

Valuation of industry apple juice concentrate by-products

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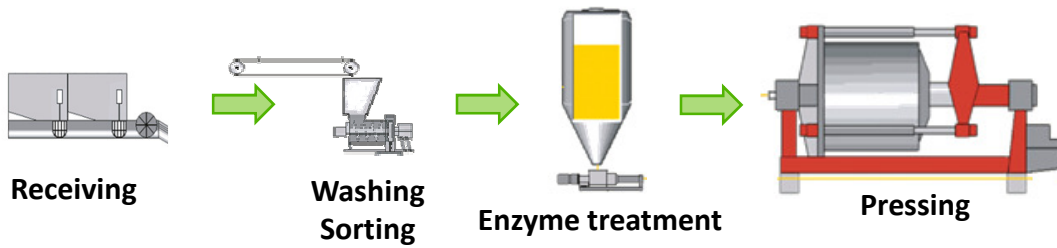
Portugal



Euro Global Summit and Expo on
Food & Beverages

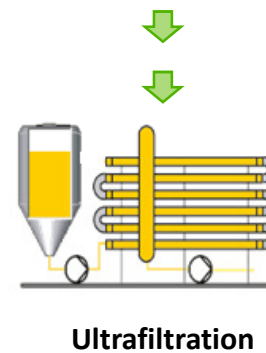
Alicante | 18 June 2015

Industrial process - Apple juice concentrate

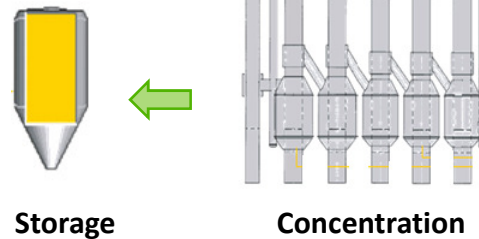


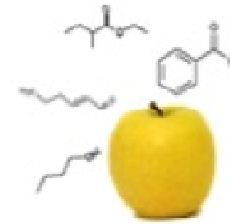
Apple pomace

Indumape
Industrialização de Fruta, S.A.



Retentate





Apple Pomace

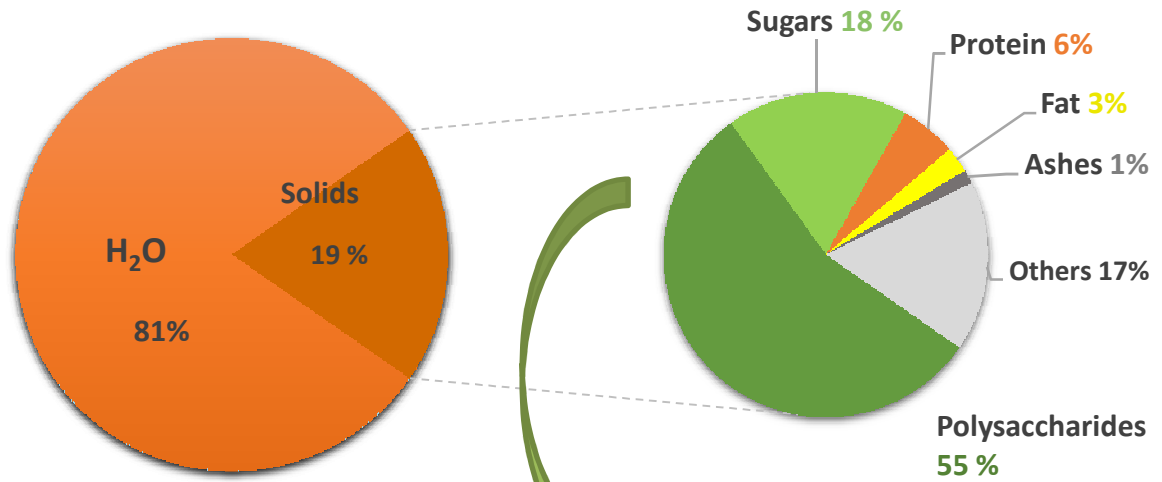


Samples

| Apple varieties | Conservation | Date | Name |
|--|----------------------|------------|-----------------|
| 80 % Golden 10 % Royal Gala 10 % Starking | Harvesting season | 15-10-2013 | SP-oct13 |
| 70 % Golden 15 % Starking 10 % Royal Gala 5 % Reinnete and others | Cold storage | 31-01-2014 | SP-jan14 |
| 60 % Royal Gala 30 % Starking 8 % Golden 2 % Reinnete and others | Harvesting season | 25-09-2014 | SP-sep14 |

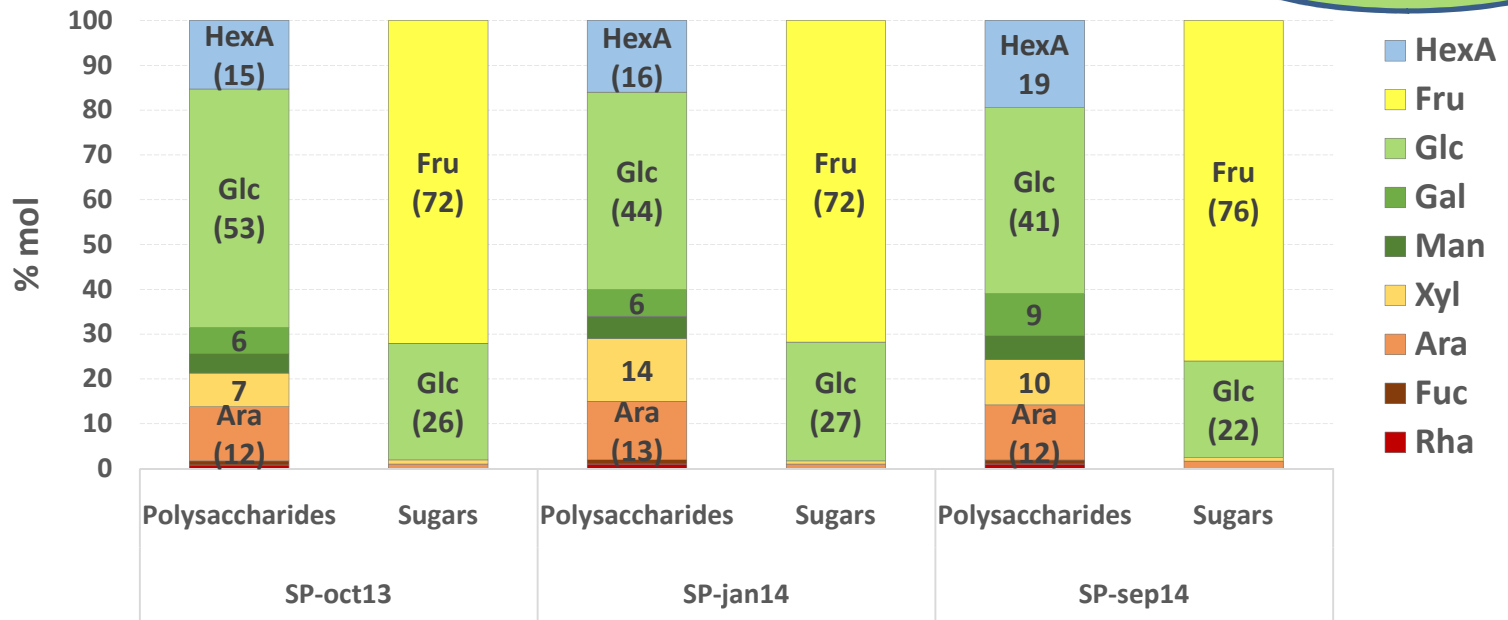


Chemical characterization



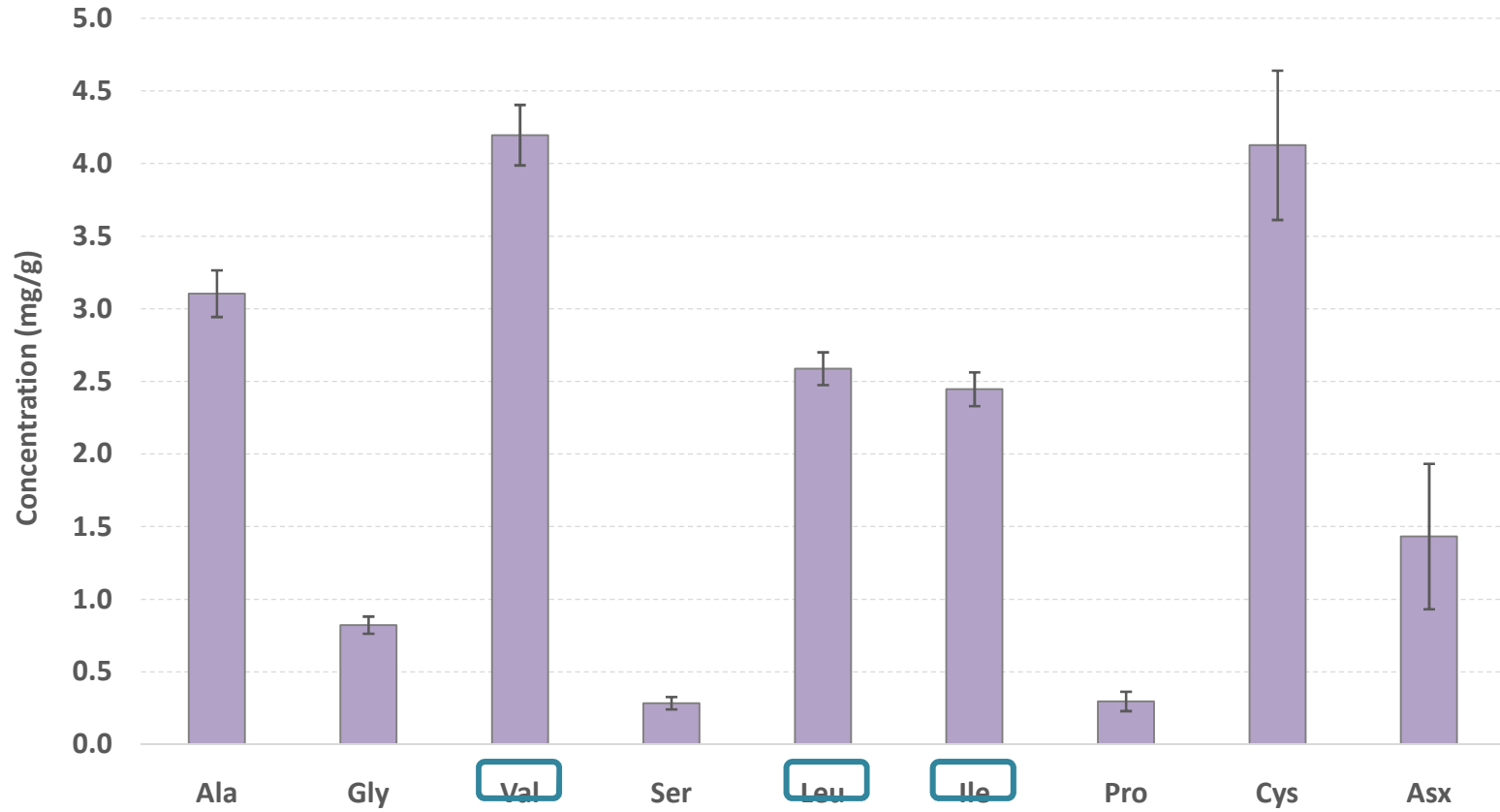
Carbohydrate composition analysis

Similar composition between lots



Chemical characterization

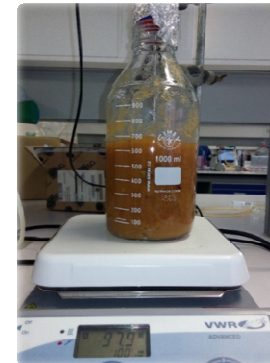
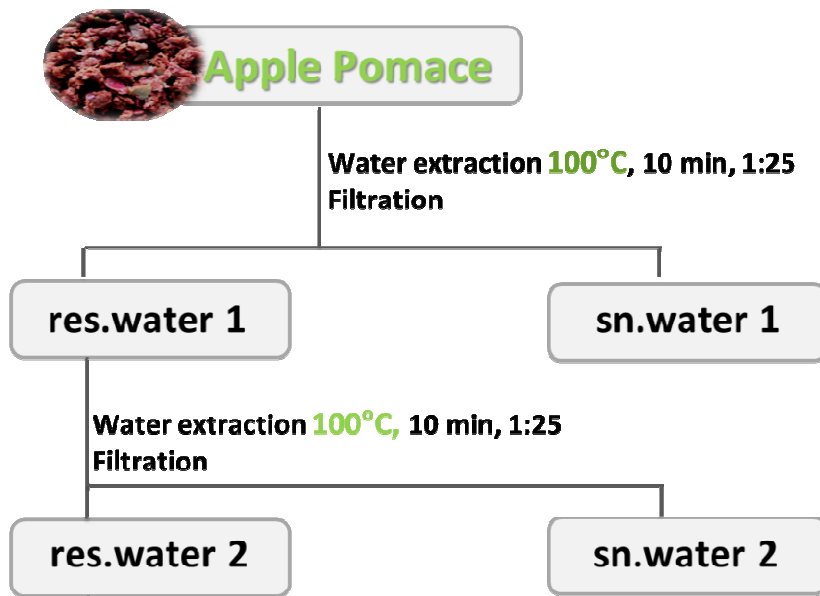
Aminoacids analysis



 - Essential Aminoacids

Sequential water extraction

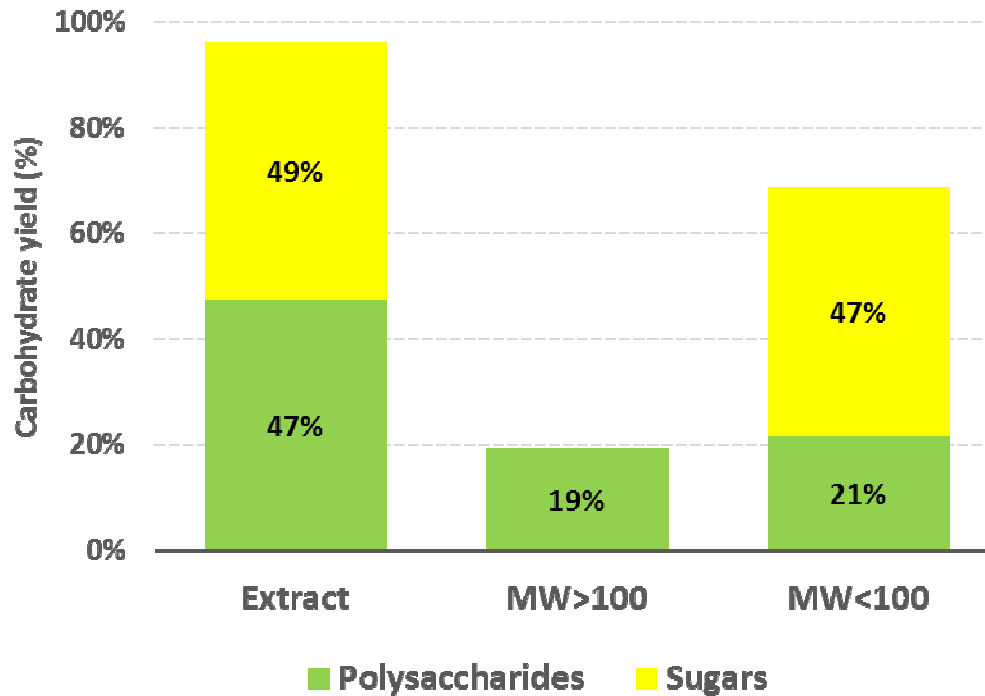
Soluble fiber extraction – boiling water



Water extraction



1st water extraction at 100°C, 10 min



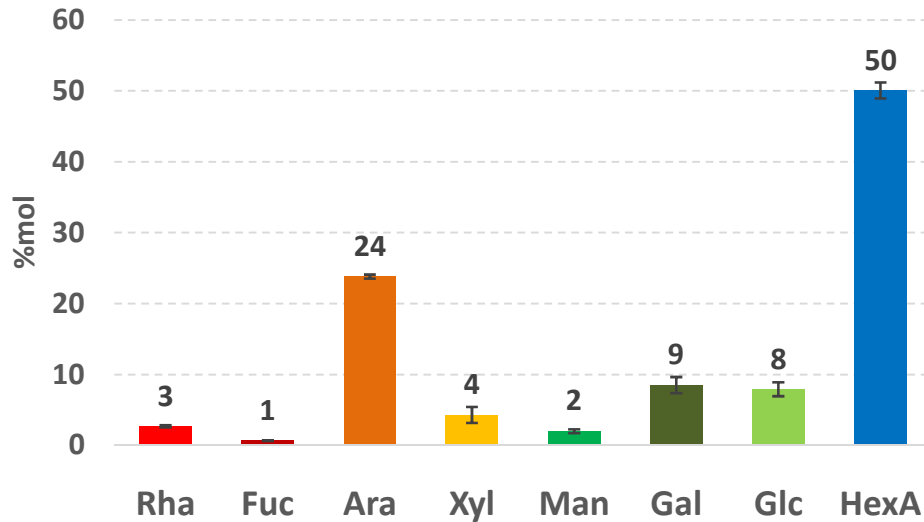
The first water extraction allowed the recovery of apple pomace sugars together with the fibres.



Polysaccharides extractions at 100°C, 10 min



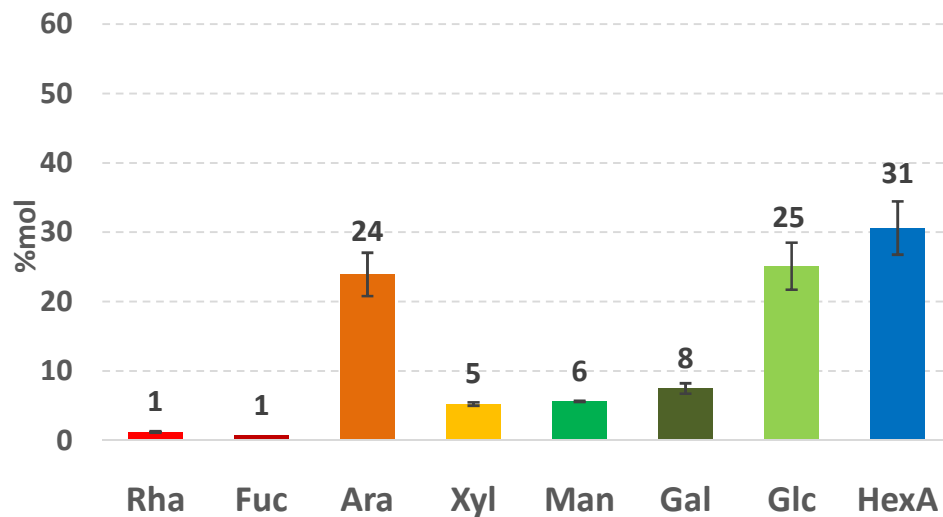
1st extraction



Yield: 22%

Pectic polysaccharides

2nd extraction



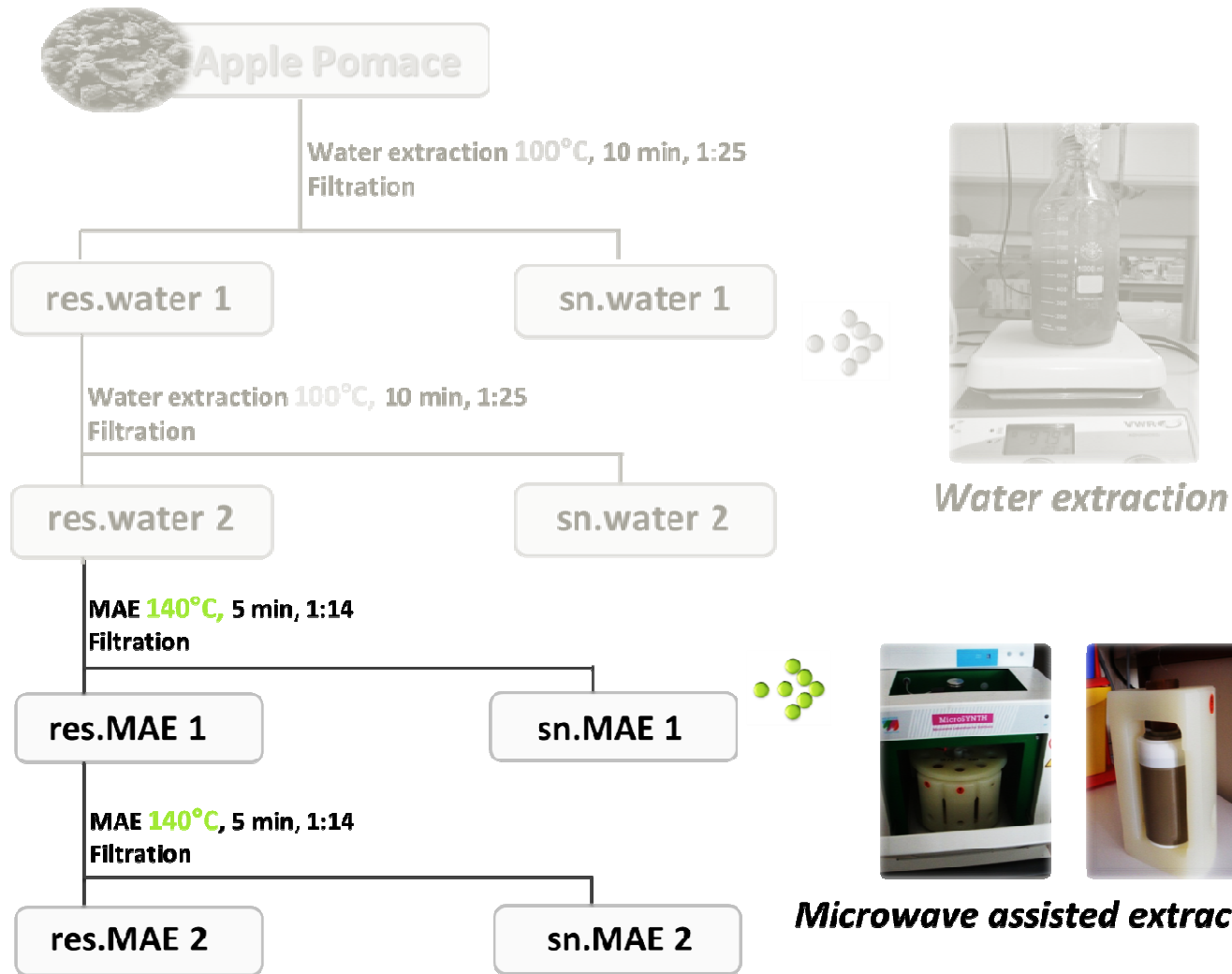
Yield: 6%

More branched pectic polysaccharides and starch (nutritionally balanced dietary fibre)



Sequential water extraction

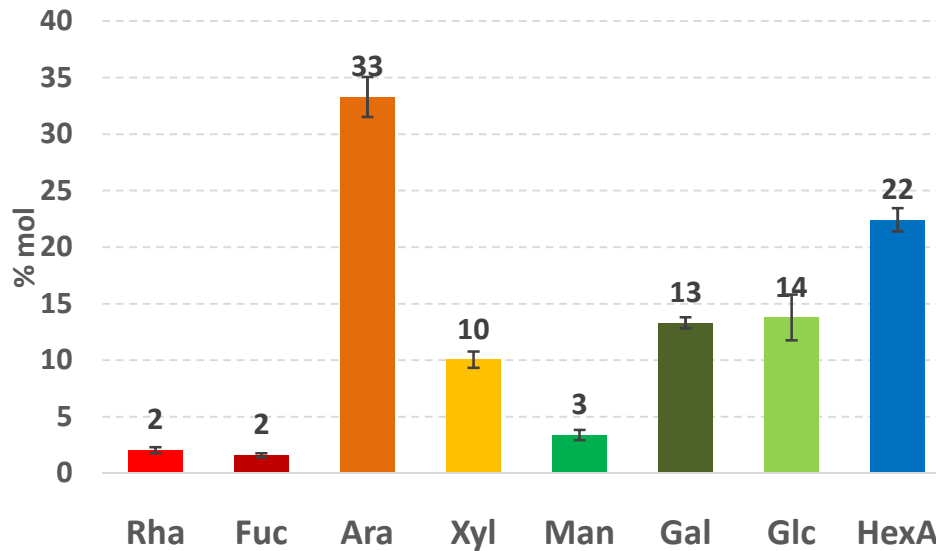
Soluble fiber extraction – Microwave assisted extraction (140°C)



Polysaccharides extractions at 140°C, 5 min (MAE)



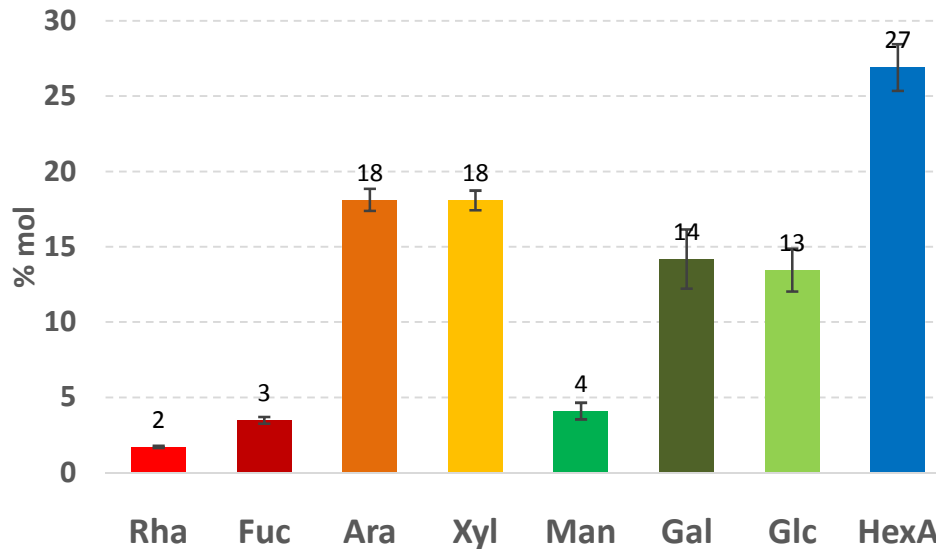
1st cycle



Yield: 8%

High branched pectic polysaccharides

2nd cycle

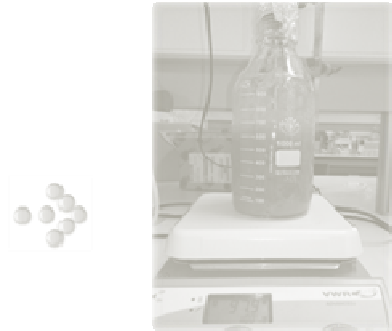


Yield: 4%

Ratio Ara/HexA decrease (debranched pectic polysaccharides) and increase the extraction of xylans

Sequential water extraction

Soluble fiber extraction – Microwave assisted extraction (180°C)



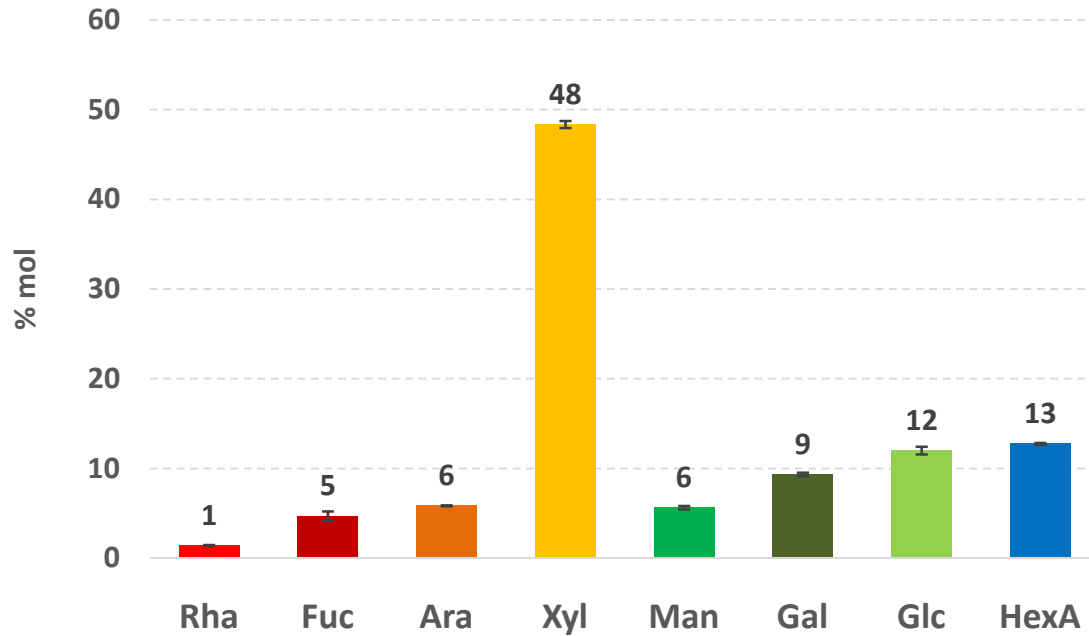
Water extraction



Microwave assisted extraction (MAE)



Polysaccharides extractions at 180°C, 2 min (MAE)

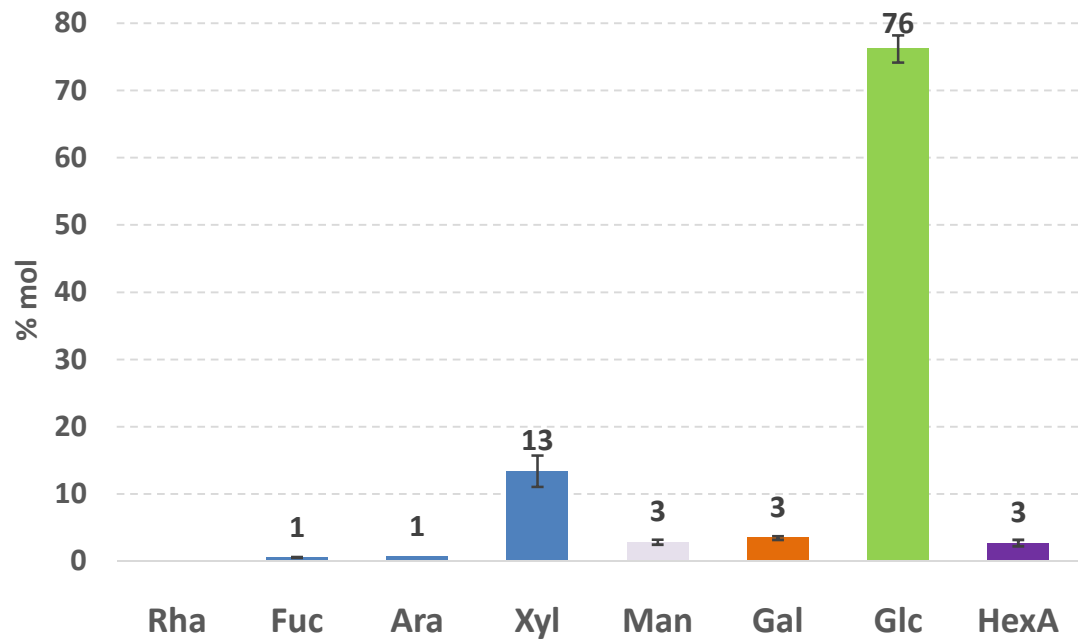


Yield: 5%

Xylose rich fibres, possibly xylans and xyloglucans



Remaining polysaccharides of final residues



45% of unextrated polysaccharides

Final residue is rich in cellulose

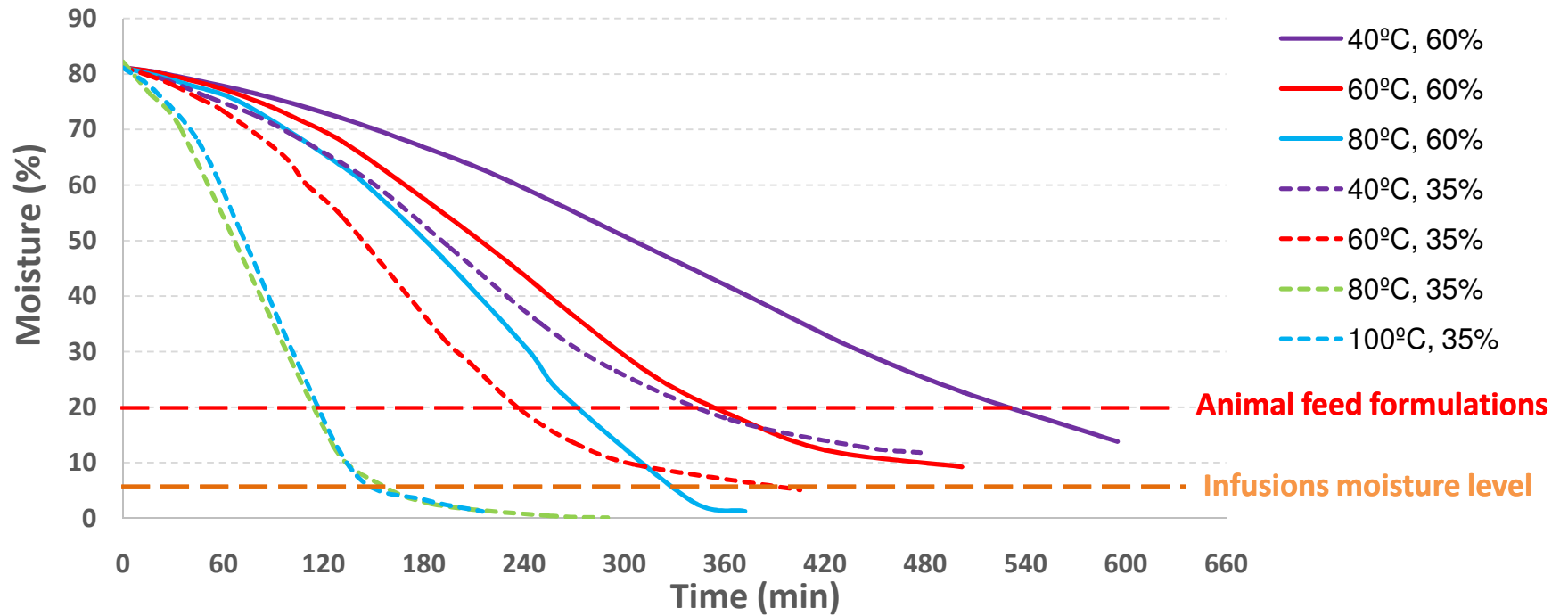


Apple pomace drying



Apple pomace drying

Apple pomace wet mass = 500,0 g



Lower relative air moisture increases drying efficiency



Apple pomace infusions

60°C



80°C



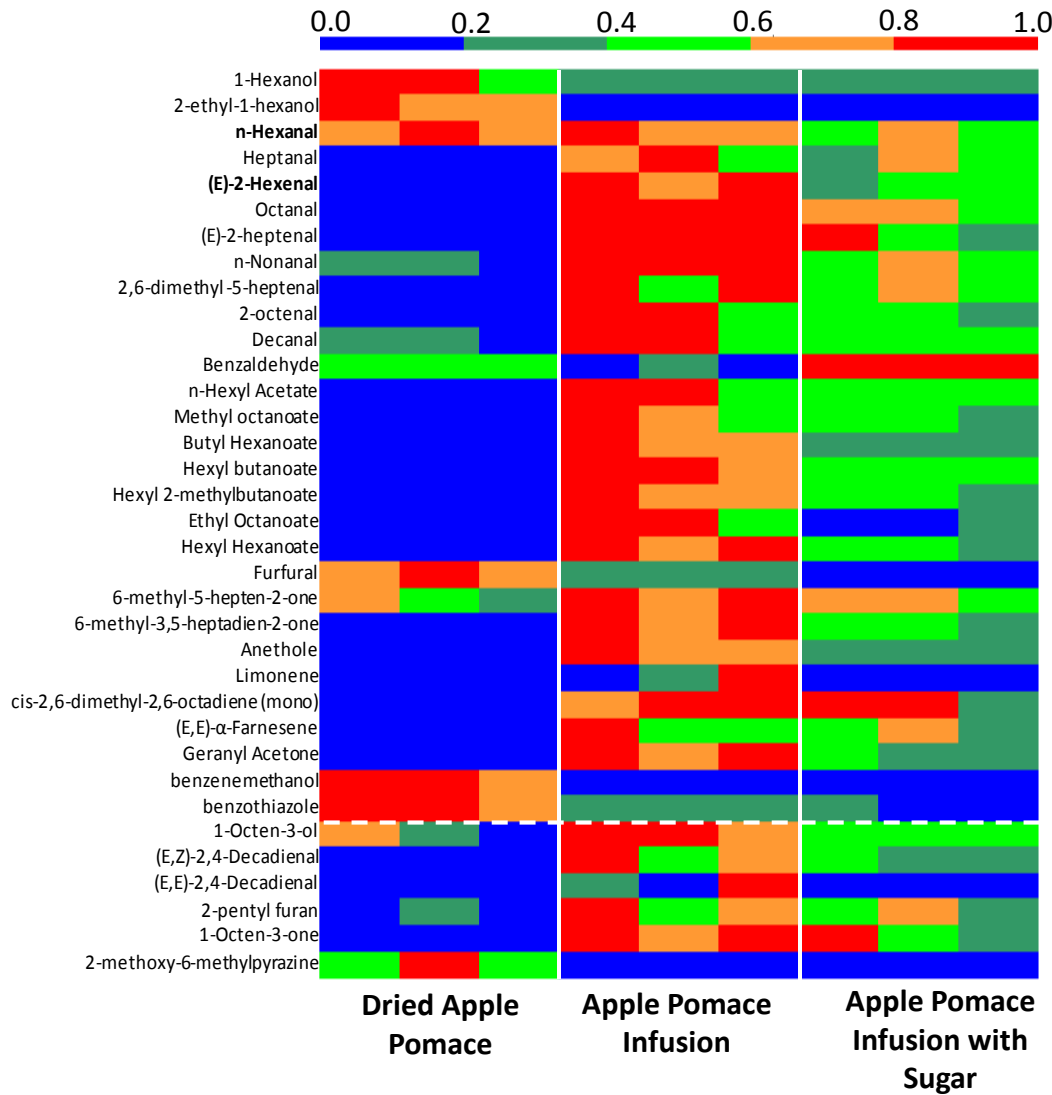
100°C



Different drying temperatures lead to infusions with different colors and flavors



Apple pomace and its infusions volatiles



Dried Apple Pomace

→ Toasted, caramel, sweet, and green notes.



Apple Pomace Infusion

→ Fruity, apple-like, citrus, and spicy notes.

Apple Pomace Infusion with sugar

→ Almond, caramel, and sweet notes.



Apple pomace possible applications



Meal for Laying hens 1%



Animal Feed



Apple infusions



Extruded for pet 1.5%



Soluble fiber

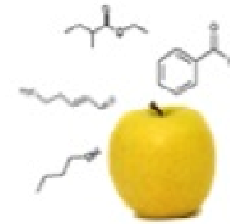
PROFIT  PPLE

The Brand



<http://www.massivemov.com/profitapple>

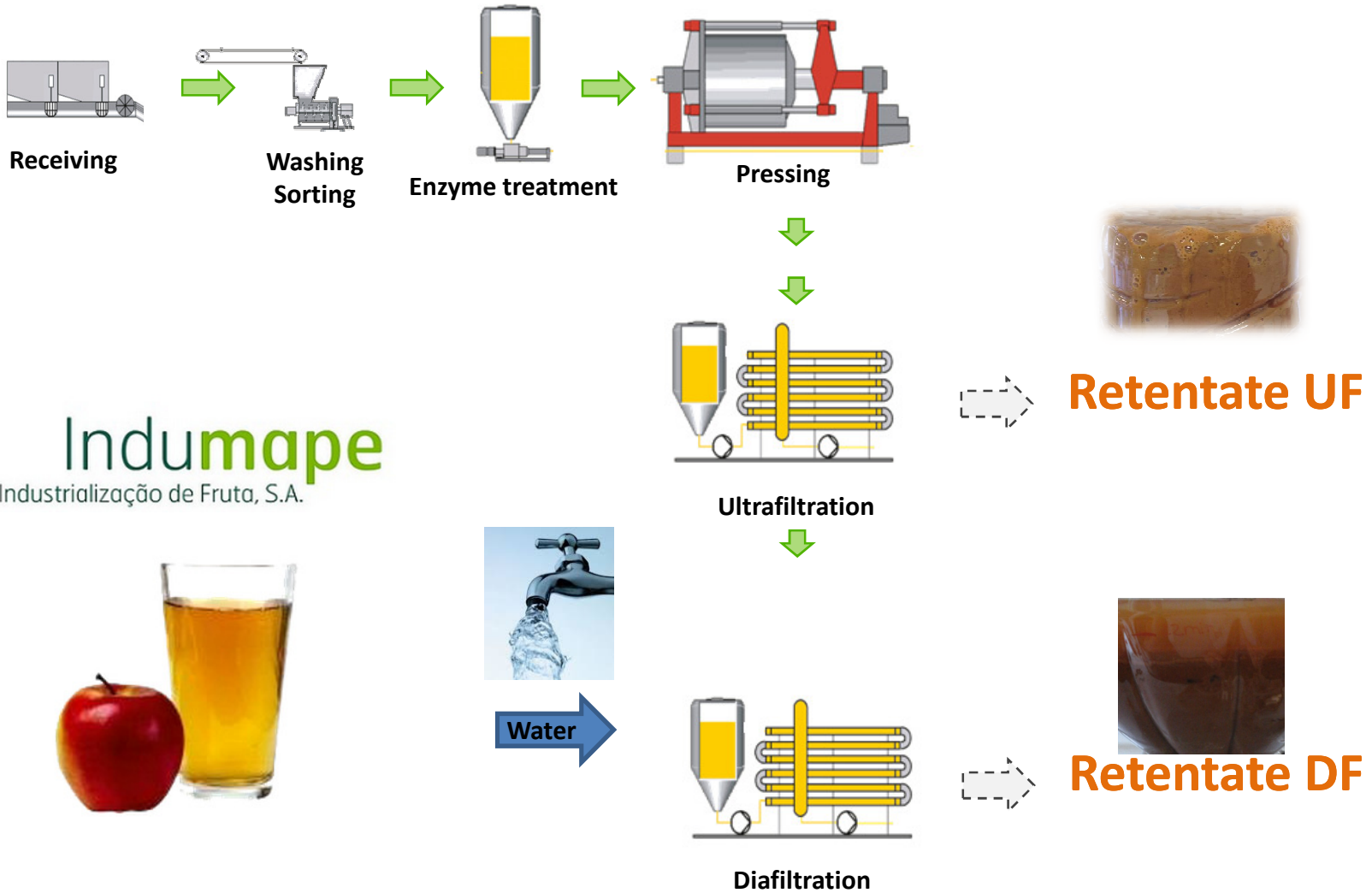




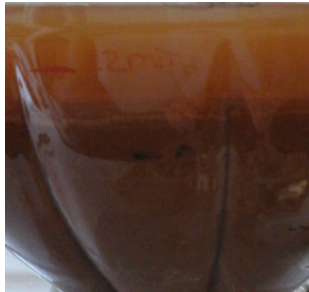
Retentate



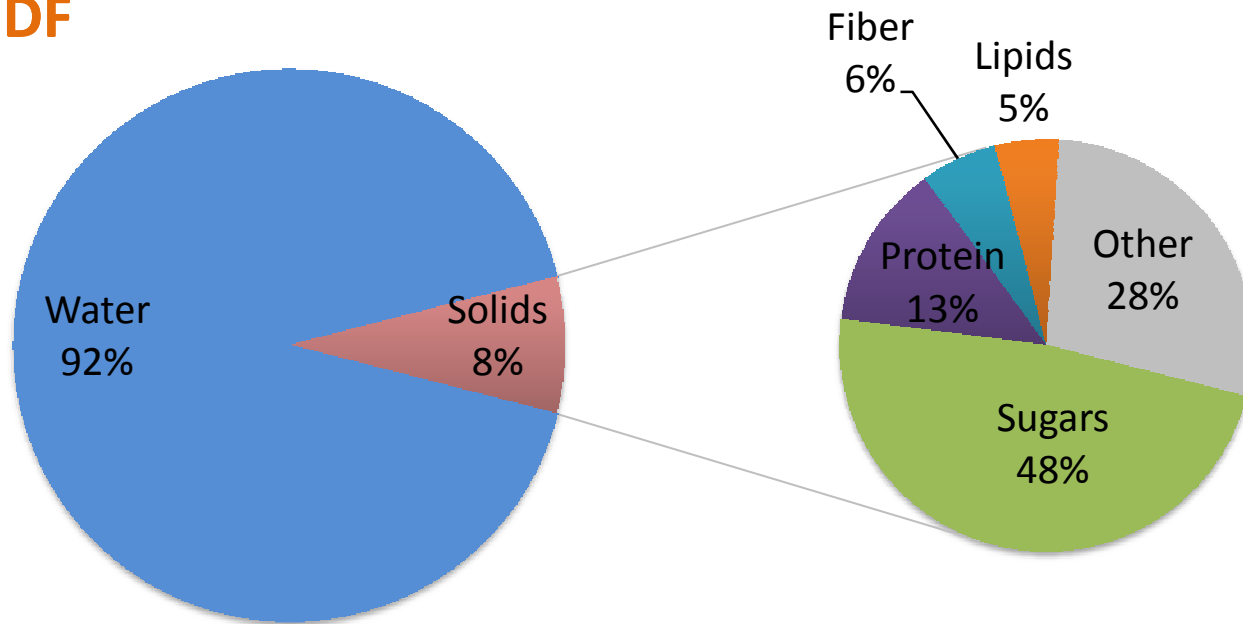
Industrial process - Apple juice concentrate



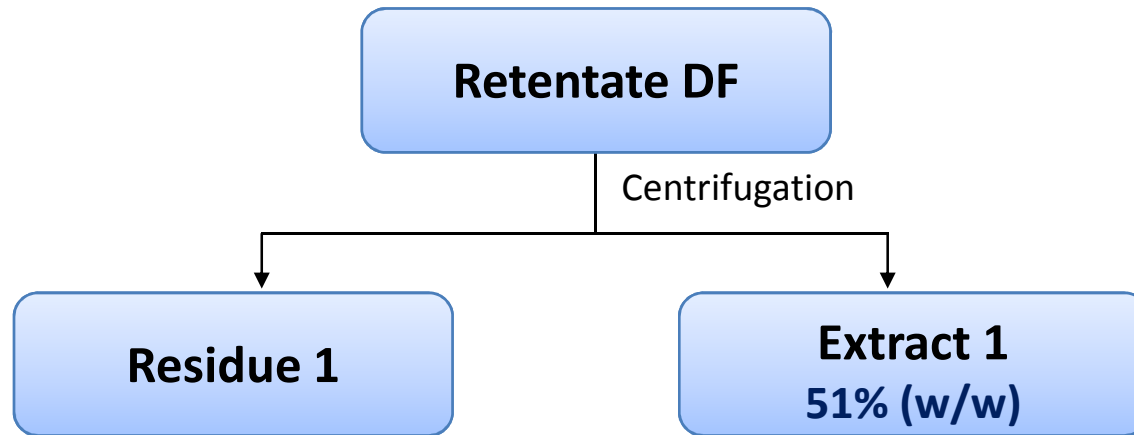
Chemical characterization



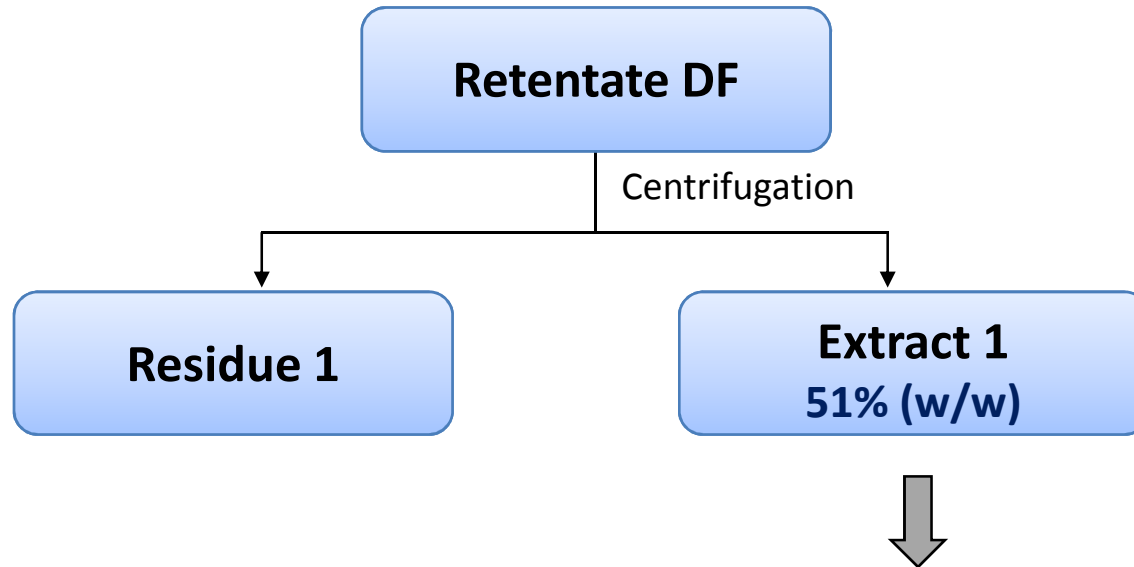
Retentate DF



Separation

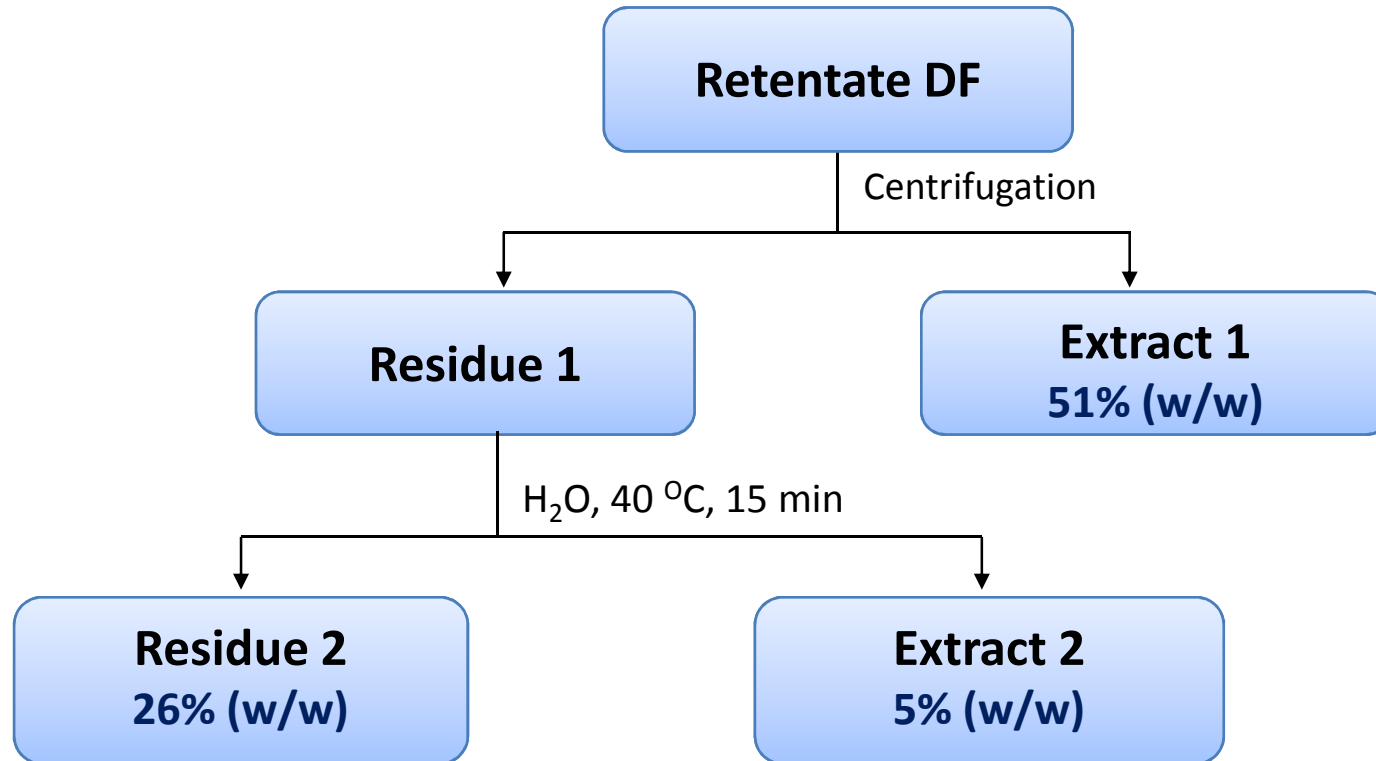


Sugar analysis of Extract 1

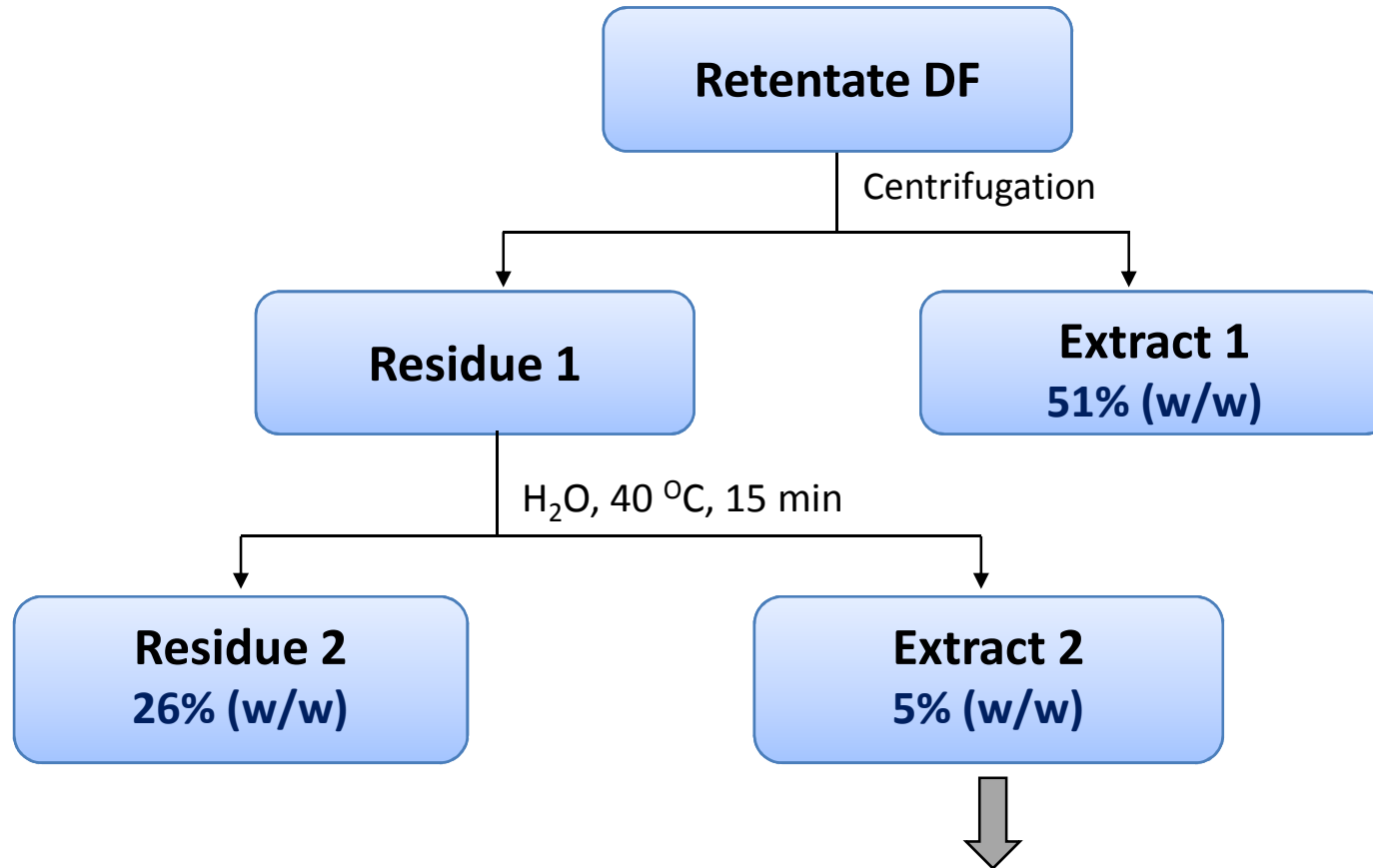


| Carbohydrates (mol%) | | | | | Total carbohydrate (mg/g) |
|----------------------|-----|------|------|-----|---------------------------|
| Ara | Xyl | Glc | Fru | Suc | |
| 2,8 | 1,0 | 16,0 | 78,7 | 1,5 | 793,8 |

Water extraction

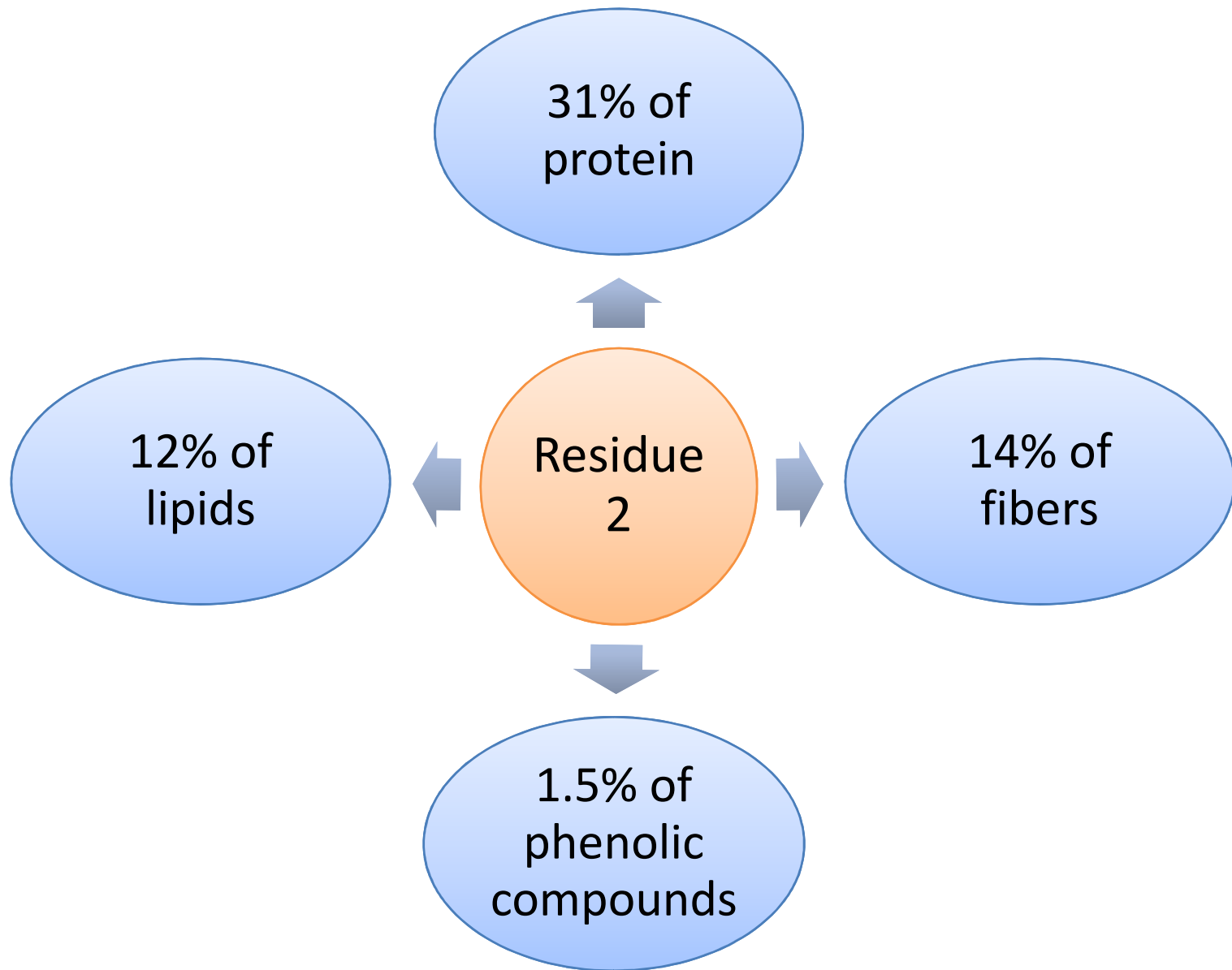


Sugar analysis of Extract 2

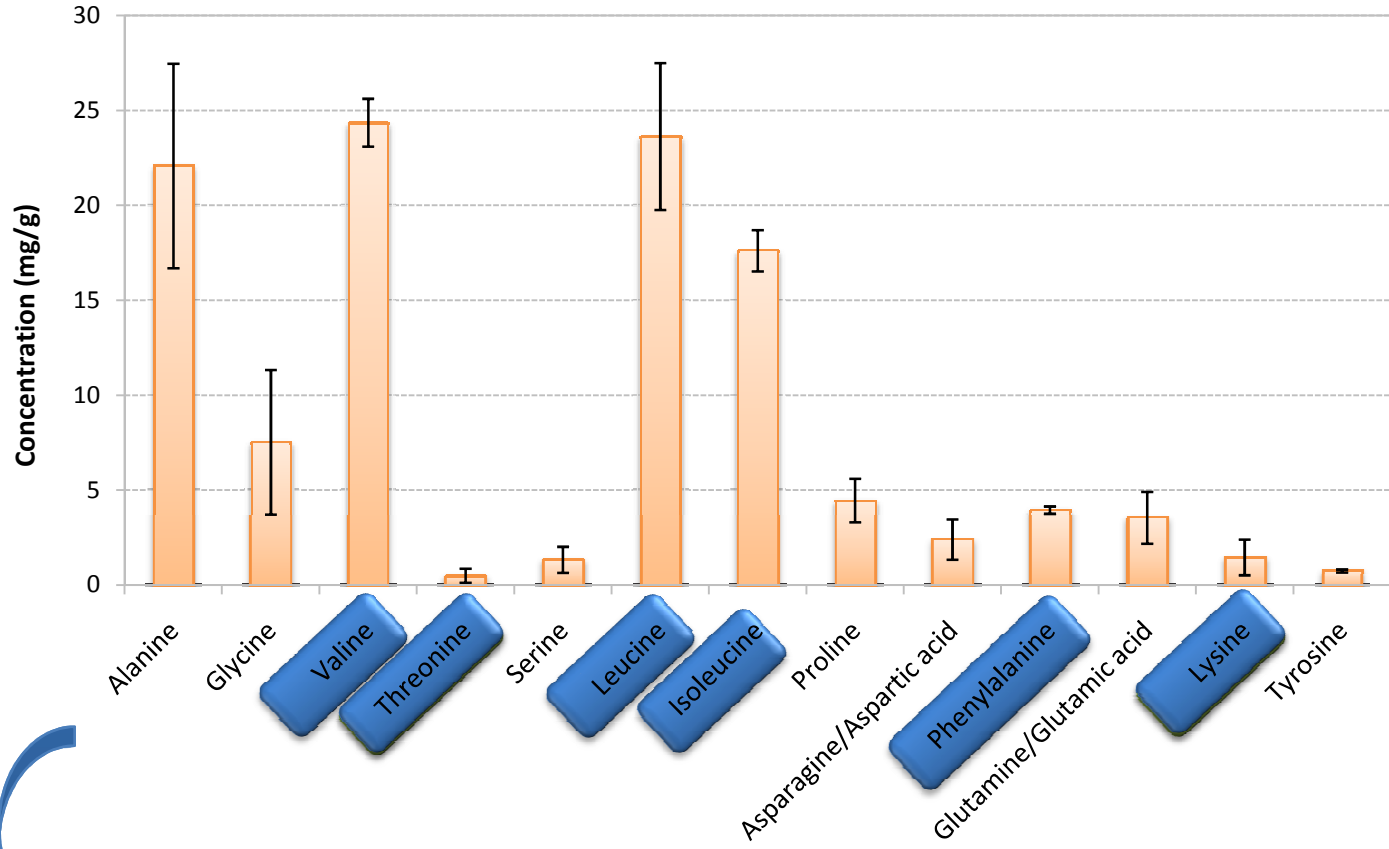


| Carbohydrates (mol%) | | | | | Total carbohydrate (mg/g) |
|----------------------|-----|------|------|-----|------------------------------|
| Ara | Xyl | Glc | Fru | Suc | |
| 2,7 | 0,8 | 21,3 | 75,2 | v | 876,9 |

Composition of Residue 2

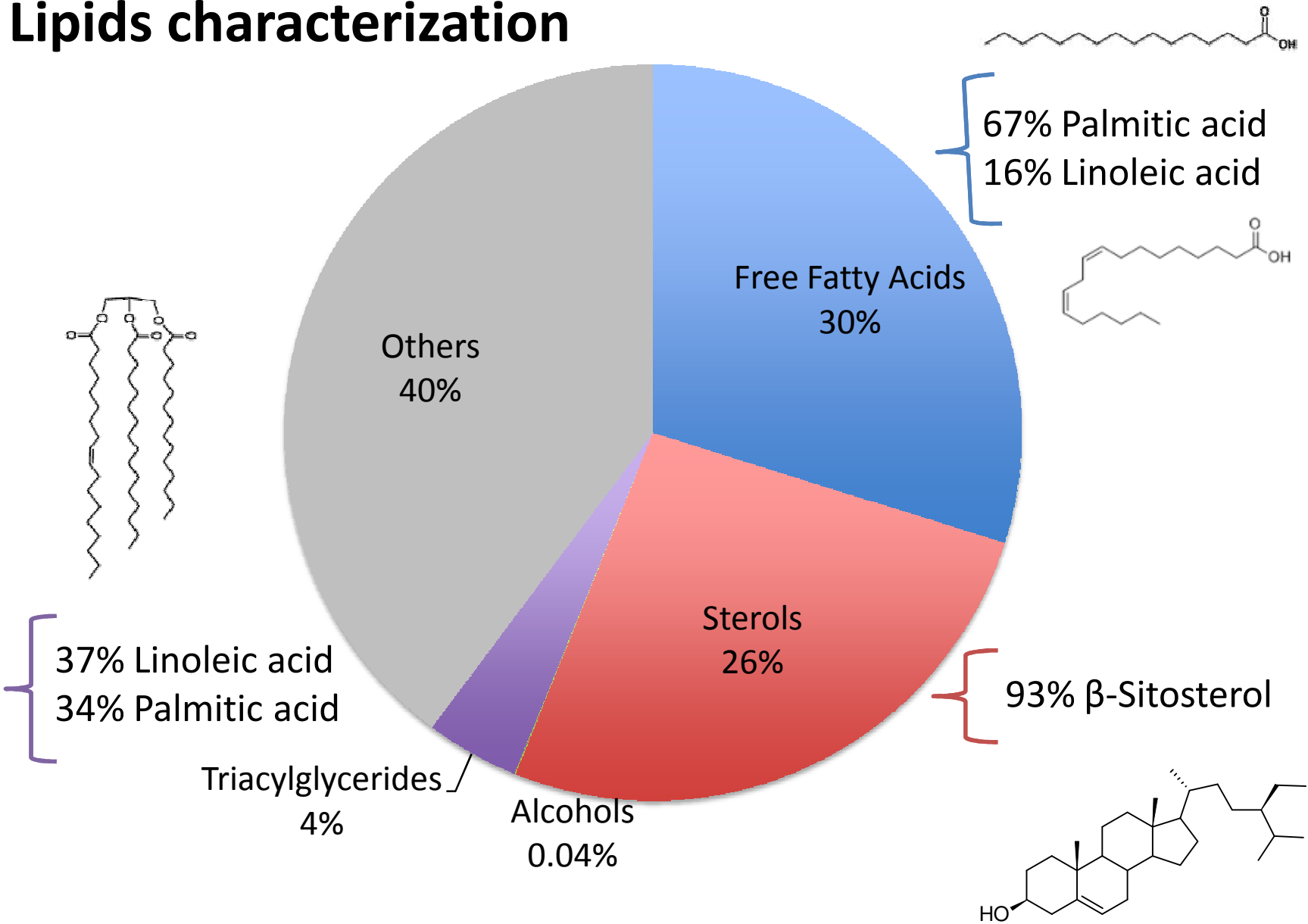


Protein

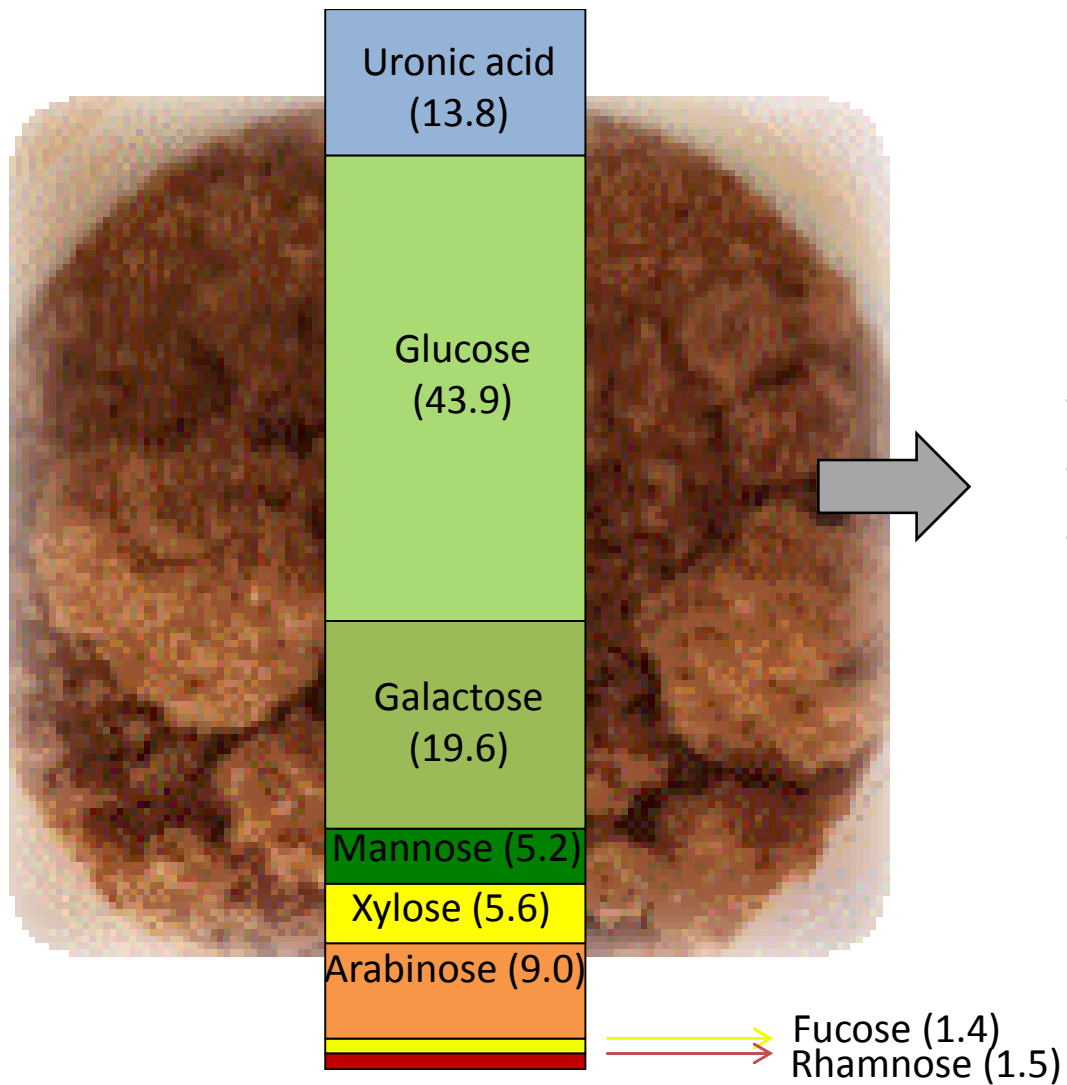


6 essential amino acids

Lipids characterization

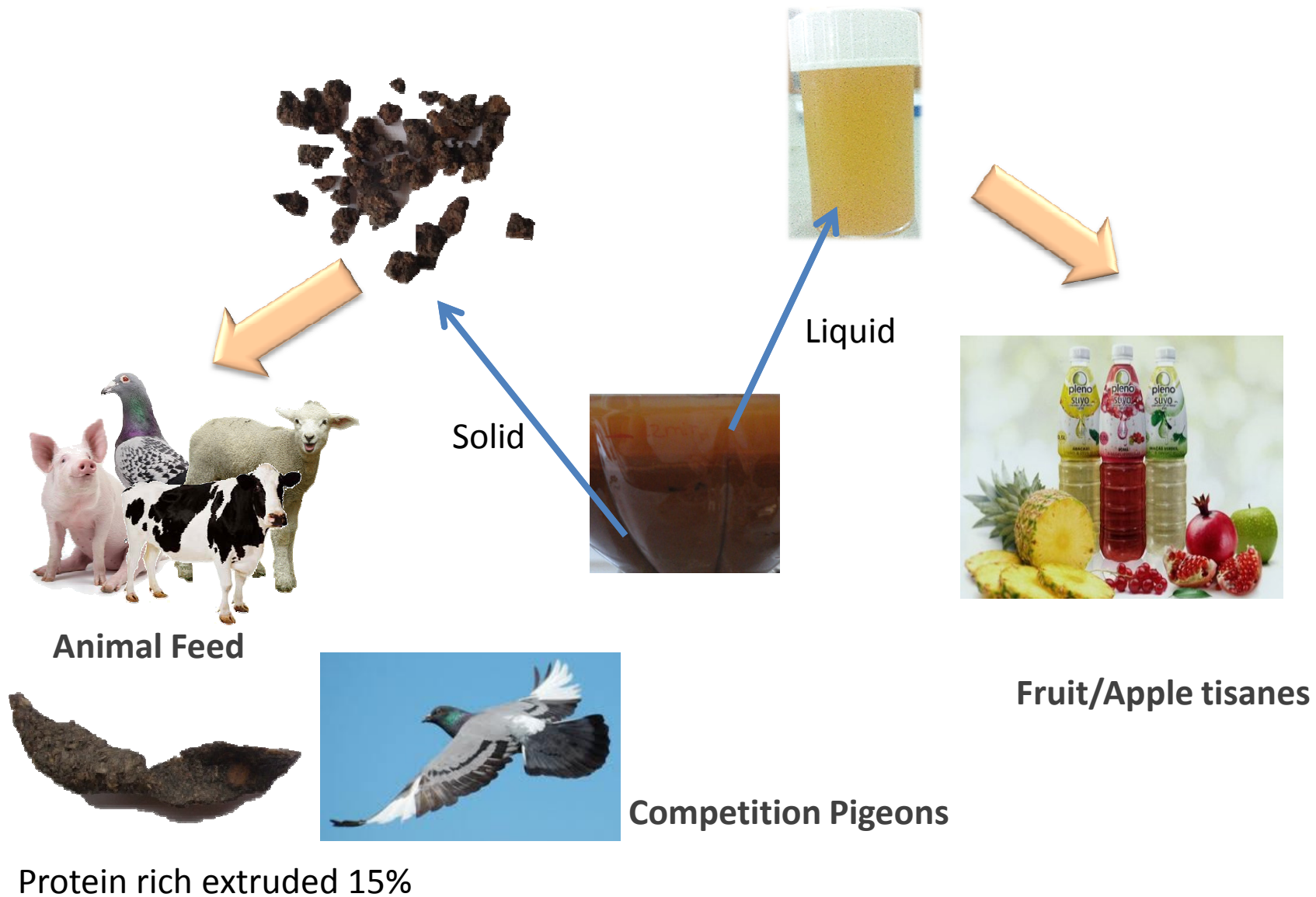


Fiber composition



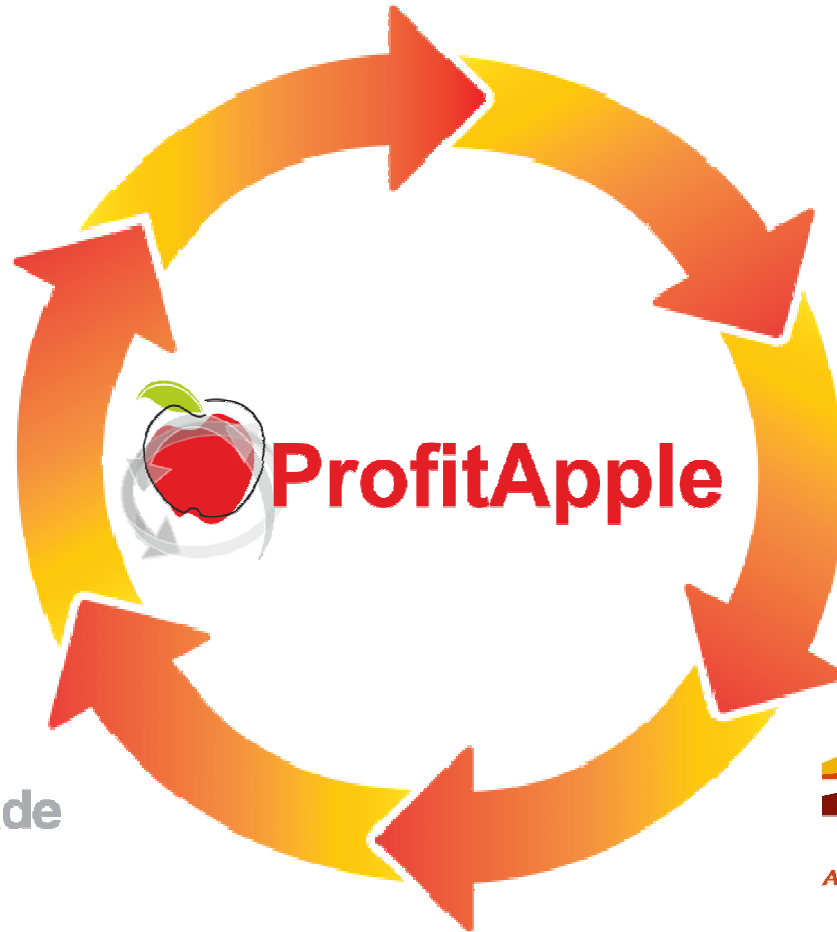
- Hemicelluloses
- Resistent starch
- Pectic polysaccharides

Apple retentate possible applications



Thanks for your attention

Indumape
Industrialização de Fruta, S.A.



universidade
de aveiro



OVG
OVARGADO S.A.

A certeza de uma alimentação saudável

