

Comparison of phenolic and flavonoid content and antioxidant activity *in vitro* among potato varieties

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Introduction

Diets rich in fruits and vegetables have been associated with a lower incidence of cancer and heart disease, which may be related to the antioxidant activity of bioactive compounds present in these foods. Phenolic compounds are potent antioxidants *in vitro*, of which flavonoids are of particular interest for their potential positive impact on health. Potatoes are one of the most consumed vegetables in the world and therefore an important source of phenolics. In Ireland they are the third most important crop with a farm gate value of approximately 45 million euros annually.

The aim of this work was to evaluate the antioxidant activity of methanolic solutions extracted from the skin and flesh of potato tubers against the stable radical DPPH and analyze its relationship to the content of total phenolics and total flavonoids.

Materials and Methods

Seven commercially available potato varieties were purchased: Kerrs Pink (KP), Orla (OR), Robinta (RO), Remarka (RK), Maris Piper (MP), Axona (AX) and Setanta (ST). Skin and flesh of three tubers per variety were ground in liquid nitrogen and extracted in triplicate using solutions of 80% methanol (v/v). Total phenolics (TP) were determined by reaction with Folin-Ciocalteu reagent according to Singleton *et al.*, (1965). Results were expressed as gallic acid equivalents (GAE). Total flavonoids (TF) were determined by reaction with sodium nitrite and aluminium chloride according to Marinova *et al.*, (2005). Results were expressed as catechin equivalents, (CE). Antioxidant activity was evaluated by reaction with the stable radical DPPH according to Goupy *et al.*, (1999). Results were expressed as adimensional trolox equivalents antioxidant capacity (TEAC).

Statistical analysis was carried out with SAS 9.1.3. using a linear mixed model with Tukey adjustment.

Results and Discussion

Results for total phenolics, total flavonoids and antioxidant activity are shown in Figure 1 A to C respectively. Correlation between total phenolics and total flavonoids (rhombus dots), total phenolics and antioxidant activity (square dots) and total flavonoids and antioxidant activity (triangular dots) are shown in Figure 1 D. All varieties showed a higher concentration of total phenolics, total flavonoids and greater antioxidant activity in the skin than in the flesh. This result was highly significant ($p < 0.0001$). The effect of variety was significant ($p < 0.0001$) for total phenolics and ($p < 0.001$) for antioxidant activity. Variety was not significant for total flavonoids in the skin but was significant in the flesh ($p < 0.05$).

Of all varieties examined, cv. Setanta had the highest levels of total phenolics in both skin and flesh. Total flavonoids and antioxidant activity were highest in the flesh of cv. Setanta. There was a good correlation between total phenolics and total flavonoids, total phenolics and antioxidant activity and total flavonoids and antioxidant activity, with the latter showing the best fit. This may be due to flavonoids having a higher antioxidant activity than other phenolic compounds. The highest proportion of total flavonoids as compared with total phenolics was found in cv. Axona and cv. Orla for skin and flesh tissues respectively.

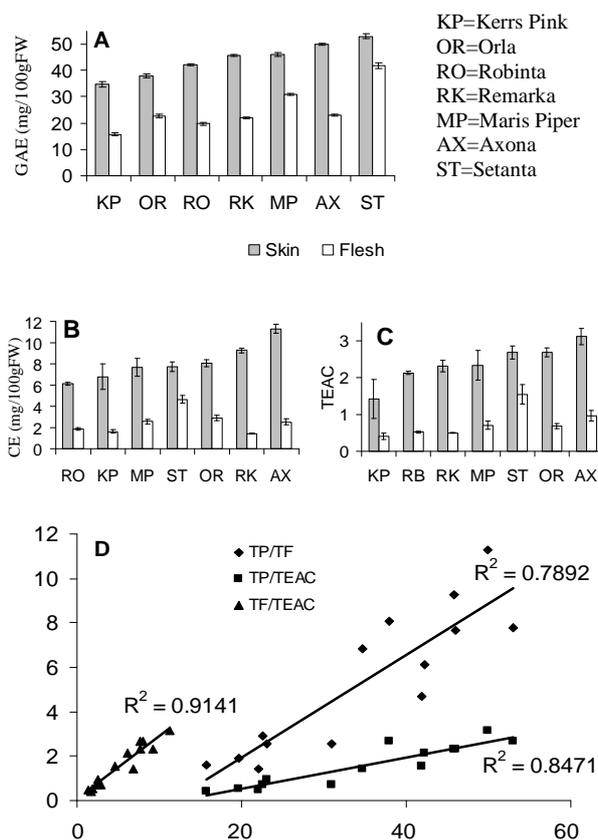


Figure 1. Total phenolics (A), total flavonoids (B), antioxidant activity (C) and correlation among them (D) for seven varieties of potato. FW=fresh weight. Error bars represent standard error.

Conclusions

The antioxidant activity of the varieties of potato analyzed is higher in the skin than in the flesh of the tuber. It is variety dependant and shows good correlation with the content of phenolic and flavonoid compounds.

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