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MEVALONIC ACID CONCENTRATIONS IN FRUIT AND VEGETABLE TISSUES

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Mevalonic acid (MVA) is a key intermediate in the isoprenoid pathways in both plant and animal systems. Important products of these pathways in fruit and vegetable tissues are the carotenoids, the essential oils and the plant growth regulators, gibberellins, cytokinins and abscisic acid. Isoprenoid metabolism has also been implicated in the metabolic events that result in the degradation of apple tissue during cool storage [1,2]. However, despite the interest shown in the metabolism of isoprenoid compounds, the only reported measurement of MVA in fruit and vegetable tissues was by Modi and Patwa [1], who estimated the MVA content of carrot tissue to be 0·25–0·5 mg/100 g. In this paper we have determined the level of MVA in a range of mature tissues and the values are shown in Table 1.

Table 1. Concentrations of MVA in fruit and vegetables

Tissue	MVA (mg/100 g)
Apple—Sturmer Pippin	3·6
—Jonathan	3·0
Rhubarb (stalks)	2·4
Sweet corn (kernels)	1·4
Peach	1·4
Nectarine	1·1
Silver beet	0·8
Butter bean	0·6
Orange (skin)	0·6
Carrot	0·4
Tomato (green)	0·4
Tomato (red)	0·3
Cucumber	0·3
Banana (flesh)	0·2
Pea	0·2
Banana (skin)	<0·05
Orange (flesh)	
Egg plant	
Onion	
Potato	
Cabbage	
Green pepper (no seeds)	

The limit of detection of the analysis was 0·05 mg/100 g tissue.

Each value is the mean of two samples.

The highest levels were found in apples and the values obtained are in the order of those found by Wills and Scott [2] to be capable of inducing flesh browning in cool stored apples. The value for carrot is within the range previously reported [1]. The low amounts found for orange were surprising in view of the relatively large amount of essential oils that accumulate in the fruit. It seems possible therefore that once MVA is synthesized in oranges, the conversion to terpenes is not rate limiting.

EXPERIMENTAL

Fruits and vegetables analysed were in a good mature condition and were obtained from retail outlets. Analysis involved conversion of MVA to its lactone (MVAL), purification of MVAL by solvents and TLC, and its analysis by GC [4].

Fresh tissue was diced and blended for 4 min with buffer soln (pH 1·5, 0·2 M KCl–HCl) (1 g/ml). The filtrate was adjusted to pH 1·5 (conc. H_2SO_4) and held at 35° for 18 hr to allow full conversion of MVA to MVAL. The mixture was extracted with EtOAc (4 × 400 ml). Solvent was evaporated by rotary evaporation at 35° and 20–25 mm Hg to small volume so as not to vaporise MVAL. Concentrate was dried (Na_2SO_4), filtered and the remaining solvent evaporated.

The sample was separated on Kieselgel G TLC plates in $CHCl_3$:Me_2CO (2:1). The MVAL regions were located using (i) NH_2OH–MeOH; (ii) KOH–MeOH; and (iii) $FeCl_3$–HCl [4]. The appropriate region was extracted with dry MeOH, filtered and an aliquot analysed by flame ionisation GLC using a 3·2 m stainless steel column of 10% SE-30 on chromosorb W, aw/dcms, 60–80 mesh. Operating details for the column were: column temp.—175°, injector temp.—185°, detector temp.—190°, carrier gas (N_2) flow rate—20 ml/min, H_2—20 ml/min, air 1 l/min. The amount of MVAL present was calculated from standard curves.

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