



## Cotton Breeding Studies in Turkey: History and Future Trends

O. Gencer<sup>1</sup>, H.B. Karadayi<sup>2</sup>, I. Eksi<sup>2</sup>

<sup>1</sup>University of Çukurova, Cotton Research and Application Centre, Adana, TURKEY

<sup>2</sup>Cotton Research Institute Nazilli-Aydın, TURKEY

### ABSTRACT

Cotton breeding in Turkey started in the 1920's by governmental organizations such as research institutes and state universities and to some extent by private organizations. Initially, breeding consisted of introduction, selection, seed multiplication and inter and intra-specific crossing studies. Later, it focused on the investigation of heritability of desirable morphological, physiological and technological characteristics. Starting in the 1980's, mutation breeding has gained importance. Furthermore, experiments at various locations in Turkey have been conducted by institutes and universities to determine genotype-environment interactions. During the last decade emphasis has been placed on earliness, resistance to pests and diseases, improved fiber quality and ginning efficiency. The future trends in cotton breeding in Turkey is crossing and gene transfer for obtaining high yielding varieties with superior fiber characteristics resistant to pests and diseases, as well as varieties suitable for organic cotton farming (including natural coloured cotton).

### Introduction

Historical evidence indicates that cotton has been cultivated in Anatolia since the 6<sup>th</sup> Century. However, its broad cultivation was achieved during Selçuk and Ottoman Empire times. Before the Turkish Republic was established, the cultivated cottons in Anatolia were Old World cultivars especially *G. herbaceum*. At that time Turkish cotton production did not exceed 15,000 metric tons of lint. The major improvement and increase in yield was achieved after the Turkish Republic established in 1923. Since 1940 the total production was about 77,000 metric tons. However, after World War II production increased very fast because of the increase of the planted area and introduction of new productive cultivars from other countries.

In 1951 total production was 149,900 metric tons of lint from 641,800 hectares and in 1997 the annual production was 783,600 tons of lint from 714,000 hectares. The increase in production resulted from increase in yield from only 234 kg/ha in 1951 to 1097 kg/ha in 1997 (Table 1).

The increase in yield is a result of new high yielding cultivars, better irrigation techniques and increase in use of fertilizers, insecticides, fungicides and better farming technology. Today, Turkey is among the top three countries in the world in average yield per hectare and seventh world cotton producing country in planting area\* and fifth in production of the world. Table 2 shows the main cotton producing countries, planted area, production and lint yield.

The main cotton growing areas are located in western (Aegean), South-western (Antalya), Southern In the 1970's *Verticillium* wilt was the most important cotton disease in Turkey causing between 16 % to 38 % yield loss in the Aegean Region. The objective of

(Çukurova) and South-eastern parts of Turkey planting area, production and lint yield for each region are given in Table 3.

### Breeding studies and objectives

Research works on cotton breeding in Turkey were initiated during the first years of the Republic (1924 – 1926). At the beginning adaptation on the introduction material from other countries were common. Then, production of new cultivars has been started by emphasizing selection and hybridization.

Breeding works on cotton were done first at the seed multiplication stations in Adana, Eskisehir, Adapazari and Yenikoy. Adana had the leadership on breeding diploid cotton (*G. herbaceum*). The breeding and cultivation techniques works on *G. hirsutum* L. were started with 40 cultivars introduced from USA in 1927.

The cotton breeding program in Turkey will focus on improving yield and fiber quality, earliness, adaptation for specific regional conditions and resistance to *Verticillium* Wilt (*V. dahliae*) and insects. Lint yield and fiber quality have always been the primary importance to the breeders because the greatest profit usually is realized from maximizing yield. Most of the Cotton in Turkey (98 %) is grown under irrigation and is harvested by hand. Rain usually begins in October. So earliness is considered one of the most important features of a cotton cultivar. Earliness has many advantages: It enables the cotton crop to develop during periods of more favourable moisture and to be harvested before damage from unfavourable weather conditions. It is important that the bolls be set early enough that most will mature before frost.

breeding programmes of cotton research were focused on developing cotton cultivars tolerant to *Verticillium* wilt (*V. dahliae* Kleb.) Nazilli 66-100 was the first

Turkish cotton cultivar developed with resistance to *Verticillium* wilt in 1975. Then, Nazilli 84 and Nazilli 87 both with higher levels of resistance to *Verticillium* wilt were developed and released.

Today, many projects on cotton improvement and resistance to diseases, insects and stresses have been investigated at the different areas of Turkey. One Cotton Research Institute (in Nazilli) and three Universities (in Adana, Antalya and Izmir) have been charged with developing higher yielding, early maturity, desirable agronomic traits, resistance to pest and improved seed and fiber quality cotton cultivars. Currently cultivated cultivars and some features are given in Table 4.

Today, as a result of breeding, 22 cotton cultivars were developed and released by different research institutions and have been given to farmers (Table 5). But, there are still many problems with cotton that may be solved by breeding such as higher levels of

resistance to pests and environmental stresses in addition to improving yield, fiber and seed quality, organic and coloured cotton farming.

## References

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**Table 1. Progress in planted area, lint production and yield in Turkey.**

Years	Planted Area (k ha)	Prodn. (k ton)	Lint Yield (kg/ha)	
			Turkey	World
1932	158.1	20.2	128	-
1940	324.0	77.1	238	-
1951	641.8	149.9	234	237
1960	621.0	192.0	309	298
1970	527.6	400.0	758	367
1980	671.7	500.0	744	402
1990	641.0	654.6	1125	576
1995	756.0	851.0	1125	567
1996	750.0	792.0	1056	588
1997	714.1	783.6	1097	580

**Table 2. World cotton planted area, production and lint yield (1997).**

Country	Planted Area (k ha)	Prodn. (k ton)	Yield (kg/ha)
India	8,800	2,700	307
USA	5,194	4,130	794
China	4,400	4,000	909
Pakistan	3,205	1,445	451
Brazil	830	300	361
Argentina	800	400	500
Turkey	750	792	1056
Turkmenistan	557	250	449
Other Countries	6,399	3,490	545
World Total	33,570	18,960	580

**Table 3. Cotton growing regions and lint production in Turkey (1997).**

Region	Planted Area (k ha)	Prodn. (k ton)	Yield (Kg/ha)
Cukurova	219.6	222.2	1012
Southeast Turkey	236.1	260.5	1103
Aegean	266.5	278.3	1044
Antalya	28.0	31.5	1125
TOTAL	750.2	792.5	1056

**Table 4. Lint yield and fiber properties of currently cultivated cultivars in Turkey.**

Cultivars	Yield (kg/ha)	Fiber Length mm	Fineness Mic.	Strength (k lb/inch <sup>2</sup> )	Lint (%)
Nazilli 84	1.843	29.0	4.0	80.2	43.5
Nazilli 87	1.589	29.0	3.8	82.7	39.1
Nazilli M-503	1.815	30.0	3.7	76.1	41.0
Nazilli M-39	1.834	28.8	4.4	79.3	40.7
Ersan 92	1.657	29.2	3.9	79.8	39.7
Maras 92	1.733	29.4	3.9	80.2	39.9
Çukurova 1518	1.397	28.8	3.6	82.0	41.2
Grandless 86	1.378	29.4	3.4	87.2	37.7
Sayar 314	1.538	30.1	4.1	81.9	41.9
DPL 15/21	1.709	29.3	4.2	82.8	42.0
Nazilli 84 S	2.148	29.4	4.2	82.9	44.3
Nazilli M-342	2.052	30.6	3.9	77.8	41.3
Nazilli 143	1.872	29.4	4.0	83.9	40.0

**Table 5. Cultivars developed and registered by research institutions in Turkey.**

Cultivars	Breeding Method	Institution	Year
Acala-130	Selection	Adana C.R.I.	1949
Acala-8	Selection	Nazilli C.R.I.	1948
Acala-1086	Selection	Nazilli C.R.I.	1948
Sealand-542	Introduction	Nazilli C.R.I.	1965
Coker 100 A/2	Selection	Nazilli C.R.I.	1965
Deltapine 15/21	Selection	Adana C.R.I.	1965
Caroline Queen -201	Introduction	Adana C.R.I.	1968
Maydos Yerlisi	Selection	Nazilli C.R.I.	1970
Nazilli 66-100	Selection	Nazilli C.R.I.	1975
Adana 967/10	Selection	Adana C.R.I.	1977
Delcerro	Introduction	Nazilli C.R.I.	1977
Ege-69	Hybridization	Nazilli C.R.I.	1977
Sayar-314	Hybridization	Adana C.R.I.	1980
Nazilli-84	Hybridization	Nazilli C.R.I.	1984
Glandless-86	Hybridization	Ege University	1986
Nazilli-87	Hybridization	Nazilli C.R.I.	1987
Nazilli M 503	Hybridization	Nazilli C.R.I.	1992
Nazilli M-39	Hybridization	Nazilli C.R.I.	1992
Maras-92	Hybridization	Maras A.R.I.	1992
Ersan-92	Hybridization	Maras A.R.I.	1992
Nazilli-143	Hybridization	Nazilli C.R.I.	1998
Nazilli M 342	Hybridization	Nazilli C.R.I.	1998

