

# ADDING VALUE TO BLACKCURRANT PROCESSING WASTE

challenges and opportunities for fibre incorporation in bread

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# BERRYPOM PROJECT



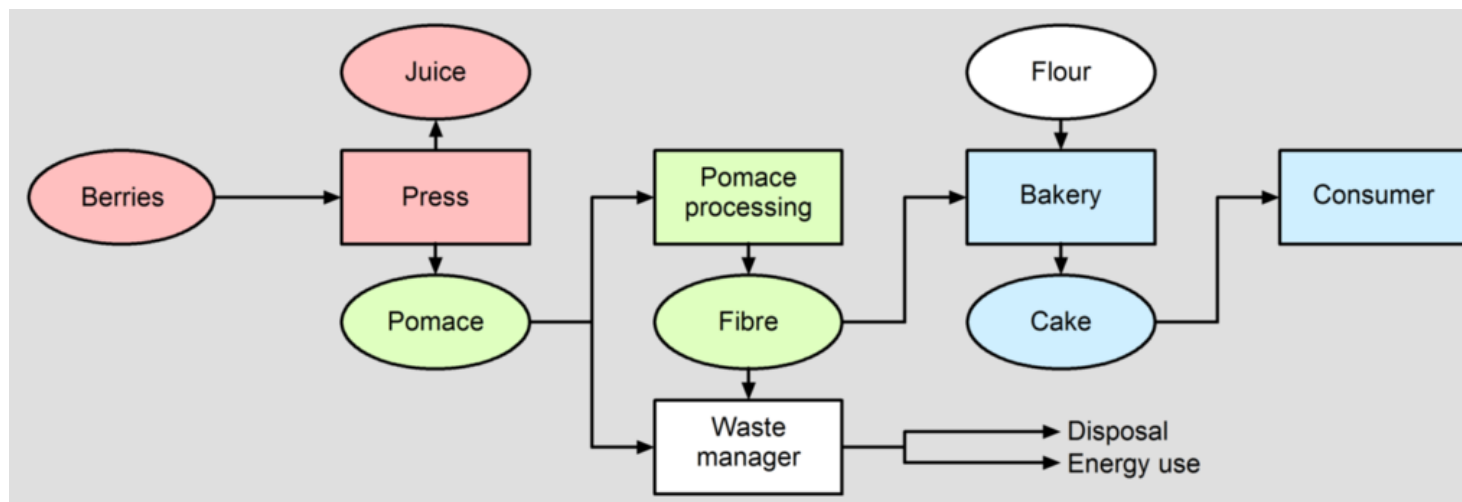
**BERRYPOM**: Innovative approaches to adding value to fruit processing waste to improve the nutritional quality of processed foods

Partners from **Germany, UK, Sweden, Spain** and **New Zealand**  
Funded by **DEFRA** and the **University of Huddersfield**



# PROJECT GOALS

- Investigation of the properties of berry processing co-products to optimize recovery of **dietary fibre** and **polyphenols**
- Incorporation of these functional ingredients into **cereal products**:
  - **Model bread dough systems**
  - **Soft bakery products** (e.g., muffins)
  - **Brittle bakery products** (e.g., sweet/savoury cookies)
  - **Extruded products** (e.g., breakfast cereals, ready-to-eat snacks)





# UK CONTRIBUTION



Gooseberry



Strawberry



Chokeberry



Elderberry



Redcurrant



**BLACKCURRANT** (*Ribes nigrum*)

## WHY BLACKCURRANT?

Second most financially significant soft-fruit crop after strawberry in the UK

(Source: DEFRA annual report 2014)



# BLACKCURRANT POMACE

Berry residue after industrial pressing  
and enzymatic treatment

Approximate composition of blackcurrant  
pomace (g/100g)

|                           |           |
|---------------------------|-----------|
| <b>Protein</b>            | 3         |
| <b>Carbohydrates</b>      | 16        |
| <b>Fat</b>                | 3         |
| <b>Water</b>              | 6         |
| <b>Ash</b>                | 3         |
| <b>Dietary Fibre (DF)</b> | <b>63</b> |
| <b>Insoluble DF</b>       | 56        |
| <b>Soluble DF</b>         | 8         |





# DIETARY FIBRE

**Dietary fibre** is the edible part of plants that are resistant to digestion and absorption in the human small intestine with complete or partial fermentation in the large intestine.

**Dietary fibre** includes **polysaccharides, oligosaccharides, lignin** and **associated plant substances**. Dietary fibers promote beneficial physiological effects including laxation, and/or blood cholesterol attenuation, and/or blood glucose attenuation.

**AACC International**



# DIETARY FIBRE

## Soluble

- Pectin
- Hemicelluloses
- Mixed linkage  $\beta$ -glucan
- Psyllium gum
- Inulin

Increase viscosity  
Control postprandial glycaemic index  
Lower cholesterol

## Insoluble

- Cellulose
- Hemicelluloses
- Lignin
- Resistant starch

Facilitate peristalsis – Decrease  
intestinal transit  
Increase fecal bulk



# POMACE PROCESSING

## POMACE MILLING



→  
Sieve size  
1 mm







# FIBRE EXTRACTION STRATEGIES



Aqueous extraction with  
HCl/KCl buffer at pH 2.0, at  
80°C for 2 h. Solid to liquid  
ratio 1:15



Soluble dietary fibre

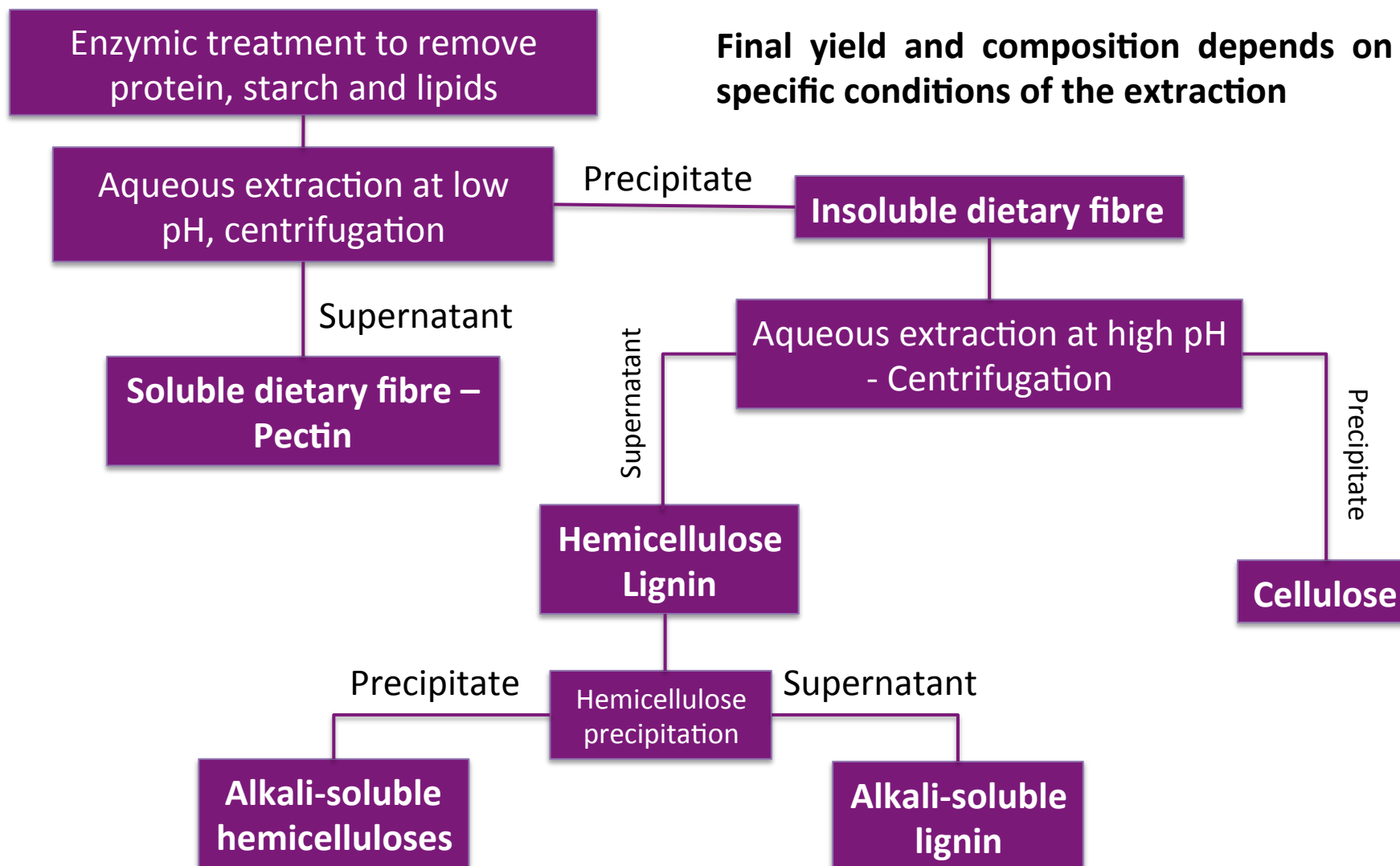


Insoluble dietary fibre



# FIBRE EXTRACTION STRATEGIES

Final yield and composition depends on the specific conditions of the extraction





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# FIBRE EXTRACTION STRATEGIES



**Pomace**

**Total  
IDF**

**Pectin**

**Chelating agent  
soluble pectin**

**Hemi-  
celluloses**

**Cellulose**



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# FIBRE ENRICHED BISCUITS



Courtesy of German partners

Biscuits made with addition of various berry pomaces (10% wheat flour replacement)



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# FIBRE ENRICHED MUFFINS

REF

15%

15% - seeds

20%

30%



Courtesy of German partners

Muffins with various amounts of dried blackcurrant pomace



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# OTHER FIBRE ENRICHED PRODUCTS

**Cookies**



**Meringue**



**Flap jack**



**Muffins**



Courtesy of German partners



# FIBRE ENRICHED BREAD DOUGH

## CHALLENGES

### Processing

- Sticky dough formation
- Changes in water absorption
- Changes in proofing properties
  - Increased processing time
- Fermentation tolerance decreases
  - **Reduction of loaf volume**
- **Changes in air cell structure**

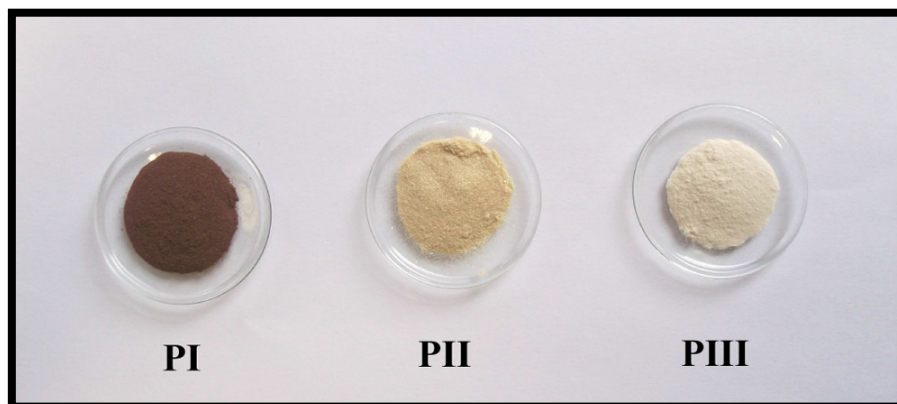
### Sensory properties

- Texture: Formation of firm crumbs
- Colour: Darkens
- Taste: Modification of taste depending on fibre source



# STRATEGIES TO IMPROVE QUALITY

Treatment of IDF fraction with  $H_2O_2$  (facilitates lignin removal and bleaching) results in isolation of whiter colour IDF with improved softening and swelling characteristics



Reference

$H_2O_2$  assisted  
extraction

$NaClO_2$  assisted  
extraction



$H_2O_2$  assisted  
extraction





# STRATEGIES TO IMPROVE QUALITY

- **Tuning of fibre isolation** conditions and physiochemical properties of fibre
- **Optimisation of milling** of blackcurrant pomace. Breads are tender and more elastic
- **Optimisation of proportion** of soluble-to-insoluble fibre. Technologically important (dough development, water retention etc)
- **Enzymatic treatment of fibre** with hemicellulases and pentosanases could be performed for structural modification of fibres that leads to improved dough and bread quality



# OUR APPROACH

## Functionality of blackcurrant pomace into model dough systems

We will tackle formulation issues of fibre-enriched dough (optimum fibre and whole pomace content, moisture content, dough development time etc).

## Characterization of model dough systems containing blackcurrant pomace and fibre isolate

In-depth **physicochemical** characterization of fibre-enriched dough including work on its **rheological, thermal, microstructural** and **gas retention properties** during processing



# SUMMARY

**BERRYPOM** project investigates innovative ways of incorporating blackcurrant pomace in bread dough

- Isolation and physico-chemical characterisation of fibres of industrial relevance
- Explore the functionality of novel food ingredients
- Adding value to blackcurrant juice processing waste streams

