УНИВЕРСИТЕТ ИТМО

Using of WPI by-product in the manufacturing of yoghurt

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Global Food waste

Artificial additives

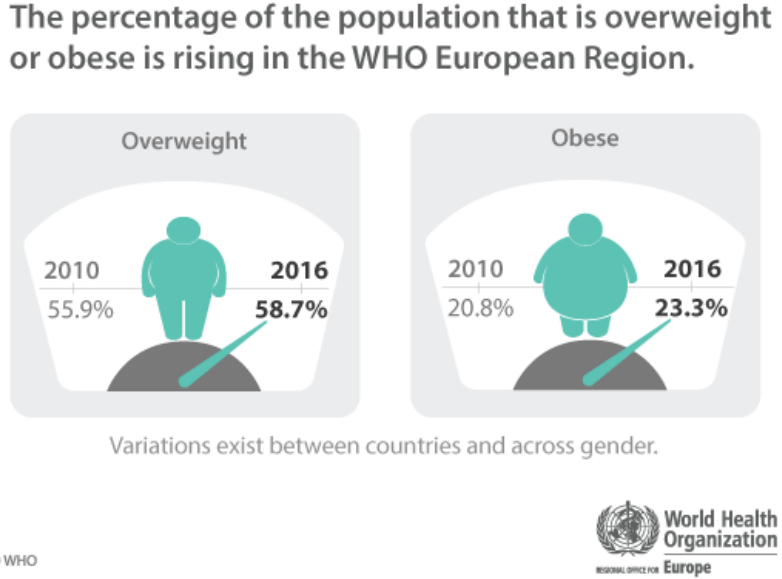
Antioxidants-preservatives-colourants

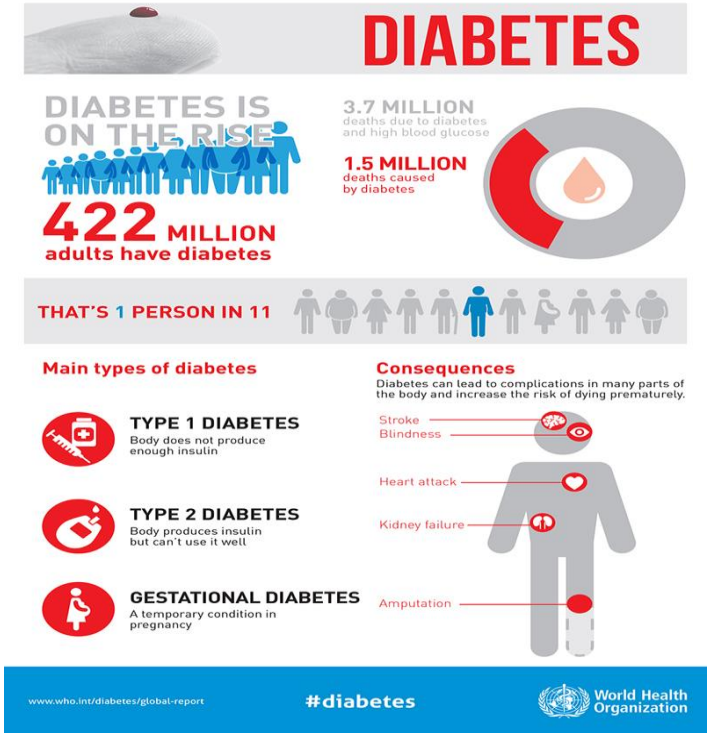
Technological Problems

Protein Allergy

Casein –gluten

Increasing the number of people with progressing civilizational diseases

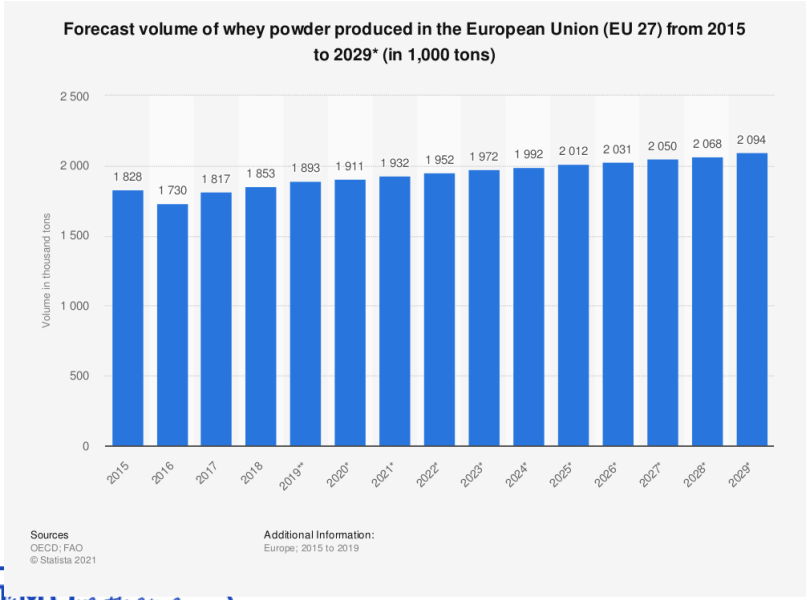




So…..,

- Valorization of food wastes for edible purposes represents a challenge field.
- Dairy and vegetable wastes contain significant amounts of valuable compounds derived from the original material.
- Transformation of these valuable compounds into numerous added-value and marketable products rather than the usual utilization of food waste as energy, feed, and fertilizers

Why Cheese whey (CW)?



- CW The major by-product stream, generated….
- Total worldwide production about 180 to 190 million tons/year.
- The high importance of CW for the industrial dairy sector owing to :
- High organic load – high management cost especially for cheesemaking industries
- High nutritional value (owning to its functional ingredients)

Typical functional properties of CW in food systems

Functional properties	Mode of action	Food system
Solubility	Dissolvable	Beverages
Water absorption	Water-binding	Meat/bakery
Viscosity	Thickening	Soups
Gelation	Structure – forming	Meat/fish
Emulsification properties	Emulsifying	Infant formula
Fat absorption	Binding free fat	Sausages
Foaming properties	Aeration	Whipped topping
Flovour binding	Binding/release	Formulated foods
Mineral binding	Specific adsorption	Nutritional foods

Materials :

	WPI (%)	SMP (%)	WMP*(%)
Protein	87.8	27-30	26
Moisture	4.6	4-6	4-6
Fat	0.7	1-1.5	26-27

- WPI: whey protein isolate
- SMP: Skim milk powder
- WMP: whole milk powder
- Freeze-dried yoghurt starter culture (YF-L812) Chr. Hansen's mixed strains :*Streptococcus thermophilus* & *Lactobacillus delbrueckii ssp. Bulgaricus*

Experiment Design

Description of samples	Treatment	The protein content of yoghurt mixes(w/v, %)
FFY	Control full-fat yoghurt	5.10
NFY	Control nonfat yoghurt	4.37
NFYWP-3	nonfat yoghurt with substitution 3%WPI	4.64
NFYWP-5	nonfat yoghurt with substitution 5% WPI	4.81
NFYWP-7	nonfat yoghurt with substitution7% WPI	4.98
NFYWP-9	nonfat yoghurt with substitution 9% WPI	5.16

- TS of all the yoghurt mixes standardized at 14% (Protein 4-5%)
- Four treatments with the addition of WPI by the substitution of SMP with WPI as (3,5,7,9) %.
- Control 1 : full-fat yoghourt Control 2 : Non-fat yoghourt

Processing steps of yoghurt

- Heat treatment (85°C/30min)
- Cooling (42-44°C)
- Inoculation with DVS starter culture (0.5% W/W)
- Incubation at 43°C for 4-5 hrs. till getting proper coagulation
- Coagula refrigerated over night

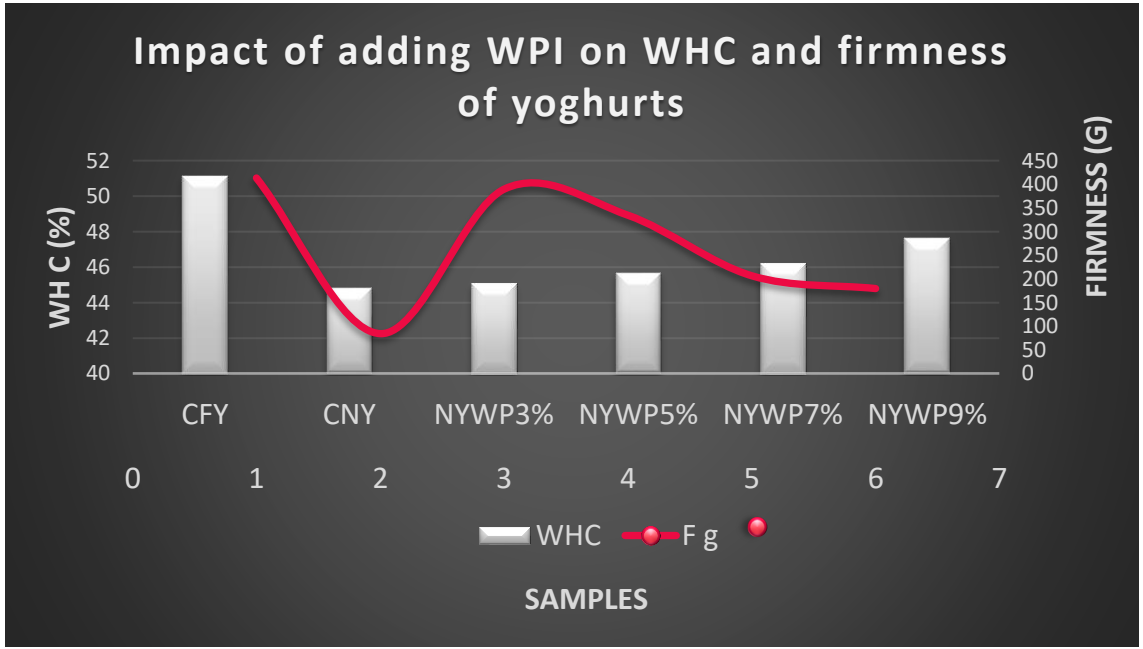
Analysis Methods

- Measurement of water retention of yoghurt:

$$\text{WHC \%} = \frac{weight\ of\ the\ remaining\ after\ centrifugation}{weight\ of\ the\ sample} \times 100$$

- Rheological properties of yoghurt samples: rheometer (RN 4.1, RHEOTEST).
- Firmness and deformation: domestic texture analyzer "Structurometre ST2".
- Microstructure : SEM

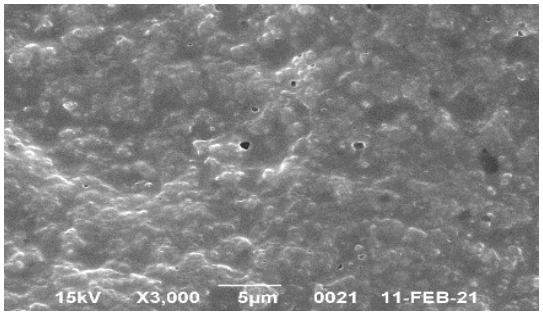
Results



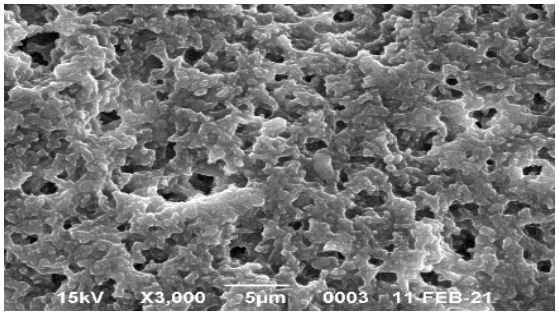
- **Water holding capacity**
- **Firmness** *Penetration distance: 4 mm using an acrylic cylindrical probe (15 mm diameter, 20 mm height). Speed of the probe was 1 mm/s with a trigger of 7 g.*

Microstructure of yoghurt:

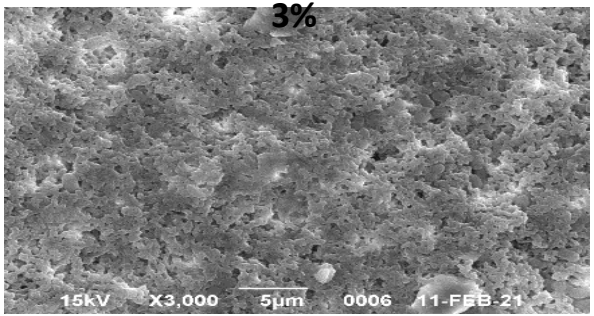
FFY



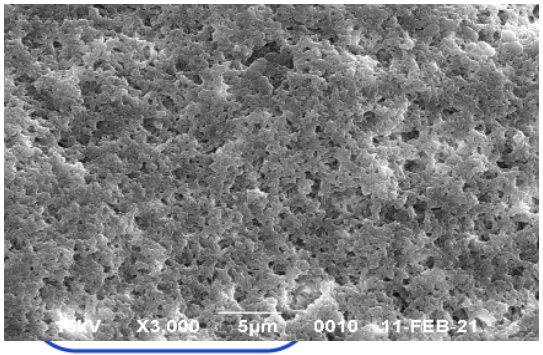
NFY



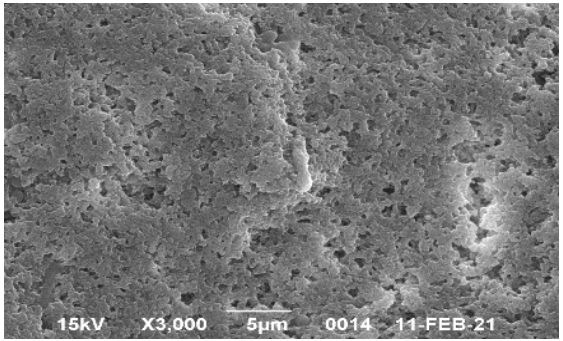
NFYWPI 3%



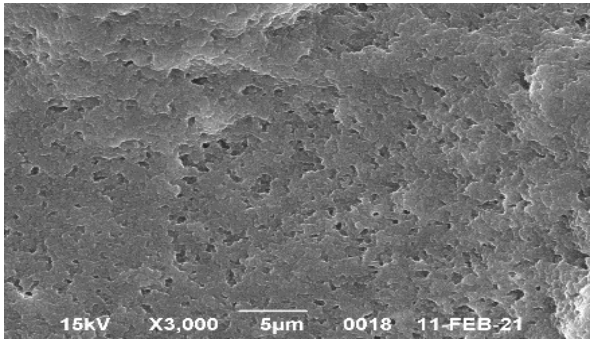
NFYWPI 5%



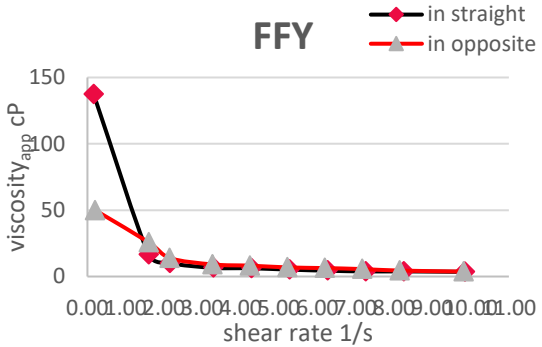
NFYWPI 7 %

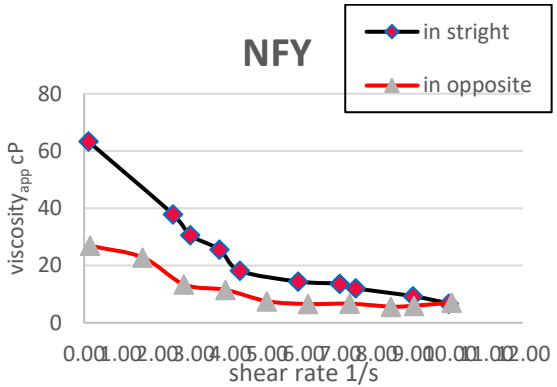


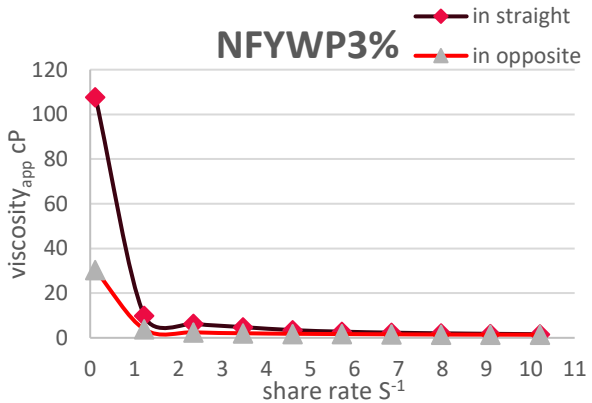
NFYWPI 9%

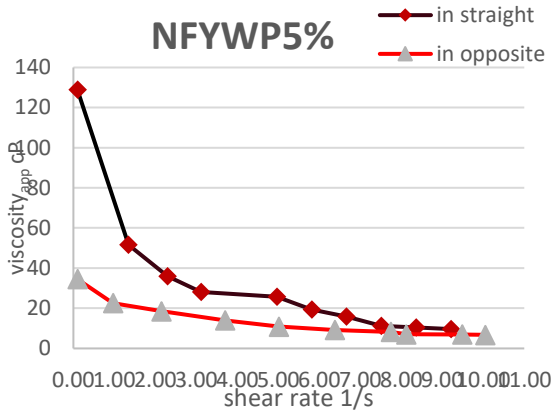


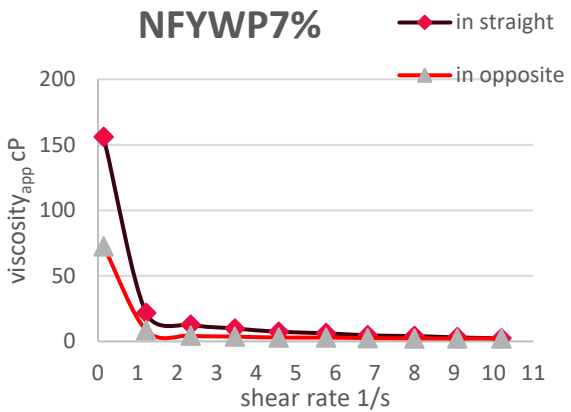
Impact of WPI addition on the rheological properties

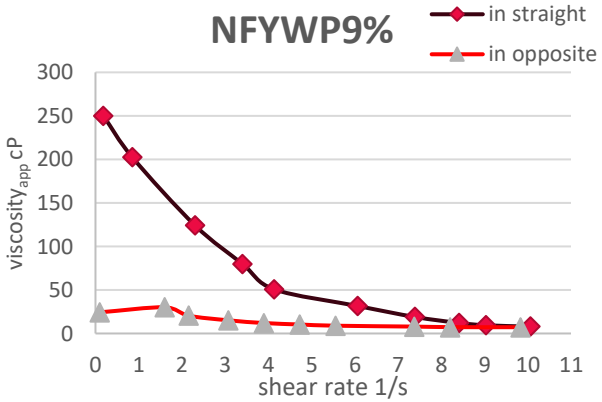












Thanks for your attention!

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