



---

***Opuntia ficus indica* and *Opuntia macrorhiza*:  
Promising Sources of Flavonols –  
Comparison between varieties from different origins**

**Tamer Moussa-Ayoub<sup>1,2</sup>, Sascha Rohn<sup>3</sup>, El-Sayed Abd El-Hady<sup>2</sup>,  
Helmy Omran<sup>2</sup>, Salah El-Samahy<sup>2</sup>, Lothar W. Kroh<sup>1</sup>**

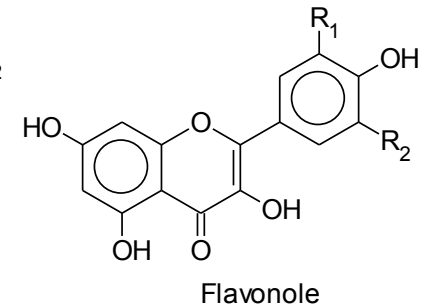
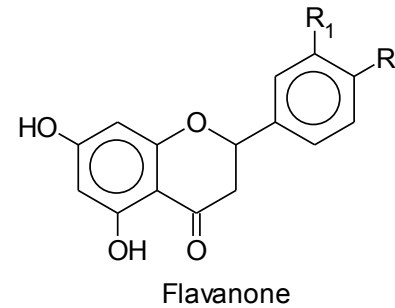
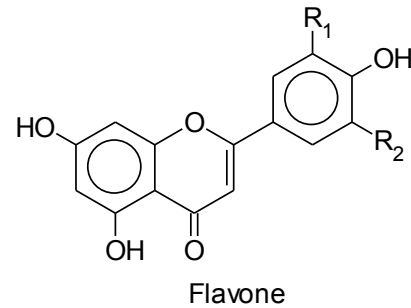
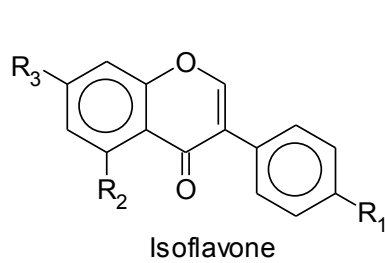
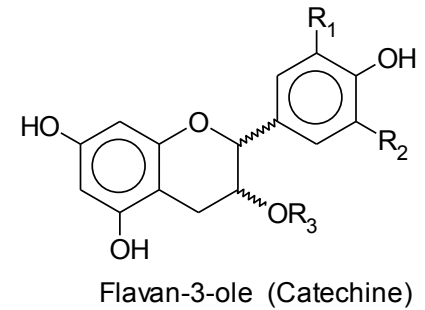
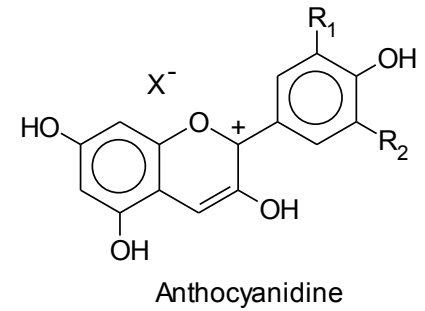
<sup>1</sup>Technische Universität Berlin, Institute of Food Technology and Food Chemistry, Berlin, Germany.

<sup>2</sup>Suez Canal University, Agriculture Faculty, Department of Food Technology, Ismailia, Egypt.

<sup>3</sup>Universität Hamburg, Institute of Food Chemistry, Hamburg, Germany.

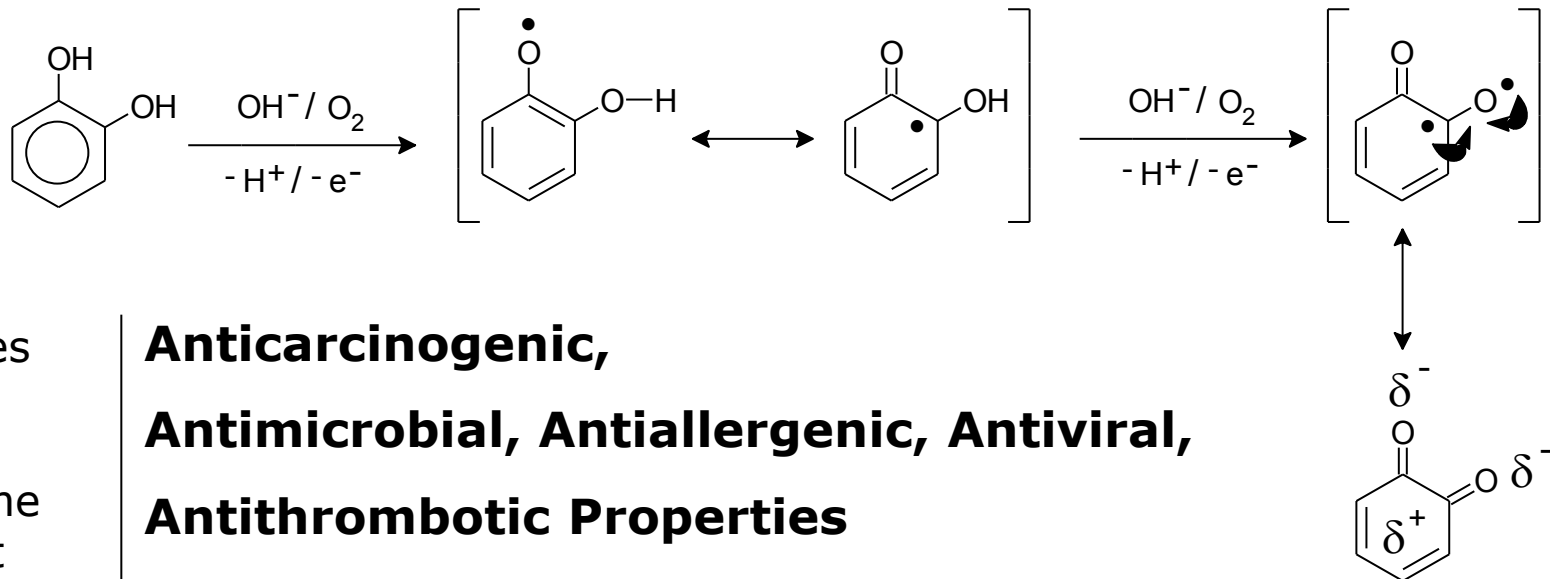
---

# Flavonoids



# Physiological Properties

Far most important: **Antioxidant Activity**



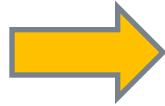
Besides  
or  
to some  
extent  
basis for

**Anticarcinogenic,**  
**Antimicrobial, Antiallergenic, Antiviral,**  
**Antithrombotic Properties**  
**Antiinflammatory, Immunomodulatory Effects**  
**Estrogenic activity**  
**Enzyme-inhibition**

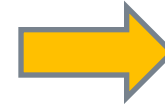
# Cactus pear plant

---

Cactus Pear plant



*Opuntia* spp.  
manifold species  
and varieties



Cactaceae

*Opuntia ficus indica*  
(Indian fig)

Cladode

Fruit



# Problems

---

Many investigations interested only in analyzing pigments (betacyanins and betaxanthins)

Only a few investigations in the literature deal with **flavonoids of cactus pear species and varieties**

- most of them used acidic hydrolysis for the determination of aglycons
- controversial results: Some say „quercetin“, some say „kaempferol“ and some say „isorhamnetin“
- few investigations on physiological properties (e.g. antioxidant activity)

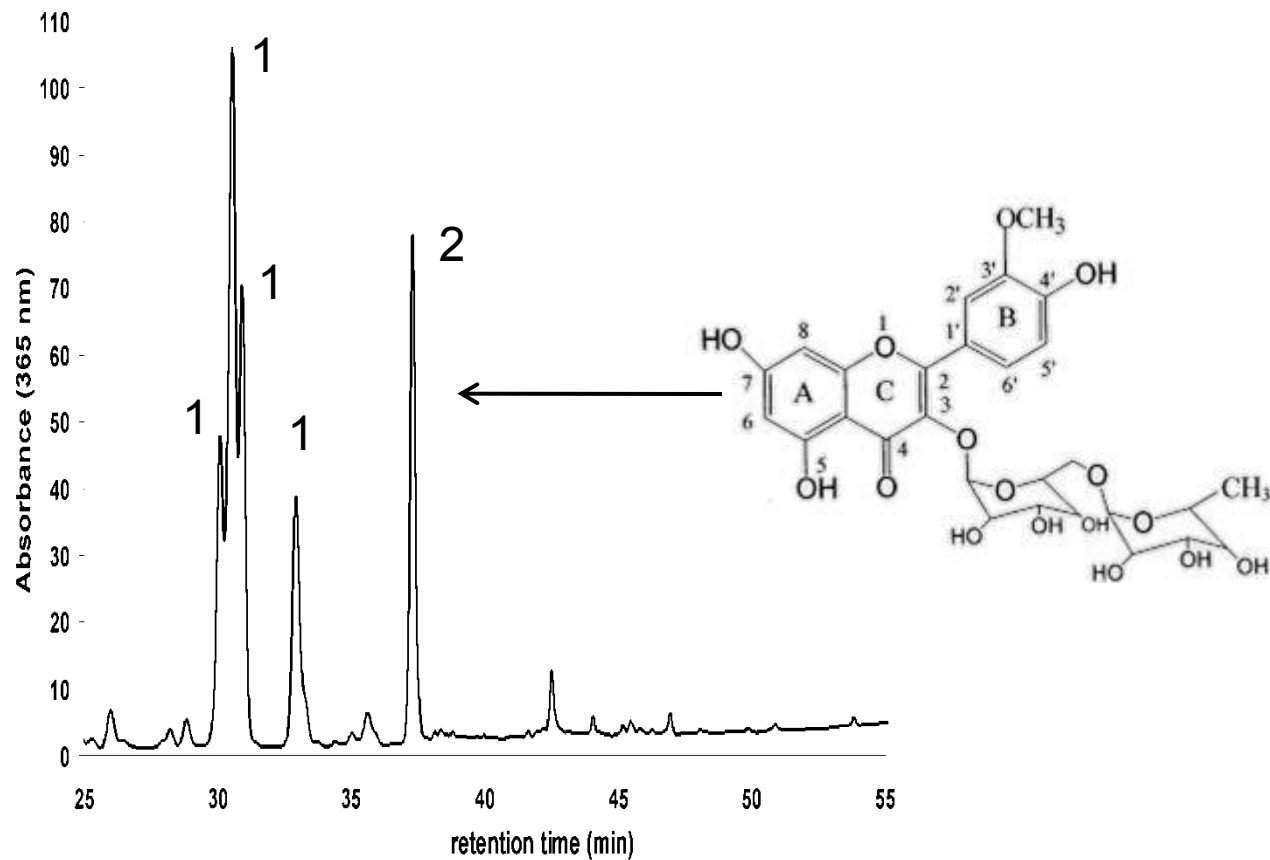
# Aims

---

Only a few investigations in the literature deal with flavonoids of cactus pear varieties and species

- Identification of flavonol compounds
- Comparison of varieties of different origin
- Developing a comparative and soft hydrolysis method
- Comparison with *O. macrorhiza*
- Determination of the antioxidant activity

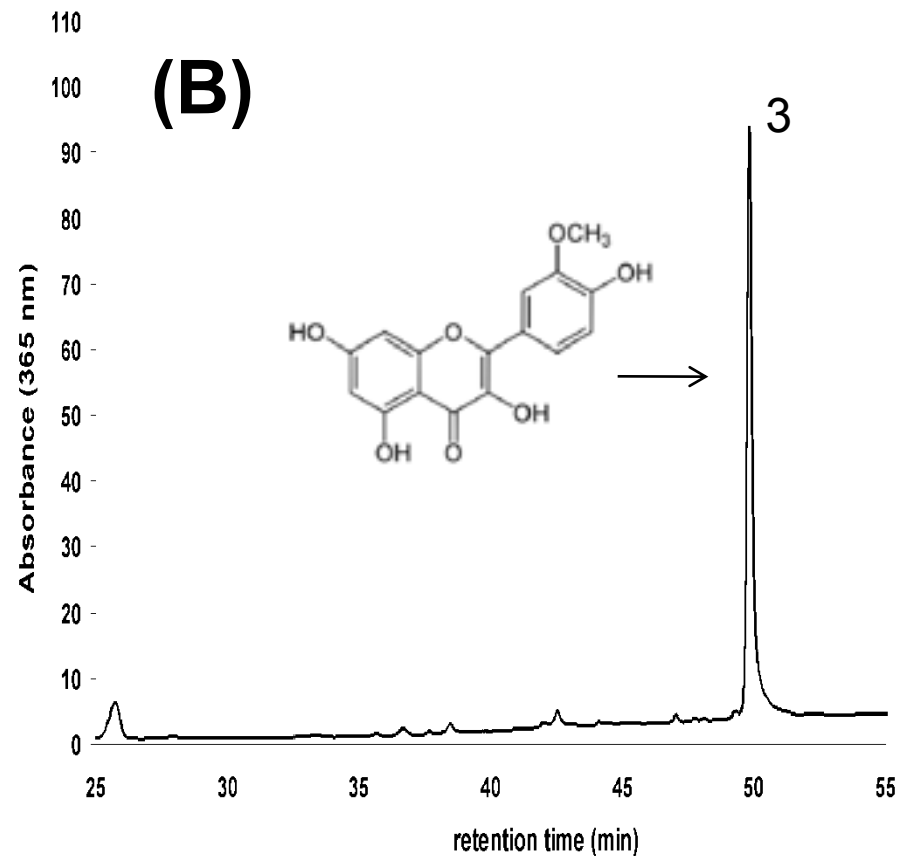
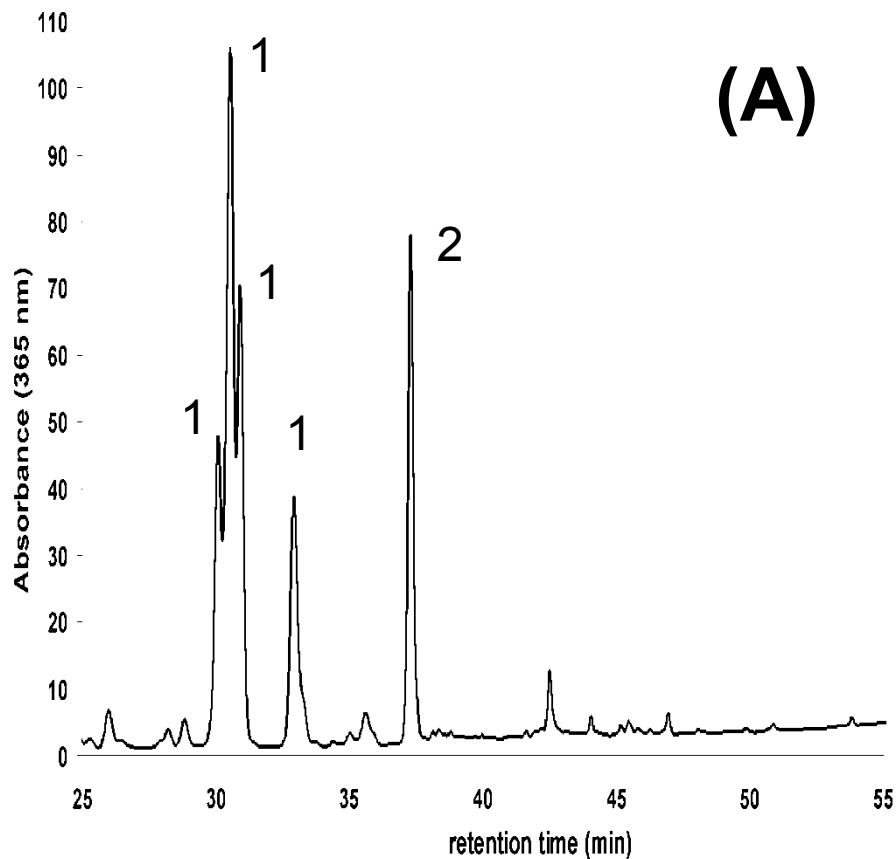
# Flavonols in *O. ficus indica* peel



(1) isorhamnetin glycosides, (2) isorhamnetin-3-O-rutinoside

# Flavonols in *O. ficus indica* peel

Before (A) and after (B) enzymatic hydrolysis



(1) isorhamnetin glycosides, (2) isorhamnetin-3-O-rutinoside, (3) isorhamnetin.



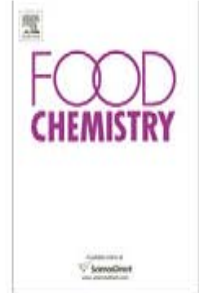


ELSEVIER

Contents lists available at ScienceDirect

## Food Chemistry

journal homepage: [www.elsevier.com/locate/foodchem](http://www.elsevier.com/locate/foodchem)



### Analytical Methods

## Identification and quantification of flavonol aglycons in cactus pear (*Opuntia ficus indica*) fruit using a commercial pectinase and cellulase preparation

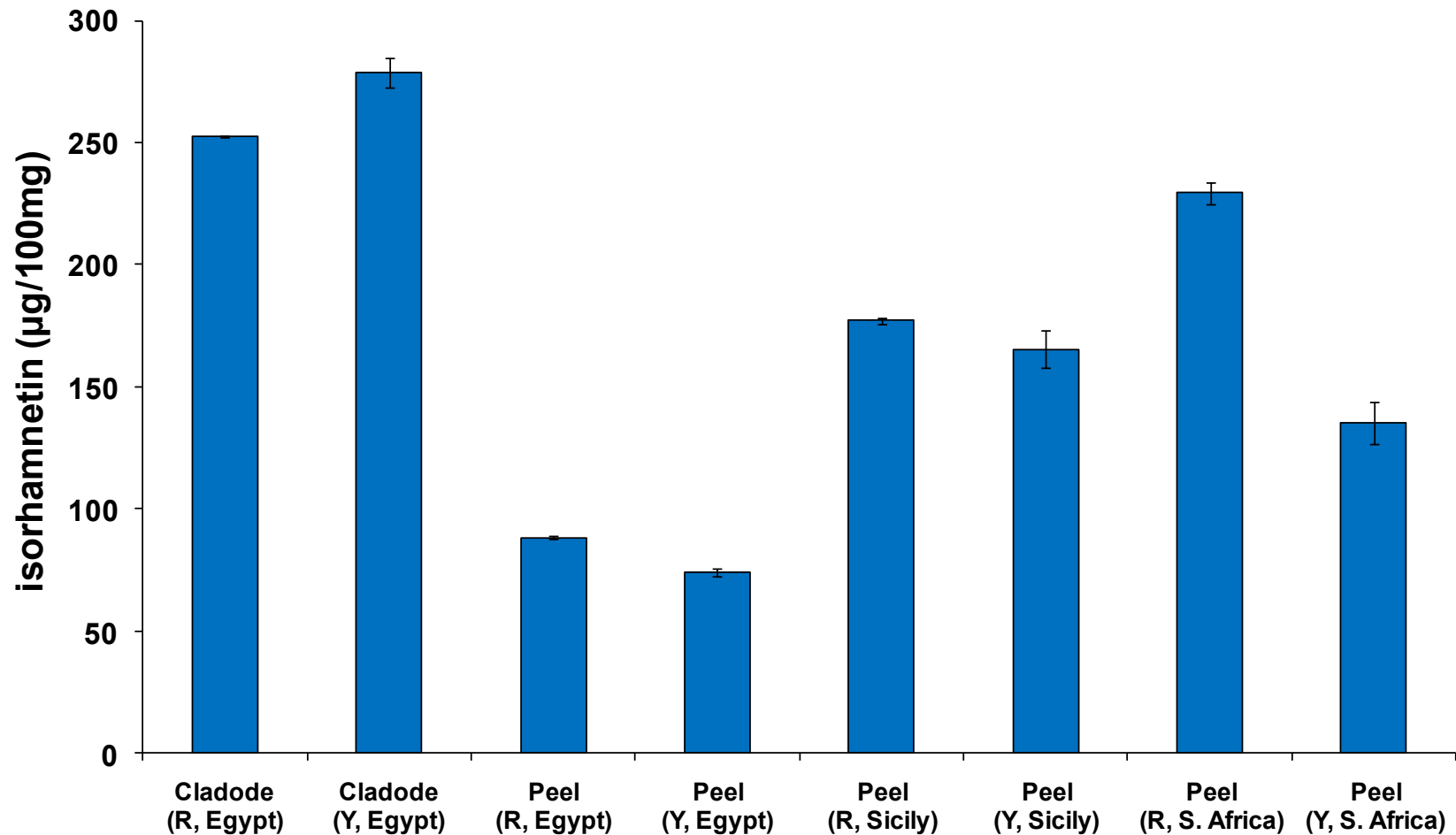
Tamer E. Moussa-Ayoub<sup>a,b</sup>, Salah K. El-Samahy<sup>b</sup>, Lothar W. Kroh<sup>a</sup>, Sascha Rohn<sup>c,\*</sup>

<sup>a</sup> 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

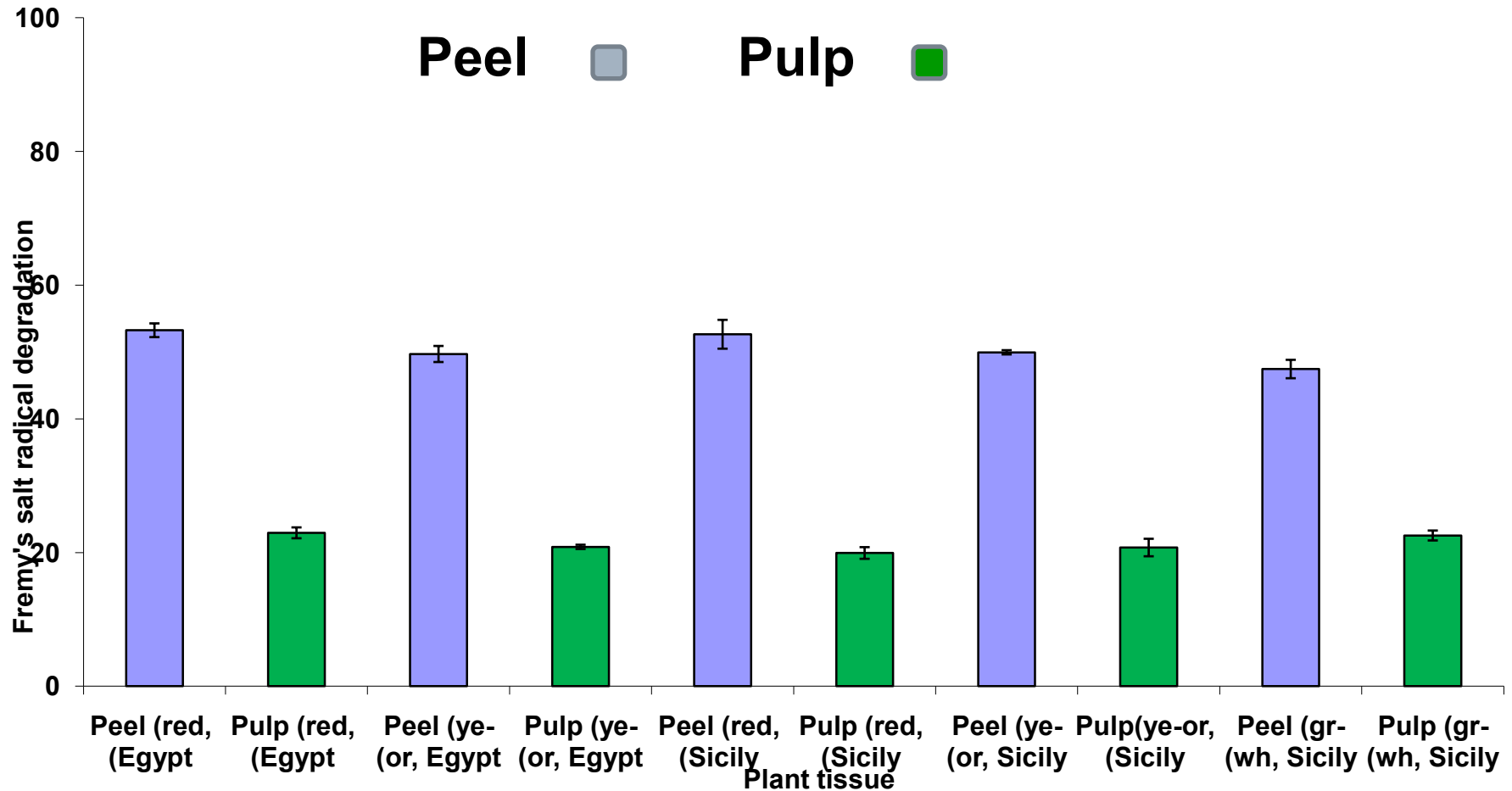
<sup>b</sup> Suez Canal University, Agriculture Faculty, Department of Food Technology, 41522 Ismailia, Egypt

<sup>c</sup> Universität Hamburg, Institute of Food Chemistry, Grindelallee 117, D-20146 Berlin, Germany

# Flavonols in *O. ficus indica* from different origins



# Antioxidant activity (ESR Spectroscopy) of both peels and pulps of *O. ficus indica* from different origins



Degradation (%) of fremy's salt radical (1mM) after 15 min by diluted extracts (1:15)

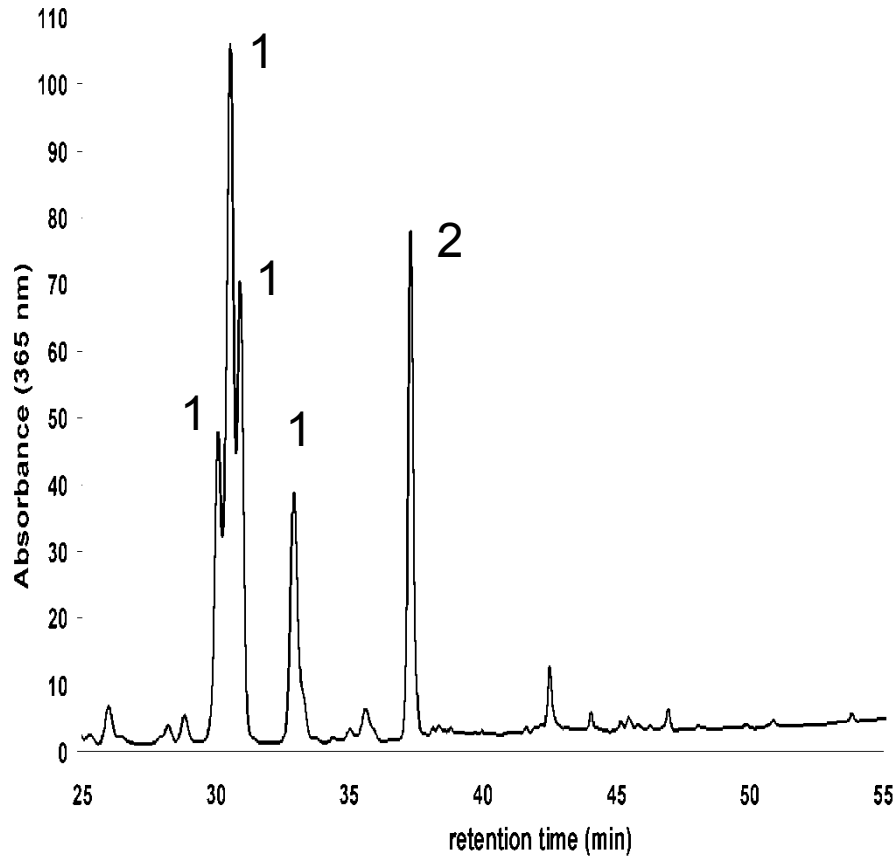
# *O. ficus indica* vs. *O. macrorhiza*

---

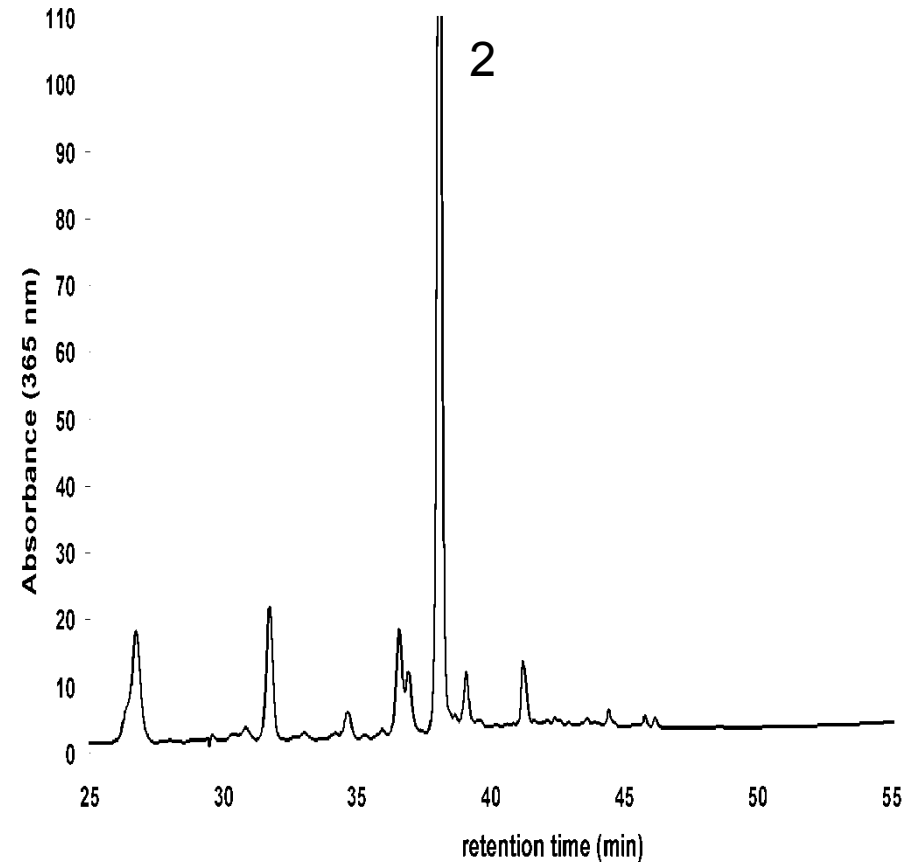


# Flavonols in *O. ficus indica* and *O. macrorhiza*

## *O. ficus indica*

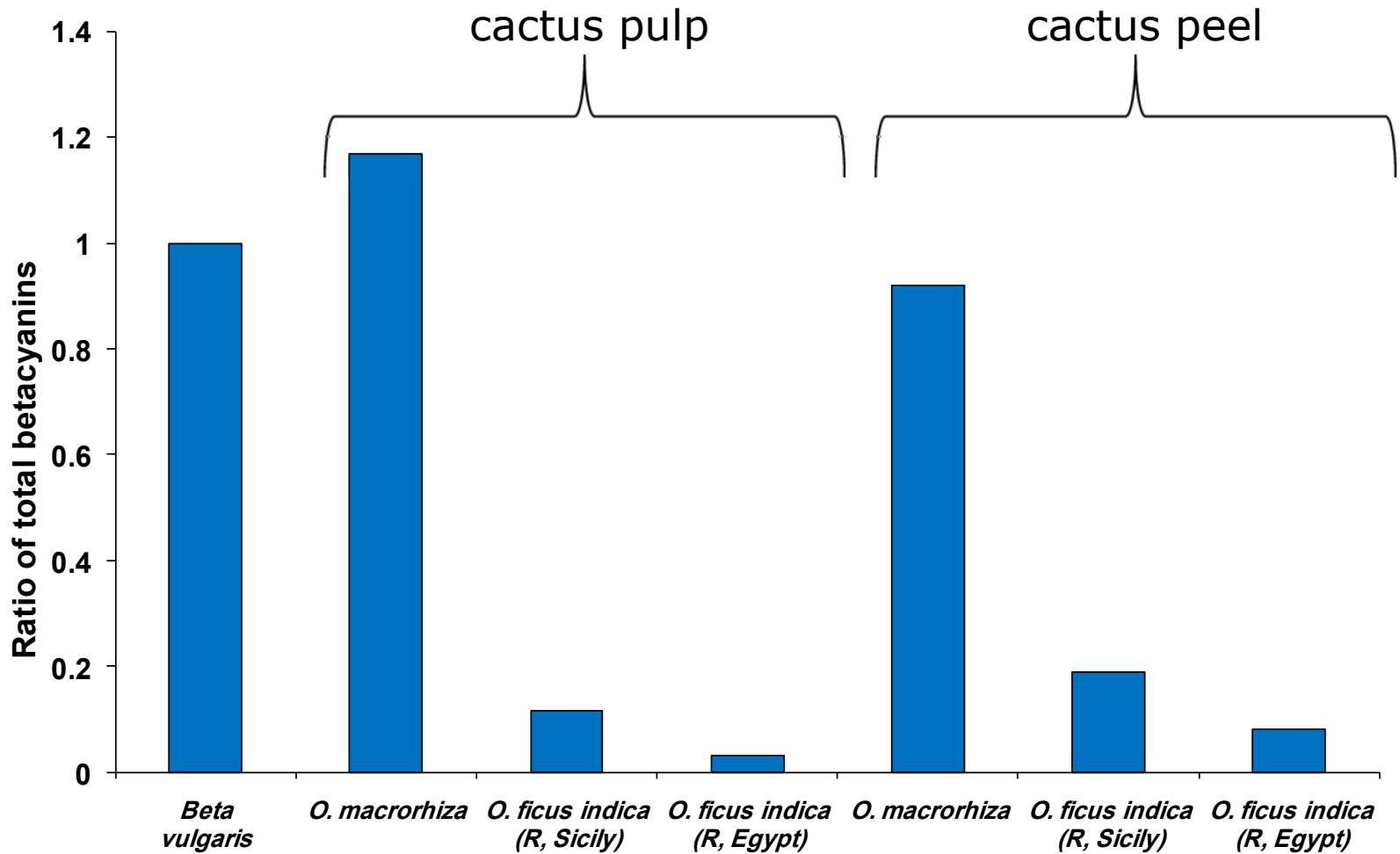


## *O. macrorhiza*

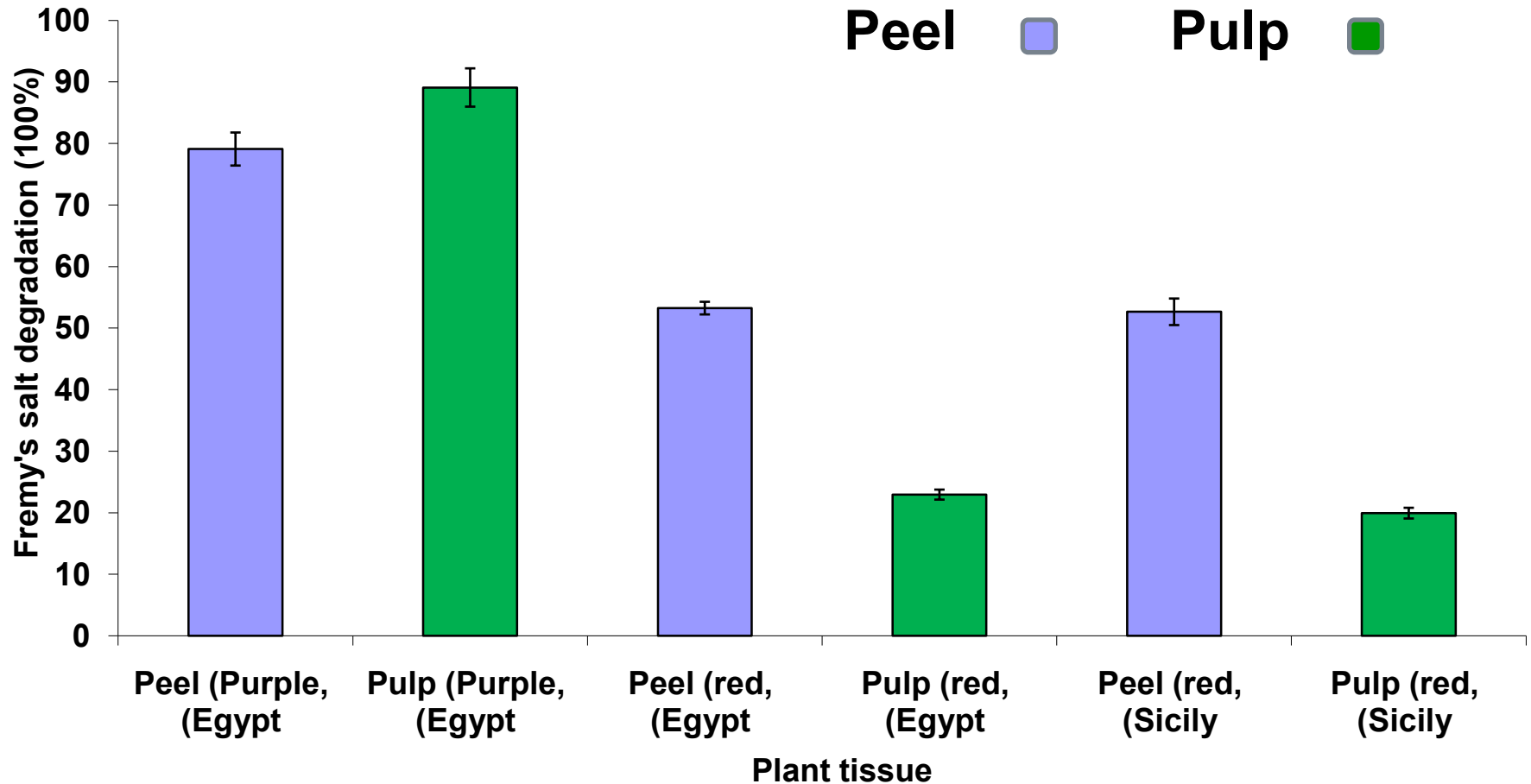


(1) isorhamnetin glycosides, (2) isorhamnetin-3-O-rutinoside

# Betacyanins in *O. ficus indica* and *O. macrorhiza*



# Antioxidant activity (ESR Spectroscopy) of *O. ficus indica* and *O. macrorrhiza*



Degradation (%) of fremy's salt radical (1mM) after 15 min by diluted extracts (1:15)

# Summary

---

- *Opuntia ssp.*: Promising sources of bioactive flavonols
- Enzymatic hydrolysis more soft than acidic hydrolysis for the determination of flavonol aglycons (no formation of degradation products)
- Dominant flavonol: Isorhamnetin
- *O. macrorhiza* comparatively highest in betacyanins and antioxidant activity



---

**Thank you for your attention !!!**

A photograph of a large field of green prickly pears (cholla) in the foreground. The background shows a line of trees and a clear blue sky with some light clouds. A thick red horizontal bar is positioned at the top of the image, and a thin red horizontal line is at the bottom.