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Phytotoxicity of hexanoic acid in *Pisum sativum*: effects on roots and isolated mitochondria.

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Key message

Incubation of pea roots with hexanoic acid leads to inhibition of O₂ consumption, solute leakage and affects mitochondrial membrane potential and respiration.

Organic acids are known phytotoxins in some anaerobic waterlogged soils. In this work, we tested the influence of hexanoic acid (HxA) on pea roots. HxA had an inhibitory effect on root tissue O₂ consumption but only at pH 5.0, not at pH 6.0. Intact root tissues exposed to 20 mM HxA for 1 h showed solute leakage. Mitochondria were isolated from pea roots after 1 h incubation in the presence or absence of HxA, at either pH 5.0 or 6.0. The maximum effect of HxA on $\Delta\Psi$ was detected at pH 5.0 in the presence of succinic acid and without BSA in the assay buffer. A smaller effect was induced by HxA at pH 5.0 with malic plus glutamic acids, while at pH 6.0 no effect was observed. Mitochondrial respiration was affected by HxA after root incubation at pH 5.0. The decrease of respiration was induced by HxA with both succinic acid and malic plus glutamic acids but BSA in the assay buffer enhanced the effect of HxA, at least with succinic acid. These findings strongly suggest that the toxicity of HxA is caused by its un-dissociated form, affecting plasmalemma permeability and mitochondrial activities.