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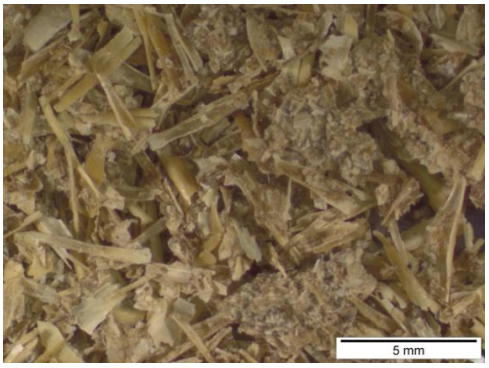
Enzymatic production of insoluble lignin-rich cereal fibre preparations and their technological functionality in a model food

Brewer's spent grain (BSG) is an abundant (ca. 30 Mt/a), lignocellulosic side-stream from the brewing industry. It is the insoluble residue that is left from the malts after mashing. Currently the use of BSG is limited to animal feed. However, BSG is rich in carbohydrates (50 %), protein (20 %) and lignin (20 %), which could be valuable raw materials for different applications if they can be efficiently separated. The objective of this PhD thesis is to study the fractionation of BSG by enzymatic, chemical and mechanical processing. Special focus is on the isolated cereal lignin, which will be characterized and studied as a food component, especially for its antioxidative properties and the functioning as a dietary fibre. Based on an EU definition lignin can also be claimed as dietary fibre given that it still remains associated with carbohydrate polymers of plant origin. This PhD project was started in the beginning of 2010.

So far the work has included the following research topics:

- milling studies with different types of mills and grinders, both with wet and dry techniques to improve BSG hydrolysis
- microscopy analyses of the milled fractions
- hydrolysis experiments with varying enzyme mixtures to find the optimal cocktail for BSG carbohydrate solubilisation
- BSG protein solubilisation by proteolytic enzymes
- isolation of BSG lignin in pilot scale
- chemical characterization of BSG lignin
- *in vitro* studies of lignin behaviour in human colon model



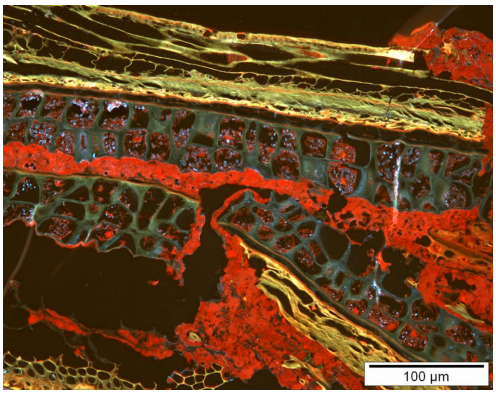


Figure: Microscopy images of BSG. Above: untreated BSG as received from the brewery, below: BSG stained with Calcofluor and Acid Fuchsin. Lignocellulosic cell walls appear yellow, aleurone cell walls blue and protein red.