

Development of functional oat ingredients for health food market

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INTRODUCTION

OAT IS AN OPTIMAL RAW-MATERIAL FOR HEALTH-PROMOTING FOODS

- A superior source of soluble fibres plus phytochemicals, nutritionally valuable lipids, and high-quality protein.
- The physiological effects of oat β -glucans are well-documented.
- Oat can be included into gluten-free diet.
- The consumers are aware of the health-promoting properties of oat.

AIM

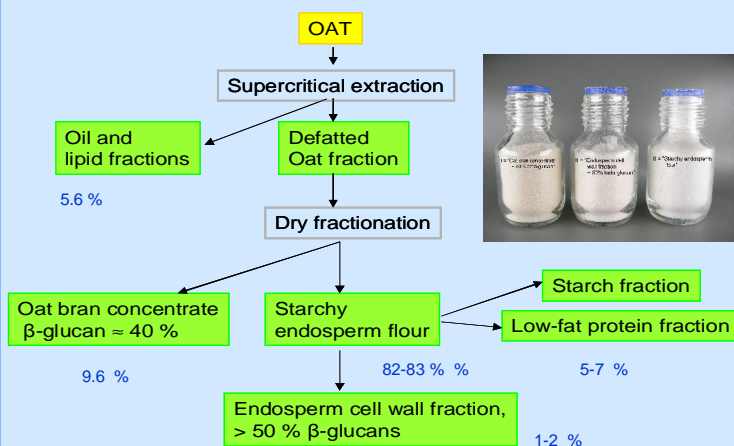
To develop a novel, technologically and economically feasible fractionation process for oat to produce high fibre, protein, starch, and oil fractions.

GLOBAL SOLUBLE FIBRE MARKETS HIGH POTENTIAL: BETA-GLUCANS COMPOSE ONLY 1 %. WHY?

- 1) β -glucans are technologically challenging in many applications when compared to other soluble fibres.
- 2) The connections between the molecular weight of β -glucans, viscosity and health effects are not yet totally understood.
- 3) The fractionation processes of oats are not always technologically feasible enough. The utilization of other fractions is than concentrated beta-glucan ingredients is very low.
- 4) Hydrolysis of oat lipids and subsequent oxidation can bring extra challenges for the shelf-life of oat ingredients and especially oat products.

RESULTS

NOVEL OAT FRACTIONATION PROCESS



KEY ELEMENTS AND SPECIAL FEATURES OF THE FRACTIONATION PROCESS

- A unique dry fractionation process that gives fractions with higher β -glucan content than earlier received in similar processes (\cong 40 % in main fraction)
- The unit operations of the process:
 - Tailored pretreatment of the raw-material
 - Supercritical fluid extraction (SFCO₂ extraction)
 - Ø High pressure, moderate temperature
 - Milling and air-classification of low fat flour
- Repeated milling and air-classification cycles can give a selection of versatile fractions.

PROPERTIES AND BENEFITS OF THE MAIN FRACTIONS

• Oat bran concentrate

- Ø Properties: β -glucan content \approx 40 %; A coarse, light-brown fraction; Molecular weight (2 Milj. Da)
- Ø High content of small bioactive compounds
- Ø Benefits in applications:
 - Ø Less needed to introduce sufficient amount of β -glucans into products, less 'side compounds' that can cause technological problems or reduce product quality
 - Ø High molecular weight gives more possibilities to tailor properties for versatile product types
 - Ø Low fat content \rightarrow better stability against deterioration and oxidation

• Starchy endosperm flour

- Ø Protein content 20 - 25 %; β -glucan content 0.4 – 1.5 %; B-glucan in native state;
- Ø Low fat content
- Ø Fine particle size

• Protein fraction

- Ø Protein content up to 75 %
- Ø Low fat content
- Ø Promising ingredient in non-dairy yoghurt-type products

• Endosperm cell wall concentrate

- Ø Subaleurone fraction and endosperm cell walls; Almost white, very light, cotton-like material
- Ø β -glucan content > 50 %

• Oat oil & lipids

- Ø Bright yellow colour
- Ø High in oleic and linolic acids, contains polar lipids over 20 %
- Ø Resists oxidation very well, long shelf-life

CONCLUSIONS

A novel fractionation process with several benefits has been developed. The main advantages of this process are:

- A dry process is economically more feasible than wet processes.
- Lipid removal by supercritical extraction is efficient and the dry fractionation step benefits significantly from the defatted raw-material.
- The process is mild and therefore heat labile bioactive compounds are better preserved.
- Oat kernel components can be recovered in a native state e.g. β -glucan molecular weight is maintained at 2 million Daltons.