



# CORN ARABINOXYLAN: A NON-DIGESTIBLE & HIGHLY SOLUBLE DIETARY FIBER

## DIETARY FIBER AT A GLANCE

Dietary fibers refer to carbohydrate polymers and oligomers that escape digestion in the small intestine and pass into the large bowel where they are partially or completely fermented by the colonic microflora. Dietary fiber can be categorized as follows:

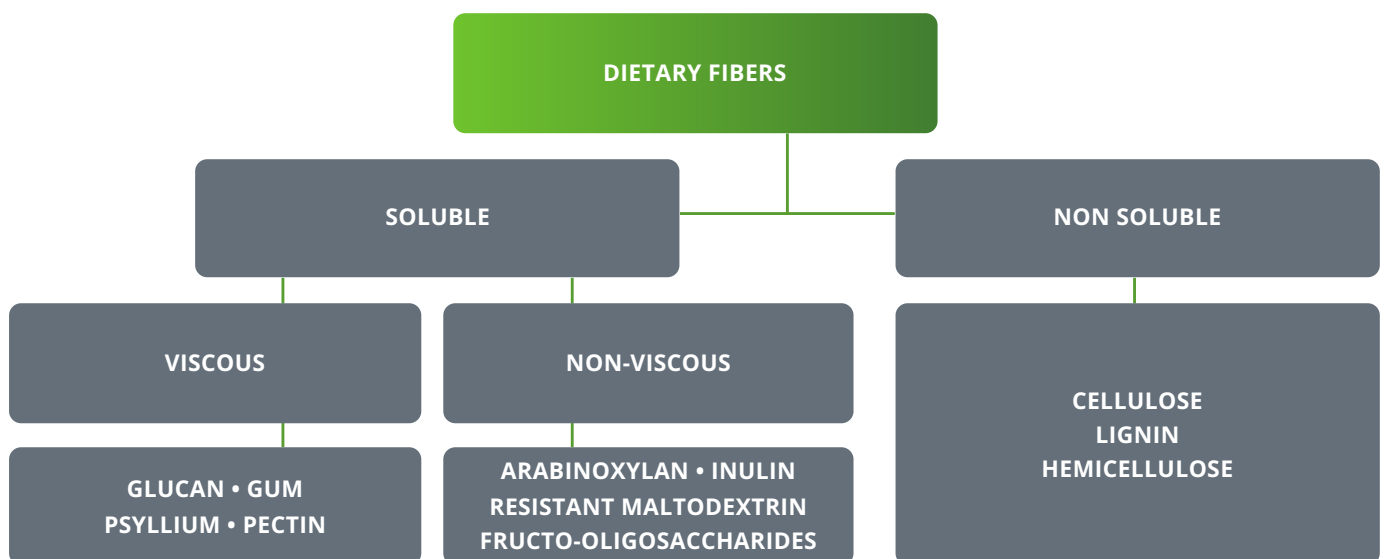


Figure 1: Dietary fibers classification.

# CORN ARABINOXYLAN AT A GLANCE

Corn arabinoxylan is a new gluten-free dietary fiber produced by ClonBio Foods using sustainable and innovative technologies. It is a pure arabinoxylan (over 75% total dietary fiber).

ClonBio Foods produces a single corn arabinoxylan. Its molecular weight is high compared with other soluble fibers, as shown below.

|                        | MOLECULAR WEIGHT (KDa) |
|------------------------|------------------------|
| Corn arabinoxylan      | 200                    |
| Maltodextrin           | 27                     |
| Resistant maltodextrin | 2                      |
| Inulin                 | 0.74                   |

Table 1: Molecular weight of corn arabinoxylan.

Corn arabinoxylan is mainly composed of xylose and arabinose, with side residues such as glucuronic acid and galactose.

Maltodextrin and resistant maltodextrin are mainly made with glucose and small traces of fructose.

Inulin is a fructo-oligosaccharide.

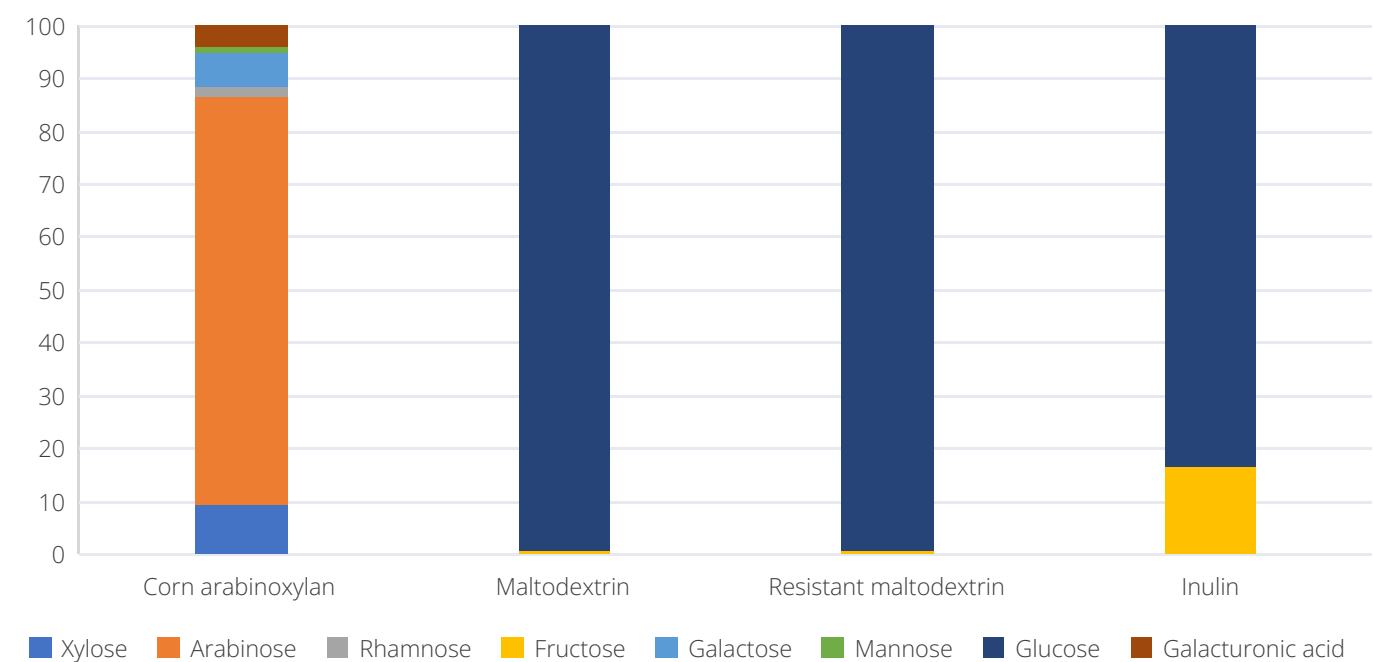


Figure 2: Monomeric composition (%) of corn arabinoxylan.

# ARABINOXYLAN AT A GLANCE

- Arabinoxylan is a **natural functional dietary fiber** found in cell walls of all major cereal grains, including wheat (up to 9% in whole grain), barley (up to 8% in whole grain), rice (up to 3% in whole grain), oat (up to 3% in whole grain), rye (up to 7% in whole grain), and corn (up to 4% in whole grain)<sup>1</sup>.
- As constituents of dietary fiber, arabinoxylans also have nutritional and health-promoting benefits [**prebiotic, antioxidant, and** reduce the risk of cardiovascular-related issues, diabetes, and cancer]<sup>2</sup>.
- Arabinoxylans are attracting lot of interest due to their technological performance in food applications such as bakery and dairy products. Arabinoxylans display functional properties including viscosity modulation, gel formation, emulsion or foam stabilizations, water absorption, fat/ sugar replacement, and prebiotic activity.



## CORN ARABINOXYLAN THROUGHOUT THE GASTROINTESTINAL TRACT

### IN VITRO DIGESTION MODEL:

Corn arabinoxylan, maltodextrin, resistant maltodextrin and inulin were digested using the standardized INFOGEST 2.0 protocol<sup>3</sup>, with modifications to fit polysaccharides rich matrices<sup>4</sup>.

### GASTRIC PHASE

(0-2h) with pepsin (Digestion process: pH 3.0 at 37 °C)

### INTESTINAL PHASE

(3-4h)

Phase 1: with porcine pancreatin (Digestion process: pH 7.0 at 37 °C for 1 hour)

Phase 2: with Rat small intestine extract (Digestion process: pH 6.8 at 37 °C for 1 hour)

**Gastric Phase:** Solutions of corn arabinoxylan, maltodextrin, resistant maltodextrin and inulin (3%, w/w) in distilled water were prepared. For the stomach stage, solutions were mixed with an equal volume of simulated gastric fluid (SGF). Then, 2 mL of a porcine pepsin solution were added and the pH was adjusted to 3.0. The mixture was incubated in an orbital Thermomixer at 37 °C with continuous agitation for 2 hours.

**Intestinal Phase:** Gastric digestates were subsequently mixed with an equal volume of simulated intestinal fluid (SIF). Pancreatin and bile salts were added to the digestion and the pH was adjusted to 7.0. Digestions were carried out in an orbital Thermomixer at 37 °C with continuous agitation for an hour. Following this phase, rat small intestine extract (RSIE) was added. Reactions were performed in an orbital Thermomixer during 1 h at 37 °C and 750 rpm. Digestion was stopped and samples were collected for carbohydrates analysis.

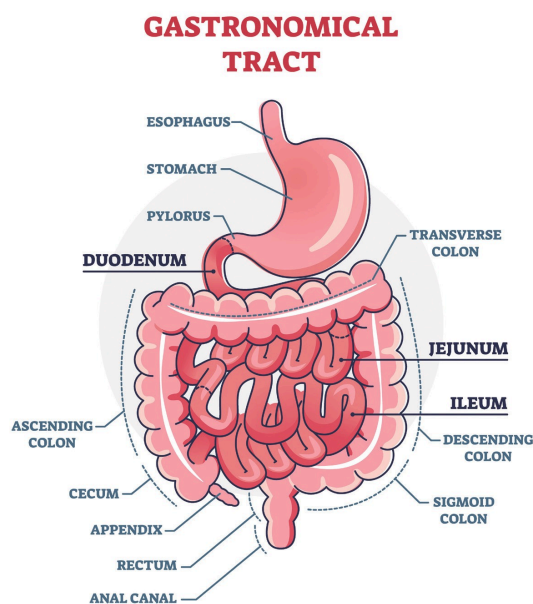


**Figure 3:** In vitro digestion model of carbohydrates.

## RESULTS

- A high release of glucose ( $\Delta$  glucose mg/g of 180) was observed in maltodextrins by the end of digestion. This can be explained by the structure of maltodextrins generally consisting of 5-10 glucose units that are easily hydrolyzed by digestive enzymes.
- Resistant maltodextrin was hydrolyzed and resulted in the increase of glucose ( $\Delta$  glucose mg/g of 27). Fructose was also observed in the digested resistant maltodextrin.
- Inulin hydrolysis resulted in the increase of fructose and glucose release. This is probably due to the partial hydrolysis of sucrose.
- In corn arabinoxylan, the amount of xylose and arabinose remained relatively unchanged after going through the digestive process. Similarly to inulin, some glucose release was also observed [ $\Delta$  glucose mg/g of 7 for corn AX versus 8 for inulin].

| mg/ g of sample        |                            | Xylose          | Arabinose       | Fructose         | Glucose           | Sucrose          |
|------------------------|----------------------------|-----------------|-----------------|------------------|-------------------|------------------|
| Corn arabinoxylan      | Beginning of the digestion | 1.16 $\pm$ 0.02 | 5.65 $\pm$ 0.06 |                  | 0.54 $\pm$ 0.02   |                  |
|                        | End of the digestion       | 0.81 $\pm$ 0.65 | 3.12 $\pm$ 2.63 |                  | 7.68 $\pm$ 0.11   |                  |
| Maltodextrin           | Beginning of the digestion |                 |                 |                  | 1.85 $\pm$ 0.13   |                  |
|                        | End of the digestion       |                 |                 |                  | 185.65 $\pm$ 1.96 |                  |
| Resistant Maltodextrin | Beginning of the digestion |                 |                 | 0.24 $\pm$ 0.01  | 4.95 $\pm$ 0.08   |                  |
|                        | End of the digestion       |                 |                 | 0.81 $\pm$ 0.31  | 31.70 $\pm$ 0.06  |                  |
| Inulin                 | Beginning of the digestion |                 |                 | 39.24 $\pm$ 2.77 | 4.31 $\pm$ 0.12   | 26.91 $\pm$ 1.60 |
|                        | End of the digestion       |                 |                 | 43.37 $\pm$ 0.22 | 12.77 $\pm$ 0.0   | 7.81 $\pm$ 1.27  |

**Table 2:** Digestion profile of corn arabinoxylan, maltodextrin, resistant maltodextrin and inulin.

## KEY MESSAGES

- Dietary fibers can be partially digested.
- The final glucose release was found to be the lowest in corn arabinoxylan.
- Corn arabinoxylan structure is highly preserved and will reach the colon **relatively intact** to be fermented by the gut microbiota.

## References

- 1 <https://www.sciencedirect.com/science/article/abs/pii/B9781845694142500230>
- 2 <https://www.sciencedirect.com/science/article/abs/pii/S1756464614001820>
- 3 <https://www.nature.com/articles/s41596-018-0119-1>
- 4 <https://www.sciencedirect.com/science/article/abs/pii/S0963996920310796?via%3Dihub>