

Apple by-products transformation into flours



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Framework

This work aimed to produce and analyse flours from apple (Gala cultivar) by-products.

Fruit and vegetable by-products

They are peels, stems/cores, leaves, pomaces, unripe or damaged fruit/vegetable.

Correspond to ~14% of all food produced¹ and ~50% of industrial manufacturing².

Rich in fibre: from 30 to 90% of dry weight.

Rich in bioactive compounds (mostly bound to the fibre): phenolic acids, flavanols, flavonols, flavanones, flavones, coumarins, anthocyanins, carotenoids, tocols.

Health benefits: antioxidant activity, gut microbiota improvement, satiety increase, lower energy intake, prevention of chronic diseases (diabetes, obesity, cancers, cardiovascular diseases).

Flours advantages

Fruit by-products flours can be easily used as ingredients in several industries³ as:

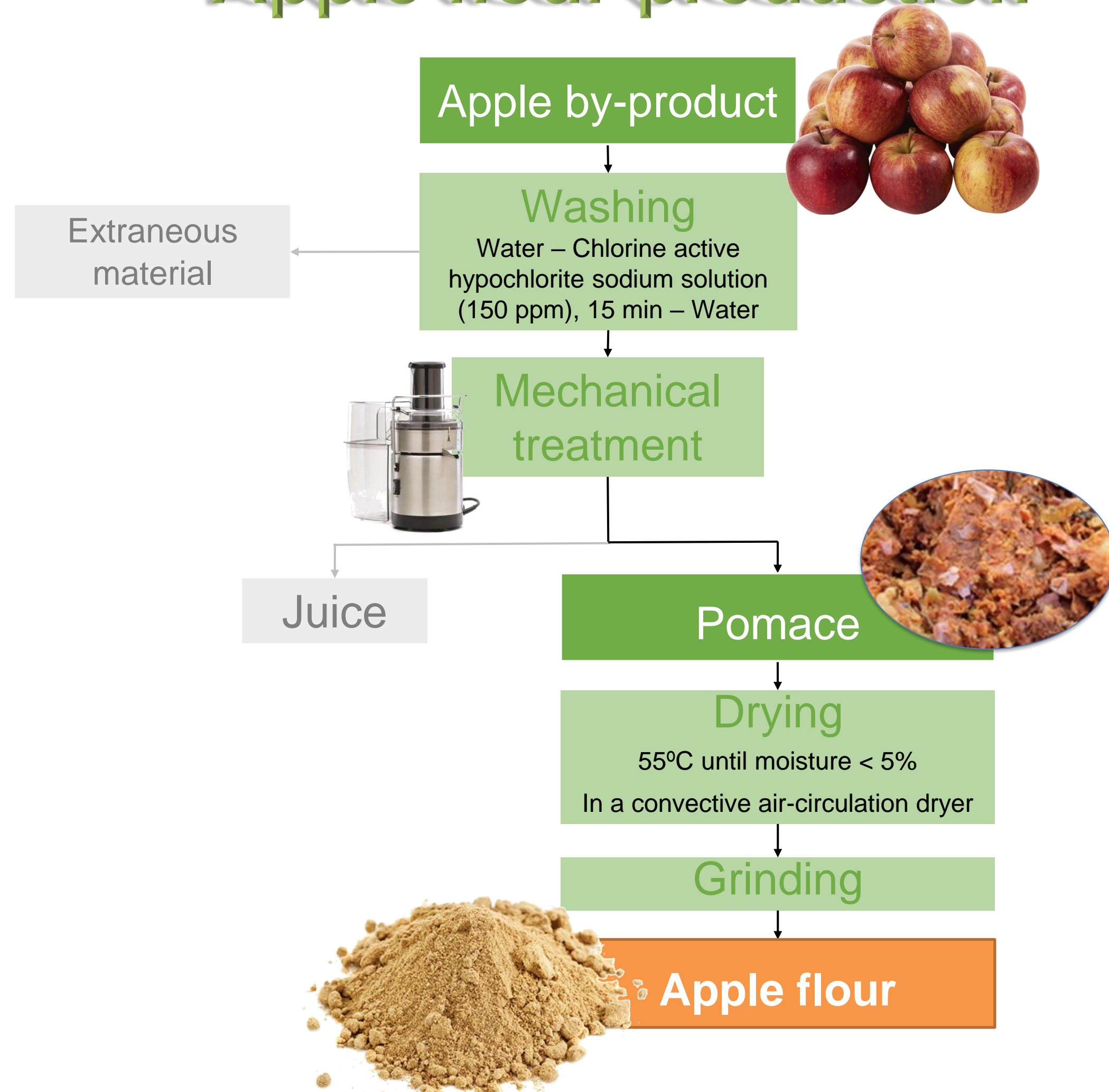
- Dairy (yogurts, ice cream, etc.)
- Bakery (cookies, cakes, breads, etc.)
- Animal products (meatballs, fish burgers, etc.)
- Beverage (functional beverages)

When applied into food products, they:

- ↑ fibre content
- ↑ bioactive compounds content, namely antioxidant activity and other health benefits
- ↑ shelf-life (due to antioxidant activity and antimicrobial)
- Provide natural colour pigments

Methods and Results

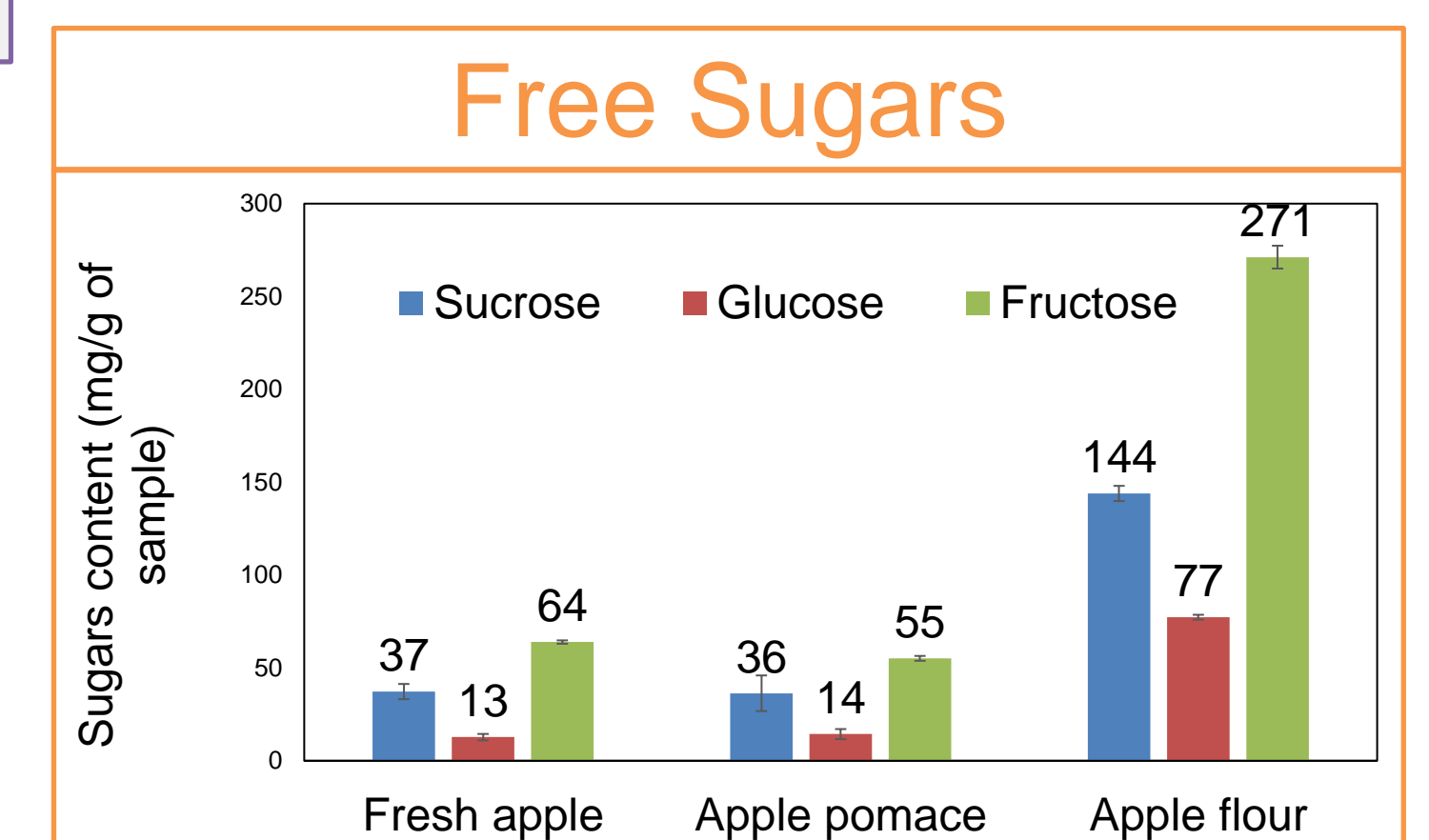
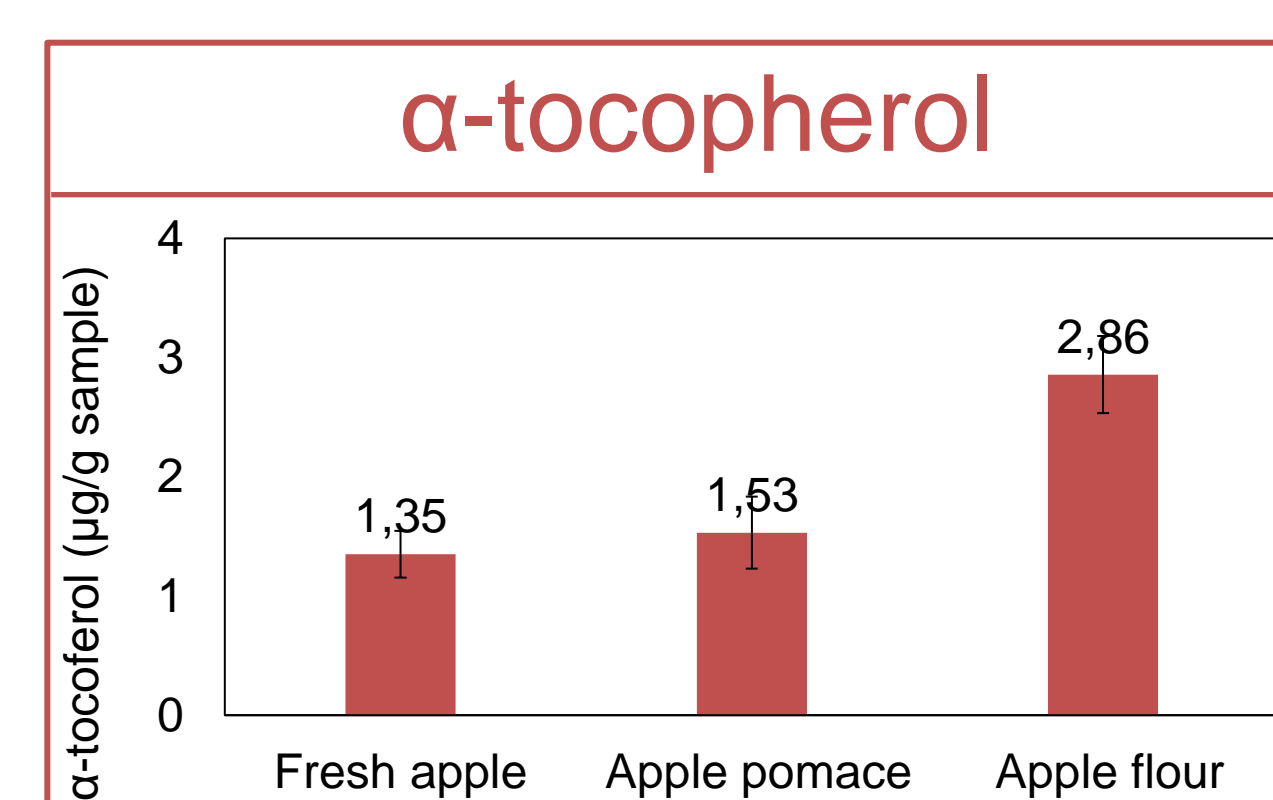
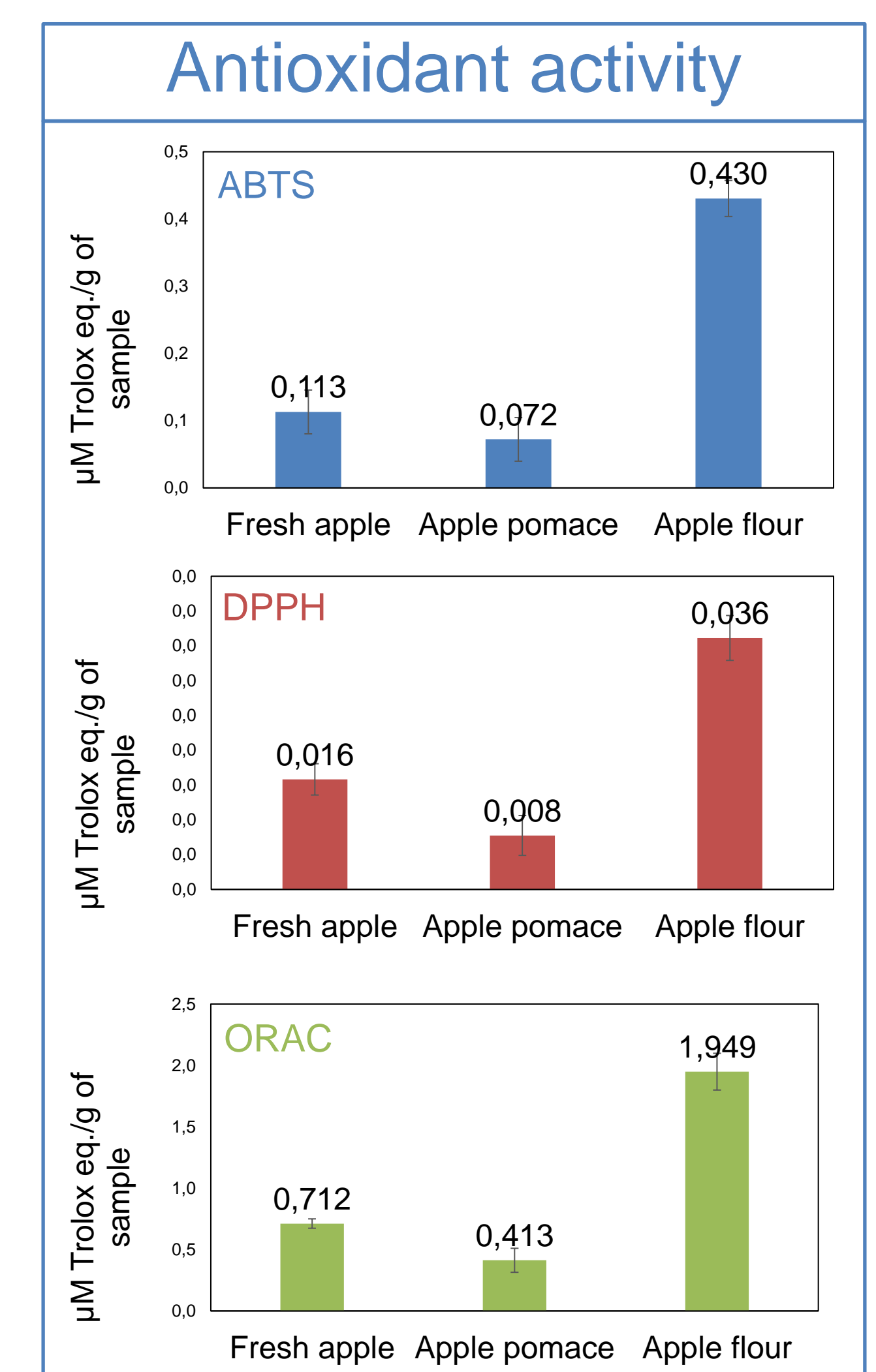
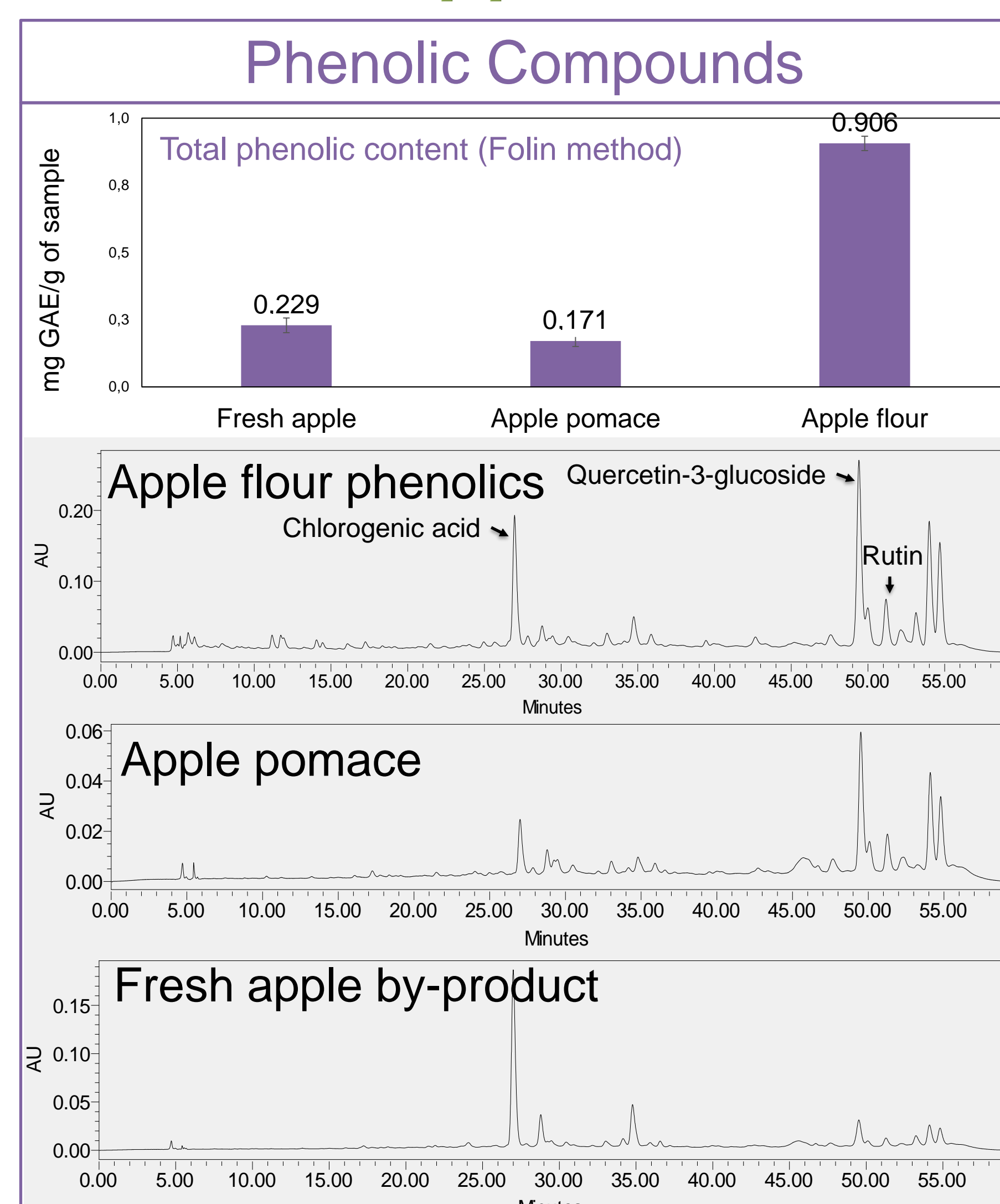
Apple flour production



Nutritional composition

Moisture	10.8 ± 0.4 %
Ash	1.49 ± 0.04 %
Fat	1.37 ± 0.03 %
Protein	2.4 ± 0.4 %
Total carbohydrates	84.0 ± 0.8 %
Total dietary fibre	30.7 ± 2.9 %
Insoluble dietary fibre	20.8 ± 0.3 %
Soluble dietary fibre	9.9 ± 2.5 %
Sugars (sucrose, glucose and fructose)	526.5 ± 36.2 mg sugars/g of flour

Apple flour characterization



Conclusions

These results showed that apple flour is rich in fibre and bioactive compounds such as phenolic compounds associated to antioxidant effect. Thus, transforming apple by-products into flour can be an effective way to valorise these by-products once these flours can be used as added-value ingredients, for instance, to increase fibre content in foods.

References

- ¹ FAO, *The State of Food and Agriculture 2019. Moving forward on food loss and waste reduction*. 2019: Rome. Licence: CC BY-NC-SA 3.0 IGO.
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- ³ Cilli, L. P.; Contini, L. R. F.; Sinnecker, P.; Lopes, P. S.; Andreo, M. A.; Neiva, C. R. P.; Nascimento, M. S.; Yoshida, C. M. P.; Venturini, A. C., *Effects of grape pomace flour on quality parameters of salmon burger*. Journal of Food Processing and Preservation 2019, e14329.

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