FLAVONOID BIOSYNTHESIS CONTROLS FIBER COLOR IN NATURALLY COLORED COTTON

INTRODUCTION

Cotton is the largest natural textile material – and the increasing use of naturally colored cotton reflects the consumers' desire to use natural products.

There are **two basic types of naturally colored cotton: brown and green**. However, the quality of the cotton fiber of these colored cotton plants is poor, limiting its use and development. In this study, we looked at the potential to alter the cotton fibers' color and quality, through modifying the flavonoid pathway.

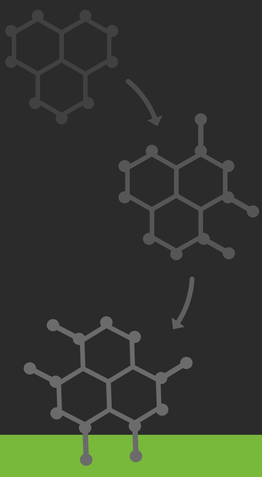
Green cotton

Brown cotton

WHAT IS THE FLAVONOID PATHWAY?

Flavonoids are the main components of plant pigments and have been studied in many plants. The "flavonoid biosynthetic pathway" is, simply put, a pathway of chemical reactions that form molecules, taking place within the cotton plants.

Previous studies on cotton fiber color show that the pigmentations of brown cotton fibers (BCF) and green cotton fibers (GCF) might be affected by the flavonoid biosynthetic pathway. We tested this by characterizing the genetic mechanisms regulating pigment formation in colored cotton fibers, thus **exploring the possibility of changing the color of cotton through biotechnological techniques**.



METHODS

In this work, **transcriptome analysis** and **qRT-PCR** revealed that flavonoid metabolic pathway genes were enriched during pigment synthesis among BCF, GCF, and white cotton fibers (WCF). **Silencing the CHI gene** in a BCF line resulted in three fiber phenotypes among offspring of the RNAi lines. **Overexpression of the *Gh3GT* or *At3GT* gene** in BCF lines resulted in GCF. Additionally, flavonoid metabolites of BCF and GCF were significantly higher than those of WCF as assessed by a **metabolomics analysis.**

RESULTS

Our research indicates that the **formation of brown pigments in cotton fibers is controlled by the flavonoid biosynthetic pathway**, and the formation of green pigments in cotton fibers may be controlled by the same pathway because the overexpression of *Gh3GT* and *At3GT* in BCF plants resulted in GCF.

Pathway may also control formation of green pigments

Pathway controls formation of brown pigments

CONCLUSION

This study shows the potential of flavonoid pathway modifications to alter cotton fibers' color and quality.

PeerJ

Flavonoid biosynthesis controls fiber color in naturally colored cotton. PeerJ 4:e4537 DOI: 10.7717/peerj.4537 http://peerj.com/articles/4537/

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