EXPLORING HEAT RESILIENCE IN COTTON THROUGH INTEGRATED MORPHO-PHYSIOLOGICAL AND BIOCHEMICAL ANALYSIS

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2 BACKGROUND: HEAT STRESS IN COTTON

Cotton production faces mounting risk from rising temperatures due to climate change.

Heat stress during reproductive stages reduces:
Floral development,Boll retention
Fiber elongation

Global yield and fiber quality are declining under extreme temperatures.

3 EXPERIMENTAL DESIGN

Field experiment at CRS Faisalabad under natural thermal stress.
Evaluated multiple upland cotton genotypes.

Two environmental regimes:

Optimal temperature
Heat-stressed (elevated) conditions

4 MORPHOGIGAL & PHYSIOFGICAL TRAITS

Significant genotypic variation observed in:
Boll retention,Number of bolls per plant,Seed cotton yield
Plant height

Heat stress reduced:
Photosystem II efficiency (Fv/Fm)
Relative water content (RWC)
Cell membrane thermostability

Tolerant genotypes maintained:
High chlorophyll stability, Strong photosynthetic rate
Greater overall vigor

5 PHYSOGICAL DRIVERS OF HEAT TOLERANCE

Key physiological determinants of heat tolerance include:
Sustained photosynthetic efficiency
Stable chlorophyll under stress
Enhanced water retention mechanisms
Balanced leaf temperature and transpiration
Balanced Cell membrane thermostability

Core interpretation:
Genotypes maintaining PSII protection + water balance +Cell membrane thermostability show superior thermotolerance.

6 FUTURE BIOCHEMIICAL ANALYSIS

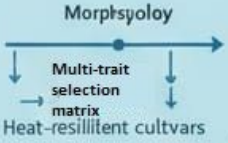
Future biochemical assays will include:
Antioxidant enzymes (SOD, CAT, POD)
Osmolytes (proline, glycine betaine)
ROS-scavenging efficiency

Purpose:
Validate physiological basis of heat tolerance and improve accuracy of screening heat-resilient cotton genotypes.

7. INTEGRATED SCREENING FRAMEWORK

Combining morphological, physiological, and biochemical indicators provides a robust multi-dimensional selection approach.

Enables reliable identification of heat-resilient genotypes suitable for climate-stressed cotton-growing regions.



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