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Development of an easy Molecular Approach for Adulteration Detection by Isothermal Amplification applied to 100% Arabica Coffee Authentication

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Introduction

Coffee is one of the largest commodities and the most widely consumed drinks all over the world. The great commercial value of coffee makes the evaluation of its adulteration important. The two commercially available species: *C. arabica* and *C. canephora* have distinct characteristics and address the needs of different markets, with *C. arabica* coffee holding a higher commercial value. In the context of 100% Arabica coffee consumption, *C. canephora* constitutes a potential contaminant, whether incorporated deliberately or unintentionally. Moreover, coffee can be adulterated with foreign substances such as corn, compromising its quality. Until today, quality control of 100% arabica coffee is limited, and developing an easy, rapid, non-subjective, DNA-based, reproducible molecular approach for identifying coffee adulteration is crucial.

Figure 1. Detection of *C. canephora* and *Zea mays* adulteration in coffee products labeled as 100% *C. arabica*.

Materials/Methods

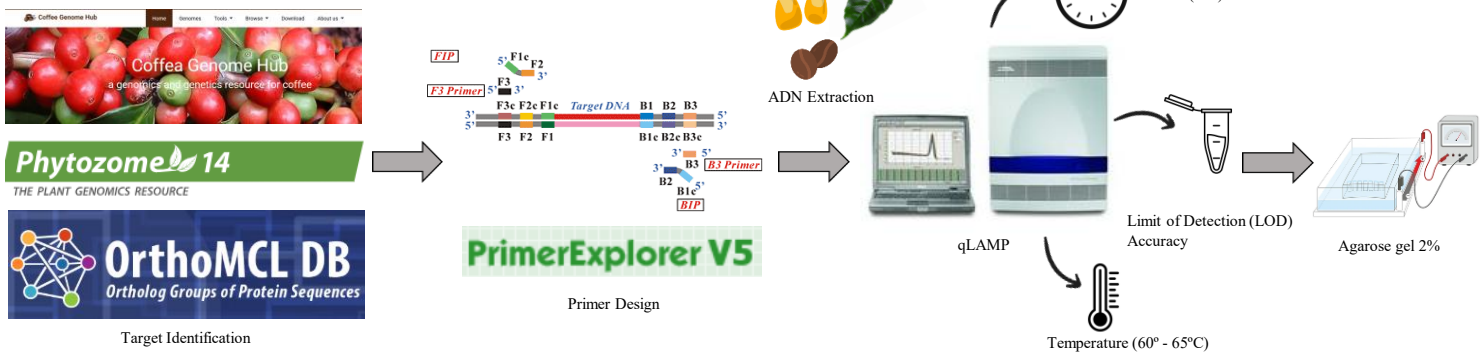


Figure 2. Workflow for target identification and experimental validation.

Results/Discussion

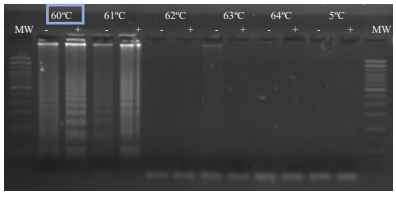


Figure 3. Agarose 2% gel showing temperature optimization test.

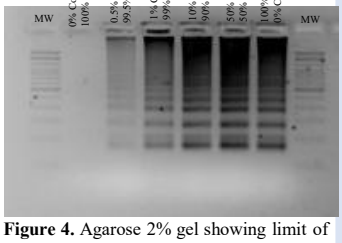
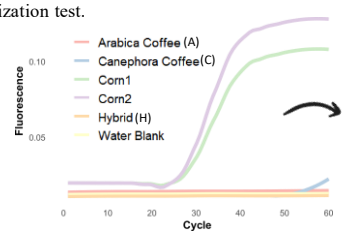


Figure 4. Agarose 2% gel showing limit of detection (LOD) analysis.



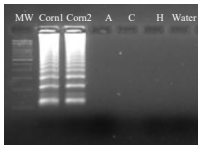


Figure 5. qLAMP amplification curves and agarose gel profile.

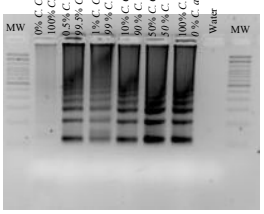


Figure 6. Agarose 2% gel showing limit of detection (LOD) analysis.

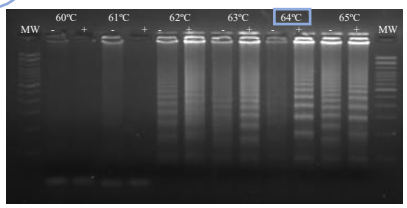
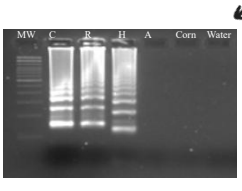
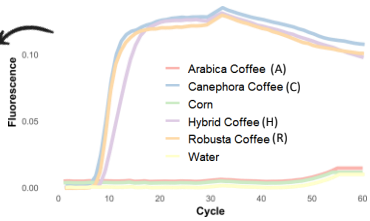


Figure 7. Agarose 2% gel showing temperature optimization test.

Figure 8. qLAMP amplification curves and agarose gel profile.





Conclusion/Perspectives

This study demonstrates the first and innovative rapid DNA based test for coffee authentication quality, using an easy approach of isothermal amplification. The validation of these targets highlights the potential of applying this approach to the determination of other contaminants, as well as to the development of flow-based rapid test prototypes for the efficient detection of coffee contamination on a large scale. This strategy shows great potential for quality control of 100% arabica coffee.

References:

1.Wang, X., Lim, L. T., & Fu, Y. (2020). Review of analytical methods to detect adulteration in coffee. Journal of AOAC International, 103(2), 295-305.

2.Perez, M., Domínguez-López, I., López-Yerena, A., & Vallverdú Queralt, A. (2023). Current strategies to guarantee the authenticity of coffee. Critical Reviews in Food Science and Nutrition, 63(4), 539-554.