Project 2 experimental work progress (Aalborg University)

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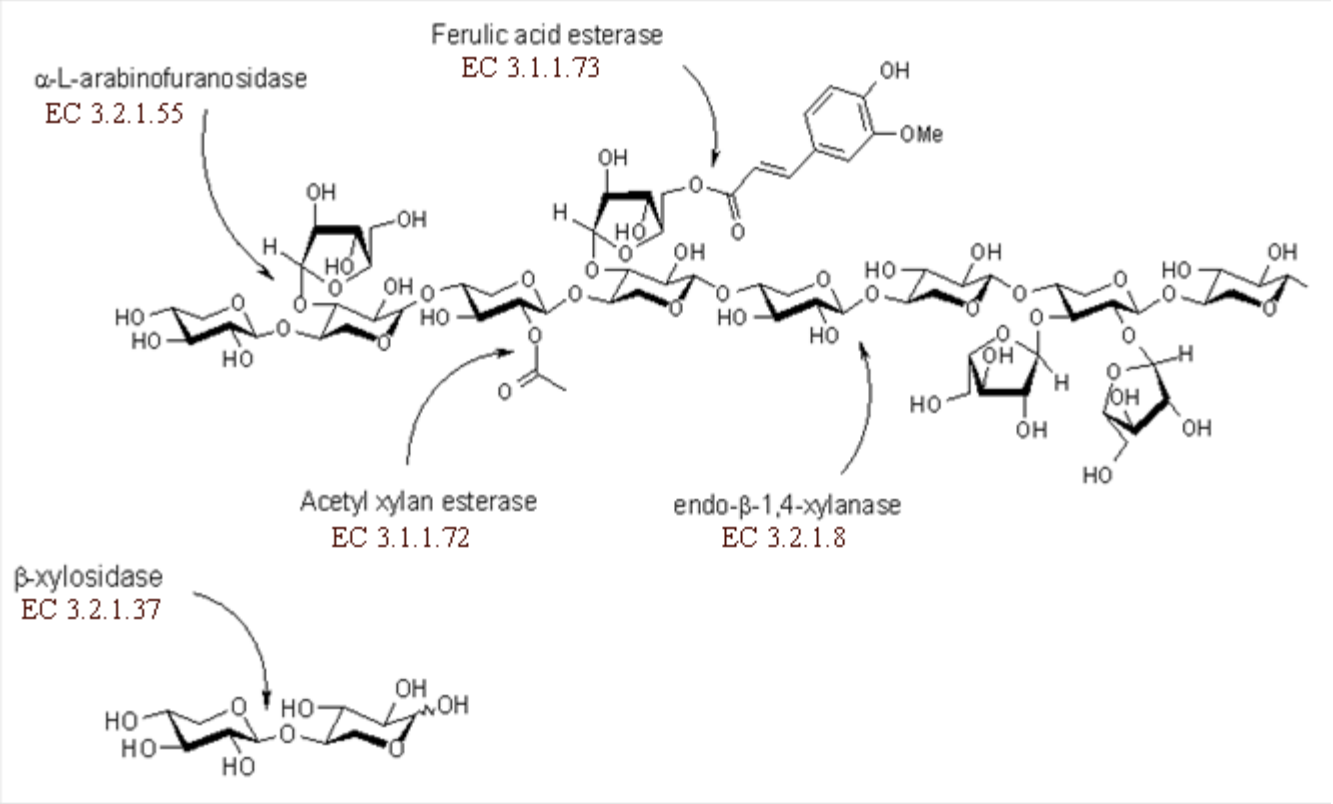
Karup, 12 November

Arabinoxylan - main hemicellulose component of yellow biorefinery (wheat straw, corn cobs and stover) and green biorefinery (fresh green leaves) feedstock



How to describe (predict) structural composition of arabinoxylooligosaccharides from different feedstock?

Given: Arabinose/xylose ratio

Describe (predict): ratio of every isomer in oligosaccharides mixture

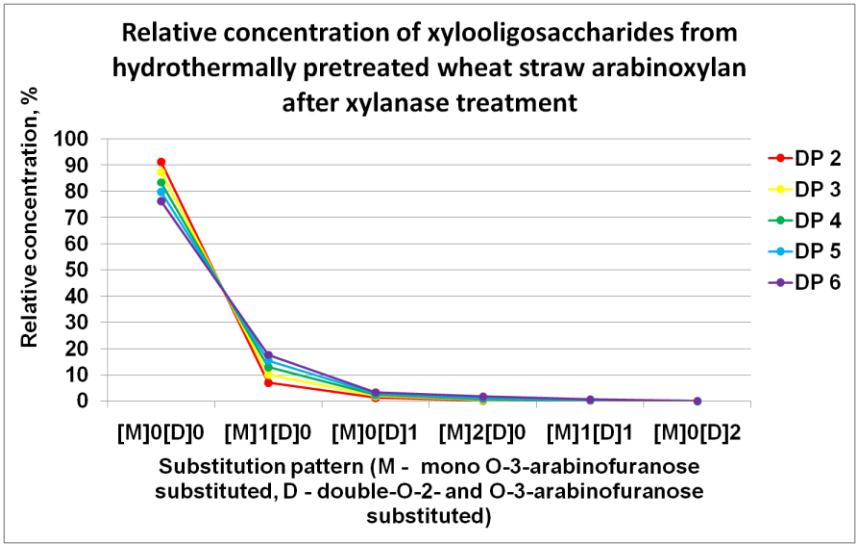
Substitution patterns of trisaccharides from wheat flour	Concentration (% from total number of oligosaccharides in trisacharides fraction)
Three unsubstituted residues	28,7%
One monosubstituted residue	27,3%
One double-ubstituted residue	17,1%
Two monosubstituted residues	8,7%
Two doublesubstituted residues	3,3%

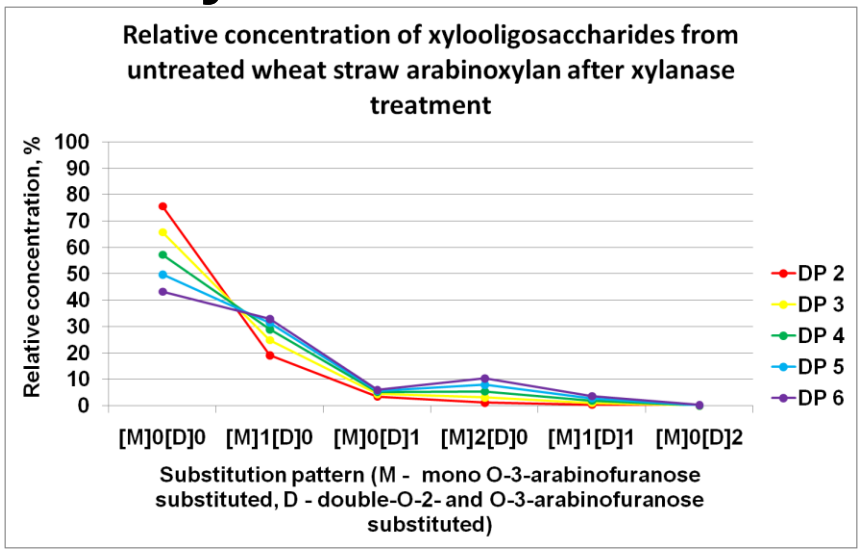
Combinatorial model for random distribution of substituted xylose residues within arabinoxylan main chain

1) Combinatorial model describing random distribution of substituted xylose residues in arabinoxylans was critically assessed using periodate oxidation and Smith degradation experimental results.

2) Structural composition of short arabinoxylooligosaccharides (arabinose/xylose ratio <0,91) can be semiquantitatively approximated by the model suggested (<25% relative error)

Structural composition of oligosaccharides of different length produced from hydrothermally pretreated and untreated wheat straw arabinoxylans





✓Unsubstituted xylooligosaccharides comprise almost entire total amount of oligosaccharides (DP3-7) from hydrothermally pretreated wheat straw arabinoxylan. At the same time their amount for untreated wheat straw is lower while substituted oligosaccharides ratio is higher.

✓Based on the model ratio of any substitution pattern for oligosaccharides of any length can be semiquantitatively calculated for arabinoxylan from different feedstock.

Future plans

- Enzymatic production of short (3-5 DP) arabinoxylooligosaccharides.
- Determination of optimal length and substitution pattern for highest prebiotic efficiency.

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One double-ubstituted residue	17,1%
Two monosubstituted residues	8,7%
Two doublesubstituted residues	3,3%
One monosubstituted residue and one doublesubstituted residue	10,8%
Two monosubstituted residues and one doublesubstituted residue	1,8%
One monosubstituted residue and twodoublesubstituted residues	1,2%
Three monoubstituted residues	0,9%
Three doublesubstituted residues	0,2%