Innovative DNA Profiling for Hemp Fibre Authentication in Textiles

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Introduction

Hemp (*Cannabis sativa* L.) is a versatile and sustainable plant, known for its **eco-friendly properties** and wide range of industrial applications, especially in textiles. However, with the rapid growth of the hemp textile industry, ensuring product **authenticity is crucial** for maintaining regulatory compliance and consumer trust. Robust methods are needed to verify product authenticity and ensure compliance with legal standards. **DNA-based molecular techniques** have emerged as a promising solution, as traditional methods often fail to distinguish hemp from similar plant fibres like cotton.

Objectives

Develop a **DNA-based tool** to identify hemp and validate its effectiveness in **distinguishing and authenticating** hemp fibres from other plant fibres in textile products.

Methods

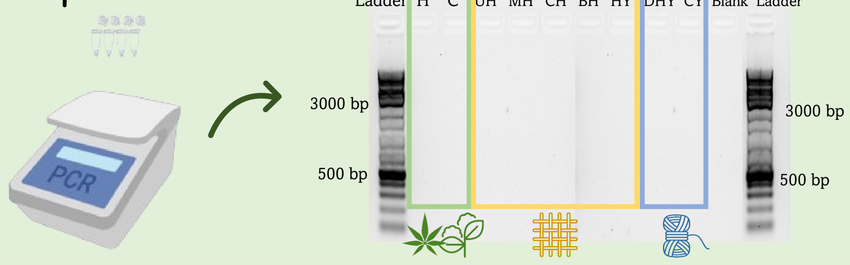
1. DNA Extraction of different samples

Cannabis sativa L. **(H)** | *Gossypium hirsutum* **(C)** | Unfinished hemp fibre **(UH)** | Mechanically finished hemp fibre **(MH)** | Chemically finished hemp fibre **(CH)** | Biologically finished hemp fibre **(BH)** | 90 % cotton + 10 % hemp yarn **(HY)** | Dyed 90 % cotton + 10 % hemp yarn **(DHY)** | 100 % cotton yarn **(CY)**

Hemp and cotton leaves | Hemp fibres with different finishes | Yarn with mixtures

2.. Design of Specific Primers for *C. sativa* L.

3. PCR Amplification



Results and Discussion

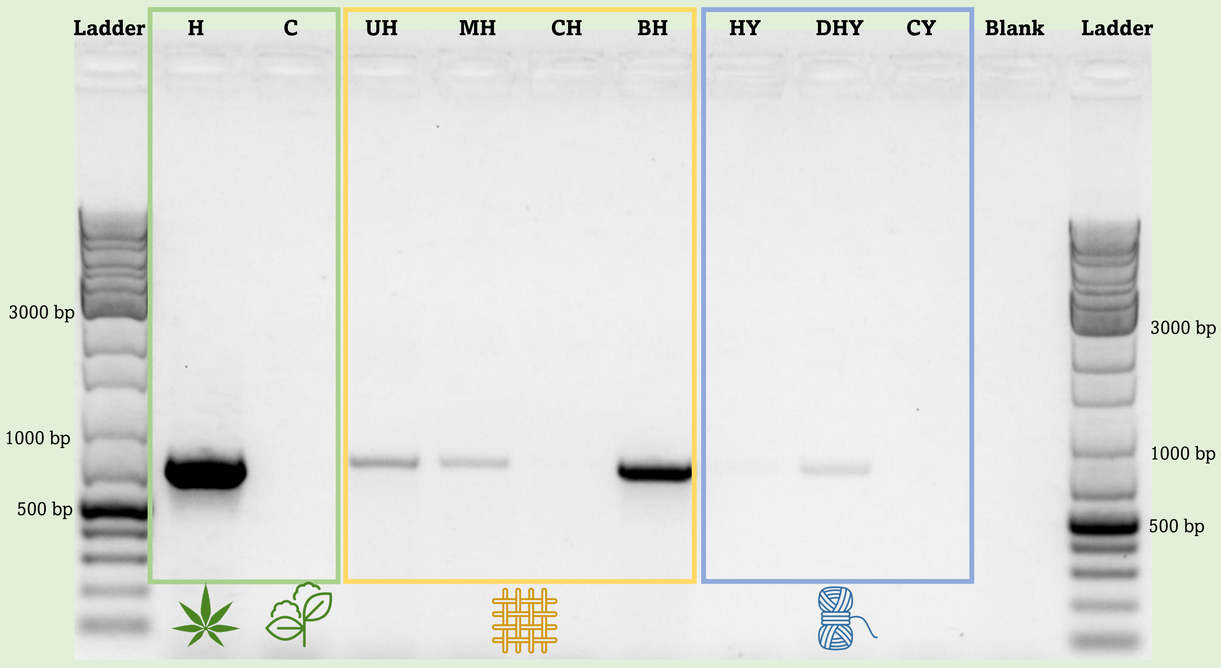


Figure 1. Agarose gel electrophoresis of PCR from DNA samples: H, C, UH, MH, CH, BH, HY, DHY, CY amplified with the *Cannabis_sativa* primer. Blank – negative control without DNA (primer *Cannabis_sativa*).

Amplification did not occur in samples C, CH, and CY;

The designed primer demonstrated **high specificity** for *Cannabis sativa* L., amplifying in all hemp samples;

The absence of amplification in the chemically treated hemp fibre suggests that the **chemical process may degrade the DNA**;

The successful amplification in 90 % cotton and 10 % hemp mixtures (HY and DHY) reinforces the **primer's usefulness for hemp traceability**;

The lack of amplification in 100 % cotton **confirms the primer's specificity for hemp**.

Conclusion and Future Work

- ✓ **High specificity** of the designed primer for *Cannabis sativa L.* in processed textiles;
- ✓ The method effectively **distinguishes hemp from other plant fibres**, including in cotton-hemp blends;
- ✓ **Future work** should include expanding the analysis to a **varied range of textile products** containing different plant fibres blends.

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