Effects of *Citrus Aurantium* (Bitter Orange) Fruit Extracts on Metabolic Fluxes in the Rat Liver


Departamento de Bioquímica, Universidade Estadual de Maringá, Maringá, Pr.

The fruit extracts of *Citrus aurantium* (“bitter orange”) are traditionally used as weight-loss products and as appetite suppressants. An important fruit component is p-synephrine, which is structurally similar to the adrenergic agents. Weight-loss and adrenergic actions are always related to metabolic changes and this work was designed to investigate a possible action of the *C. aurantium* extract on liver metabolism. The isolated perfused rat liver was used to measure catabolic and anabolic pathways, including oxygen uptake and perfusion pressure. The *C. aurantium* extract and p-synephrine increased glycogenolysis, glycolysis, oxygen uptake and perfusion pressure. All these changes were at least partially sensitive to both α- and β-adrenergic antagonists. p-Synephrine (200 μM) produced an increase in glucose output (1.73 μmol min⁻¹ g⁻¹) that was only 15% smaller than the increment caused by the extract (400 mg/L) containing 196 μM p-synephrine (2 μmol min⁻¹ g⁻¹). For oxygen consumption stimulation the difference was more pronounced, 0.28 μmol min⁻¹ g⁻¹ for p-synephrine and 0.45 μmol min⁻¹ g⁻¹ for the extract. At low concentrations the *C. aurantium* extract tended to increase gluconeogenesis, but at high concentrations it was inhibitory, opposite to what happened with p-synephrine. The action of the *C. aurantium* extract on liver metabolism is similar to the well known actions of adrenergic agents and can be partly attributed to its content in p-synephrine. Since many of these actions are catabolic in nature, it can be concluded that they are, in principle at least, compatible with the weight-loss effects usually attributed to *C. aurantium*.

Key words: adrenergic signalling; glycogenolysis; glycolysis; respiration; weight loss

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