

**Title** Phenolic contents and other health and sensory related properties of apple fruit (*Malus domestica* Borkh., cv. Aroma): Effect of postharvest UV-B irradiation

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### Abstract

The effects of postharvest irradiation with visible light and UV-B radiation on several health and sensory related properties, including antioxidant capacity (ORAC assay), phenolic compounds, total phenols, ascorbic acid, skin colour, soluble solids and titratable acidity, were measured in 'Aroma' apples and the relationships between these properties were evaluated. The kinetics of flavonoid accumulation during irradiation were measured with a non-destructive method based on chlorophyll fluorescence. The response to irradiation was compared between peel and flesh of apples harvested from the inner (shade-grown) and outer (sun-exposed) canopy of the tree. The antioxidant capacity, the sum of phenols (HPLC) and the content of anthocyanins, quercetin glycosides, chlorogenic acid and ascorbic acid increased upon postharvest irradiation. The accumulation of flavonols started earlier and increased to a higher level than that of anthocyanins. A combination of visible light and UV-B radiation was the most effective irradiation treatment and the response was greatest for the peel of the shade-grown apples. The apple flesh showed no response to any of the irradiation treatments. Postharvest irradiation improved the apple skin colour, but did not influence the level of soluble solids or titratable acidity in the apples. No visible damage or substantial weight loss was found in the apples after the irradiation treatments. The results suggest that postharvest irradiation can be utilised to improve the health value and colour appearance of apples without changing important taste-related parameters or causing damage to the fruit. Principal component analysis of the data showed that principal component 1 explained 72% of the total variation and was closely related to the skin colour, sum of the phenols, total phenols, the content of ascorbic acid and also the level of soluble solids and antioxidant capacity. Principal component 2 explained 12% of the total variation and was primarily related to titratable acidity. The antioxidant capacity in the peel was better correlated with the sum of the phenols ( $r = 0.70$ ,  $P < 0.001$ ) than with the content of ascorbic acid ( $r = 0.54$ ,  $P < 0.001$ ). The red to green colour values ( $a^*$ ) of the apple skin were closely correlated with the sum of the phenols ( $r = 0.91$ ,  $P < 0.001$ ) and ascorbic acid content ( $r = 0.83$ ,  $P < 0.001$ ) in the apple peel.