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A PCR marker linked to a THCA synthase polymorphism is a reliable tool to discriminate potentially THC-rich plants of Cannabis sativa L.

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Abstract

Neither absolute THC content nor morphology allows the unequivocal discrimination of fiber cultivars and drug strains of Cannabis sativa L. unequivocally. However, the CBD/THC ratio remains constant throughout the plant's life cycle, is independent of environmental factors, and considered to be controlled by a single locus (B) with two codominant alleles (B(T) and B(D)). The homozygous B(T)/B(T) genotype underlies the THC-predominant phenotype, B(D)/B(D) is CBD predominant, and an intermediate phenotype is induced by the heterozygous state (B(T)/B(D)). Using PCR-based markers in two segregating populations, we proved that the THCA synthase gene represents the postulated B locus and that specific sequence polymorphisms are absolutely linked either to the THC-predominant or the THC-intermediate chemotype. The absolute linkage provides an excellent reliability of the marker signal in forensic casework. For validation, the species-specific marker system was applied to a large number of casework samples and fiber hemp cultivars.

KEYWORDS: Cannabis sativa L.; THCA synthase; chemotype; forensic science; genetic segregation; linkage; molecular marker; species-specific

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