Yield and Technological Characteristics in Advanced Cotton (*Gossypium hirsutum* L.) Lines Under Drought Stress Conditions

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Abstract: The objective of this study was to develop better yielding and high quality cotton varieties under drought stress conditions. Five cotton lines as known drought tolerant (Blightmaster, Sicala 33, Tamcot CD 3H, Cabu CS 2-1-83 and Kurak 2) and 3 testers (Maraş 92, Erşan 92 and Stoneville 453) were crossed in the Line x Tester mating design at Southeastern Anatolia Agricultural Research Institute in 2001. Selected 42 hybrid lines obtained from breeding program from 2001 to now (Stage F_6) and check cultivars were grown in the augmented design with 6 replications at the same experimental area under induced drought stress conditions in 2007. According to results; analysis of variance indicated that there were non-significant differences among the genotypes for all of the investigated characters except for fiber fineness and fiber elongation. However, most of the lines had higher values than check varieties in terms of seed cotton yield, fiber yield, ginning percentage, first picking percentage, fiber length, fiber fineness, fiber strength and fiber uniformity. The result of this study showed that some of the lines had better yield and technological characteristics than check varieties under water stress conditions. The lines which had higher values than check varieties were selected for next generations, according to next year's results; it will be decided for registration of the promising lines.

Key Words: Cotton (*Gossypium hirsutum* L.), Drought Stress, Yield , Technological Characteristics

INTRODUCTION

It is estimated that atmospheric CO_2 concentration will be doubled and subsequently this will affect climatic parameters such as temperature in the latter of half of the 21st century (Hodges and McKinion, 1996). Turkey has been indicated as one of the most affected countries. It is said that climatic changes have more effect on C_3 plants such as cotton (Unay and Basal, 2005)

Water is the most limiting factor in cotton production and numerous efforts have been made to improve cotton drought tolerance. Cotton is normally not classified as a drought tolerant crop as are some other plants species such as sorghum (*Sorghum bicolor*) which is cultivated in areas normally too hot and dry to grow other crops (Poehlman, 1986). Nevertheless, cotton does have mechanisms that make it well adapted to semi-arid regions, such as its deep penetrating and extensive root systems, leaves, fruits that can be shed when plants are stressed, and a flexible fruiting period (Ray *et al*., 1974).

One aim of cotton breeding program is to produce cultivar for dryland production systems that have high yield potential and enhanced water use efficiency in addition to tolerance to water stress. Among to abiotic stresses, water stress is the most yield limiting factor in cotton. Therefore, selection for drought tolerance is important for plant breeders in cotton. If a genotype can maintain optimum relative water content, or does not allow high rate of water loss from the leaf surface or by developing lower stomatal size and frequency without decreasing net photosynthesis, it would help plant producing good yield under drought stress. So lower excised leaf water loss, lower transpiration rate (lower stomatal size and frequency) and higher relative water content in leaf has been reported as selection criteria to breed plants against drought stress (Clarke & McCaig, 1982; Malik & Wright, 1997, 1999; Rahman *et al*., 2000).

By reason of global warming the water limitation will be more important factor day by day. So, the breeders must develop cotton variety which tolerance to the water limitation and drought conditions. The objective of this study was to develop better yielding and high quality cotton varieties under drought stress conditions

MATERIALS AND METHODS

This study was conducted in the experimental field of the Southeastern Anatolia Agricultural Research Institute during the cotton growing season of 2007 in Diyarbakır, Turkey. The experiment was arranged in the augmented block design with six replications. Forty-two (42) new lines and two check varieties (Stoneville 453 and Şahin 2000) were used as plant material. The planting was made with combine cotton drilling machine on 9 May 2007; all plots received 120 kg ha^{-1} N and 60 kg ha^{-1} P_2O_5. Half of the N and all P_2O_5 were applied at sowing time and the remaining N was given at the square stage as ammonium nitrate.

Each plot consisted of 2 rows, of 12 m long at planting and only 10 m length at harvest. Between and within the row spacing were 0.70 m and 0.20 m respectively. The experiment was thinned and hoed two times by hand and three times with machine and only once herbicides was applied just before sowing. The experiment was carried out under induced drought stress conditions by irrigating only 4 times throughout the growing season. In the first and the last irrigations the traditional timing was followed, but eventually a total of only 250 mm water was applied by increasing the time interval between irrigations. Statistical analysis were performed using JMP 5.0.1 statistical software (SAS Institute Inc., 2002) and the means were grouped with LSD (0.05) test.

RESULTS AND DISCUSSION

Breeding in cotton like other crops is a continuous process. This is generally achieved by crossing varieties/genotypes with desirable traits followed by selection. In this study the experiment was carried out under induced drought stress conditions and selection was done according to field observations, high yielding and technological characteristics.

Analysis of variance revealed that non-significant differences among the genotypes for all of the investigated characters except for fiber fineness and fiber elongation. Mean values of the genotypes for the traits and LSD values are given in Table 1, Table 2 and Table 3.

As seen in Table 1 there were non significant differences among genotypes for seed cotton yield, lint yield and first picking percentage. Average seed cotton yield was 3683 kg ha^{-1} . Seed cotton yield values changed between 2030 – 5686 kg ha^{-1} and 13 new lines had higher yield than check varieties

Fiber yield values changed between 803-2203 kg ha^{-1} and average yield was 1471 kg ha^{-1}, for fiber yield. 12 lines had higher than check varieties.

First picking percentage ranged from 42.80% and 85.59% and means was 70.03%. 14 new lines had higher values than check varieties.

As seen in Table 2, there were non- significant differences among genotypes for fiber length and fiber strength. Fiber length ranged from 24.78 to 30.33 mm, average fiber length was 27.35 mm. In terms of fiber length, 7 new lines had better than compared with check varieties.

Significant differences were noted for fiber fineness. Fiber fineness (micronaire) ranged from a low of 3.90 for (SST-2) to 6.46 for (KST-6). Average micronaire value was 4.99. SST-2 (3.90 mic.) and BER-9 (4.05 mic.) had lower micronaire value than check (Table 2).

Fiber strength ranged from 22.13 to 33.73 g/tex. The highest strength value was observed for SMR-15 (33.73 g/tex) and the lowest was observed for TER-34 (22.13 g/tex) . Fiber strength value mean was 28.87 g/tex and 10 new lines had better than check varieties

Table 1 : Seed Cotton Yield, Lint Yield and First Picking Percentage of Lines/Varieties.

Line/Variety	**S Cotton Yield (kg ha^{-1})**	***Line/Variety***	**Lint Yield (kg ha^{-1})**	***Line/Variety***	**F Picking Percentage %**
SMR-15	5686,80	*BER-3*	2213,90	*KST-7*	85,59
BER-3	5463,50	*SMR-15*	2132,30	*BMR-15*	84,89
KST-7	5371,30	*KST-7*	2035,50	*KST-6*	82,71
TMR-26	5180,80	*TMR-26*	2008,20	*TMR-10*	81,61
BMR-25	4851,90	*TER-20*	1950,20	*SST-18*	81,48
TER-20	4755,20	*BMR-25*	1946,50	*BMR-25*	81,02
BST-1	4616,80	*BMR-15*	1859,90	*BST-1*	80,60
SER-11	4570,70	*BST-1*	1835,70	*TST-19*	79,16
BMR-15	4506,70	*SER-11*	1825,20	*CMR-24*	78,94
SER-30	4424,90	*SER-30*	1759,10	*BMR-22*	77,81
TMR-10	4255,20	*SER-28*	1745,20	*CMR-4*	77,48
SER-28	4176,30	*SER-21*	1679,30	*KER-6*	77,45
SER-21	4090,00	*STV 453 (C)*	1648,30	*SMR-15*	77,39
ŞAHİN 2000 (C)	4086,30	*SST-8*	1605,40	*TST-27*	77,26
SST-8	4076,60	*TMR-10*	1604,00	*ŞAHİN 2000 (C)*	76,65
TMR-21	4011,20	*SER-26*	1586,70	*TST-22*	76,56
STV 453 (C)	3977,70	*TMR-21*	1547,70	*TST-7*	76,48
SER-26	3932,30	*ŞAHİN 2000 (C)*	1547,30	*SST-2*	76,23
SMR-2	3838,50	*SMR-2*	1471,40	*TER-7*	75,31
CMR-4	3746,30	*TER-1*	1462,40	*SER-30*	74,89
BER-9	3677,80	*CMR-4*	1460,60	*TER-34*	71,81
SER-31	3567,70	*BER-9*	1410,50	*TMR-26*	71,60
TER-1	3560,30	*SMR-11*	1394,30	*SMR-2*	71,45
SER-18	3479,90	*SER-18*	1386,90	*STV 453 (C)*	70,55
KER-2	3435,30	*KER-2*	1365,80	*SER-21*	68,84
CMR-24	3407,00	*CMR-24*	1343,70	*KER-2*	68,67
SMR-11	3375,70	*TST-7*	1340,30	*TER-20*	67,60
SER-29	3350,40	*SER-29*	1333,50	*SMR-5*	66,49
TST-7	3325,10	*SER-31*	1333,30	*SMR-11*	65,89
SER-20	3195,70	*TER-34*	1312,80	*SER-20*	65,62
SMR-5	3191,20	*BMR-22*	1289,10	*KMR-5*	64,44
BMR-22	3113,80	*SST-2*	1283,50	*SER-11*	63,64
SST-2	3076,60	*SER-20*	1271,90	*TER-1*	63,19
TER-34	3039,40	*SMR-5*	1257,90	*SER-18*	63,06
KER-6	2926,30	*KMR-5*	1231,60	*SER-31*	61,16
KMR-5	2887,60	*KER-6*	1202,20	*BER-26*	60,67
TST-22	2811,80	*SST-18*	1108,40	*SER-28*	60,41
SST-18	2755,20	*KER-4*	1104,50	*SER-29*	59,82
KER-4	2724,00	*TST-22*	1056,20	*BER-9*	58,34
TST-19	2695,70	*KST-6*	1044,70	*TMR-21*	57,72
KST-6	2381,70	*TST-19*	1041,10	*BER-3*	54,54
BER-26	2346,00	*BER-26*	1017,20	*SER-26*	53,48
TST-27	2116,80	*TER-7*	867,90	*SST-8*	50,34
TER-7	2030,50	*TST-27*	803,20	*KER-4*	42,80
Mean	**3683**		**1471**		**70,03**
CV (%)	**28,65**		**27,59**		**6,34**
LSD (0.05)	**n.s**		**n.s**		**n.s**

Table 2: Fiber Technological Characteristics of Lines/Varieties

Line/Variety	**Length (mm)**	***Line/Variety***	**Fineness (Micronaire)**	***Line/Variety***	**Strength (g/tex)**
SMR-15	30,33	*KST-6*	6,46	*SMR-15*	33,73
KST-7	29,66	*TST-7*	6,15	*TST-27*	33,58
BER-9	29,61	*TER-7*	5,70	*TMR-10*	32,93
SMR-5	29,01	*BMR-22*	5,63	*CMR-24*	32,73
CMR-24	28,96	*TER-1*	5,60	*SMR-5*	31,78
SER-18	28,78	*CMR-4*	5,48	*KST-7*	31,73
TST-27	28,49	*KER-2*	5,46	*SER-11*	31,33
STV 453 (C)	28,35	*TMR-10*	5,40	*BER-9*	30,98
SER-20	28,33	*KER-6*	5,35	*TST-19*	30,93
BST-1	28,24	*SER-26*	5,33	*SER-18*	30,58
ŞAHİN 2000 (C)	28,13	*BER-3*	5,32	*STV 453 (C)*	30,28
SER-29	28,06	*SST-8*	5,31	*TMR-26*	29,98
SST-8	28,04	*SER-21*	5,22	*TER-1*	29,93
SER-31	27,90	*SMR-11*	5,19	*SER-26*	29,88
TMR-10	27,73	*BST-1*	5,18	*TST-22*	29,83
KER-4	27,71	*SER-11*	5,13	*BMR-25*	29,78
KER-2	27,62	*BMR-15*	5,07	*SER-29*	29,73
TER-20	27,55	*STV 453 (C)*	5,07	*SER-20*	29,68
SER-11	27,48	*TER-20*	5,03	*SST-8*	29,63
SMR-11	27,30	*KMR-5*	5,01	*BMR-15*	29,43
SER-26	27,29	*TER-34*	5,01	*KER-4*	29,23
BMR-25	27,27	*SER-18*	5,00	*TER-20*	29,13
SMR-2	27,12	*TST-27*	5,00	*TER-7*	29,13
TST-22	27,06	*SMR-5*	4,94	*BST-1*	28,63
TMR-26	26,98	*BMR-25*	4,89	*CMR-4*	28,63
KMR-5	26,93	*SER-28*	4,89	*KST-6*	28,63
TMR-21	26,93	*CMR-24*	4,84	*SMR-11*	28,58
TER-1	26,85	*TST-22*	4,84	*BER-3*	28,23
BER-3	26,80	*BER-26*	4,79	*ŞAHİN 2000 (C)*	28,08
SER-30	26,75	*SMR-15*	4,76	*TST-7*	28,03
TST-19	26,75	*TST-19*	4,75	*KER-6*	27,88
SST-18	26,72	*SER-29*	4,74	*SMR-2*	27,73
SST-2	26,70	*TMR-26*	4,74	*SER-30*	27,48
BMR-15	26,68	*KER-4*	4,71	*SER-31*	27,48
TER-7	26,68	*SST-18*	4,68	*BMR-22*	27,43
KER-6	26,61	*SER-30*	4,57	*KMR-5*	26,83
SER-21	26,60	*TMR-21*	4,57	*KER-2*	26,73
BER-26	26,25	*KST-7*	4,48	*SST-2*	26,68
KST-6	26,13	*SER-31*	4,46	*SST-18*	26,08
BMR-22	25,93	*SMR-2*	4,37	*SER-21*	25,83
TST-7	25,77	*SER-20*	4,36	*SER-28*	24,93
SER-28	25,46	*ŞAHİN 2000 (C)*	4,27	*TMR-21*	24,63
CMR-4	25,31	*BER-9*	4,05	*BER-26*	23,83
TER-34	24,78	*SST-2*	3,90	*TER-34*	22,13
Mean	**27,35**		**4,99**		**28,87**
CV (%)	**6,68**		**3,04**		**7,43**
LSD (0.05)	**n.s**		**0,69 ***		**n.s**

Table 3: Fiber Technological Characteristics of Lines/Varieties

Line/Variety	**Elongation (%)**	**Line/Variety**	**Uniformity (%)**	**Line/Variety**	**Ginning Percentage (%)**
ŞAHİN 2000 (C)	6,98	BMR-15	87,18	TER-34	43,83
TMR-26	6,68	SMR-15	87,13	BER-26	43,76
BMR-15	6,63	BER-9	85,08	KMR-5	43,21
KER-2	6,63	TER-1	85,08	KST-6	42,79
TST-7	6,63	SER-26	84,88	SER-28	42,59
BER-3	6,48	SER-30	84,88	SER-21	41,82
TER-20	6,48	SST-18	84,88	STV 453 (C)	41,55
BST-1	6,28	BMR-25	84,78	SST-2	41,55
SMR-2	6,28	TMR-10	84,78	TER-7	41,55
TER-1	6,23	SER-21	84,68	TER-20	41,35
TER-7	6,23	SER-31	84,68	BMR-15	41,10
BER-26	6,18	STV 453 (C)	84,65	KER-4	40,93
BER-9	6,18	KER-4	84,48	BMR-22	40,89
SER-11	6,18	KST-7	84,28	BER-3	40,86
TMR-21	6,18	SMR-2	84,23	SMR-11	40,72
KST-6	6,13	TER-20	84,23	TER-1	40,72
KMR-5	6,08	KER-6	84,18	KER-6	40,58
TER-34	6,08	BER-3	84,13	BST-1	40,55
TST-22	6,08	BMR-22	84,08	SST-18	40,14
KST-7	5,98	SMR-5	84,08	SER-29	39,95
SER-28	5,98	TER-7	84,08	TST-7	39,95
SMR-15	5,98	TMR-26	84,08	SER-11	39,88
CMR-24	5,88	SER-29	83,93	SER-26	39,72
KER-4	5,88	SST-8	83,93	CMR-24	39,71
TMR-10	5,88	ŞAHİN 2000 (C)	83,90	SER-20	39,67
STV 453 (C)	5,87	SER-11	83,68	SST-8	39,57
BMR-22	5,83	BST-1	83,58	SER-30	39,53
BMR-25	5,78	SER-20	83,58	KER-2	39,47
CMR-4	5,78	TST-19	83,58	BMR-25	39,41
SER-31	5,78	CMR-24	83,48	SER-18	39,29
SST-2	5,78	KER-2	83,48	ST-19	39,23
SST-8	5,78	TST-22	83,48	CMR-4	39,14
SST-18	5,68	CMR-4	83,38	SMR-5	38,91
TST-27	5,48	SER-18	83,18	TMR-21	38,72
SER-21	5,38	KMR-5	83,08	TMR-26	38,52
SER-26	5,28	SMR-11	83,08	SMR-2	38,43
SER-30	5,28	TST-7	82,78	BER-9	38,20
SMR-11	5,28	TMR-21	82,73	TST-22	38,11
TST-19	5,28	KST-6	82,58	ŞAHİN 2000 (C)	37,78
SER-29	5,18	SER-28	82,58	TST-27	37,76
SER-20	5,08	SST-2	82,28	TMR-10	37,71
KER-6	4,98	TST-27	82,08	KST-7	37,70
SER-18	4,88	BER-26	81,88	SMR-15	37,69
TER-34	4,78	TER-34	80,98	SER-31	37,25
Mean	**5,88**		**83,89**		**40,04**
CV (%)	**4,18**		**1,61**		**2,55**
LSD (0.05)	**1,13 ***		**n.s**		**n.s**

From Table 3, it can be seen that significant differences were observed among varieties for percent elongation. Elongation ranged from a high of 6.98% (Şahin 2000) to a low of 4.78 % (TER-34). Mean of lines/varieties was 5.88%, check varieties had better than new lines for this character.

There were non-significant differences among the genotypes for fiber uniformity, average uniformity was 83.89 %, values changed between 87.17 - 80.97 % and 11 lines had higher value than check varieties

Non-significant differences were observed for ginning percentage, ranged from 37.25 % for SER-31 to 43.83 % for TER-34. For ginning percentage 6 new lines had higher value than check varieties.

CONCLUSION

In order to improve yield and fiber quality properties of cotton under stress conditions 42 promising hybrids and two check varieties were evaluated in this study. The result of this study showed that some of the lines had better yield and technological characteristics than check varieties under water stress conditions.

The lines which had higher values than check varieties were selected for next generations. Controls and selected lines were conducted under stress and non-stress conditions at the Southeastern Anatolia Agricultural Research Institute's experimental fields in randomized complete block design with four replications in 2008. According to results; it will be decided for registration of the promising lines

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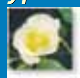
Relationships Between Leaf Chlorophyll Content, Yield and Yield Components of Cotton (*Gossypium hirsutum* L.)



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INTRODUCTION

- Cultivation of cotton is of great importance for the national economy worldwide due to the increasing demand for cotton products. Therefore improving high yielding varieties with high nutritional value is of vital importance for communities. The chlorophyll content meter (CCM), in particular the Minolta SPAD 502, provides a rapid and non-destructive diagnosis of plant N status and have been widely applied to assessment of chlorophyll content index in crop plants such as corn, wheat, cotton, rice as well as other agricultural species *(Patrick, 2007).*

INTRODUCTION

- The chlorophyll content meter is useful for improving nitrogen and fertilizer management and is ideal for crop stress, leaf senescence, plant breeding, health determination and other studies *(Hendry 1987, Merzlyak and Gitelson 1995, Peñuelas and Filella 1998, Merzlyak et al. 1999).*
- Determination of the relationships of the chlorophyll content, yield and yield components facilitates selection of high yielding varieties from breeding materials (Singh, 2001).

INTRODUCTION

- Genomic dissection studies indicated that, the genetic control of chlorophyll content was also markedly influenced by water regime but showed only modest association with productivity (Saranga et al, 2008).
- Recently researchers concentrated on relationships between leaf chlorophyll and plant morphology. Bronson et al., 2001 found that in-season chlorophyll meter measurements of cotton correlated with petiole nitrate-N, leaf N and lint yield and that the measurements were less variable than petiole nitrate.

INTRODUCTION

- Boggs et al., 2003 indicated that cotton leaf chlorophyll correlated significantly with soil nitrate-nitrogen and cotton yield. On the other hand Sardar et al, 2003 reported that application of potash didn't affect the leaf chlorophyll content but significant differences in leaf chlorophyll content of different cotton varieties were observed.
- Feibo et al., 1998 stated that significant curvilinear relationships were found between Minolta- SPAD values at various stages and photosynthetic intensity, lint yield and total boll number per hectare, respectively. They also reported that critical SPAD levels for maximum lint yield for short-season cotton.

INTRODUCTION

- In general the brightest, most intense colors indicate higher chlorophyll content, and in general high chlorophyll content will correlate with higher crop yield. Therefore the aim of this study was to evaluate different cotton varieties in relation to their leaf chlorophyll content, yield and yield components and also significant traits having great contribution to yield through correlation in addition to making easy selection.

MATERIALS AND METHODS

This study was conducted in the experimental field of the Southeastern Anatolia Agricultural Research Institute during the cotton growing season of 2007 in Diyarbakir, Turkey.

MATERIALS AND METHODS

- The experimental design was arranged in the completely randomized block design with four replications. Thirteen cotton varieties were used as plant material. The planting was made with combine cotton drilling machine on 9 May 2007; all plots received 120 kg ha-1 N and 60 kg ha-1 P2O5. Half of the N and all P2O5 were applied at sowing time and the remaining N was given at the square stage as ammonium nitrate.

MATERIALS AND METHODS

- Each plot consisted of 4 rows, of 12 m long at planting and only 10 m length at harvest. Between and within the row spacing were 0.70 m and 0.20 m respectively. The experiment was thinned and hoed two times by hand and three times with machine and only once herbicides were applied just before sowing.

MATERIALS AND METHODS

- Insects were monitored throughout the experiment and decided that no insect control was necessary the during growing season.

MATERIALS AND METHODS

- Furrow irrigation was applied seven times starting up June 28, amounting to 750 mm water.

MATERIALS AND METHODS

- Leaf chlorophyll content was measured by a Minolta SPAD-502 chlorophyll meter at second week of bloom. Leaf reading were taken on the fifth fully expanded leaf below the terminal of the plant according to Johnson and Saunders., 2003.

MATERIALS AND METHODS

- Chloropyll content, plant height, number of boll per plant, number of monopodial branches, number of sympodial branches were taken from randomly selected twenty plants in each plot. At maturity, 25 well developed open bolls were hand harvested randomly from each genotype for boll weight, seed cotton weight per boll, and 100 seed weight calculations.

MATERIALS AND METHODS

- Plots were harvested twice by hand on October 15, and on 5 November in 2007. The four rows of each plot were harvested to determine of lint yield and seed cotton yield. Stastistical analysis were performed using JMP 5.0.1 statistical software (SAS Institute Inc., 2002) and the means were grouped with LSD (0.05) test. In the study, evaluation of the correlation between characters was estimated according to Wright (1923).

RESULTS AND DISCUSSION

- Results from the analysis of variance are presented in Table 1. Data analysis indicated that there were significant differences among cultivars for all of the investigated characters except number of sympodial branches.

Table 1. The mean values of chlorophyll content, yield and yield components of different cotton genotypes

Varieties	CHL	NBP	BW	SCW	NMB	NSB	100 SW	PH	FY	SCY
1.Flora	44.12 a-d	20.90 de	8.11 b-d	6.05 a-c	3.45 ab	14.85	10.22 b-d	77.60 d	1569.1 cd	3717.6 d
2.Ba 119	43.75 a-d	28.50 ab	7.01 gh	5.23 de	3.60 a	14.70	9.55 ef	92.70 bc	1952.8 ab	4556.8 a-c
3.Fantom	44.86 a-c	25.35 bc	7.79 b-f	5.60 cd	1.15 e	15.70	9.80 de	93.75 bc	1855.1 a-c	4466.7 a-c
4.Deltaopal	43.38 b-e	23.90 cd	7.35 fg	5.61 cd	3.40 a-c	15.85	9.27 f	97.15 ab	1556.7 d	3924.8 cd
5.Stoneville 468	43.22 c-e	24.60 c	6.67 h	5.03 e	2.55 b-d	14.95	9.27 f	89.90 bc	2038.9 a	4755.0 ab
6.Nazilli 342	41.65 ef	24.70 c	7.38 fg	5.62 b-d	2.65 a-d	15.30	10.37 bc	98.10 ab	1965.1 ab	4722.0 ab
7.Gapeyam- 1	45.13 ab	25.55 bc	8.29 bc	6.44 a	2.95 a-d	15.75	10.52 b	88.35 b-d	1870.2 ab	4865.3 ab
8.Sdp 97/324	41.68 ef	22.50 c-e	7.41 e-g	5.67 b-d	2.45 cd	15.35	9.70 ef	90.85 bc	1798.3 a-d	4458.1 a-c
9.Adn P 0-1	40.50 f	23.60 c-e	7.65 c-g	5.79 bc	3.60 a	15.25	9.95 c-e	90.60 bc	1954.4 ab	4775.5 ab
10.Gsn 12	[illegible]	25.50 bc	8.07 b-e	6.11 ab	2.80 a-d	15.90	11.05 a	98.35 ab	1866.4 ab	4406.2 a-c
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]

The mean values of chlorophyll content and seed cotton yield of different cotton genotypes

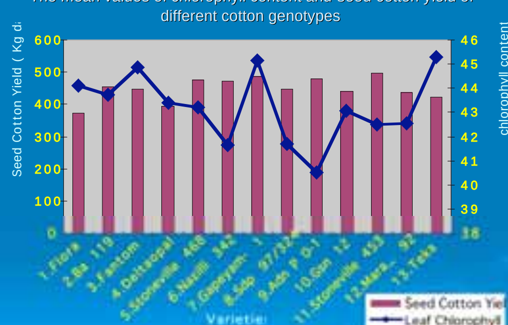


Table 2. Correlation coefficients between leaf chlorophyll content, yield and yield components of cotton

	CHL	NBP	BW	SCW	NMB	NSB	100 SW	PH	FY	SCY
CHL	1,000	-0,078	0,342*	0,254*	-0,233	-0,095	0,182	-0,130	0,029	0,058
NBP		1,000	-0,146	-0,110	0,430**	0,288*	-0,104	0,252	0,212	0,213
BW			1,000	0,959**	-0,036	0,073	0,569**	0,130	-0,186	-0,103
SCW				1,000	0,047	0,192	0,533**	0,222	-0,128	-0,017
NMB					1,000	0,065	-0,079	0,059	-0,265	-0,248
NSB						1,000	-0,071	0,495**	0,287*	0,357**
100 SW							1,000	-0,142	-0,037	0,003
PH								1,000	0,096	0,126
FY									1,000	0,959**
SCY										1,000

CHL: Chloropyll content (SPAD reading); NBP: Number of boll per plant; BW: Boll weight (g), SCW: Seed cotton weight per boll (g), NMB: Number of monopodial branches (no/plant), NSB: Number of sympodial branches (no/plant), 100 SW: 100 Seed weight (g), PH: Plant height (cm), FY: Fiber yield (kg ha-1), SCY: Seed cotton yield (kg ha-1)

It can be seen that on Table 2, there were significant correlations between leaf chlorophyll content and boll weight (r = 0.342*) and also leaf chlorophyll content and seed cotton weight per boll (r = 0.254*). There were positive but non-significant correlations between chlorophyll content and seed cotton yield also fiber yield.

Path coefficient analysis

- Path coefficient analysis permits a through understanding of contribution of various characters by partitioning the correlation coefficient into components of direct and indirect effects.
- The direct, indirect effects of investigated characters on seed cotton yield and their percent of contribution to seed cotton yield is presented on Table 3.

Table 3. Direct, indirect effects and % contribution of investigated characters on seed cotton yield

		Indirect Effects Via								
	Direct effects	CHL	NBP	BW	SCW	NMB	NSB	100 SW	PH	SCY
CHL	0.1136 (9.86%)		-0.0271 (2.35%)	-0.4988 (43.34%)	0.3460 (30.06%)	0.1140 (9.90%)	-0.0204 (1.77%)	0.0151 (1.30%)	0.0158 (1.37%)	0,058
NBP	0.3449 (33.55%)	-0.0089 (0.86%)		0.2143 (20.84%)	-0.1489 (14.48%)	-0.2102 (20.44%)	0.0615 (5.98%)	-0.0086 (0.84%)	-0.0306 (2.97%)	0,213
BW	-1.4582 (49.49%)	0.0388 (1.31%)	-0.0507 (1.72%)		1.3024 (44.20%)	0.0179 (0.60%)	0.0157 (0.53%)	0.0469 (1.59%)	-0.0158 (0.53%)	-0,103
SCW	1.3571 (45.86%)	0.0289 (0.97%)	-0.0379 (1.27%)	-1.3995 (47.30%)		-0.0234 (0.79%)	0.0410 (1.38%)	0.0440 (1.48%)	-0.0269 (0.91%)	-0,017
NMB	-0.4885 (60.33%)	-0.0265 (3.27%)	0.1484 (18.32%)	0.0535 (6.60%)	0.0649 (8.02%)		0.0140 (1.72%)	-0.0066 (0.81%)	-0.0073 (0.89%)	-0,248
NSB	0.2130 [illegible]	-0.0109 [illegible]	0.0996 [illegible]	-0.1076 [illegible]	0.2611 [illegible]	-0.0321 [illegible]		-0.0059 [illegible]	-0.0601 [illegible]	0,357**
100 SW	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
PH	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]

According to the path coefficient analysis, chlorophyll content (0.1136, 9.86%) had a small positive effect on seed cotton yield, but it had great positive indirect effect via seed cotton weight (0.3460, 30.06%) and number of monopodial branches (0.1140, 9.90%). Number of boll per plant (0.3449, 33.55%) had a positive direct effect on seed cotton yield, but it had highest indirect effect via boll weight. Number of sympodial branches had positive direct effect (0.2130, 26.95%) on seed cotton yield and it had indirect effect via seed cotton weight.

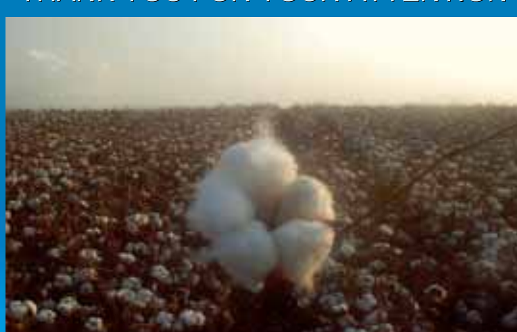
CONCLUSION

- The results of the present study indicated that leaf chlorophyll content value were changed between 40.50 -45.29, and seed cotton yield were changed between 3717.6 – 4954.6 kg ha-1 in different cotton varieties. Chlorophyll content was assessed at second week of blooming of cotton growing stage. Along the cotton varieties only GAPEYAM-1 had high yielding and higher chlorophyll content. There were significant correlations between leaf chlorophyll content and boll weight (r= 0.342*) and also leaf chlorophyll content and seed cotton weight per boll (r= 0.254*).

CONCLUSION

- It is not obvious that high yielding cotton varieties gave high chlorophyll content at that stage. So we recommended that monitoring every weeks starting at early squaring and ending at peak bloom. At this study path coefficient analysis revealed that chlorophyll content had a small direct effect on seed cotton yield but it had great indirect effect via seed cotton weight and number of sympodial branches. Among the investigated characters seed cotton weight, number of boll per plant and number of sympodial branches had higher direct effect on seed cotton yield than chlorophyll content. There is limited information between leaf chlorophyll content and yield contributing characters of cotton in the literature. Therefore further investigation is required on the leaf chlorophyll content and physiological studies.

THANK YOU FOR YOUR ATTENTION



YIELD AND TECHNOLOGICAL CHARACTERISTICS IN ADVANCED COTTON LINES UNDER DROUGHT STRESS CONDITIONS

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OBJECTİVE

- **One aim of cotton breeding program is to produce cultivar for dryland production systems that have high yield potential and enhanced water use efficiency in addition to tolerance to water stress.**
- Among to a biotic stresses, water stress is one of the most yield limiting factor in cotton. Therefore, selection for drought tolerance is important for plant breeders in cotton.

OBJECTİVE

- **Cotton varieties grown in our region are sensitive to the water stress. As you know by reason of Global Warming the water limitation will be more important factor day by day. So, we must develop cotton variety which tolerance to the water limitation and drought conditions.**
- **The objective of this study was to develop better yielding and high quality cotton varieties under drought stress conditions**

MATERIAL AND METHOD

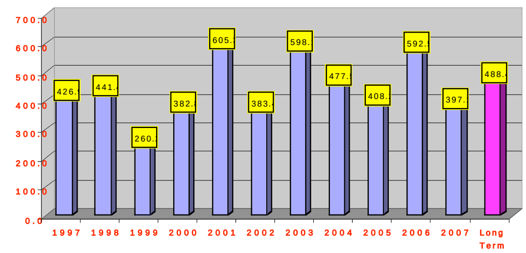
- **Five cotton lines as known drought tolerant (*Blightmaster, Sicala 33, Tamcot CD 3H, Cabu CS 2-1-83 and Kurak 2*) and 3 testers (*Maraş 92, Erşan 92 and Stoneville 453*) were crossed in a *Line x Tester* mating design at Southeastern Anatolia Agricultural Research Institute in 2001.**

- **Selected 42 hybrid lines F_6 and check varieties were grown in the Augmented design with 6 replications at the same experimental area in 2007.**
- **The plots contained two rows of 12 m length. Between and within the row spacing were 70 and 20 cm, respectively. The planting was done on 10 May 2007. All plots received 120 kg ha^{-1} N and 60 kg ha^{-1} P_2O_5.**

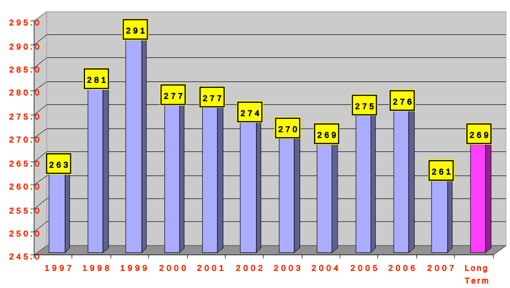
- **The experiment was carried out under induced drought stress conditions by irrigating only 4 times throughout the growing season. In the first and the last irrigations the traditional timing was followed, but eventually a total of only 250 mm water was applied by increasing the time interval between irrigations.**

- Plots were harvested by hand for yield determination on 8 October and second on 14 October 2007.
- Fiber samples were analyzed by High Volume Instrument (HVI).
- JMP 5.0.1 program was used to analyze the data and differences were tested for significance using LSD.

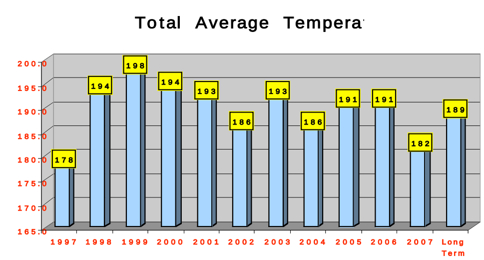
Annual, 1997-2007 and Long Term Average Precipitation of Research Area (mm)



Annual, 1997-2007 and Long Term Total Maximum Temperature of Research Area (^0C)



Annual, 1997-2007 and Long Term Total AverageTemperature of Research Area (^0C)

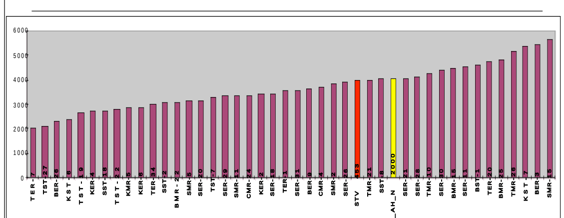


RESULTS and DISCUSSION

Seed Cotton Yield (kg ha^{-1}):

Changed Between: 2030 – 5686
Average: 3683
Highest Line: 5686
Highest Control: 4086
Number of lines higher than Control: 13
CV (%):28.65
LSD (0.05): n.s

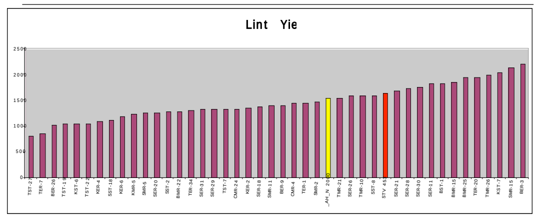
Seed Cotton Yield (kg ha^{-1})



Lint Yield (kg ha^{-1}):

Changed Between : 803 – 2213
Average : 1471
Highest Line : 2213
Highest Control : 1648
Number of lines higher than Control : 12
CV (%): 27.59
LSD (0.05): n.s

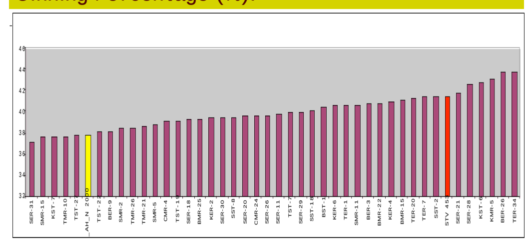
Lint Yield (kg ha^{-1})



Ginning Percentage (%):

Changed Between : 37.25 – 43.83
Average : 40.04
Highest Line : 43.83
Highest Control : 41.55
Number of lines higher than Control : 6
CV (%): 2.55
LSD (0.05):n.s

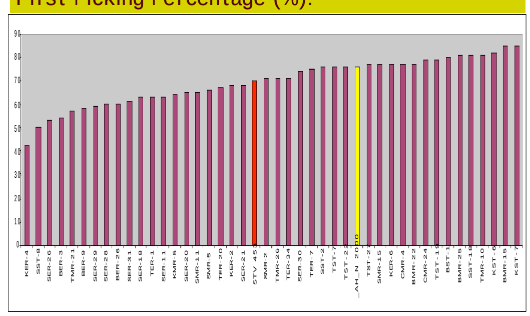
Ginning Percentage (%):



First Picking Percentage (%):

Changed Between : 42.80 – 85.59
Average : 70.03
Highest Line : 85.59
Highest Control : 76.65
Number of lines higher than Control : 14
CV (%): 6.34
LSD (0.05): n.s

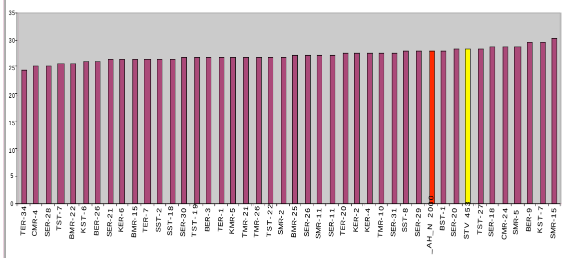
First Picking Percentage (%):



Fiber Length (mm)

Changed Between : 24.78- 30.33
Average : 27.35
Highest Line : 30.33
Highest Control :28.34
Number of lines higher than Control : 7
CV (%): 6.68
LSD (0.05): n.s

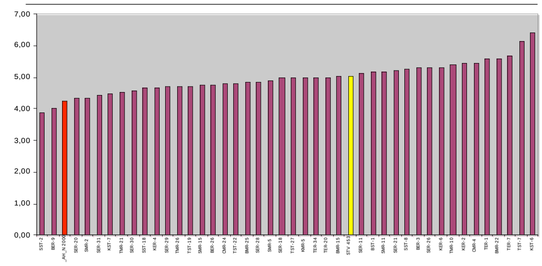
Fiber Length (mm)



Fiber Fineness (micronaire)

Changed Between : 3.90- 6.45
Average : 4.99
Highest Line : 6.45
Highest Control : 5.07
Number of lines higher than Control : 2
CV (%): 3.04
LSD (0.05): 0.69 *

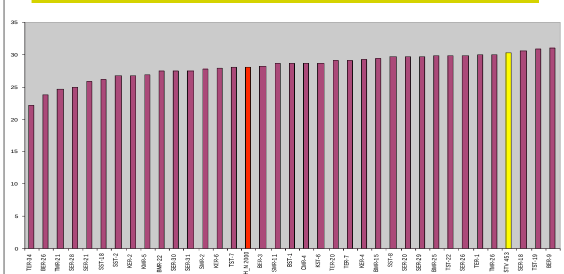
Fiber Fineness (micronaire)



Fiber Strength (g/tex)

Changed Between : 22.13- 33.73
Average : 28.87
Highest Line : 33.73
Highest Control : 30.28
Number of lines higher than Control : 10
CV (%): 7.43
LSD (0.05): n.s

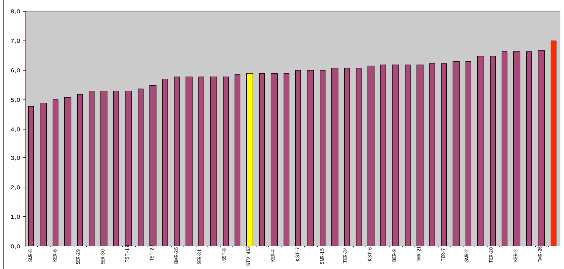
Fiber Strength (g/tex)



Fiber Elongation (%)

Changed Between : 4.77-6.98
Average : 5.88
Highest Line : 6.67
Highest Control : 6.98
Number of lines higher than Control : -
CV (%): 4.18
LSD (0.05): 1.13 *

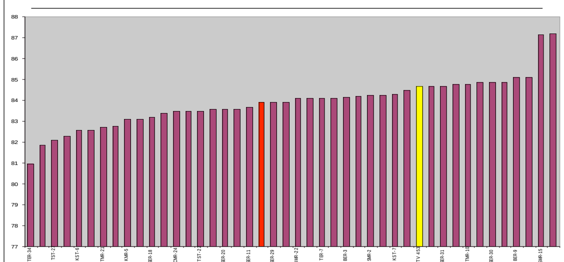
Fiber Elongation (%)



Fiber Üniformity (%)

Changed Between : 87.17- 80.97
Average : 83.89
Highest Line : 87.17
Highest Control : 84.65
Number of lines higher than Control : 11
CV (%): 1.61
LSD (0.05): n.s

Fiber Üniformity (%)



- The result of this study showed that some of the lines had better yield and technological characteristics than check varieties under water stress conditions.
- The lines which had higher values than check varieties were selected for next generations.

- Controls and selected lines were conducted under stress and nonstress conditions at the Southeastern Anatolia Agricultural Research Institute's experimental fields in randomized complete block design with four replications in 2008.

- According to results; it will be decided for registration of the promising lines

- THANK YOU FOR ATTENTION