

## **Which polyphenolic compounds contribute to the total antioxidant activities of apple?**

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The antioxidant activities of eight apple cultivars were studied by using the ferric reducing/antioxidant power (FRAP), the beta-carotene-linoleic acid model system (beta-CLAMS), and the photochemiluminescent (PCL) assays. The antioxidant activity of apples is highly correlated to the total phenolic content (TPC) measured by the Folin-Ciocalteu method and the total polyphenolic index (TPI) obtained by HPLC. Extracts of the peel and flesh were analyzed and assayed separately. The FRAP activities of both peel and flesh extracts correlate well with the TPC ( $r = 0.95$  and  $0.99$ , respectively) and the TPI ( $r = 0.82$  and  $0.99$ , respectively). Similar results were found in the beta-CLAMS activities, showing correlation coefficients of  $r = 0.90$  and  $0.91$  with the TPC for the peel and flesh extracts and of  $r = 0.90$  and  $0.84$  with the TPI for the peel and flesh extracts, respectively. The antioxidant activity measured by the PCL assay was not correlated with TPC or TPI due to the lack of integratable lag phase in this method with the flavan-3-ols/procyanidins. Among the five major polyphenolic groups, flavan-3-ols/procyanidins had the highest positive correlation with the FRAP and beta-CLAMS activities:  $r = 0.84$  and  $0.88$  for the peel extracts, respectively; and  $r = 0.98$  and  $0.87$  for the flesh extracts, respectively. At individual compound level, epicatechin and procyanidin B2 were the major contributors to the antioxidant activity of apple. Hydroxycinnamic acids may have a significant role in the flesh.