

Recent Advances in Research on Carotenoids: From Agrofood Production to Health Outcomes

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Abstract : Beyond their role as natural colorants, some carotenoids are provitamins A and may be involved in health-promoting biological actions and contribute to reducing the risk of developing non-communicable diseases, including several types of cancer, cardiovascular disease, eye conditions, skin disorders or metabolic disorders. Given the versatility of carotenoids, the COST-funded European network to advance carotenoid research and applications in agro-food and health (EUROCAROTEN) is aimed at promoting health through the diet and increasing well-being by means. Stakeholders from 38 countries participate in this network, and one of its main objectives is to promote research on little-studied carotenoids. In this contribution, recent advances of our research group and collaborators in the study of two such understudied carotenoids, namely phytoene and phytofluene, the colorless carotenoids, are outlined. The study of these carotenoids is important as they have been largely neglected despite they are present in our diets, fluids, and tissues, and evidence is accumulating that they may be involved in health-promoting actions. More specifically, studies on their levels in diverse tomato and orange varieties were carried out as well as on their potential bioavailability from different dietary sources. Furthermore, the potential effect of these carotenoids on an animal model subjected to oxidative stress was evaluated. The tomatoes were grown in research greenhouses, and some of them were subjected to regulated deficit irrigation, a sustainable agronomic practice. The citrus samples were obtained from an experimental field. The levels of carotenoids were assessed using HPLC according to routine methodologies followed in our lab. Regarding the potential bioavailability (bioaccessibility) studies, different products containing colorless carotenoids, like fruits, juices, were subjected to simulated in vitro digestions, and their incorporation into mixed micelles was assessed. The effect of the carotenoids on oxidative stress was evaluated on the *Caenorhabditis elegans* model. For that purpose, the worms were subjected to oxidative stress by means of a hydrogen peroxide challenge. In relation to the presence of colorless carotenoids in tomatoes and orange varieties, it was observed that they are widespread in such products and that there are mutants with very high quantities of them, for instance, the Cara Cara or Pinalate mutant oranges. The studies on their bioaccessibility revealed that, in general, phytoene and phytofluene are more bioaccessible than other common dietary carotenoids, probably due to their distinctive chemical structure. About the in vivo antioxidant capacity of phytoene and phytofluene, it was observed that they both exerted antioxidant effects at certain doses. In conclusion, evidence on the importance of phytoene and phytofluene as dietary easily bioavailable and antioxidant carotenoids has been obtained in recent studies from our group, which can be important shortly to innovate in health-promotion through the development of functional foods and related products.

Keywords : carotenoids, health, functional foods, nutrition, phytoene, phytofluene

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