

ANTIOSSIDANTI, PELLEROSSA, BACHI DA SETA

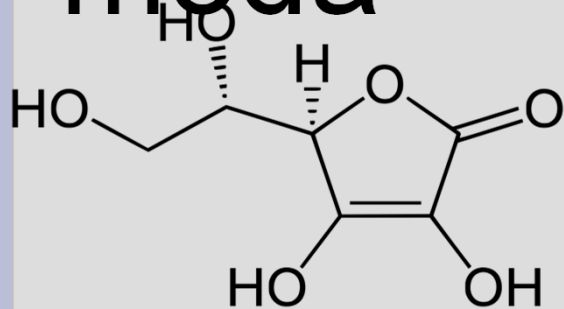
la Maclura Pomifera tra Texas e Veneto

Tiziano Vendrame

Remigio Scandiuzzi



Gli “antiossidanti” vanno di moda



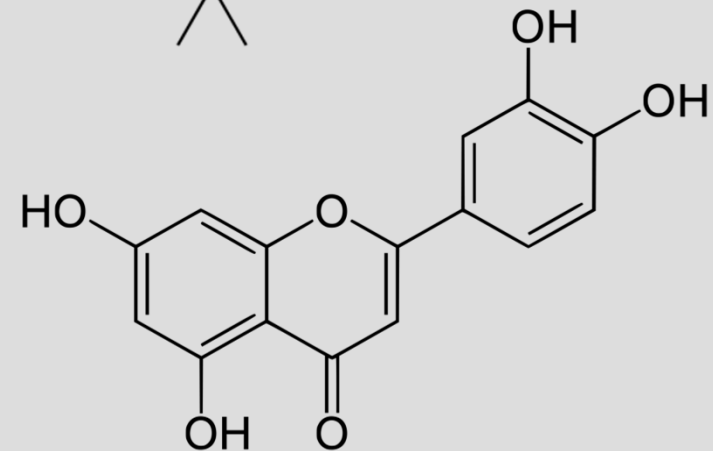
Acido L-Ascorbico = **Vitamina C**

Carotenoidi

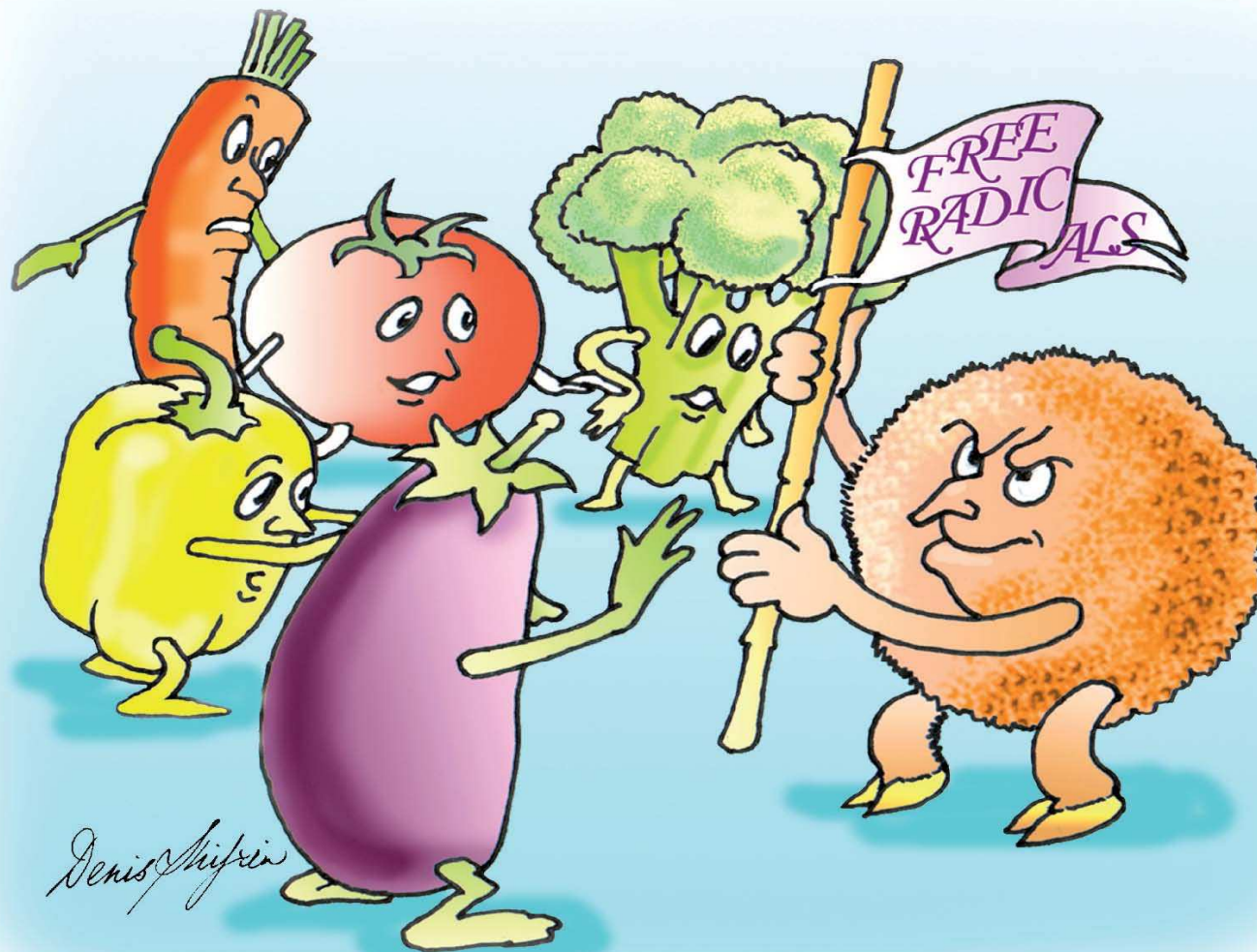


**Polifenoli
(Luteolina)**

ecc. ecc.



versione pedagogico - naïf..



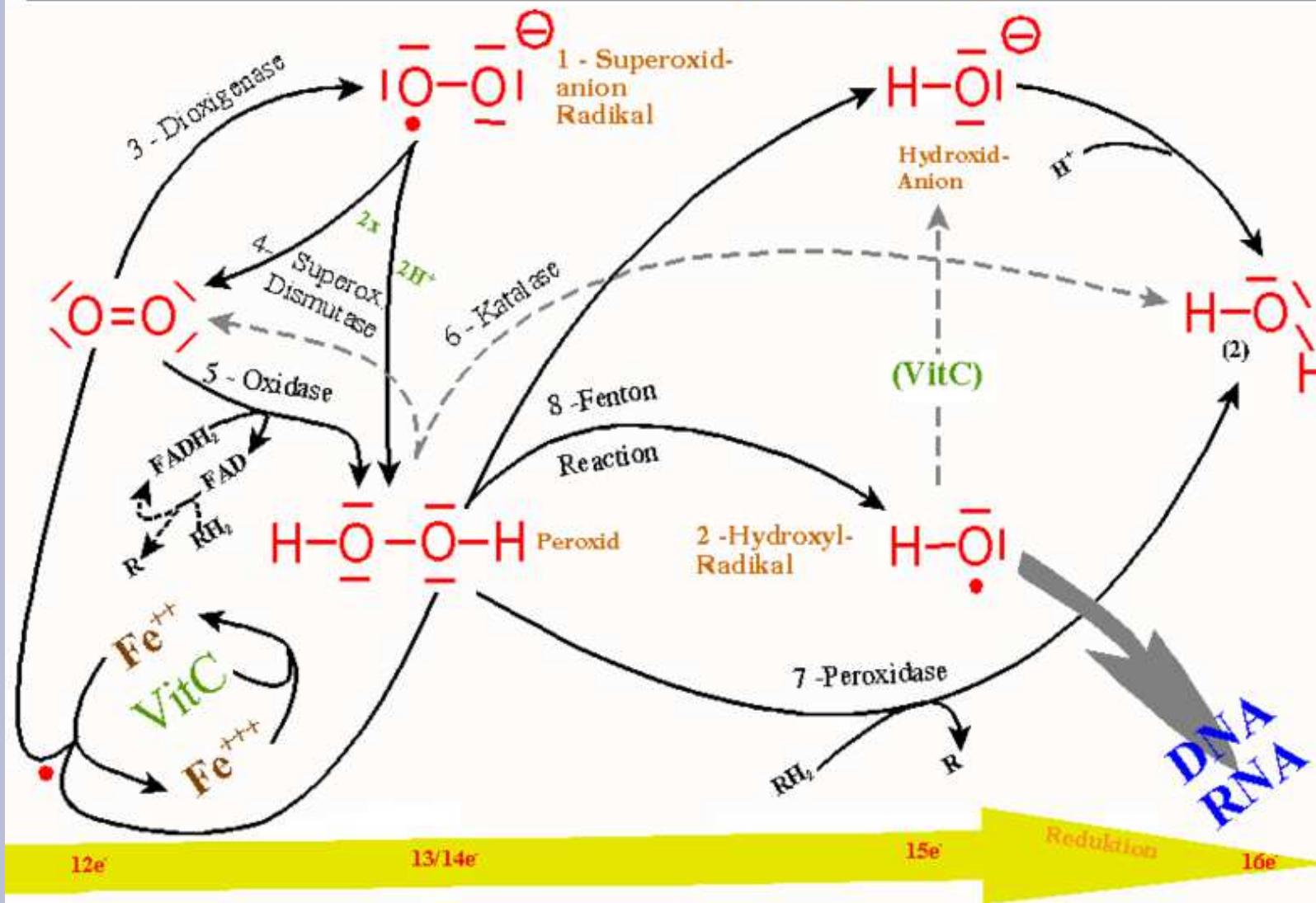
salutistici (edonistici) e colorati...



[illegible]

..angoscia da stress ossidativo!

Intermediate der O₂-Entgiftung



“Abbondano nei vegetali”

? ... livelli di (centinaia) mg/Kg !

Ma se ne voglio quantità apprezzabili?

Un esempio comodo.....

?

MACLURA POMIFERA

Antiossidanti
e non solo..

Formula



Osage-Orange
Maclura pomifera



www.treeguides.com

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Ricca di antiossidanti “particolari”



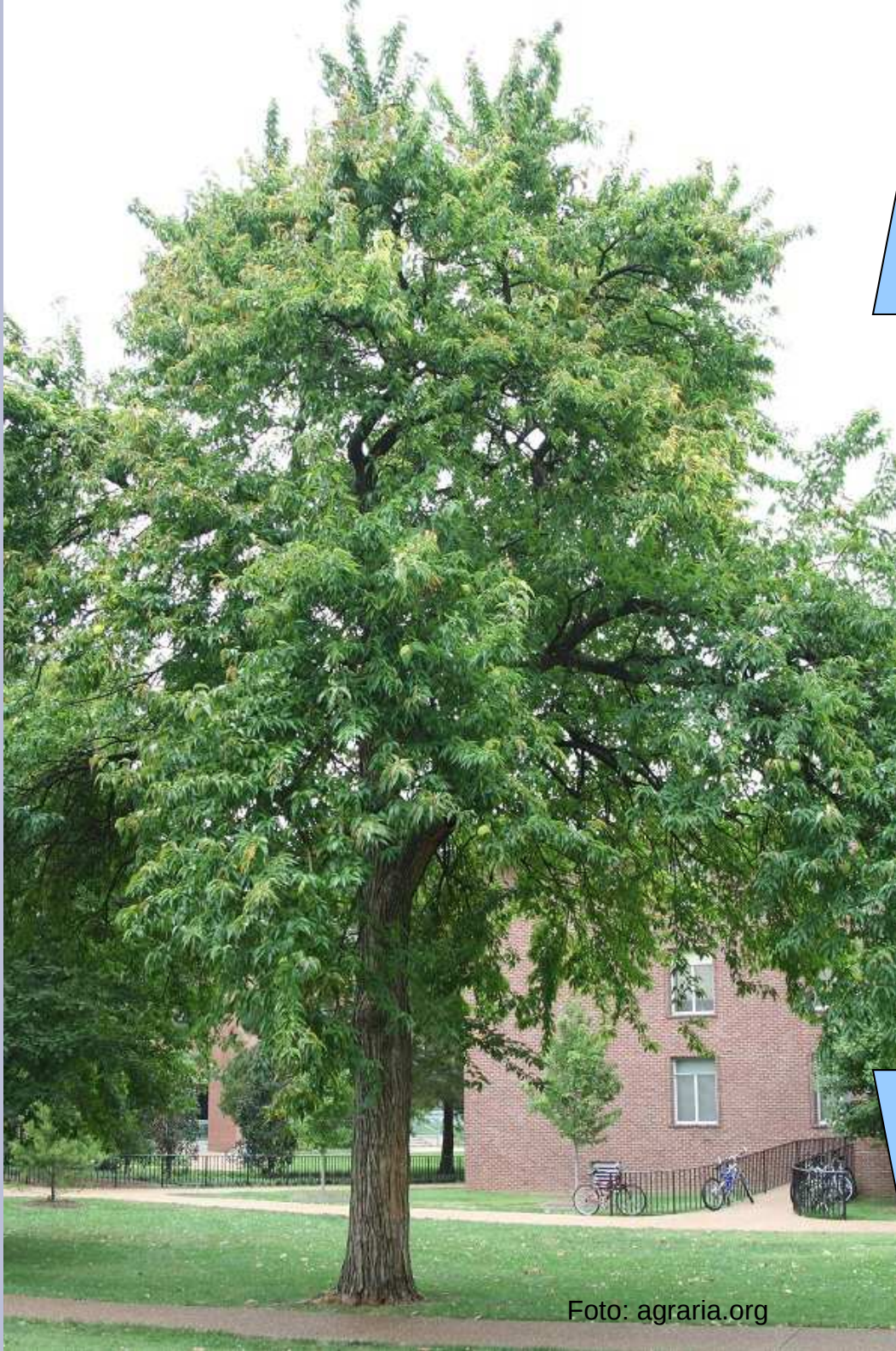
Thomas
Nuttall
(1811)

“padre” della
botanica
americana



Maclura Pomifera

8 – 15 m



Maclura Pomifera

“frutti”
elemento
caratteristico



Nome: William Maclure



Ewell Sale Stewart Library
The Academy of Natural Sciences of Philadelphia

1763 – 1840

Geologo,

cartografo,

filantropo

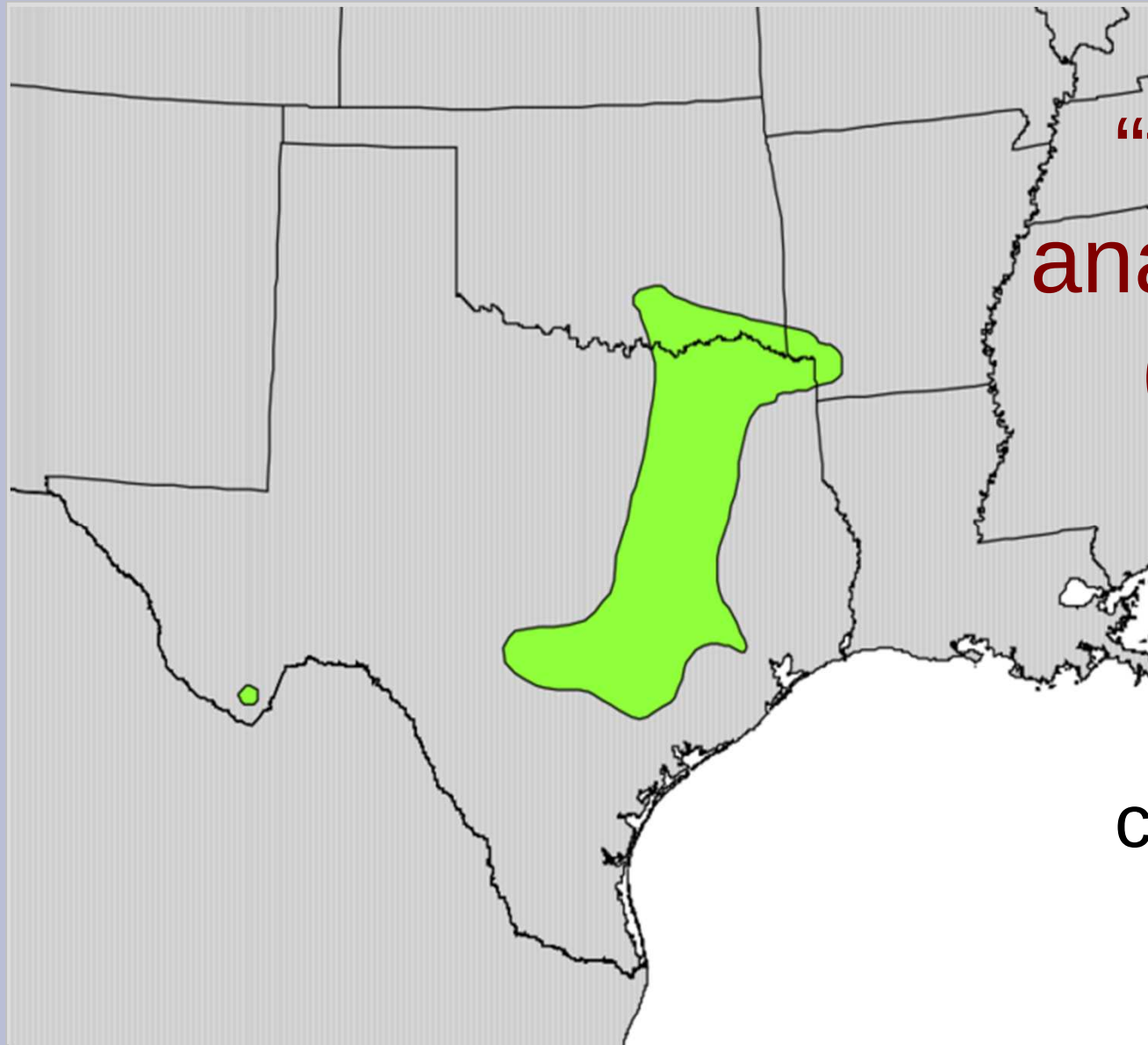
"padre" della geologia
americana

"Pomifera"

portatrice di frutti

Nome: OSAGE ORANGE

il selvaggio West!



“frutto
anacronistico”
(Texas)

coevoluzione
“megafauna”
Pleistocene

Guerriero Osage



Osage Orange

“arancio” degli Osagi

Dipinti di George Catlin,
foto Wikimedia Commons



Shonka Sabe (Black Dog)



bois d'arc
bodark
bow-wood



1 Arco = 1 Cavallo

“Frutti” (infruttescenze)

ammassi di singoli frutti
quasi “**mora gigante**”



I “parenti”

Gelso (*Morus alba* – *nigra*)



Fico (*Ficus carica*)

MORACEAE

Maclura e bachi da seta

“succedaneo” del gelso,
(primi 1900)



Maclura in Veneto e dintorni

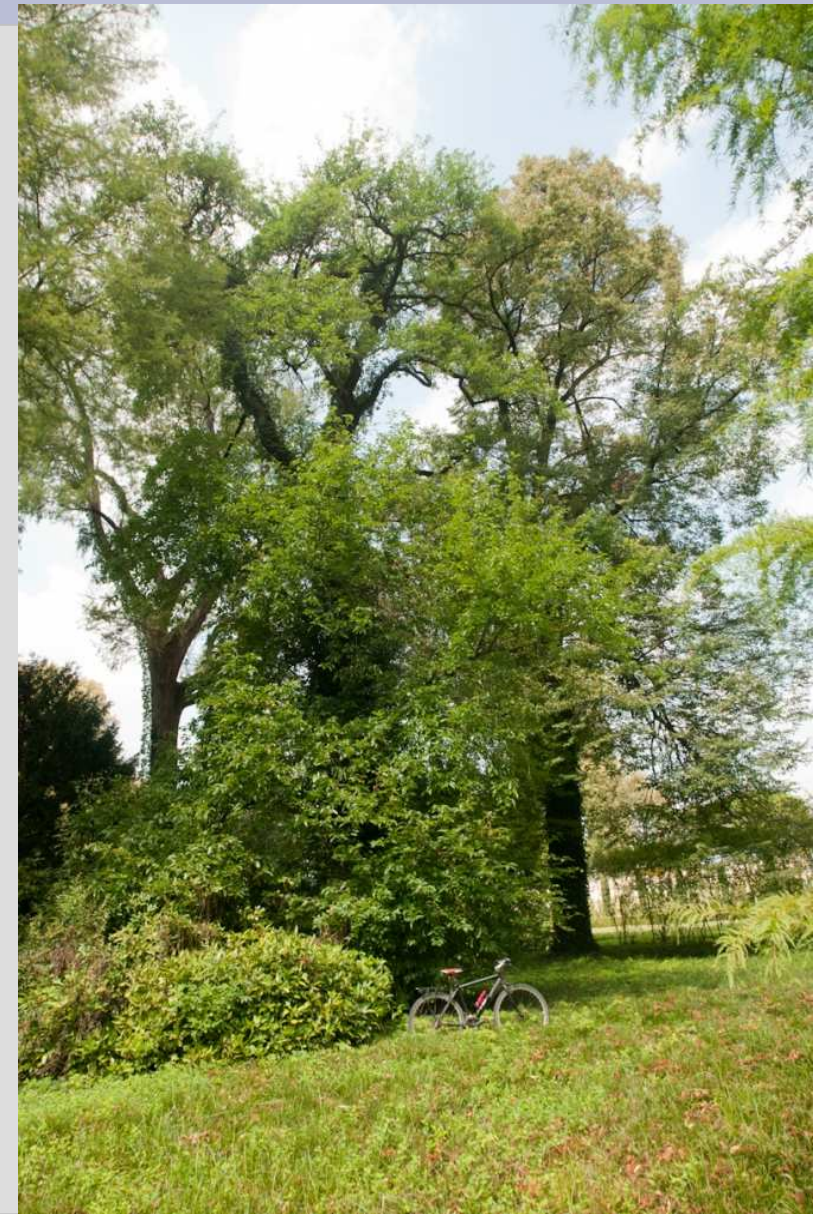
zone di bachicoltura

- Vittorio Veneto, S. Augusta
- Trentino(1860)Tito de Bassetti

ville storiche

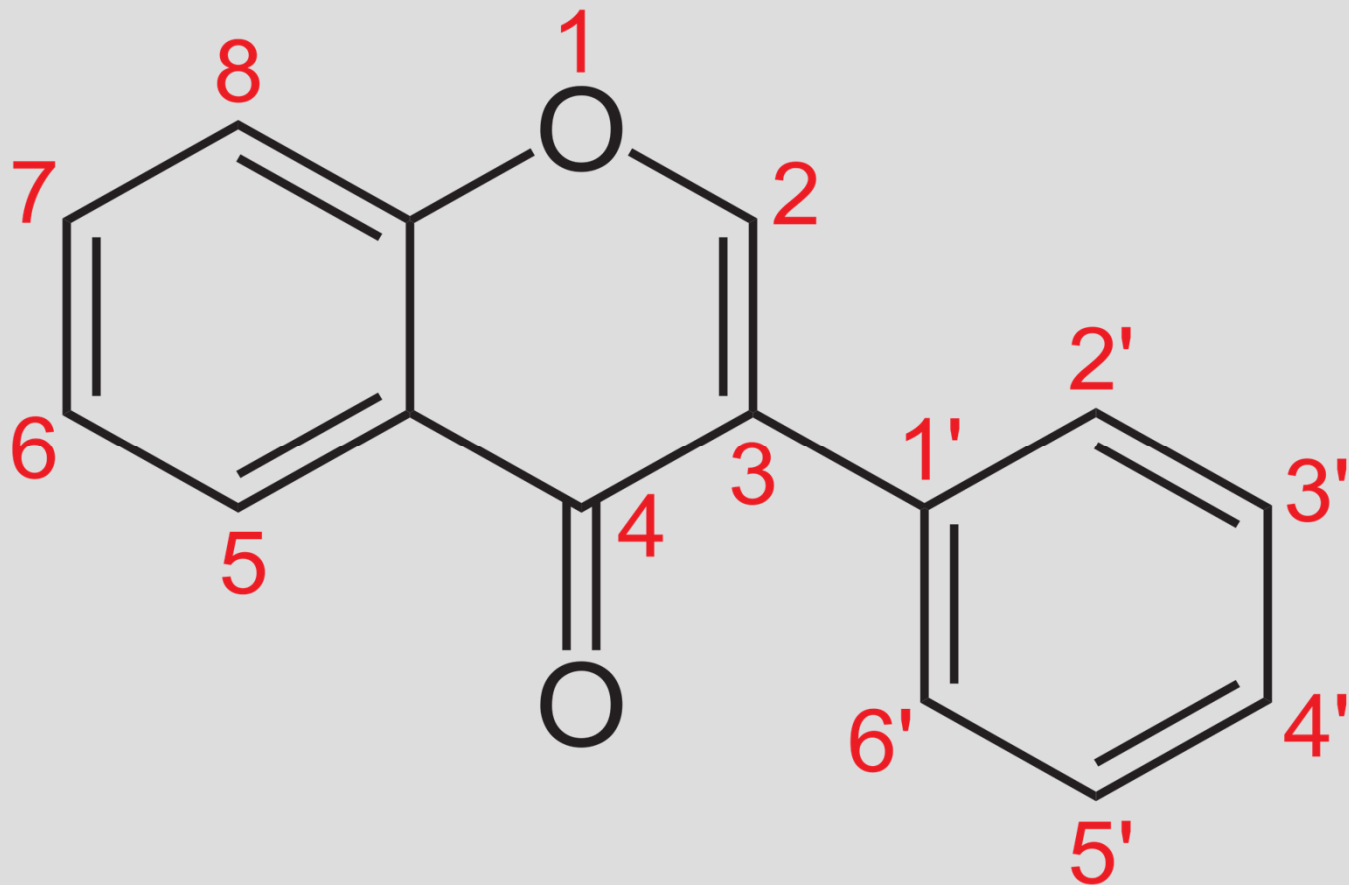
- Villa Pisani a Stra, 220 anni

*“hedge-apple”
melo da siepi*

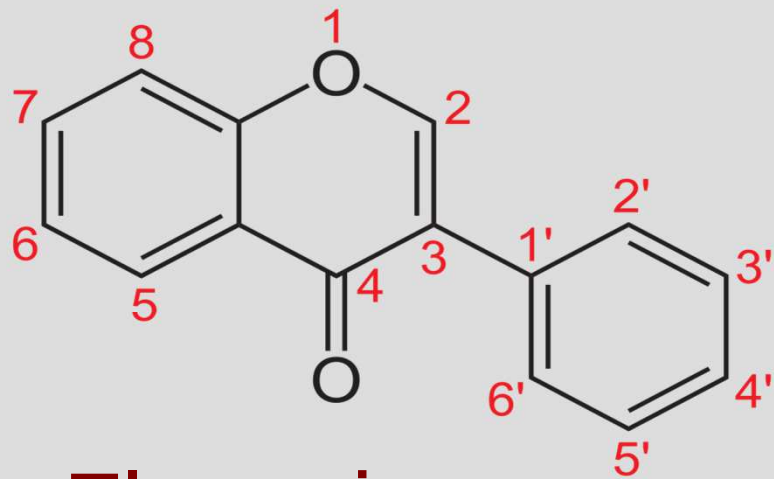


Perchè tanto interesse?

Ricchissima di isoflavoni ma.....
cosa sono gli **isoflavoni** (e i flavoni)?

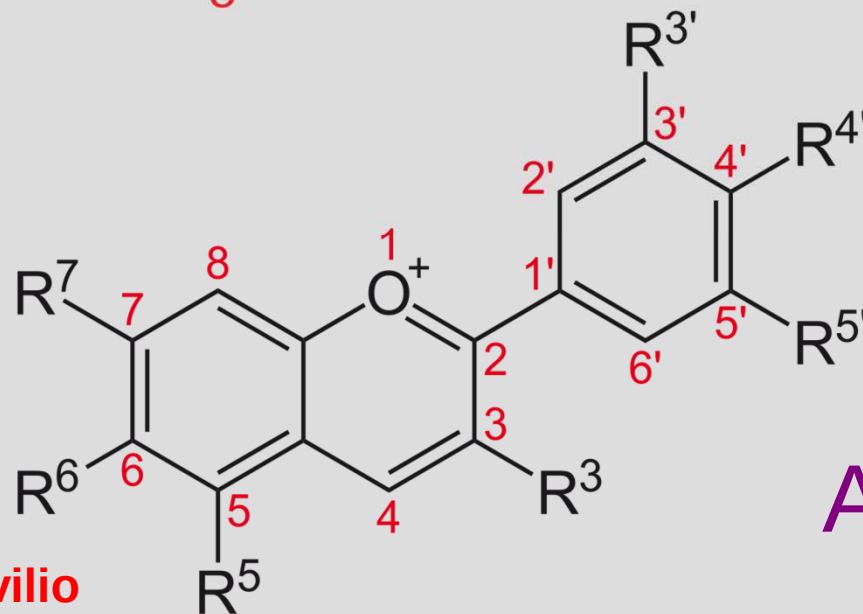
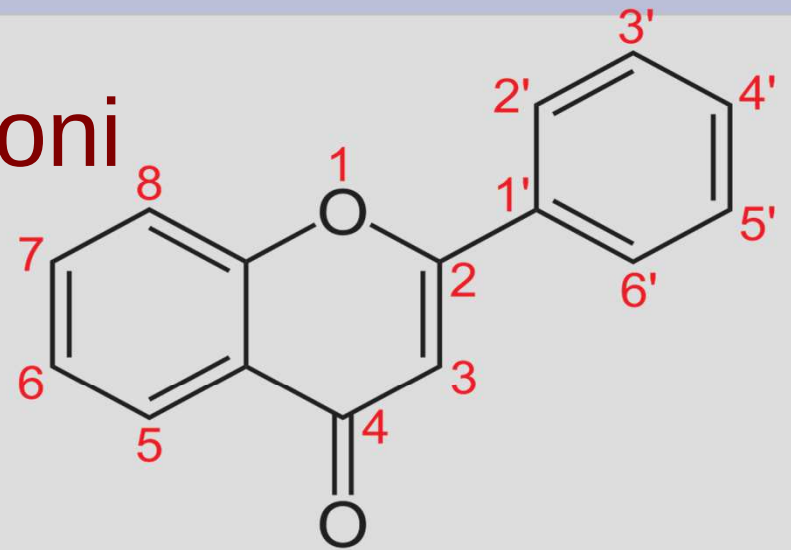


Flavonoidi



Flavoni

Isoflavoni

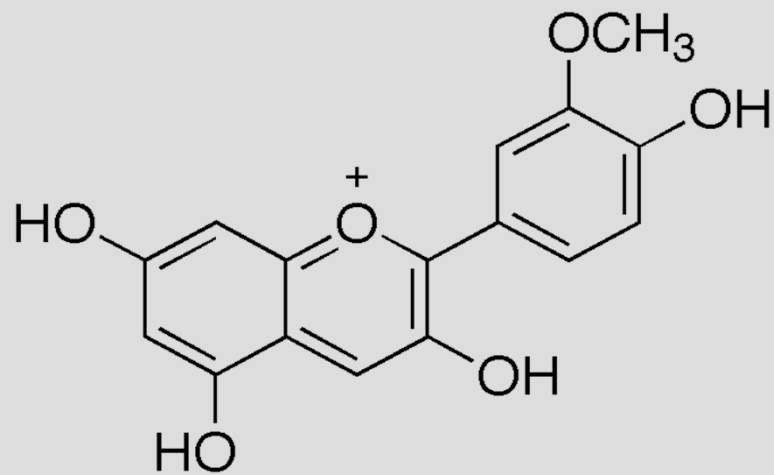


Catione Flavilio

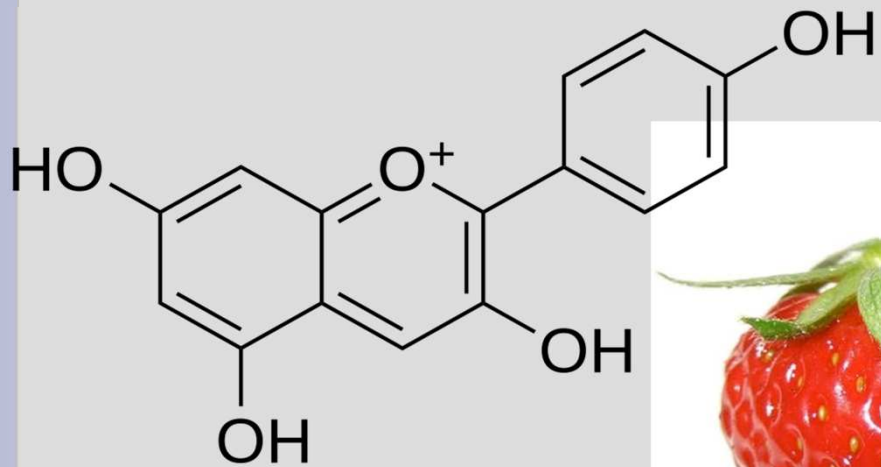
Antocianidine

Antocianidine = colore

Peonidina: peonie, rose



Antocianidine 2



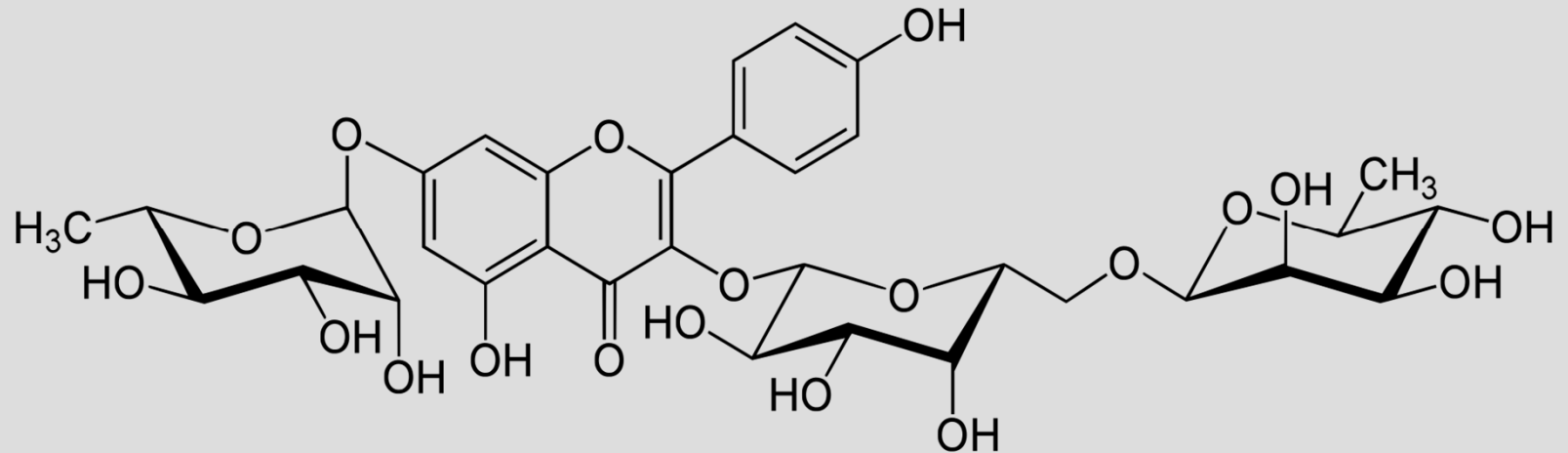
Pelargonidina:
gerani, lamponi,
fragole



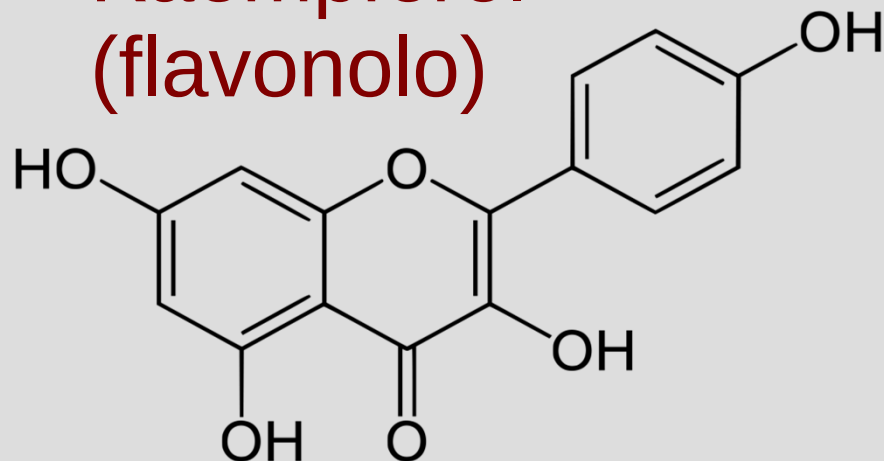
Flavonoli: Robinia (fiori)

Robinin

4% s.s.

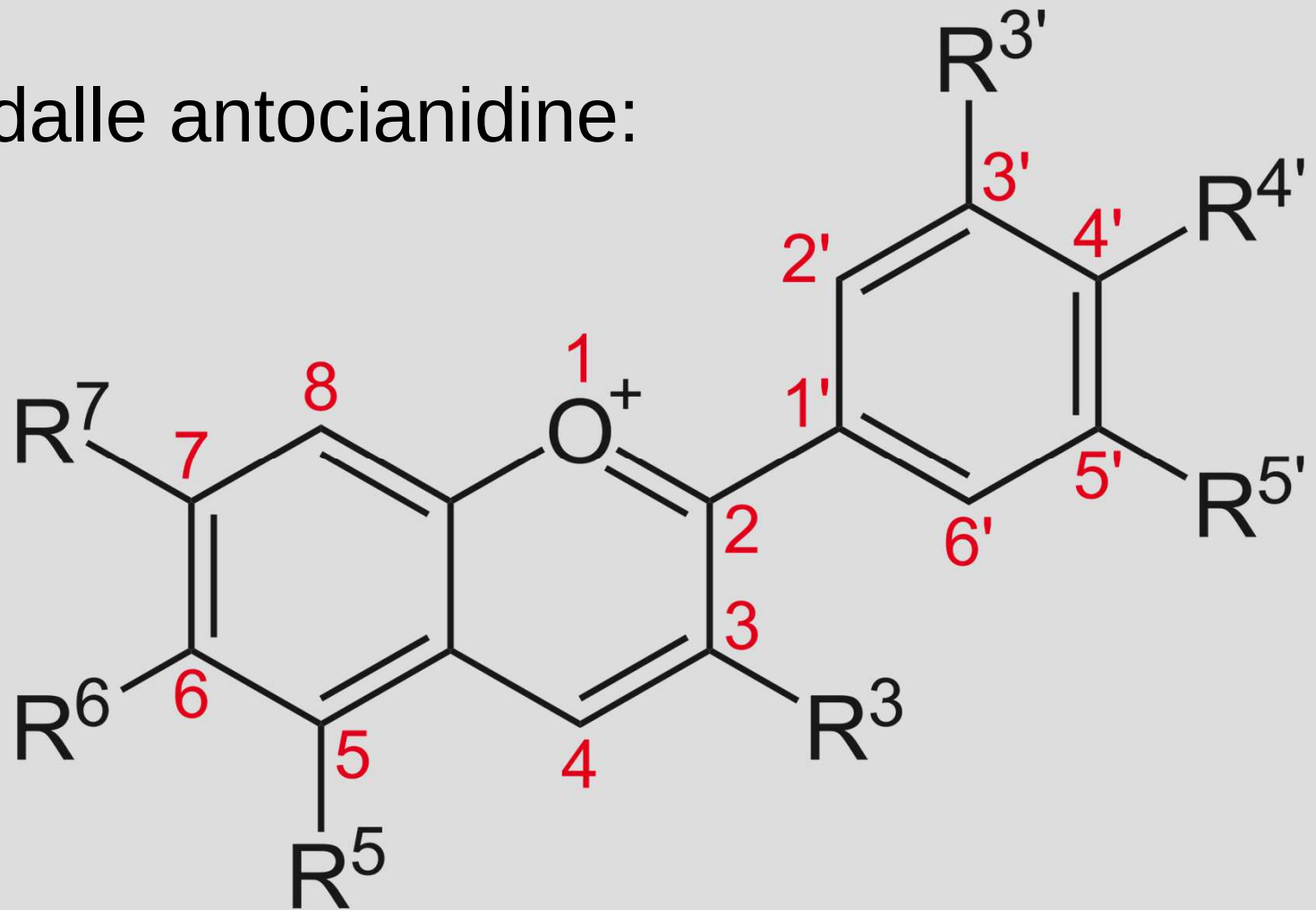


Kaempferol
(flavonolo)



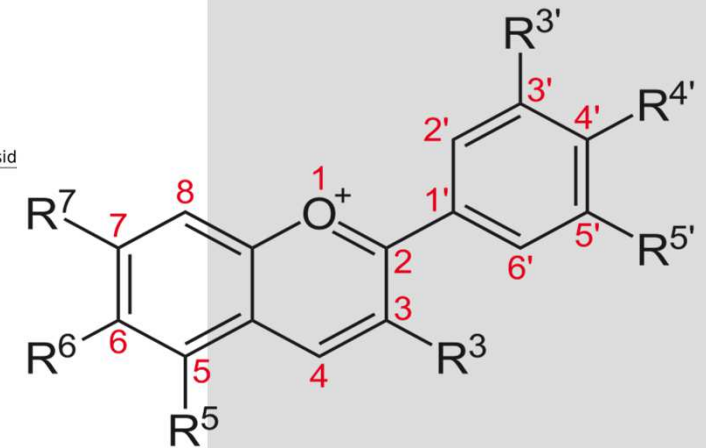
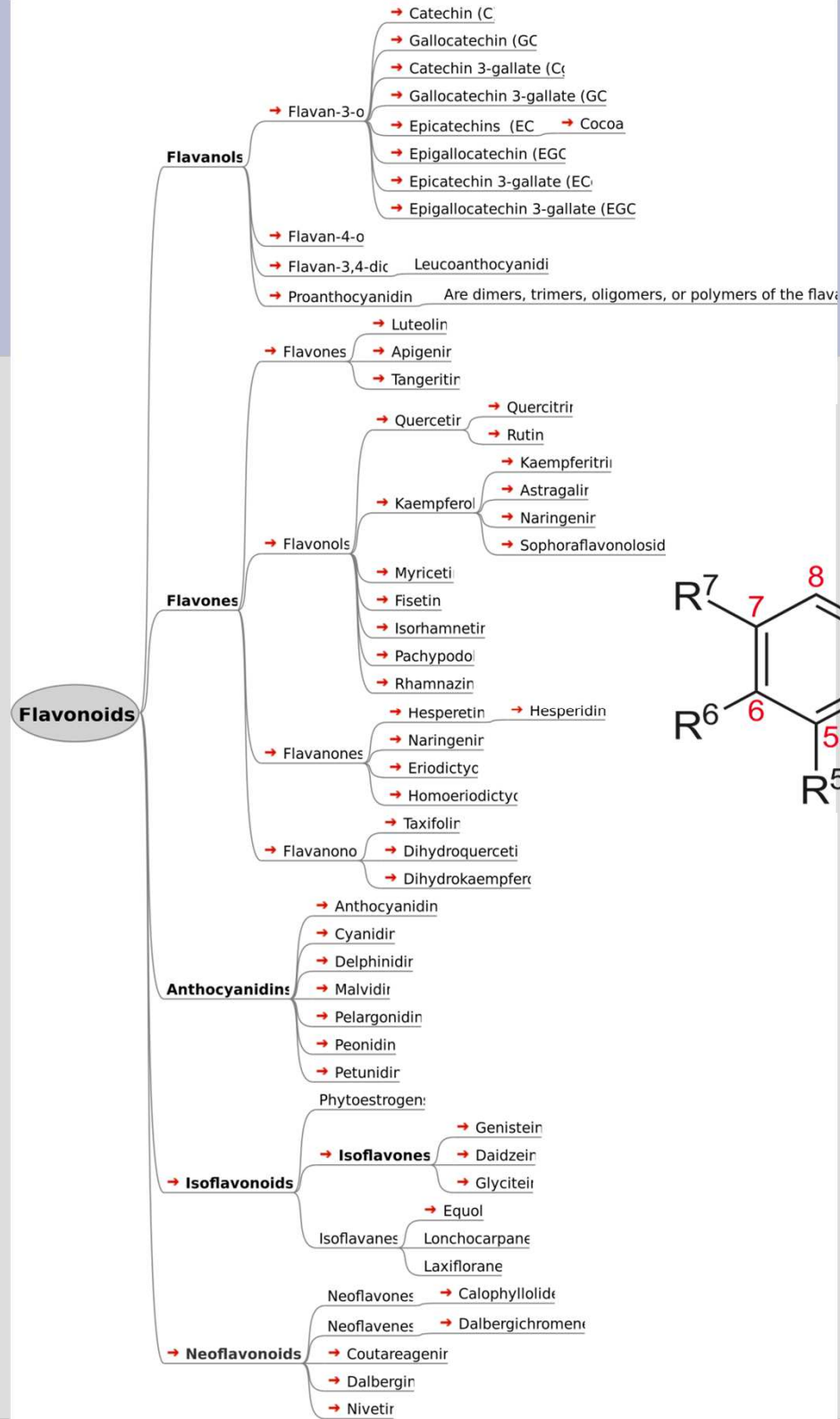
Famiglia di “COLORI” vegetali & antiossidanti

Partiamo dalle antocianidine:



Famiglia numerosa..

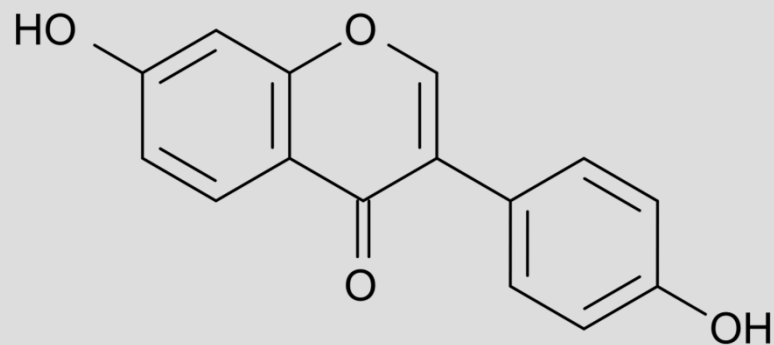
HELP!



Flavoni (comuni) & Isoflavoni (rari!)

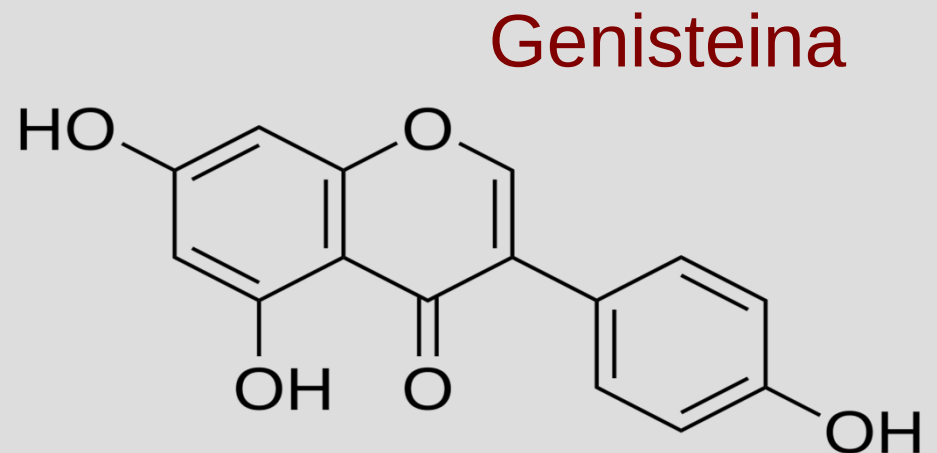
Soia = 60 ppm*

* parti per milione = mg/Kg



Daidzeina

+



Genisteina

ppm

$$1 \text{ ppm} = 10^{-6}$$

(un milionesimo)

$$1\text{mm}^3/1\text{dm}^3$$

$$1\text{dm}^3 (1\text{litro}) =$$
$$10^2 \times 10^2 \times 10^2 = 10^6 \text{ mm}^3$$

Tornando alla **SOIA**

Isoflavoni:

fattore protettivo contro il **tumore al seno**
(Cina, Giappone)

Genisteina e derivati:

sperimentazione clinica contro
il **tumore alla prostata**

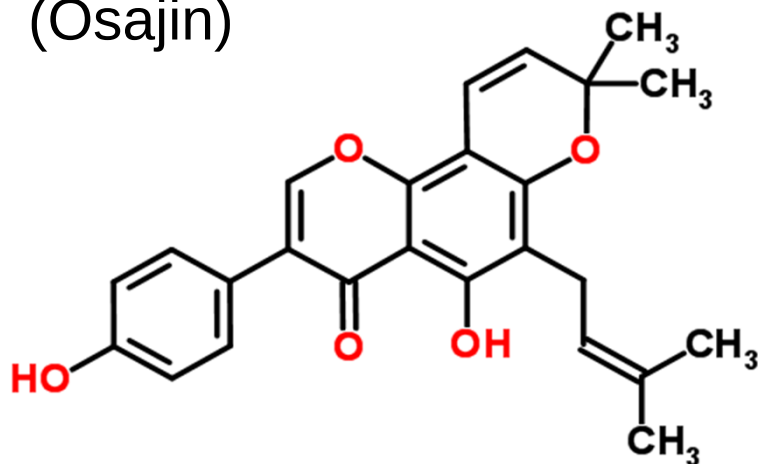
Antiossidanti e Fitoestrogeni

MACLURA

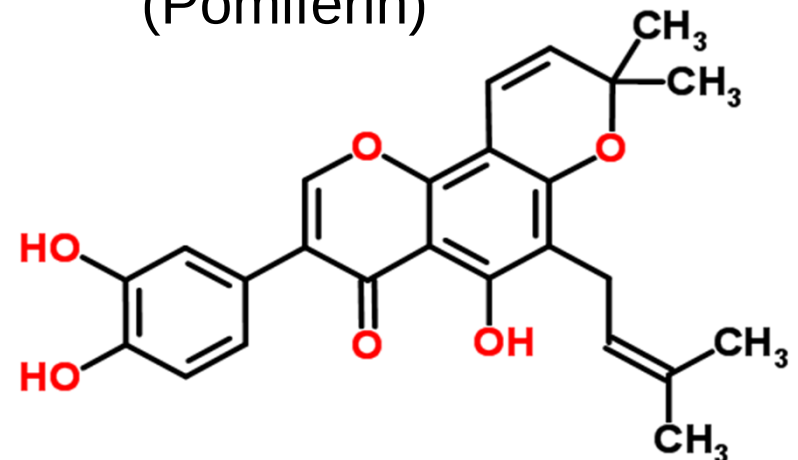
6%

Osagina+Pomiferina
(60g/Kg= 60000 ppm)

Osagina (Osajin)



Pomiferina (Pomiferin)



Uso didattico

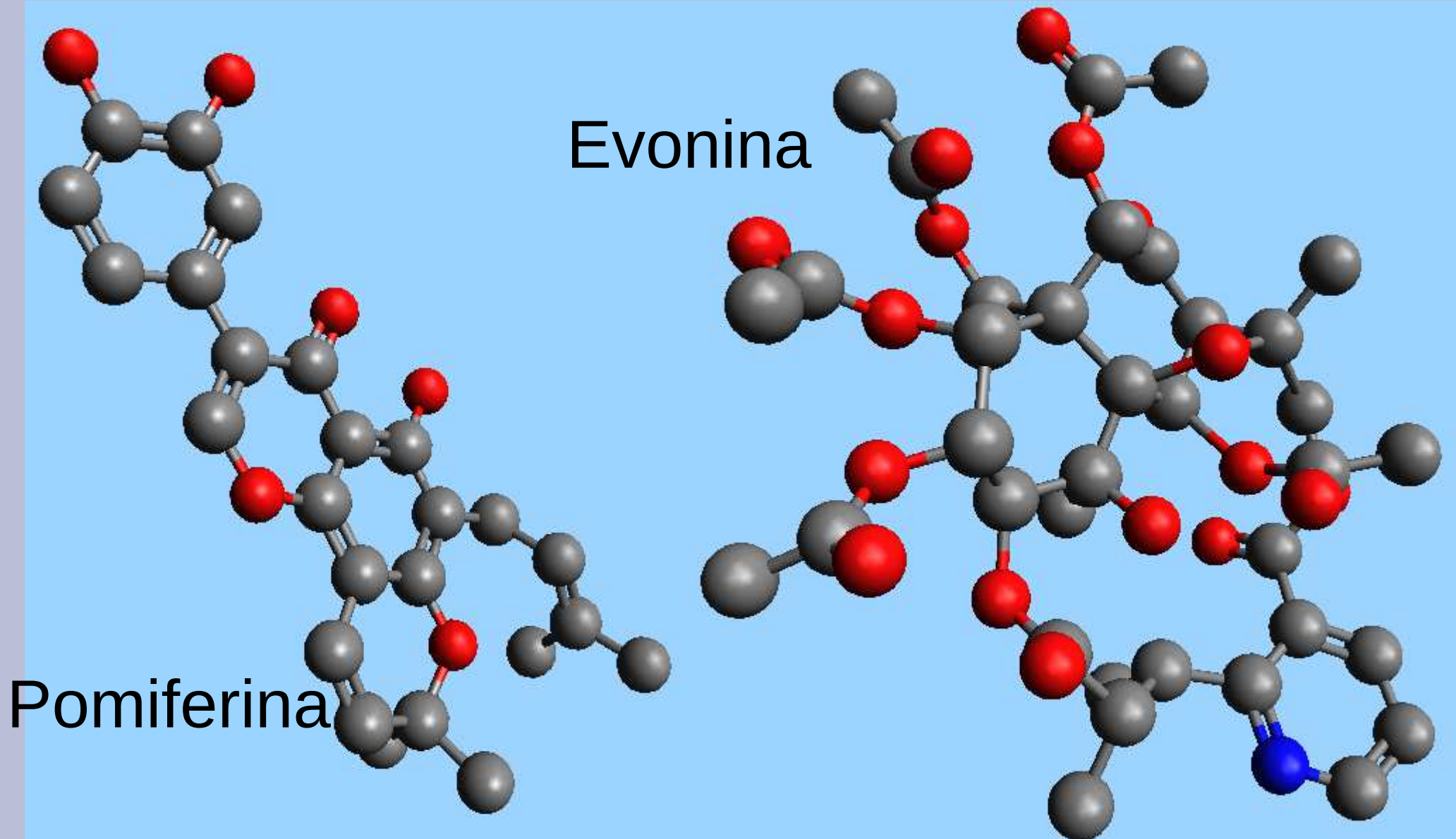
- composti con
struttura comprensibile
- percentuale elevata
- facile estrazione
- facile separazione e purificazione

Struttura: Maclura vs. Euonymus

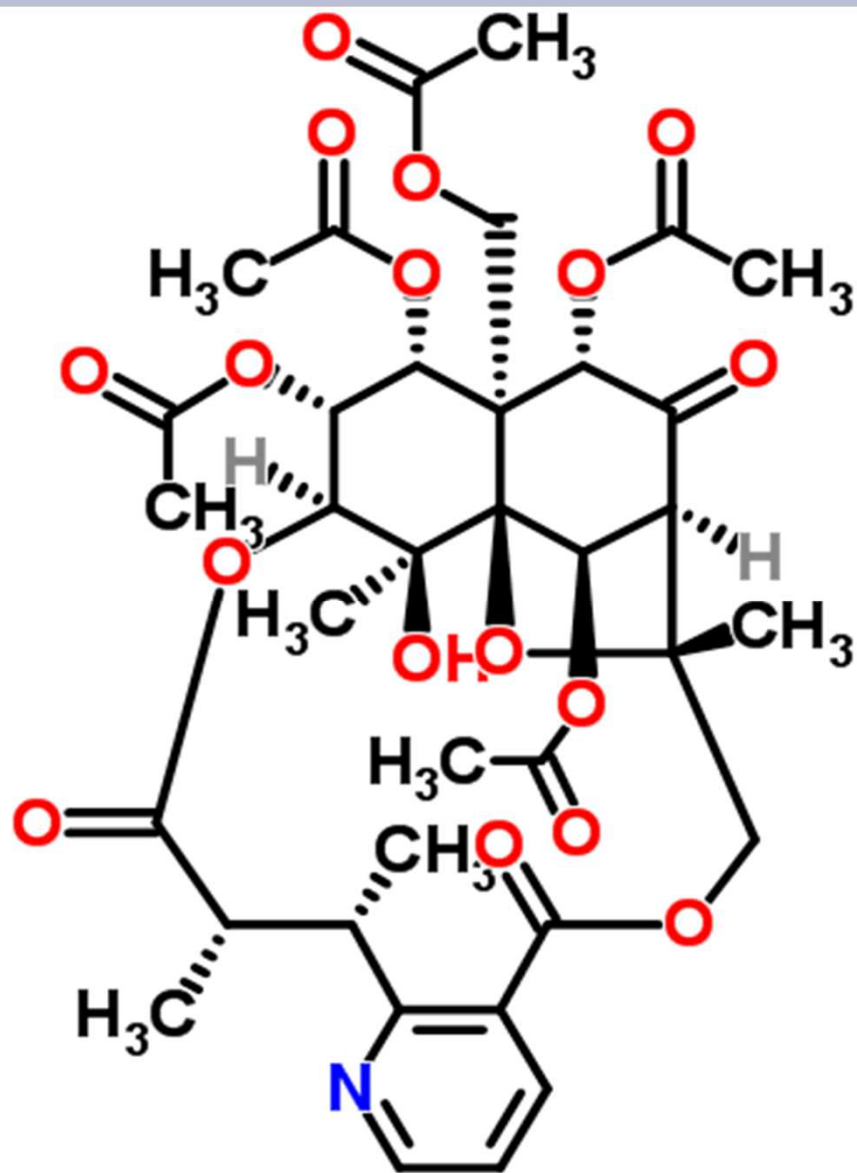


Euonymus europaeus
(0,3% alcaloidi)

Strutture a confronto



Confronto BIS



Evonina..

HELP!

Procedura: preparazione

Frutti maturi:

- affettati
- essiccati
- tritati e caricati in soxlet

Affettare



Essicare e tritare



Mr. Soxlet



Estrazioni in soxlet

- 1° etere di petrolio
(scioglie i grassi)
- 2° etere etilico
(scioglie Osagina e Pomiferina)
- l'etere etilico viene evaporato



Separazione

Trattamento con Pb^{2+} (acetato)
in metanolo:

- Pomiferina forma un complesso insolubile;
- Osagina rimane in soluzione (no complesso)



Conclusione

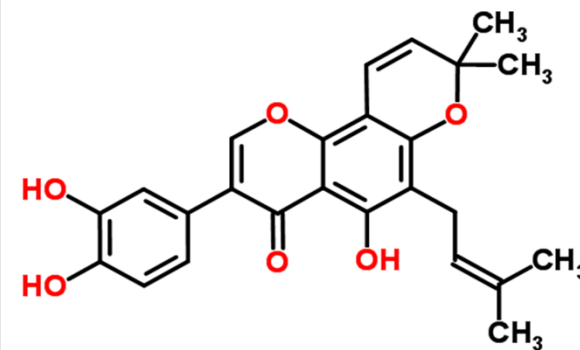
Pomiferato di piombo

Osagina in soluzione

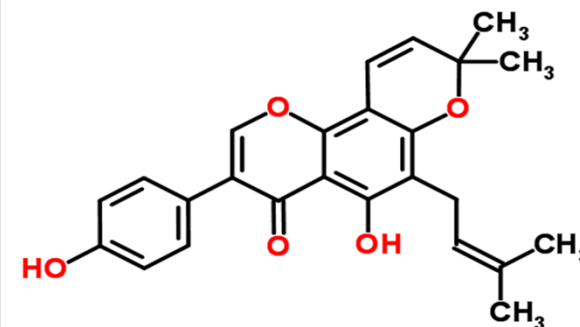


Risultato finale

Pomiferina



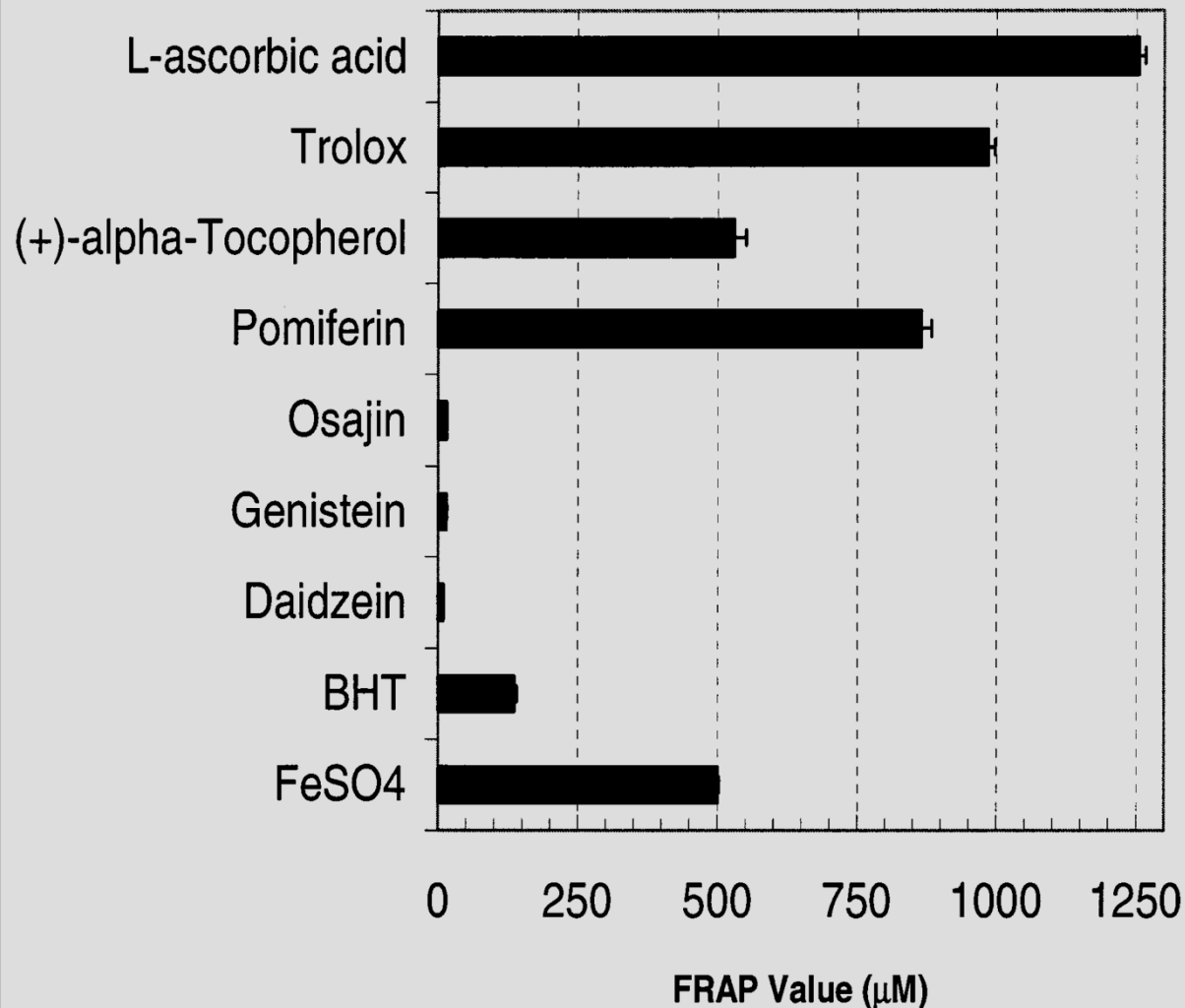
Osagina



Interesse biologico

- antiossidanti
- azione cardioprotettiva
- citotossicità (in vitro) su cellule tumorali
- ecc.

Antiossidanti



Capacità antiossidante
nel test FRAP

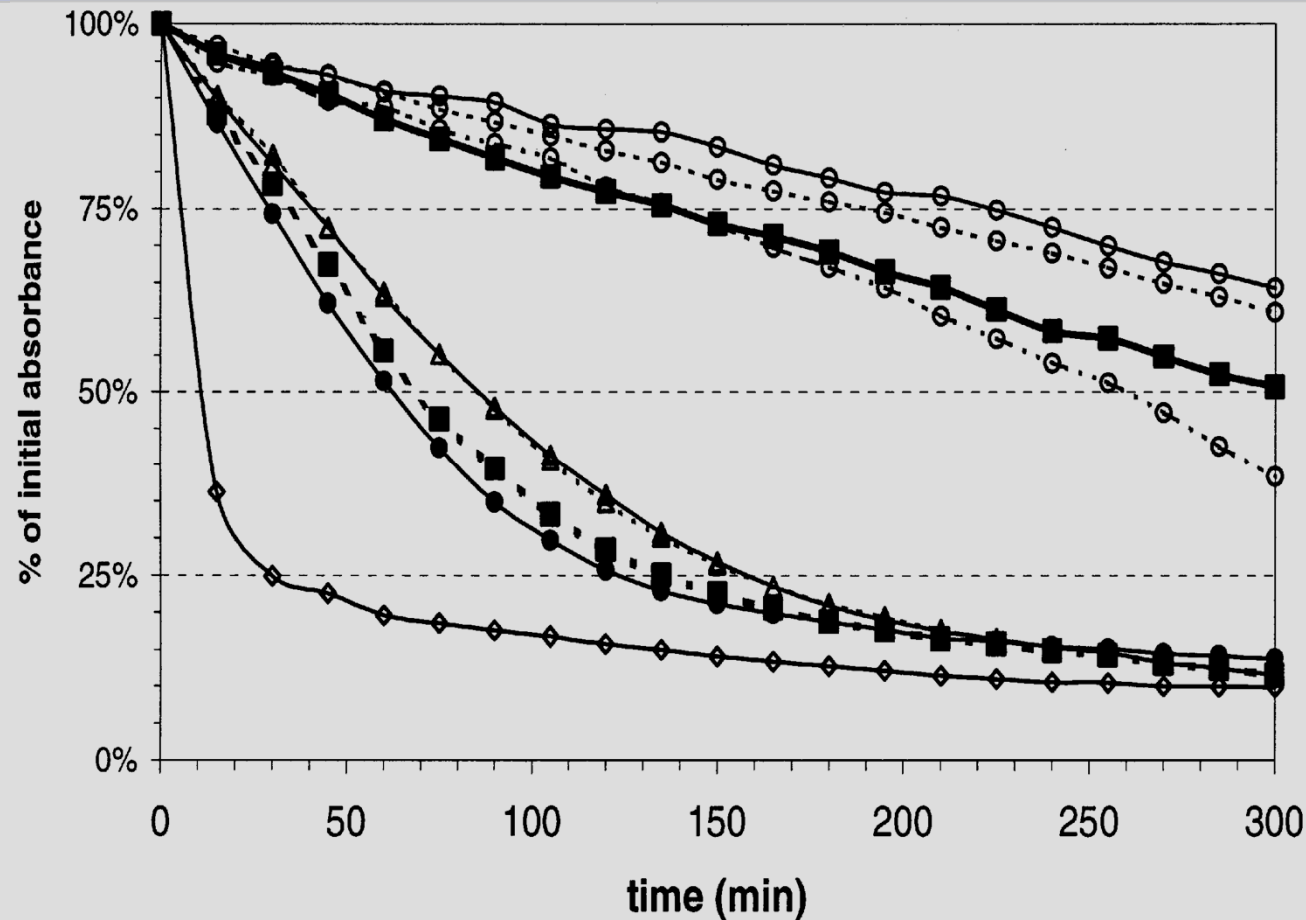
*Ferric Reducing
/Antioxidant Power*

colorimetrico

*Fe³⁺ ridotto a Fe²⁺;
Fe²⁺ dà complesso blu con
2,4,6-tripiridyl-s-triazine
(TPTZ);*

Antioxidant Isoflavones in Osage Orange, *Maclura pomifera* (Raf.) Schneid - R. Tsao,* R. Yang, J. C. Young - *J. Agric. Food Chem.* 2003, 51, 6445-6451

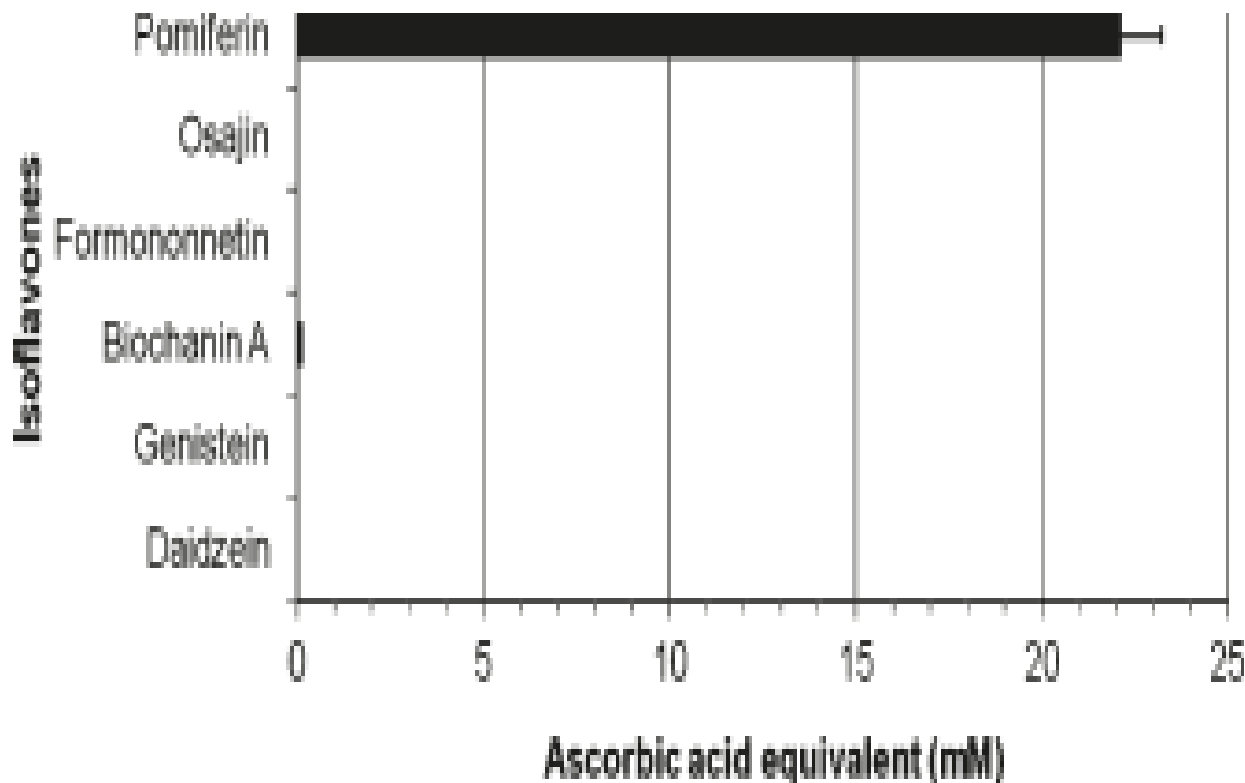
Antiossidanti 2



Decolorazione di β -Carotene
con perossidi generati da
ossidazione di acido linoleico
(meno decolorazione, più
efficacia)

Capacità antiossidante nel test β -Carotene-Linoleic Acid Model
System (β -CLAMS) - vedi rif. precedente

Antiossidanti 3



Antioxidant Activity by the PCL Assay based on photoinduced generation of the superoxide anion radical ($O_2^{\bullet-}$)

Antiproliferative activity of **pomiferin** in normal (MCF-10A) and transformed (MCF-7) **breast epithelial cells**.- R.Yang, H. Hanwell, J. Zhang, R. Tsao, ecc. - J Agric Food Chem, Vol. 59 Issue 24 Pg. 13328-36 (Dec 28 2011)

Antiossidanti: conclusione

- **Pomiferina** paragonabile a:
 - Vitamina E (α -tocoferolo)
 - Trolox (analogo idrosolubile)
 - BHT
 - Vitamina C
- **Osagina** scarso effetto

Interesse farmacologico

- antiossidanti
- azione cardioprotettiva
- citotossicità (in vitro) su cellule tumorali
- ecc.

(attività diverse per Osagina e
Pomiferina)

Esempi “organi”

CUORE

Protective effects of the flavonoids osajin and pomiferin on heart ischemia-reperfusion. (Osa+Pom)

Ceska a Slovenska Farmacie, 55(4), 168-174 (Czech) 2006

RENI

Protective effects of Osajin in ischemia-reperfusion of laboratory rat kidney. (Osa)

Pharmazie, 61(6), 552-555 (English) 2006

SISTEMA NERVOSO

Neuroprotective flavonoids from *Flemingia macrophylla* (Osa)

Planta Medica, 71(9), 835-840 (English) 2005

Esempi citotossicità

Antiproliferative activity of **pomiferin** in normal (MCF-10A) and transformed (MCF-7) **breast epithelial cells**.

R. Yang, H. Hanwell, J. Zhang, R. Tsao, ecc. - J Agric Food Chem, Vol. 59 Issue 24 Pg. 13328-36 (Dec 28 2011)

Activation of Multiple Apoptotic Pathways in Human **Nasopharyngeal Carcinoma Cells** by the Prenylated Isoflavone, **Osajin**

Huang T-T, Liu F-G, Wei C-F, Lu C-C, Chen C-C, et al. (2011) PLoS ONE 6(4): e18308

Proteomic profiling of **cholangiocarcinoma cell line** treated with **pomiferin** from *Derris malaccensis*

J. Svasti, C. Srisomsap ecc- Proteomics 2005, 5, 4504–4509

Altri esempi

Pomiferin, histone deacetylase inhibitor isolated from the fruits of *Maclura pomifera*.

Son IH, Chung IM, ecc. - Bioorganic & Medicinal Chemistry Letters [2007, 17(17):4753-4755]

Characterization of pomiferin triacetate as a novel mTOR and translation inhibitor

Magdalena M. Bajer ecc.- Biochemical Pharmacology (accepted manuscript 21/1/2014)

In vitro and ex vivo examination of topical Pomiferin treatments,

Gruber JV, et al, Fitoterapia (2014),<http://dx.doi.org/10.1016/j.fitote.2014.01.023>

Grazie per l'attenzione!

