

EFFECT OF WATER DEFICIT ON FIBER LINT PERCENTAGE IN COTTON BREEDING MATERIALS. (2024 DATA)

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Abstract. *Water scarcity is one of the major abiotic stresses limiting cotton productivity and fiber quality worldwide. The present study evaluated the fiber lint percentage of promising cotton breeding lines under two irrigation regimes: normal irrigation (1:2:1) and water-deficit conditions (0:1:0). Sixteen breeding lines and varieties were investigated. The results demonstrated that water deficit generally reduced fiber lint percentage in all genotypes. However, several breeding materials maintained relatively high lint percentage under stress conditions, indicating superior drought tolerance and genetic stability. The highest lint percentage under normal irrigation was observed in T-85-87/16 (39.0%), T-14 (39.0%), and T-21-23/10 (38.2%), while O-23-24 retained the highest value under drought conditions (38.0%). The results suggest that these genotypes represent valuable genetic resources for developing drought-tolerant cotton cultivars with improved fiber productivity.*

Keywords: *cotton, fiber lint percentage, drought stress, irrigation regime, breeding, Gossypium hirsutum L.*

Introduction. Cotton (*Gossypium hirsutum* L.) is the world's leading natural fiber crop and plays an important role in the textile industry. Improving fiber yield while maintaining fiber quality under water-limited environments has become one of the principal objectives of modern cotton breeding.

Climate change has increased the frequency and intensity of drought events, resulting in reduced cotton productivity. Water deficit influences photosynthesis, assimilate transport, boll development, and fiber formation, ultimately decreasing lint yield. Therefore, identifying drought-tolerant breeding materials capable of maintaining high fiber lint percentage under stress conditions is essential.

Fiber lint percentage is one of the most important economic traits in cotton because it directly affects ginning efficiency and lint yield. Genotypes exhibiting stable lint percentage under contrasting irrigation regimes are considered valuable sources for breeding drought-resilient cultivars.

The objective of this study was to evaluate the effect of irrigation regime on fiber lint percentage in promising cotton breeding materials.

Materials and Methods. Field experiments were conducted at the experimental field of Tashkent state agrarian university. Plant Materials. Sixteen breeding lines and cultivars were evaluated: O-69-70, O-35-36, O-37-38, O-33-34, O-16-18, O-19-20, O-95-96, O-23-24, O-97-99, O-10-11, O-12-14, O-17-19, T-21-23/10, T-14, T-85-87/16, S-6524 (standard).

Experimental Design. The experiment was conducted under two irrigation regimes:

1:2:1 – optimum irrigation

0:1:0 – artificial water-deficit condition

Fiber lint percentage was determined after ginning according to standard cotton fiber evaluation procedures. Mean values and standard errors were calculated.

Results. The irrigation regime significantly affected fiber lint percentage among the investigated genotypes (Figure 1).

Under optimum irrigation (1:2:1), lint percentage ranged from approximately **35.8% to 39.0%**. The highest values were recorded in: T-14 (39.0%), T-85-87/16 (39.0%), O-23-24 (38.5%), T-21-23/10 (38.2%).

These breeding lines exhibited superior lint productivity under favorable growing conditions.

Water deficit (0:1:0) reduced lint percentage in almost all genotypes. The reduction generally varied between **0.5 and 3.5 percentage points**, indicating the negative impact of drought stress on fiber development.

Despite the stress conditions, several breeding materials maintained relatively high lint percentage. O-23-24 showed the highest value (38.0%), followed by T-21-23/10 (38.0%), T-14 (37.5%), and T-85-87/16 (37.0%). These genotypes demonstrated greater physiological stability under moisture deficit.

Conversely, the largest reductions were observed in O-10-11, O-17-19, O-95-96, and O-69-70, indicating higher sensitivity to drought stress.

Overall, the results indicate substantial genetic variation in lint percentage response to irrigation regime, providing valuable opportunities for selecting drought-tolerant breeding materials.

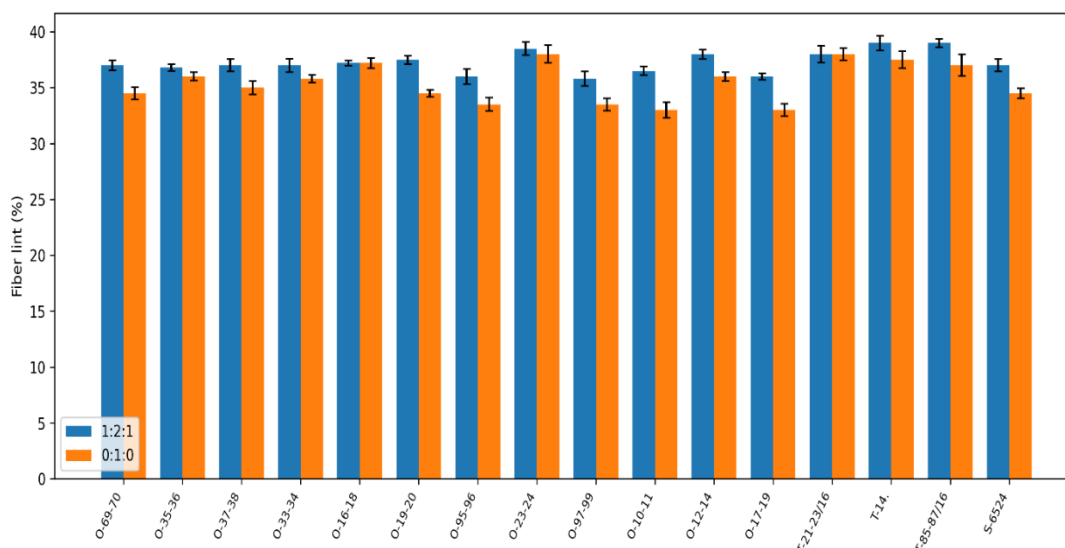


Figure 1. Fiber lint percentage of cotton breeding materials under normal (1:2:1) and water-deficit (0:1:0) irrigation regimes. (2024 data).

Discussion. Water deficit adversely affected fiber lint percentage by limiting assimilate accumulation and fiber cell development. Similar observations have been reported by previous studies, where drought stress reduced cotton fiber productivity due to decreased photosynthetic activity and impaired carbohydrate transport.

The relatively stable performance of O-23-24, T-21-23/10, and T-14 suggests that these genotypes possess favorable genetic mechanisms associated with drought adaptation. Stable lint percentage under stress is considered an important breeding criterion because it contributes directly to maintaining economic yield under unfavorable environmental conditions.

The observed genetic variability indicates considerable breeding potential for improving drought tolerance while preserving fiber quality traits.

Conclusion. The study demonstrated that irrigation regime significantly influences fiber lint percentage in cotton.

The major findings include:

Fiber lint percentage decreased under water-deficit conditions in nearly all genotypes.

O-23-24 exhibited the highest lint percentage under drought stress.

T-14, T-21-23/10, and T-85-87/16 maintained relatively stable lint percentage across irrigation regimes.

These breeding materials represent promising sources for developing drought-tolerant cotton cultivars with high fiber productivity.