

From Fruit Residues to Leather Enhancement: Pomegranate Tannins as Eco-Friendly Collagen Crosslinkers

Sara EL MOUJAHED^{1,2,*}, Rodica Mihaela DINICA², Hicham ABOU OUALID, Fouad OUAZZANI CHAHDI¹, Faouzi ERRACHIDI⁴

¹ Laboratory of Applied Organic Chemistry, Faculty of Sciences and Technologies, Sidi Mohamed Ben Abdellah University, Fez, Morocco

² Laboratory of Organic Chemistry, Faculty of Sciences and Environment, Dunarea de Jos University of Galati, Romania

³ Green Energy Park, IRESEN-UM6P, Benguerir, Morocco

⁴ Laboratory of Functional Ecology and Engineering Environment, Faculty of Sciences and Technologies, Sidi Mohamed Ben Abdellah University, Fez, Morocco

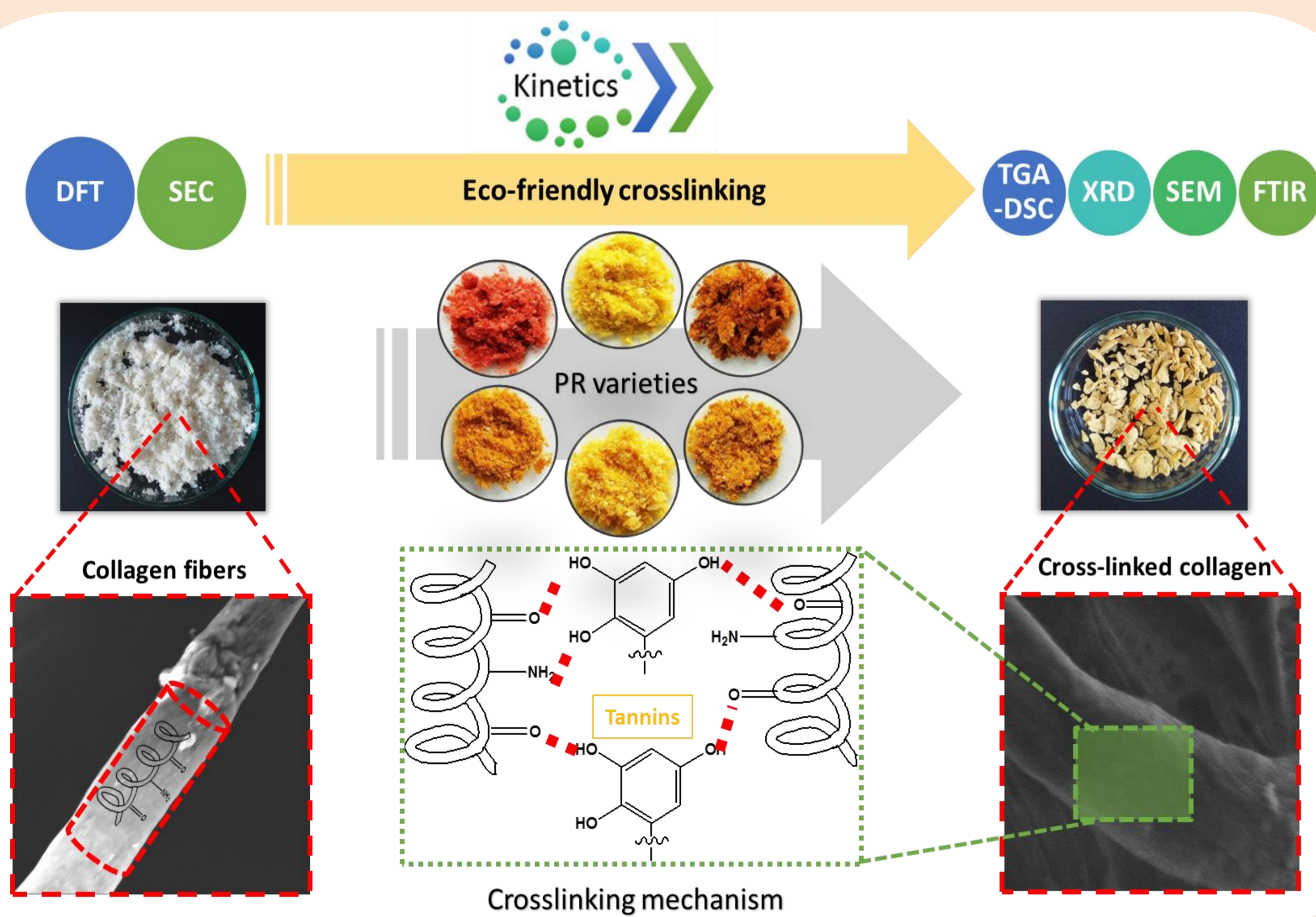
*Corresponding author: sara.elmoujahed@usmba.ac.ma

INTRODUCTION

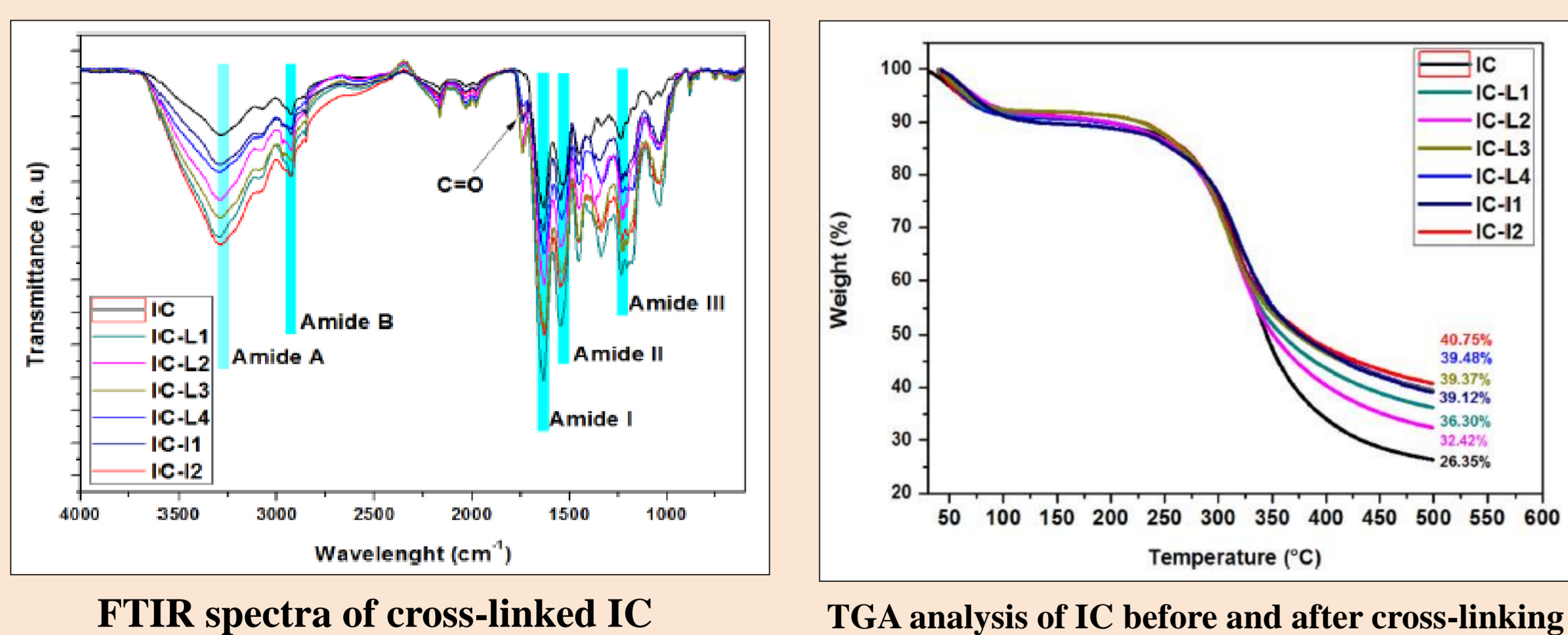
Chrome tanning, the prevailing method for leather production, has raised environmental and health concerns. In response, researchers have sought alternatives, with the circular economy proposing the use of biomasses to reduce waste. In Morocco, fruit waste generated by juice processing industries remains an untapped source of tannins. To address this, a new eco-friendly tanning method based on vegetable biomass has been developed. The study focuses on extracts from six Moroccan pomegranate by-products (PR) varieties, investigating their crosslinking behavior with insoluble collagen (IC) extracted from sheep hide under industrial tanning conditions.

CHARACTERIZATIONS

Crosslinking process

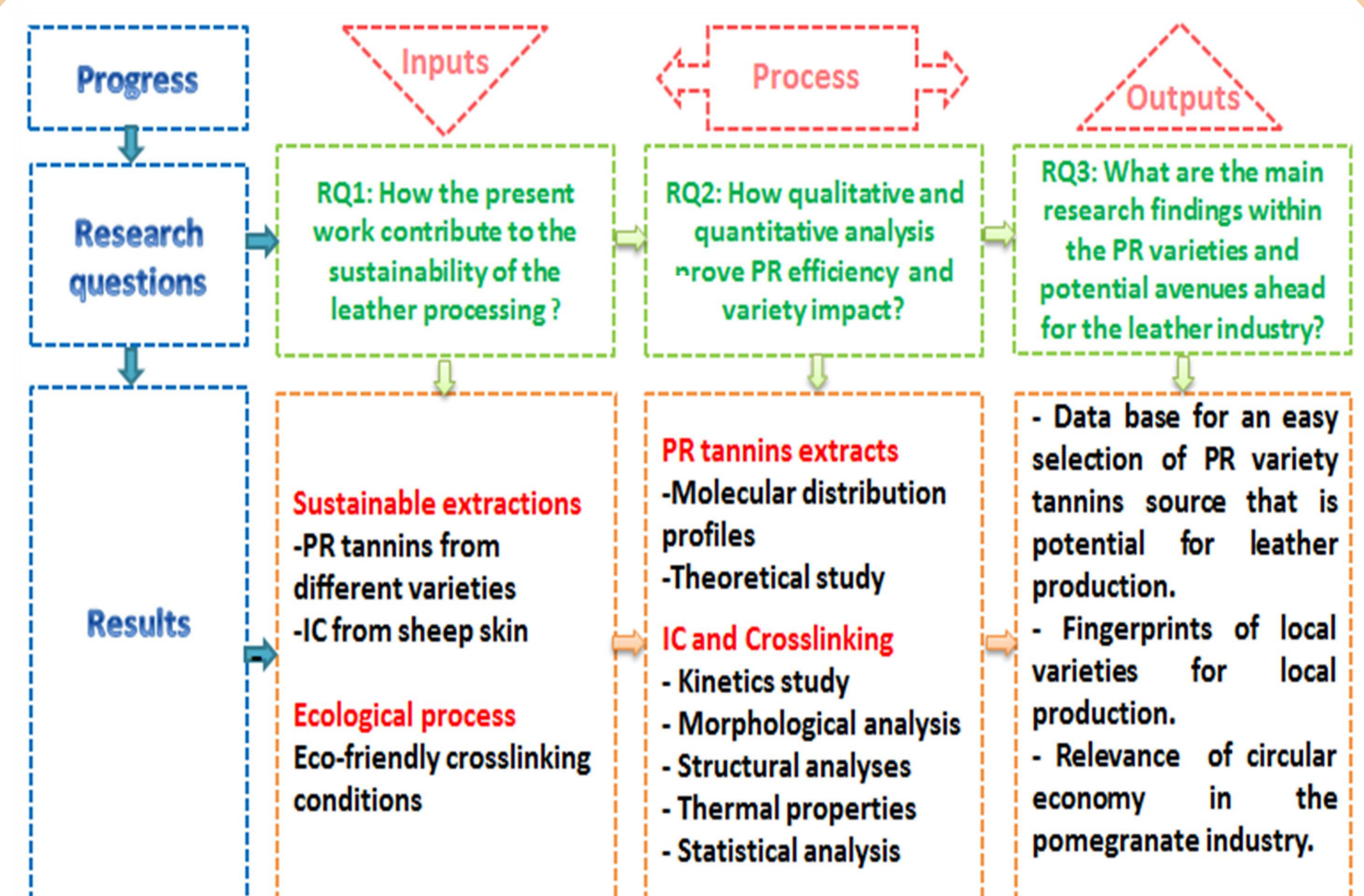


Structural & Thermal characterizations

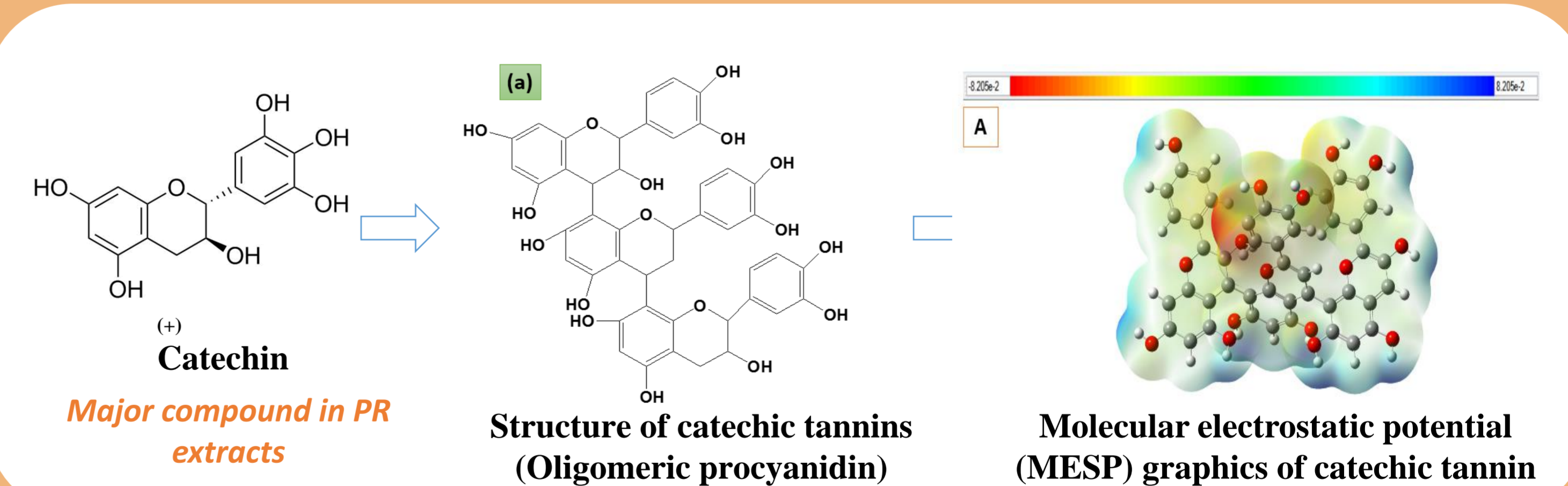


- ❖ FTIR results exhibit the functional groups contributing in the cross-linking process on the side of collagen structure.
- ❖ Shifting of absorption peaks indicate the existence of interactions between IC functional groups and extract, both intra- and intermolecular.
- ❖ Introduction of extract in the collagen structure enhances the thermal stability of collagen structure

RESEARCH FRAMEWORK



Theoretical study



- ❖ Potential active interaction sites of catechic tannins extracts were estimated also by MESP surface. As a result, the deepest Red regions (negative) has more attractive forces. These results show that more the content of catechic tannins is high more the crosslinking performance is higher.
- ❖ The crosslinking ability of extracts was found to be controlled by catechic tannins.

CONCLUSION

Using an ecological and simple extraction process, pomegranate by-products used can produce rich extracts in terms of tannins yields with a large variation in molecular weight distributions. The study underscores the potential of these extracts, produced ecologically, as promising candidates for sustainable leather production.

(To read the full paper: <https://doi.org/10.1016/j.jenvman.2023.117613>)

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