Cell Wall Composition Modulates Gut Microbiota and Short Chain Fatty Acid Production during IN-vitro Fermentation

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Cereals, legumes and tubers are dominant staple food in human population of different agro-climatic zones and geographic location. Their cell wall is an important source of dietary fibre. Dietary fibres like plant cell wall pass through the upper digestive tract intact and is available for lower gut microbiota utilization and modulation of gut environment. Depending on different botanical sources, the polysaccharide and monosaccharide compositions of cell walls vary. To understand how different type of plant cell walls affect gut microbiota fermentation otucomes, cell walls from three different types of cereals (barley, sorghum and waxy rice), legumes (pea, faba bean and mung bean) and tubers (potato, sweet potato and yam) were isolated and subjected to in-vitro human faecal fermentation. Analysis of cell wall composition revealed significant differences among cereals, legumes and tubers. Cereal cell walls were high in xylose, legume cell walls had high content of arabinose and tuber cell walls were rich in galactose. This difference was reflected on varying fermentation profiles of these substrates. Cereals cell walls degraded slower than other groups, with low short chain fatty acid production. Moreover, microbiota composition of different types of cell walls changed after 48 hours in-vitro fermentation. The research suggested that the cell wall composition is determined by the plant botanical source, and the different polysaccharides, as well as the different monosaccharide content, could determine both fermentation outcomes and microbiota community shifts.