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Characteristics of red-fleshed sweet oranges and their impact on gut microbiota and health

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Abstract

The health and nutritional benefits of citrus fruit consumption are associated with their balance of nutrients and bioactive compounds. The pigmented citrus varieties are of growing interest to the citrus industry and consumers, and the red-fleshed oranges are a new alternative by their attractive coloration and the potential health-related benefits. These varieties displayed a contrasted carotenoid profile in the pulp with accumulation of lycopene and very high concentrations of phytoene and phytofluene. This study presents a summary of the composition in main bioactive compounds and nutrients, with a special focus on the carotenoid content and composition in fruits of different red-fleshed oranges compared to traditional varieties. Furthermore, the potential biological effects of the consumption of the red-fleshed orange (Cara Cara variety, CC) in comparison with traditional orange (Washington Navel, N) were investigated, evaluating different health-related parameters and gut microbiota. An *in vitro* study with the juice and pulp of N and CC varieties, following simulation of gastrointestinal digestion and colonic fermentation, and incubation with gut microbiota isolated from obese and normal-weight children, demonstrated a reduction in the population of *Enterobacteriaceae.* Moreover, the pulp and juice of CC exhibited a more pronounced increase in the population of *Bifidobacterium* and *Bacteroides* especially in the obese group. A randomized pilot study was conducted with obese children who receive either CC or N orange (one orange fruit per day, five days per week for four weeks). After this intervention, the carotenoid profile in the faeces and plasma of individuals supplemented with CC was significantly higher in phytoene, whereas no discernible variations in carotenoids were observed in those supplemented with N orange. No changes in body weight were observed, but orange consumption positively modulated the composition of the microbiota, and the effects in specific populations will be discussed. Interestingly, a reduction in triglycerides and the insulin resistance index (HOMA-IR) was observed in both orange-type participants, especially in those consuming CC.

Keywords: Red-fleshed orange, health-benefits, carotenes, microbiota

Preferred participation: oral