Flavonols, betacyanins content and antioxidant activity of cactus Opuntia macrorhiza fruits

Tamer E. Moussa-Ayoub a,b, Salah K. El-Samahy b, Sascha Rohn c,⁎, Lothar W. Kroh a

a Technische Universität Berlin, Institute of Food Technology and Chemistry, Department of Food Chemistry and Analysis, TIB 4/3-1, Gustav-Meyer-Allee 25, D-13355 Berlin, Germany
b Suez Canal University, Faculty of Agriculture, Department of Food Technology, 41522 Ismailia, Egypt
c Universität Hamburg, Institute of Food Chemistry, Grindelallee 117, D-20146 Hamburg, Germany

Abstract

Flavonols, betacyanins content and antioxidant activity of red-purple cactus Opuntia macrorhiza fruits, a promising cactus pear species, were evaluated in comparison to the well known cactus pear fruits of Opuntia ficus-indica. Flavonol profile was evaluated by HPLC-DAD prior to and after enzymatic hydrolysis (glycosides vs. aglycons). In addition betacyanins, responsible for the purple to red color of cactus pear fruits were also estimated and compared to Beta vulgaris ssp. (roots) and red O. ficus-indica fruits. In all cases, cactus fruit pulps showed no flavonols at all. While different derivatives of isorhamnetin glycosides were found in O. ficus-indica fruit's peel, isorhamnetin-3-O-rutinoside was the only compound in O. macrorhiza fruit. Correspondingly, antioxidant activity assays showed a high antioxidant activity of both, O. macrorhiza fruit's peel and pulp. With regard to betacyanins, O. macrorhiza fruit's peel and pulp provide a deep red-purple color, whose average impact is higher compared to red beet (B. vulgaris spp.) and about 8-fold higher than red fruits from O. ficus-indica. Supporting these results, estimation of color attributes (L*, a*, b*, C and H°) showed also a high color impact of both O. macrorhiza fruit's peel and pulp.
Identification and quantification of flavonol aglycons in cactus pear (Opuntia ficus indica) fruit using a commercial pectinase and cellulase preparation

Tamer E. Moussa-Ayoub a, b, Salah K. El-Samahy b, Lothar W. Kroh a, Sascha Rohn c,*

a Technische Universität Berlin, Institute of Food Technology and Chemistry, Department of Food Chemistry and Analysis, TIB 4/3-1, Gustav-Meyer-Allee 25, D-13355 Berlin, Germany
b Suez Canal University, Agriculture Faculty, Department of Food Technology, 41522 Ismailia, Egypt
c Universität Hamburg, Institute of Food Chemistry, Grindelallee 117, D-20146 Berlin, Germany

Abstract

The applicability of pectinases and cellulases as soft hydrolysing agents on flavonol glycosides was investigated for identification and quantification of flavonol aglycons in cactus pear fruit. Freeze-dried samples of cactus pear fruit’s peel (cactus pear peels) and onions were treated with commercial pectinase and cellulase preparations at 50 °C for different time periods (up to 16 h). Additionally isorhamnetin-3-Orutinoside and quercetin-3, 40-O-diglucoside were used as model compounds. In parallel, samples of cactus pear peels and onions were treated by the traditional acidic hydrolysis using HCl. Following hydrolysis, flavonols were characterised using HPLC–DAD. Enzymatically, all model compounds and plant material were highly hydrolysable. Flavonol glycosides were completely hydrolysed after 16 h (cactus pear) and 4 h (onion), respectively. While the acidic hydrolysis caused degradation of the flavonols and produced protocatechuic acid as a degradation product, the enzymatic hydrolysis gave gentle effects and did not produce any protocatechuic acid at all.