

The best of thermally processed foods through non-enzymatic transglycosylation reactions

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The availability of nutrients and mitigation of harmful compounds are provided when foods are thermally treated, a process known as cooking, rendering their safety. This was a human civilization advance achieved 1.9 million years ago. Roasting is a thermal process that, under a low water environment, foods develop novel sensory properties, still highly appreciated nowadays. Coffee, baked, and fried foods are examples of daily-consumed thermally processed food products. Melanoidins are high molecular weight nitrogen containing compounds with the peculiar brown colour of roasted, baked, and fried foods. These have beneficial health properties and can mitigate and prevent the bioavailability of harmful pyrolysis products formed during these processes. The biological activities attributed to coffee brew melanoidins include antimicrobial, anticariogenic, anticarcinogenic, anti-inflammatory, immunostimulatory and antiglycative properties.

At the University of Aveiro, gas chromatography and mass spectrometry tools using models and real matrices of coffee roasted beans allow to disclose the chimeric melanoidins structural features and new carbohydrate-based compounds formed. These compounds have also been identified and characterized in bread crust and toasts, as well as in potato chips. The beneficial compounds produced through non-enzymatic transglycosylation reactions are at the origin of newly-formed dietary fibres and oligosaccharides with potential prebiotic effect. Honey, although not submitted to the high temperatures of roasted foods, have an acidic and low water activity medium, which for long periods favours the transglycosylation reactions that promote the formation of bioactive oligosaccharides.

Consequently, daily-consumed thermally processed food industries produce huge amounts of disposable by-products as putative sources of melanoidins prone to be used to design new food ingredients with functional properties, as well as on the development of new biodegradable polysaccharide-based packaging materials by integration of different food industry by-products, including spent coffee grounds, coffee silver skin, potato peels, and starch.

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