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Bioaccessibility of polyphenols and antioxidant capacity of orange juice and peel extracts using *in vitro* digestion

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Orange is the most cultivated citrus fruit in the world and Brazil is the first world producer, accounting for over 60% of production that is mostly exported as concentrated juice. During juice processing, solid residues are generated and commonly used for animal feed or pectin extraction. The orange juice and these residues composed mainly by peels and pomace contain a diversity of polyphenolic substances associated with bioactive properties and may be used in functional foods. To become bioavailable and exert bioactivity *in vivo*, polyphenols must be extracted from the food matrix and become bioaccessible during the gastrointestinal digestion. Therefore, in this study we used *in vitro* digestion as a preliminary tool to assess bioaccessibility of polyphenols in orange juice and orange peel extracts. Orange juice was extracted using a domestic juicer and extracts of orange peel (5 g) were prepared using water extraction (30 mL) at 70°C for 15 min. The samples were analyzed for physico-chemical parameters and subjected to *in vitro* digestion by simulating the oral, gastric and intestinal phases with digestion fluids containing the enzymes α-amylase, pepsin and pancreatin, respectively. The antioxidant activity was determined using the ABTS free radical scavenging method and total polyphenols were quantified by the Folin-Ciocalteu method. Total soluble solids and vitamin C concentrations ranged from 1.00 to 9.83 ºBrix and from 28.08 to 35.22 mg $100g^{-1}$ in peel extracts and orange juices, respectively. Total acidity, total polyphenols and antioxidant capacity were higher in juices than in extracts. The juice had a polyphenol content of 615.5 mg GAE L^{-1} and antioxidant activity of 24,412.6 mM Trolox L^{-1}. The values were of 271.1 mg GAE L^{-1} and 9,161.2 mM Trolox L^{-1} for peel extract. There were decreases in concentrations of polyphenols and in antioxidant activity of orange juice and peel extracts during the *in vitro* digestion. Despite the higher levels of total polyphenols and antioxidant activity in juices, bioaccessibility index was highest for peel extracts (37.2%). Also, upon digestion, the antioxidant capacity of peel extracts was reduced by 67.5%, while the reduction was up to 83.6% in juice samples. In conclusion, results of the *in vitro* digestion showed that orange peel extract had better bioactive potential when compared to juice in regard to antioxidant activity and phenolic bioaccessibility. This indicates valorization of citrus fruit waste and points out further applications for orange residues (or extracts) in functional foods and products.

Keywords: digestão e biodisponibilidade de compostos bioativos; citrus, fruit residues, gastrointestinal simulation.

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