

ENHANCING WALNUT (*JUGLANS REGIA* L.) QUALITY CONTROL

HIGH-RESOLUTION MELTING ANALYSIS FOR ACCURATE AND COST-EFFECTIVE VARIETY IDENTIFICATION

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INTRODUCTION

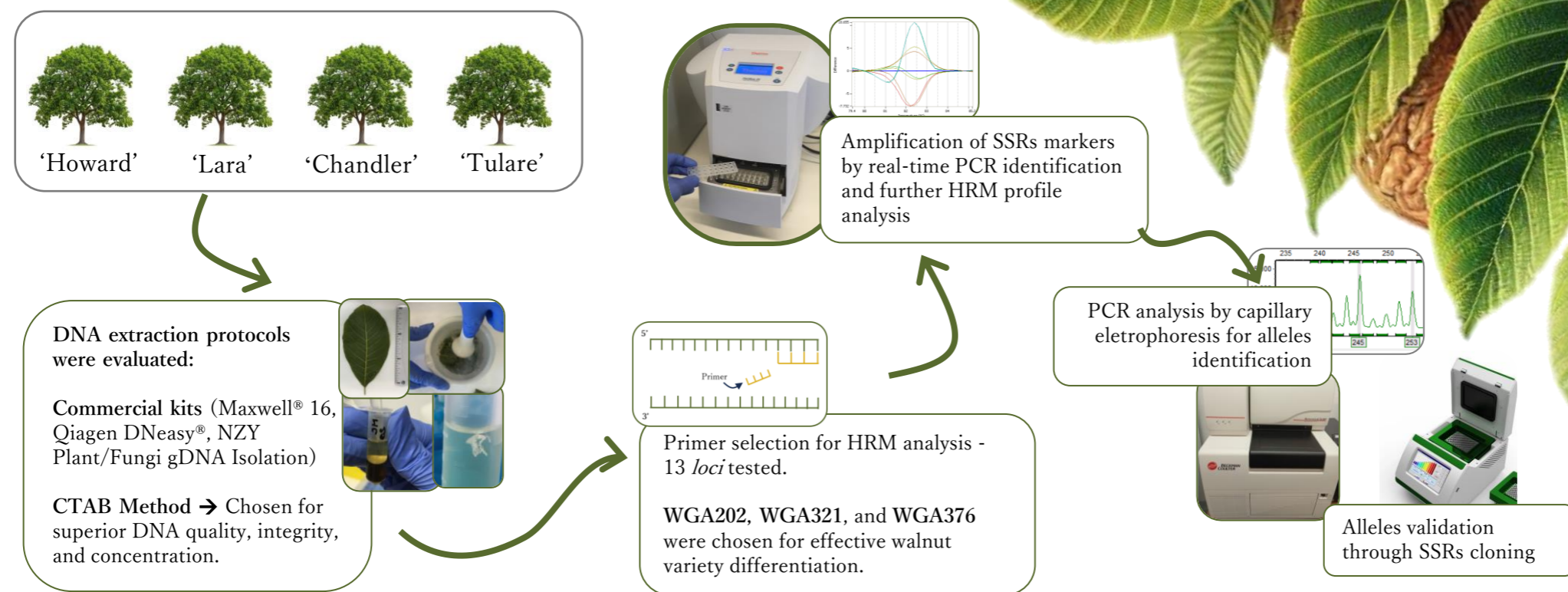
The walnut tree (*Juglans regia* L.) is of significant economic importance due to its high-quality wood, widely used in fine furniture, and its nutritious, flavorful fruits, valued as snacks and key ingredients in various food products.

Accurate identification of walnut varieties is crucial for nurseries to detect potential errors during vegetative propagation, ensuring certification of plant material. It is equally essential for farmers to resolve uncertainties about the plant material used in orchard plantations, promoting successful and reliable cultivation.

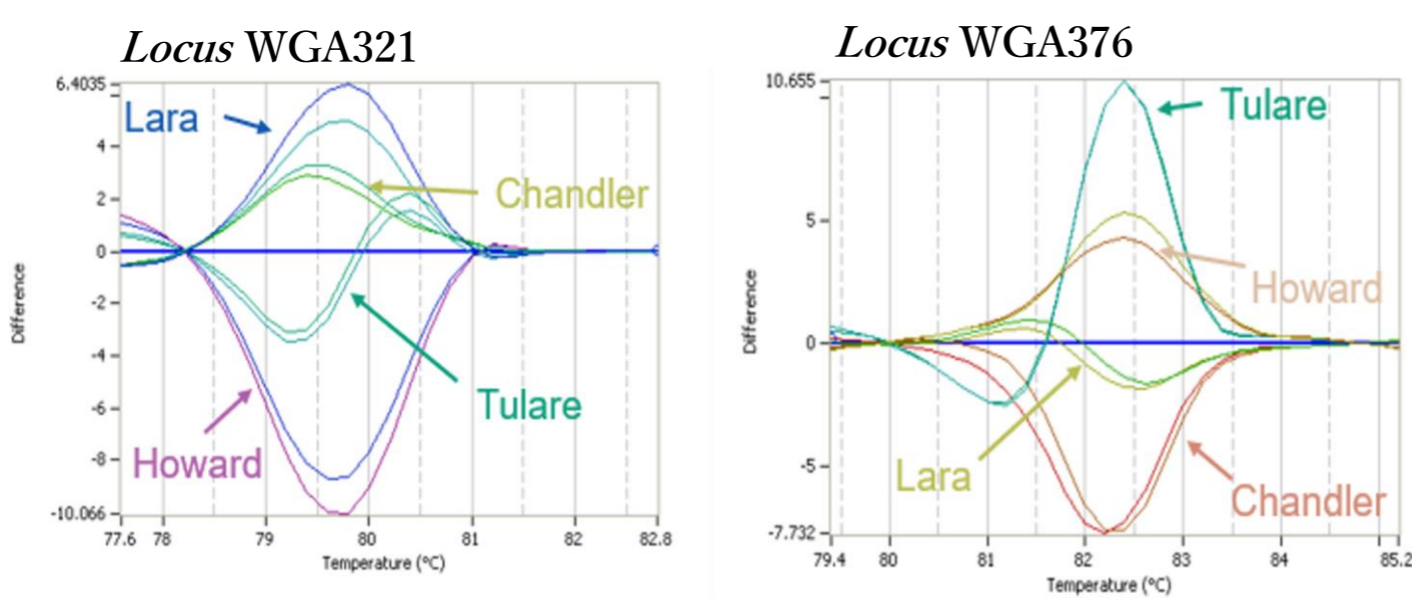
The availability of a practical, accurate, and reliable tool for walnut genotyping will be of obvious interest. Traditional genotyping methods, such as microsatellite (Simple Sequence Repeats – SSR) analysis, are often too time-consuming and expensive for routine use.

Goal: This study introduces High-Resolution Melting (HRM) analysis as an innovative, cost-effective, and rapid technique for effective walnut variety genotyping.

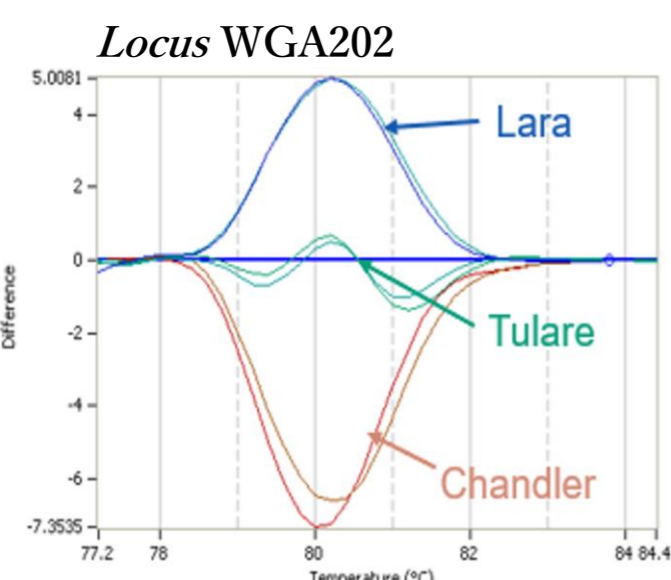
METHODOLOGY



RESULTS



The *loci* WGA321 and WGA376 enabled the discrimination among all four varieties under investigation.



The WGA202 *locus* enable the discrimination among three of the varieties under investigation, namely 'Lara', 'Tulare', and 'Chandler'.

✓ The genotype profiles from HRM analysis were validated using SSR analysis via capillary electrophoresis and sequencing.

✓ The results confirmed consistency between the two methods, ensuring the accuracy and reliability of the genotyping approach.

Efficient Variety Discrimination: Real-time PCR with HRM analysis offers a faster, cost-effective alternative to traditional methods for distinguishing walnut varieties.

Improved Quality Control: HRM analysis reduces the risk of varietal misidentification, ensuring better quality control and market compliance. The optimized methodology provides a reliable and efficient framework for the genetic analysis and genotyping of walnut tree varieties.

Future Applications: This technique could be adapted for fruit-level variety identification, ensuring accurate labeling and higher product quality for consumers.

CONCLUSIONS

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