Comparative evaluation of phytochemical profiles and identification of flavonoids in cereal grains

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The phytochemicals including flavonoids and phenolic acids mainly contained in the outer layer of the kernels are key factors responsible for the biofunctionality of whole grains. The phytochemical profiles of twelve grain samples comprising 6 wheats, 3 barleys and 3 oats were studied for comparative evaluation of their antioxidant properties. Total phenolic content (TPC) and antioxidant activities (DPPH and ORAC) of the grain extracts were measured. The bound phenolic acids were identified and quantified using HPLC and mass spectrometry. The flavonoids in different grain were analyzed using HPLC and tandem mass spectrometric techniques. TPC in acidified methanol extracts ranged from 164 to 226, 264-391, and 308-331 mg/100g for wheat, oats and barley, respectively. Similarly TPC in acetone extracts were 78 to 118, 223 to 351 and 367 to 433 mg/100g. Acetone extracts had significantly ($p<0.05$) higher TPC than acidified methanol extracts for barley samples. On the contrary, acidified methanol extracts from wheat and oats had higher TPC than their acetone extracts. The results showed that for both acetone and acidified methanol extracts, barley samples had significantly higher antioxidant activity than oats and wheat samples although even some of the oats had similar or even higher TPC compared to barley samples. Wheat extracts had low antioxidant activity assayed using both DPPH and ORAC assays. Oats had the highest levels of bound phenolic acids (431 to 656 mg/100g) followed by wheat samples (91 to 153 mg/100g). The bound phenolic acid contents of barley samples ranged from 81-105 mg/100g. The major flavonoids in barley samples are dimers and trimers of proanthocyanidins, while flavone glucosides are the major flavonoids for wheat. The phytochemical including flavonoid profile may explain the antioxidant activity for different cereal grain rather than TPC.