

Theme: Mining for Genotype-by-Environment Interaction Loci Related to Cotton Fiber Yield and Quality Traits

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Degree Type: Doctor of Philosophy in Crop Genetics and Breeding

Major: Crop Genetics and Breeding

Research Field: Molecular Breeding

Institution: Cotton Research Institute of Graduate School Chinese Academy of Agricultural Sciences
Thesis

Conclusion

- In conclusion, this study demonstrated that cotton phenotypic variation results from complex interactions between genetic effects, environmental factors, and phenotypic plasticity.
- Using a CCRI70 recombinant inbred line population evaluated across 14 contrasting environments, we combined ANOVA, GGE Biplot, CERIS-JGRA, and environmentally informed QTL mapping to better understand cotton adaptation mechanisms.
- Our analyses **identified five main environmental factors influencing the expression of cotton traits**: temperature, solar radiation, precipitation, photothermal quotient, and growing degree days. These environmental effects were particularly important during the critical development window between **100 and 135 days after planting**.
- At the genomic level, we detected **26 significant environmentally responsive QTLs**, with notable co-localizations on chromosomes 4, 9, 17, and 18, suggesting important adaptive genomic regions. In addition, **163 candidate genes** associated with environmental-response QTL intervals were identified, particularly for boll weight.
- Functional enrichment analyses revealed that many candidate genes are involved in **photosynthesis, chlorophyll binding, electron transport, and energy metabolism pathways**, highlighting their potential role in environmental adaptation

SCHEMATIC ROADMAP

