Hypercritical Separation Technology (HYST)

Research and innovation for human nutrition

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SCIENZA PER AMORE
BITS OF FUTURE
Food for All
BIOHYST

Raw materials

- Residues from fruit harvesting and processing industries (*grape pomace, orange pulp, olive pulp, pineapple, banana and mango processing waste*)
- Medicinal plants and/or pest weeds (*nettle*)
- By-products of the milling industry (*bran*)

Products obtainable by Hyst processing

- Foods with high nutritional/dietary value
- Functional foods
- food supplements
- foods intended for particular population groups

EC Regulation 1924/06 Nutrition and health claims

Food supplements

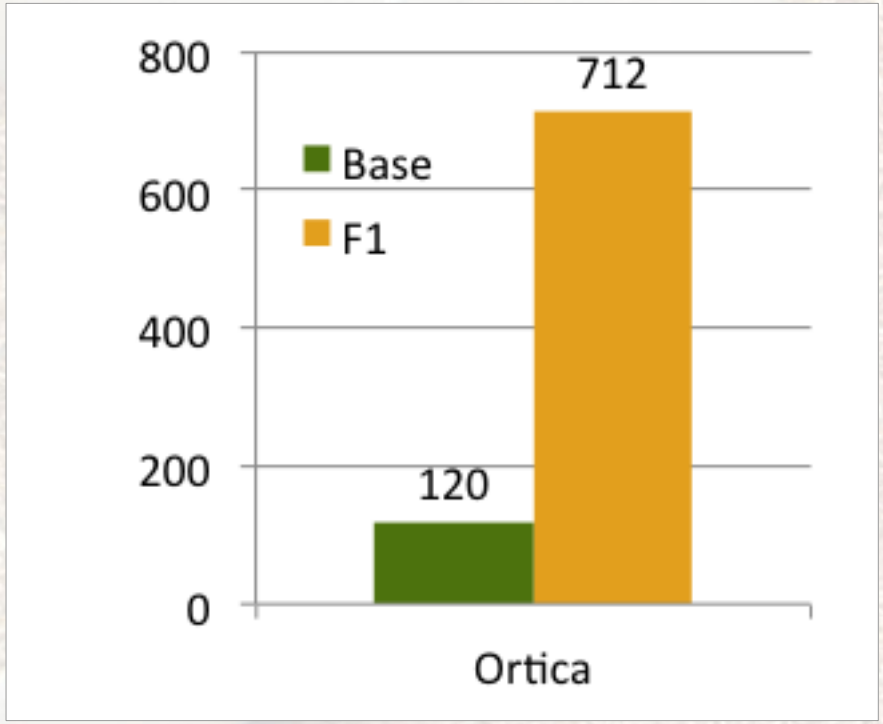
- Though increasingly popular with consumers, natural products often have the limitation of presenting low concentrations of active molecules (vitamins, minerals, antioxidants, etc)
- This limitation can be overcome by processing raw materials with the Hyst system
- Examples of Hyst food supplements:
  - Nettle
  - Artichokes
  - Grape pomace

Nettle (Urtica dioica)

Hyst products display a significant increase in concentration of certain minerals (*iron [Fe], calcium [Ca], potassium [K]*) and protein.

Use:

- Ingredients for the production of foods with high nutritional value (*source of protein and minerals*)
- Specific food supplements (*Fe and Ca*)



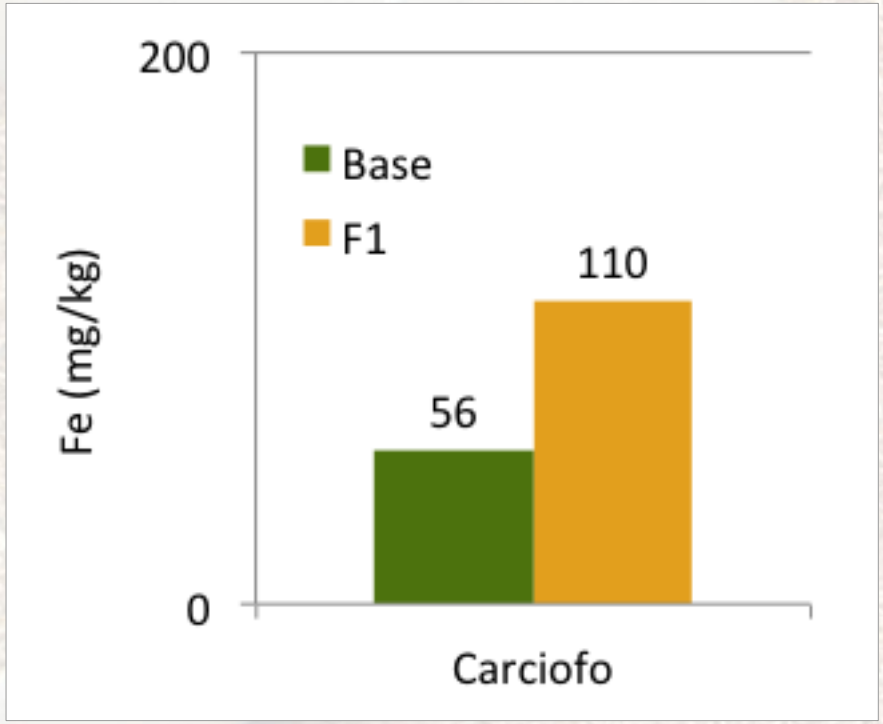
The effect of Hyst processing on the concentration of Fe in products obtained from Nettle (Urtica Dioica).

Artichoke (Cynara scolimus)

Hyst products characterized by a significant increase of certain minerals (*iron [Fe], calcium [Ca], potassium [K]*) and dietary fiber.

Use:

- Ingredients for the production of foods with high nutritional value (*source of protein and minerals*).
- Specific food supplements (*Fe and Ca*).



The effect of Hyst processing on the concentration of Fe in products obtained from artichoke (Cynara scolimus).

Polyphenolic compounds

- Flavonoid properties: anti-inflammatory, anti-cancer, anti-microbial, anti-viral, cardio-protective, neuro-protective and hepato-protective.
  (Nutrients 2014, 6, 391-415)
- Grapes: a unique mix of polyphenolic compounds
- Food industry: production of new products, nutraceuticals and food additives
- Cosmetic industries interested in antioxidant properties
- Extraction techniques generally expensive

Grape pomace

- Preliminary tests carried out on Giacché grape pomace (grape vine native to Lazio region)
- Fine fractions (F1) obtained from grape pomace show a **60%** increase of **acylated malvidin** (anthocyanins)
  - Antioxidant and anti-radical
- Use: Food additives, preservatives, cosmetics
- Opportunity to explore potentials in the preparation of powders high in antioxidants from the leaves (**quercetin dihydrate** - flavonol)

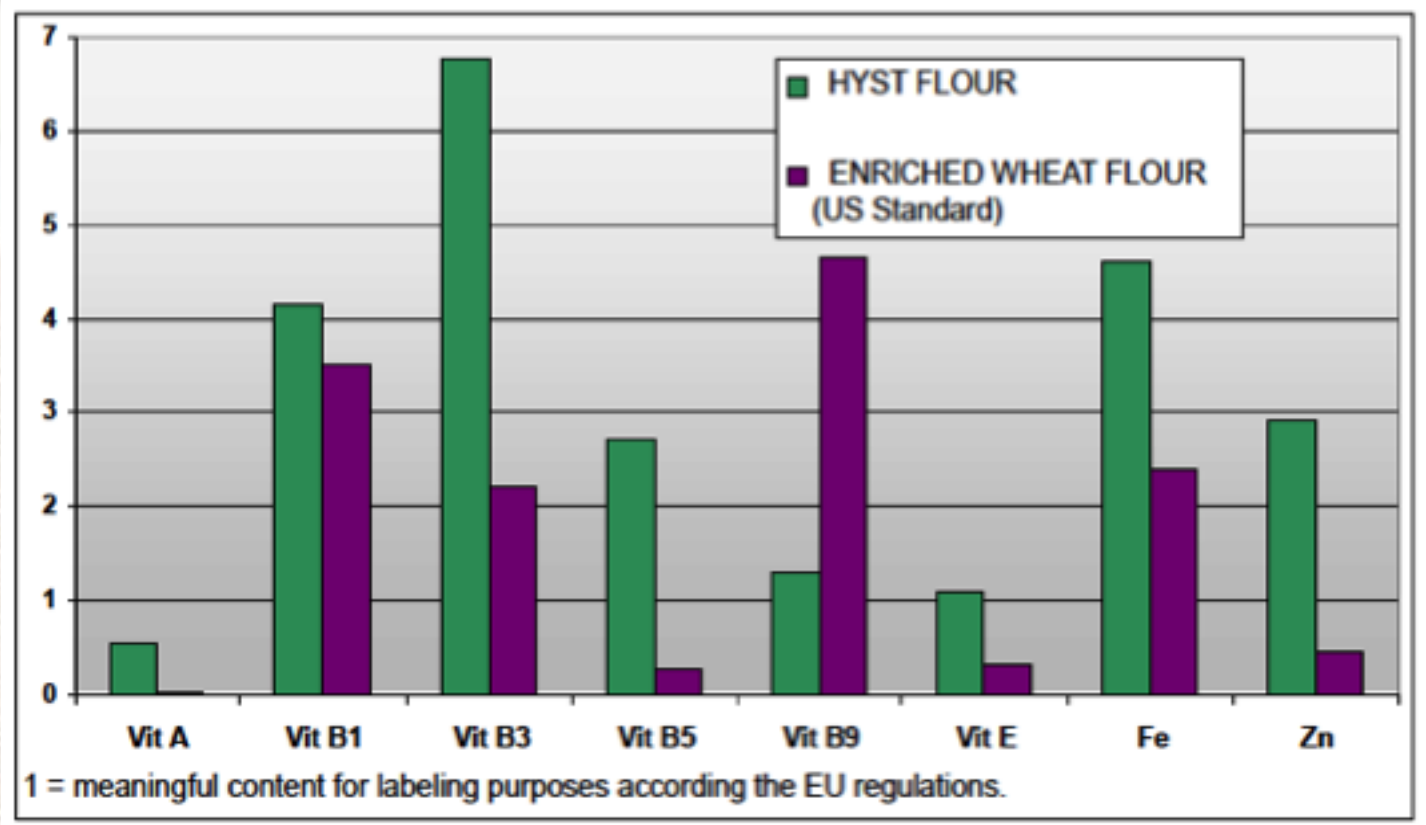
Functional foods sector

- The sector is characterized by a continuous search for new strategies to optimize the recovery of nutrients
- Fractionation/recombination techniques (such as Hyst) represent one of the main evolutionary trends of food technology
- Preliminary extraction or enrichment of nutrients and bioactive compounds from various food matrices, to be used as ingredients that recombined/reconstituted appropriately can produce improved foods in terms of dietary and nutritional value

Bran

- By-products of milling industries are almost entirely used in the feed sector
- Large amounts of nutrients are lost with traditional milling processes:
  - More than 70% of Vitamin B6 is found in the grain
  - More than 50% of Vitamin B5
  - More than 33% of Vitamin B1
  - Most of Fe, Zn, Mg, K
  - Proteins of high biological value rich in essential amino acids

Natural fortification



100g of Hyst flour contain the Recommended Daily Allowance (RDA) of vitamin B3 and more than 60% RDA of vitamin B1 (brain-health promoter in children, *European Food Safety Authority*)

Hyst bran flour

"Fine" fraction (Bran F1):
significant increase of protein content (from 13% to 20%) and **starch content** (7 to 40%) compared to raw material.

Without fortification by addition we obtain a flour

- **high in protein**
- **high in fiber**
- **a source of phosphorus, iron and magnesium**

(under EC Regulation 1924/06)

100% exploitment with Hyst processing

"Coarse" fraction (Bran G):
increase in content of **dietary fiber and phosphorous** [P], **manganese** [Mn] 20%.

Possible uses:

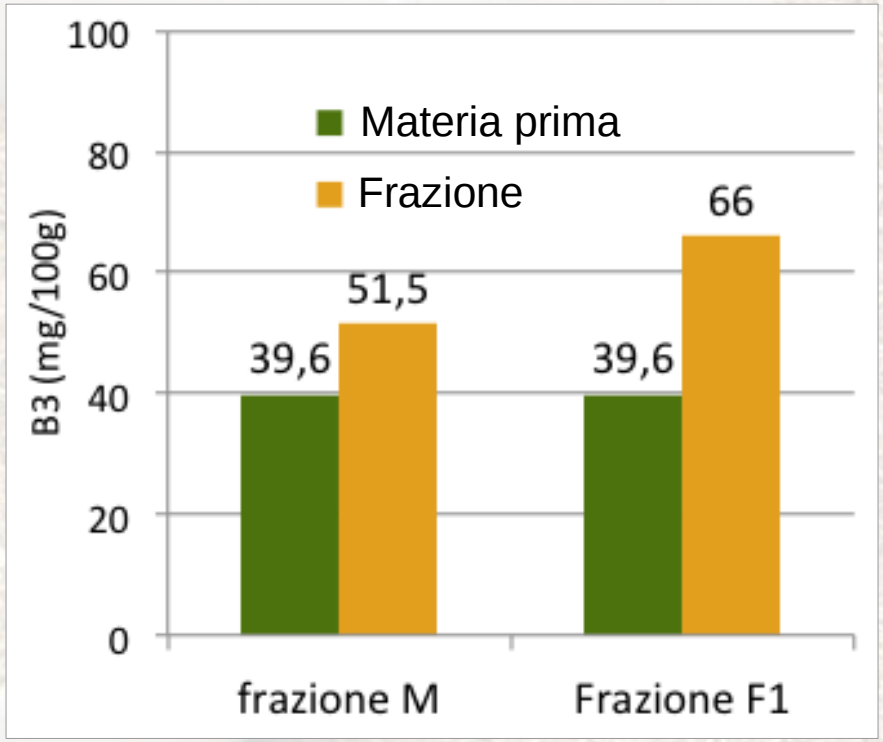
- food supplement of P and Mn
- Ingredients for foods high in nutritional/dietary value (**high in fiber and a source of minerals**)

Rice husk

Hyst products characterized by a **significant increase** in the concentration of **vitamin B3 (niacin, PP)** in fractions **M** (+30%) and **F1** (+67%)

Uses:

- food supplements of vitamin B3
- Ingredients to produce foods high in nutritional/dietary value



Effect of Hyst processing on the concentration of B vitamins in products obtained from rice husk

Thank you for your attention