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The Effects of Food Matrix and Different Excipient Foods on β-Carotene Bioaccessibility in Carrots

Authors : Birgul Hizlar, Sibel Karakaya

Abstract : Nowadays, consumers are more and more aware of the benefits beyond basic nutrition provided by food and food compounds. Between these, carotenoids have been demonstrated to exhibit multiple health benefits (for example, some types of cancer, cardiovascular diseases, eye disorders, among others). However, carotenoid bioaccessibility and bioavailability is generally rather low due to their specific localization in plant tissue and lipophilic nature. This situation is worldwide issue, since both developed and developing countries have their interest and benefits in increasing the uptake of carotenoids from the human diet. Recently, a new class of foods designed to improve the bioaccessibility/bioavailability of orally administered bioactive compounds is introduced: excipient foods. Excipient foods are specially designed foods which are prepared depending on the physicochemical properties of target bioactive compounds and increasing the bioavailability or bioaccessibility of bioactive compound. In this study, effects of food matrix (greating, boiling and mashing) and different excipient foods (olive oil, lemon juice, whey curd and dried artichoke leaf powder) on bioaccessibility of β-carotene in carrot were investigated by means of simulating in vitro gastrointestinal (GI) digestion. β-carotene contents of grated, boiled and mashed (after boiling process) carrots were 79.28, 147.63 and 151.19 µg/g respectively. No significant differences among boiled and mashed samples indicated that mashing process had no effect on the release of β-carotene from the food matrix ($p > 0.05$). On the contrary, mashing causes significant increase in the β-carotene bioaccessibility ($p < 0.05$). The highest β-carotene content was found in the mashed carrots incorporated with olive oil and lemon juice (C2). However, no significant differences between that sample and C1 (mashed carrot with lemon juice, olive oil, dried artichoke leaf powder), C3 (mashed carrot with addition of olive oil, lemon juice, whey curd) and). Similarly, the highest β-carotene bioaccessibility (50.26%) was found mashed C3 sample ($p < 0.05$). The increase in the bioaccessibility was approximately 5 fold and 50 fold when compared to grated and mashed samples containing olive oil, lemon juice and whey curd. The results demonstrate that both, food matrix and excipient foods, are able to increase the bioaccessibility of β-carotene.

Keywords : bioaccessibility, carotenoids, carrot, β-carotene
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