231	0.155
July (B)	0.173	0.305	0.205
July (M)	0.002	0.117	0.027
July (L)	-0.018	0.107	0.018
Aug. (B)	0.003	0.122	0.018
Aug. (M)	-0.235	-0.094	-0.136
Aug. (L)	-0.302	-0.186	-0.216
Sep. (B)	-0.334	-0.230	-0.308
Sep. (M)	-0.280	-0.167	-0.247
Sep. (L)	-0.471	-0.395	-0.369

*, ** Significant at p = 0.05 and p = 0.01, respectively.

Table 7. Correlation coefficients between mean of daily maximum relative humidity and lint yield of the three cultivars.

Period	Giza 89	Giza 85	Giza 83
April (B)	0.407	0.408	0.400
April (M)	0.507	0.503	0.538 *
April (L)	0.463	0.460	0.481
May (B)	0.464	0.422	0.414
May (M)	0.418	0.383	0.369
May (L)	0.387	0.366	0.342
June (B)	0.277	0.278	0.295
June (M)	0.359	0.344	0.366
June (L)	0.398	0.391	0.365
July (B)	0.360	0.366	0.367
July (M)	0.347	0.362	0.437
July (L)	0.321	0.350	0.451
Aug. (B)	0.337	0.333	0.394
Aug. (M)	0.253	0.251	0.347
Aug. (L)	0.283	0.281	0.384
Sep. (B)	0.312	0.314	0.444
Sep. (M)	0.303	0.299	0.456
Sep. (L)	0.421	0.408	0.442

*, ** Significant at p = 0.05 and p = 0.01, respectively.

Table 8. Correlation coefficients between mean of daily minimum relative humidity and lint yield of the three cultivars.

Period	Giza 89	Giza 85	Giza 83
April (B)	0.613 *	0.541 *	0.593 *
April (M)	0.597 *	0.527	0.596 *
April (L)	0.607 *	0.496	0.519
May (B)	0.379	0.290	0.236
May (M)	0.303	0.151	0.092
May (L)	0.275	0.155	0.132
June (B)	0.532 *	0.429	0.530
June (M)	0.625 *	0.452	0.453
June (L)	0.603 *	0.453	0.406
July (B)	0.667 **	0.520	0.464
July (M)	0.614 **	0.468	0.446
July (L)	0.518	0.364	0.309
Aug. (B)	0.637 **	0.480	0.427
Aug. (M)	0.645 *	0.486	0.434
Aug. (L)	0.642 *	0.493	0.446
Sep. (B)	0.618 *	0.461	0.436
Sep. (M)	0.680 **	0.553 *	0.565 *
Sep. (L)	0.621 *	0.553 *	0.580 *

*, ** Significant at p = 0.05 and p = 0.01, respectively.

Table 9. Correlation coefficients between mean of daily average relative humidity and lint yield of the three cultivars.

Period	Giza 89	Giza 85	Giza 83
April (B)	0.559 *	0.516	0.544 *
April (M)	0.576 *	0.534 *	0.590 *
April (L)	0.566 *	0.502	0.525
May (B)	0.466	0.398	0.367
May (M)	0.411	0.310	0.271
May (L)	0.384	0.317	0.291
June (B)	0.444	0.393	0.455
June (M)	0.545 *	0.447	0.461
June (L)	0.566 *	0.477	0.437
July (B)	0.589 *	0.505	0.473
July (M)	0.588 *	0.495	0.515
July (L)	0.527	0.429	0.438
Aug. (B)	0.622 *	0.503	0.489
Aug. (M)	0.593 *	0.471	0.471
Aug. (L)	0.597 *	0.486	0.502
Sep. (B)	0.568 *	0.463	0.510
Sep. (M)	0.606 *	0.513	0.582 *
Sep. (L)	0.553 *	0.514	0.560

*, ** Significant at p = 0.05 and p = 0.01, respectively.

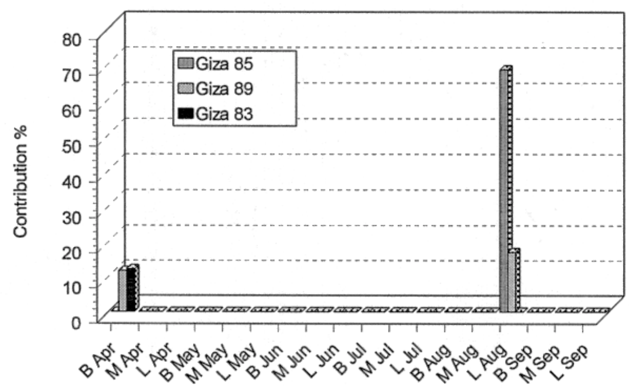

Figure 1. Percentage contribution of maximum daily air temperature mean to variance of lint yield.

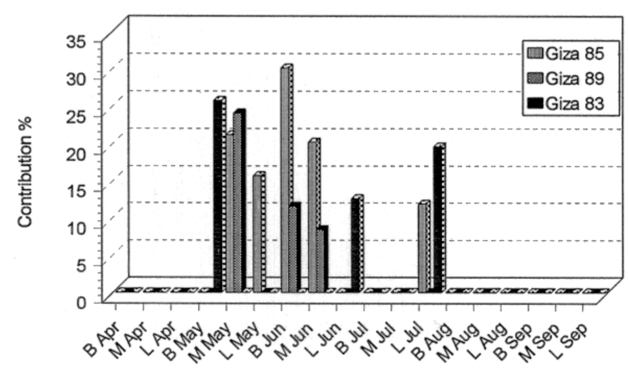

Figure 2. Percentage contribution of minimum daily air temperature mean to variance of lint yield.

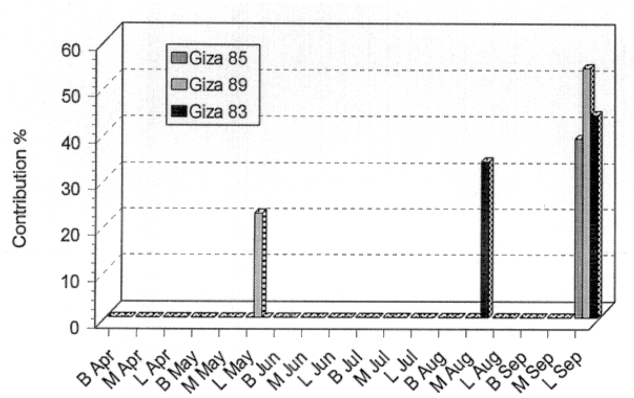

Figure 3. Percentage contribution of average daily air temperature mean to variance of lint yield.

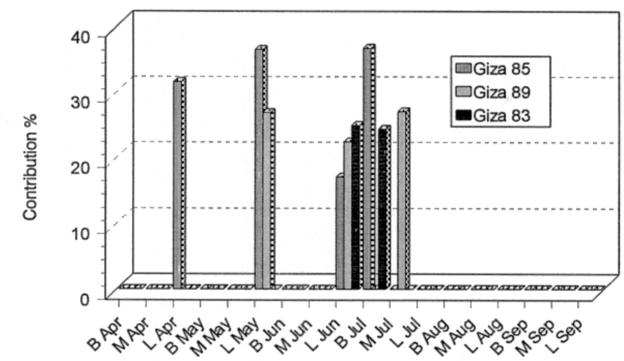

Figure 4. Percentage contribution of maximum daily soil temperature mean to variance of lint yield.

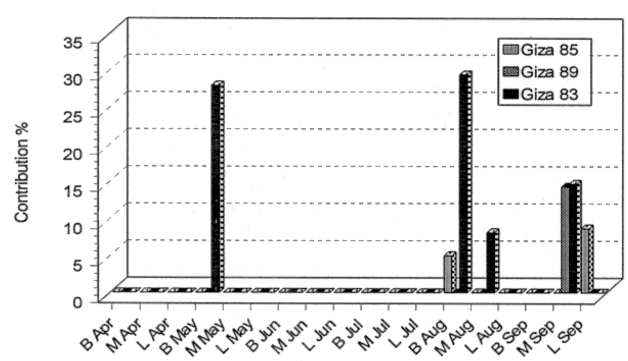

Figure 5. Percentage contribution of minimum daily soil temperature mean to variance of lint yield.

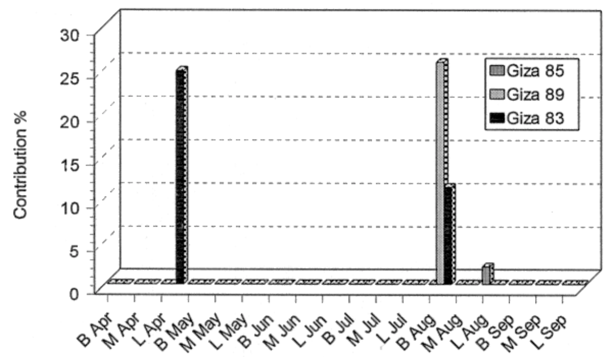

Figure 6. Percentage contribution of average daily soil temperature mean to variance of lint yield.

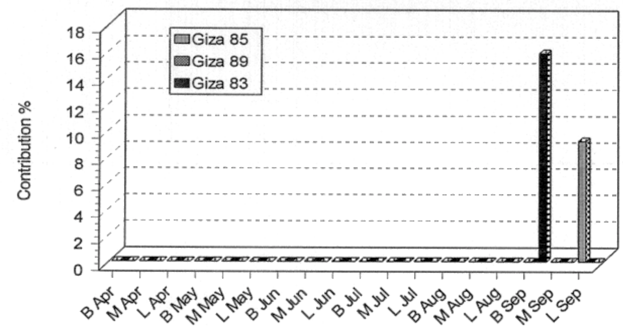

Figure 7. Percentage contribution of maximum daily relative humidity mean to variance of lint yield.

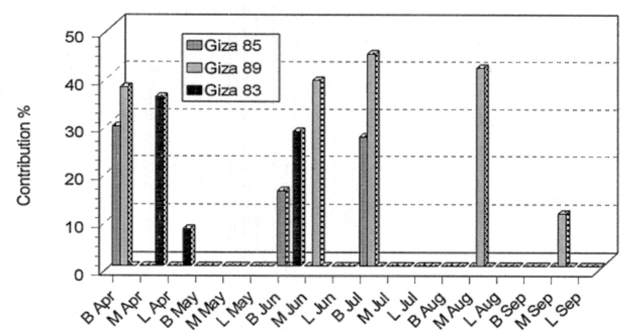

Figure 8. Percentage contribution of minimum daily relative humidity mean to variance of lint yield.

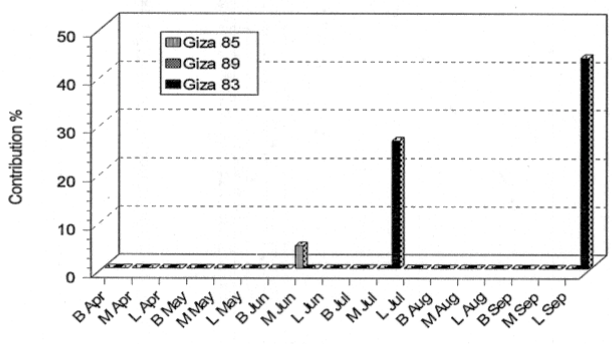

Figure 9. Percentage contribution of average daily relative humidity mean to variance of lint yield.