Cereal grain polysaccharides as functional food ingredients: structure-property relations

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Mixed linkage (1→3),(1→4) linear β-D-glucans and arabinoxylans constitute major polysaccharide components of the pericarp and endosperm cell wall matrix of cereal grains (e.g., wheat, barley, oat) which can provide a significant portion of the recommended daily dietary fiber intake. These non-digestible polysaccharides have been attracting research and industrial interest due to several health benefits linked with their consumption, in relation to risk reduction and/or better management of inflammatory conditions associated with chronic diseases; in fact, they are among the very few constituents that regulatory authorities (FDA, EFSA) have permitted the use of health claims, providing marketing opportunities for development of functional products enriched with these fibers. The nutritional benefits of cereal fibers, in terms of structure-function relations, are not fully elaborated, although solubility, extractability, viscosity and molecular structure seem to be important. The physical properties of β-D-glucans and arabinoxylans, such as solubility, propensity for chain aggregation and rheological behavior, in solution and gel state, are dependent on linkage type and substitution patterns, molecular weight and chain conformation. Despite the strong incentive to incorporate cereal fibers in food products, using isolates or concentrates, their industrial usage still remains a challenge from a processing-formulation and sensorial perspective; e.g. among other factors, compositional-processing effects and endogenous enzymic systems seem to have a strong impact on structure modification and their physical properties. Moreover, phase separation phenomena can take place in composite food matrices (e.g., dairy formulations), affecting the sensorial acceptability and shelf life of the end-product. This presentation aims to highlight some aspects on chemistry, properties and use of cereal cell wall polysaccharides, with an effort to elaborate on molecular structure - functionality relations and their impact on end-product quality attributes.