Anti-inflammatory and anti-diabetic effects of anthocyanins from colored cereals.

ANTI-INFLAMMATORY AND ANTI-DIABETIC EFFECTS OF ANTHOCYANINS FROM COLORED CEREALS

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Introduction: Anthocyanins are located in aleuronic or pericarp layers of various types of pigmented cereal grains. Many studies have been reported on the health-promoting effects of anthocyanins and on their anti-inflammatory and antidiabetic activities. This study was aimed at investigating the anthocyanin profile of pigmented grains, and at scrutinizing bioactive molecules by assessing their effects on the expression of inflammatory markers and on the activity of pancreatic and brush border enzymes.

Material & Methods: The present study compares five different colored grains: three corn samples and two wheat samples. A pH-differential method was used to measure total anthocyanin content, while anthocyanin profiling was carried out by means of RP-HPLC/DAD. Antioxidant capacity was determined by means of the FRAP assay. Immunomodulating effects were evaluated by using cytokine-stimulated biosynthesis of inflammation factors in Caco-2 cells transfected with a pNiFty2-Luc vector. In these studies, cyanidin-3-glucoside was used as positive control. Inhibitory activity against intestinal α-glucosidase and pancreatic α-amylase was also assessed.

Results: Four major anthocyanins were identified by HPLC profiling: cyanidin-3-glucoside was predominant in purple wheat, and delphinidin in blue corn. The highest total anthocyanin content was detected in purple wheat (0.74 mg/g), followed by some of the blue corn varieties (0.66 mg/g and 0.53 mg/g in cultivars T and MF, respectively), whereas non-blue corn had very low levels (0.18mg/g). Conversely, the antioxidant capacity was the highest in the non-blue Rostrato corn variety (47.2 μmolFe(II)/g), comparable to that of the purple wheat (47.5 μmolFe(II)/g). The highest ferulic acid concentration was detected in blue corn (cultivar T) and in the red-colored Rostrato corn, whereas specific fractions derived from de-branning of blue wheat (cultivar Skorpion) had the highest rutin content.

The immune response of Caco-2 cells decreased significantly in a dose-responsive manner for all grains extracts. Extracts from blue corn (cultivar SK) and purple wheat where effective in decreasing inflammatory response at anthocyanin concentrations comparable to those of pure cyanindin-3-glucoside. Purple wheat and blue corn (cultivar T) extracts also displayed significant inhibition of α-amylase activity. Values ranged between 78% (wheat)

and 95.4% (corn) at final concentrations of extract solids in the 100-130 μg/ml range. Under comparable conditions, brush border α-glucosidase inhibition from the same extracts was 57.8 % (wheat) and 65.4% (corn).

Conclusion: This study highlights the promising antioxidant activity, anti-inflammatory, and antidiabetic effects of anthocyanins-rich extracts from corn and wheat. These cereals can be incorporated into staple grain-based foods such as pasta, bread, noodles, or snacks, but also in other types of foods, such as dairy products or fiber-rich drinks. In this frame, they could be regarded as both a natural food colorant and as a functional food ingredient. Their use as natural dietary supplements deserves further attention, given their ability to control the carbohydrate metabolism and to modulate inflammation. Also worth of further studies are their reported effects on cardiovascular risk factors, as well as their effects on the intestinal microbiota.

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