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Bioactive Compounds in Under-Utilized Latin-American Tropical Fruits -

Evaluation by TOSC – Assay and Activity-Guided HPLC Fractionation

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ROS and antioxidants

Oxidative Processes during human metabolism

➔ reactive oxygen species "ROS"

equilibrium between oxidants and antioxidants

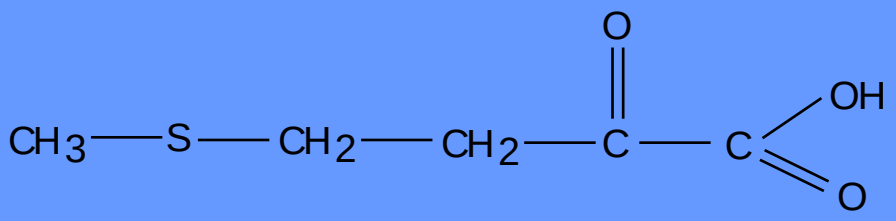
if disturbed, initiation or promotion of severe illnesses like cardiovascular diseases and cancer possible

Dietary antioxidants may assist to achieve optimal antioxidative status

Dietary antioxidants

- Vitamin C
- Vitamin E
- Carotenoids
- Polyphenols
  - Phenolcarbonic acids
  - Anthocyanins
  - Flavonoids

Ethylen formation by radical induced decomposition of KMBA



+ **ROS**

KMBA = α-Ketomethiolbutyric acid

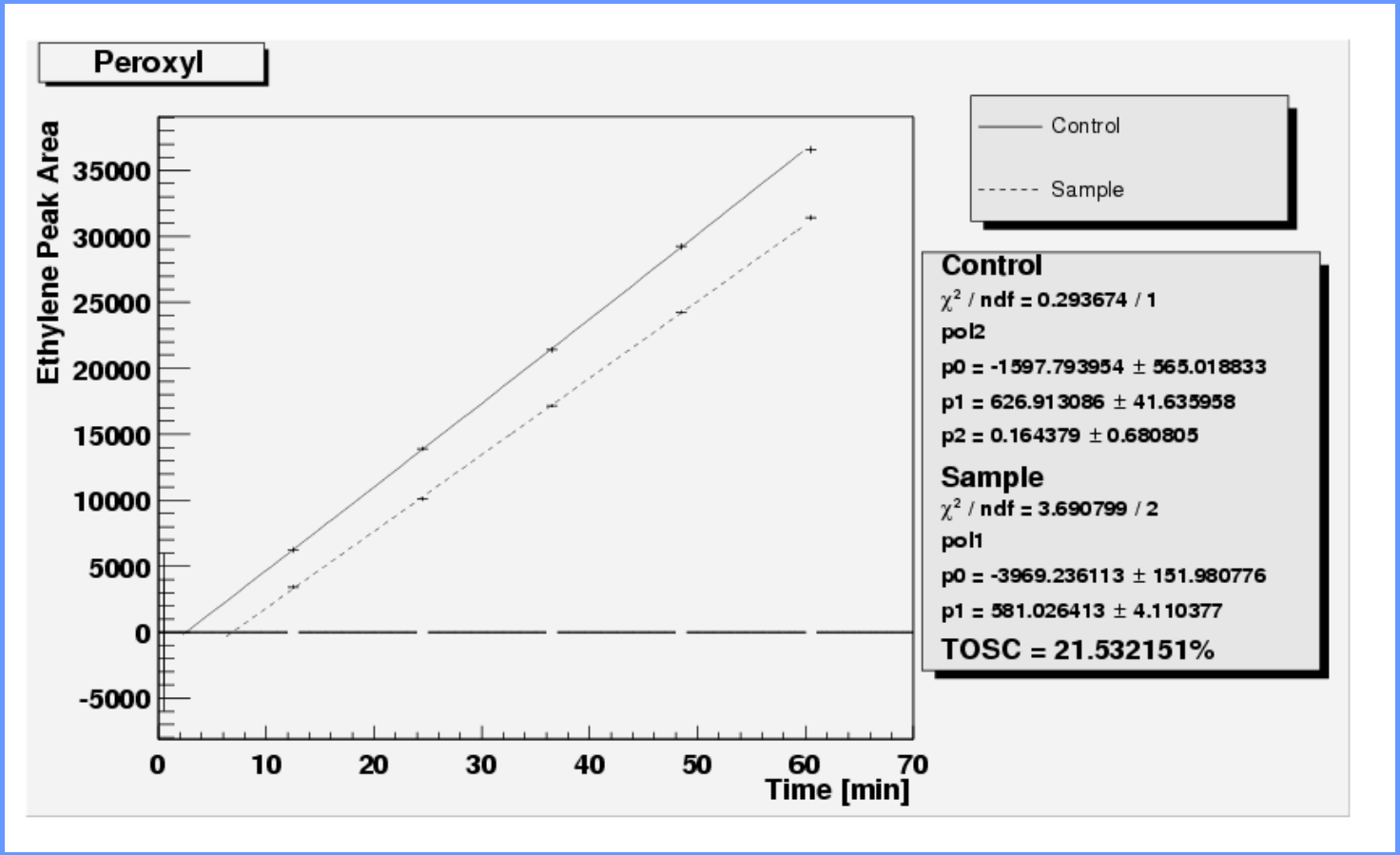
1/2 $H_3C-S-S-CH_3$ + $H_2C=CH_2$ + 2 CO_2

Ethylen

ROS (reactive oxygen species) with physiological relevance:
peroxyl radical, hydroxyl radical, peroxynitrite

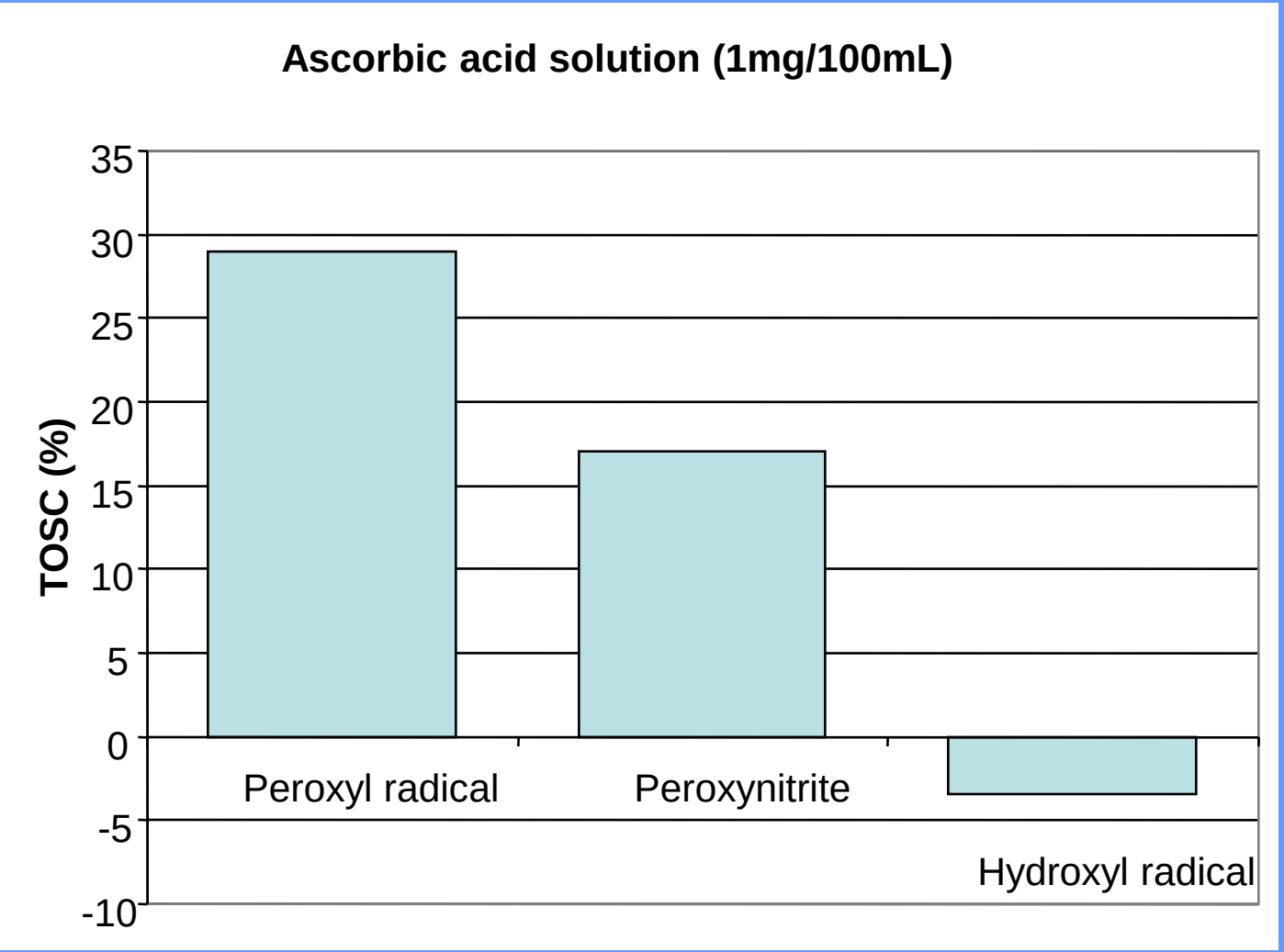
TOSC assay

Total oxidant scavenging capacity assay



relation between areas under the kinetic curves for sample and control reaction curves ⇒ TOSC values

TOSC values of ascorbic acid



Target fruits

açaí
(*Euterpe oleracea*)

Amazonian palm fruit,
grape-sized
dark purple when ripe

rich in anthocyanins

blackberry
(*Rubus spp*)

Commercially cultivated from the Highlands of Mexico to the Andes
anthocyanins

camu-camu
(*Myrciaria dubia*)

Shrub
from the Amazon basin, mainly the western part
Highest vitamin C content known in fruits (up to 3 g/ 100g fresh weight)

Target fruits

cashew apple (*Anacardium occidentale* L.)

Tree, originates from northeastern Brazil
Needs pronounced dry periods
Cultivation on big scale for cashew nut production
Peduncle thickened to pseudofruit „cashew apple“
Vitamin C and polyphenols

tree tomato (*Cyphomandra betacea*)

Originally domesticated by Indians in the Northern Andes, varieties with red and yellow pulp
Carotenoids and vitamin C

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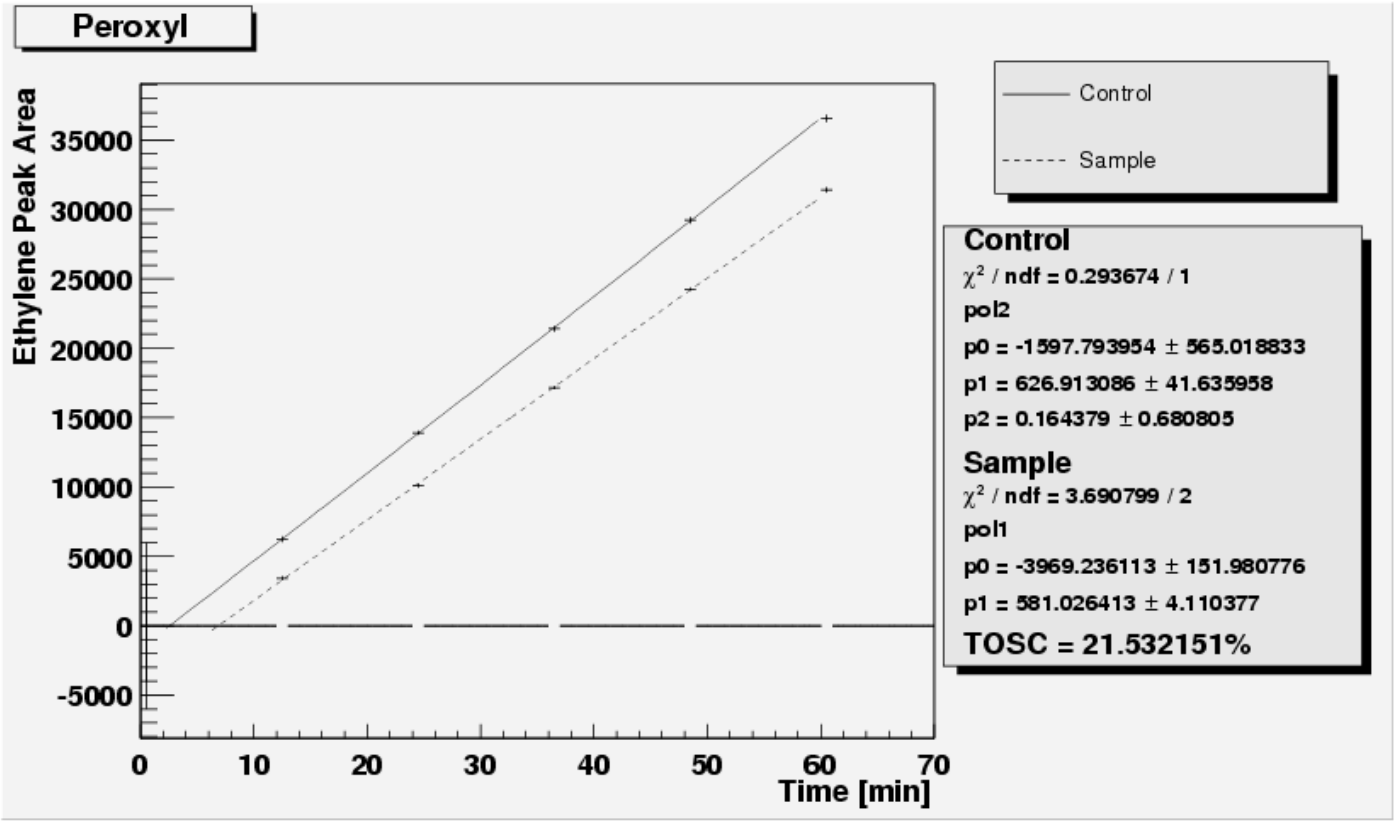
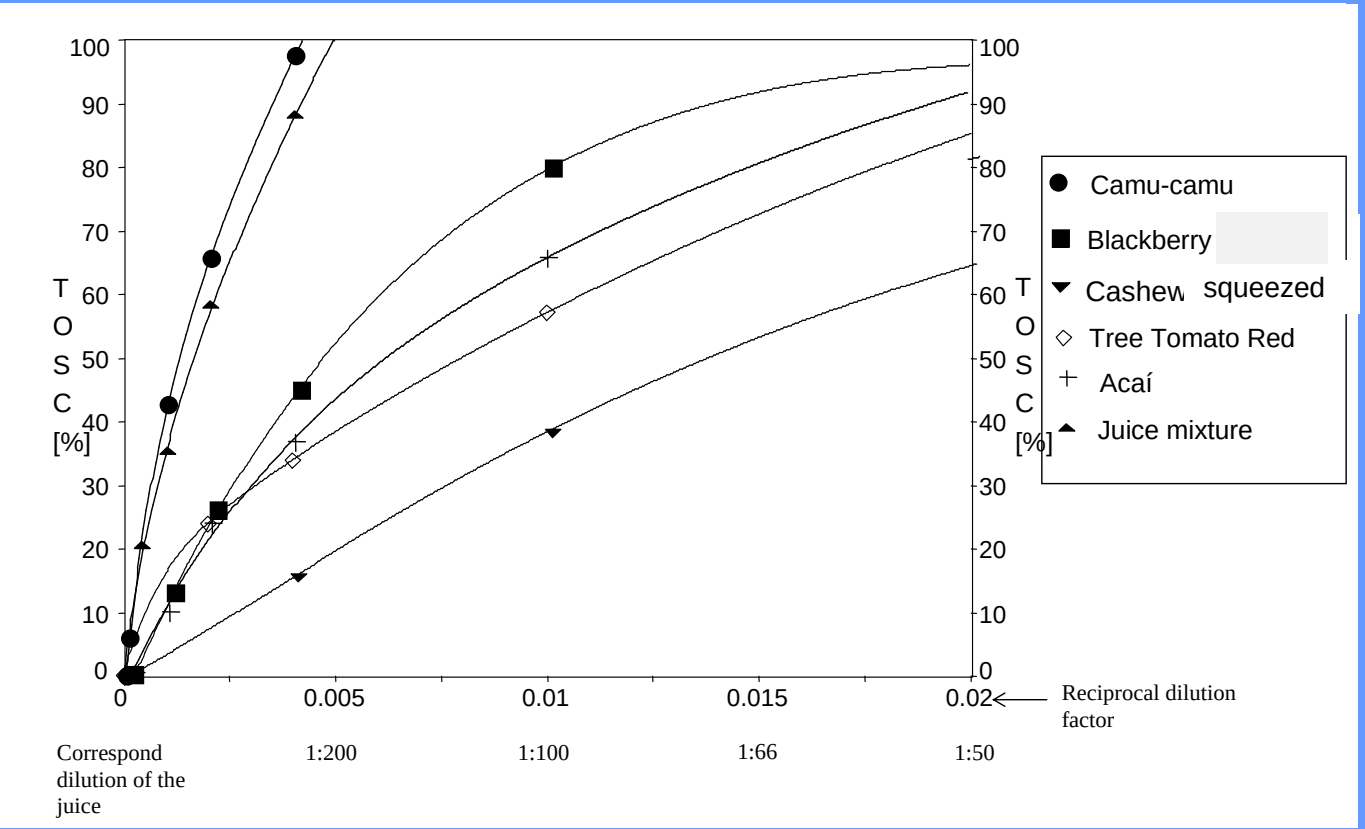
TOSC assay

Total oxidant scavenging capacity assay



relation between areas under the kinetic curves for sample and control reaction curves ⇨ TOSC values

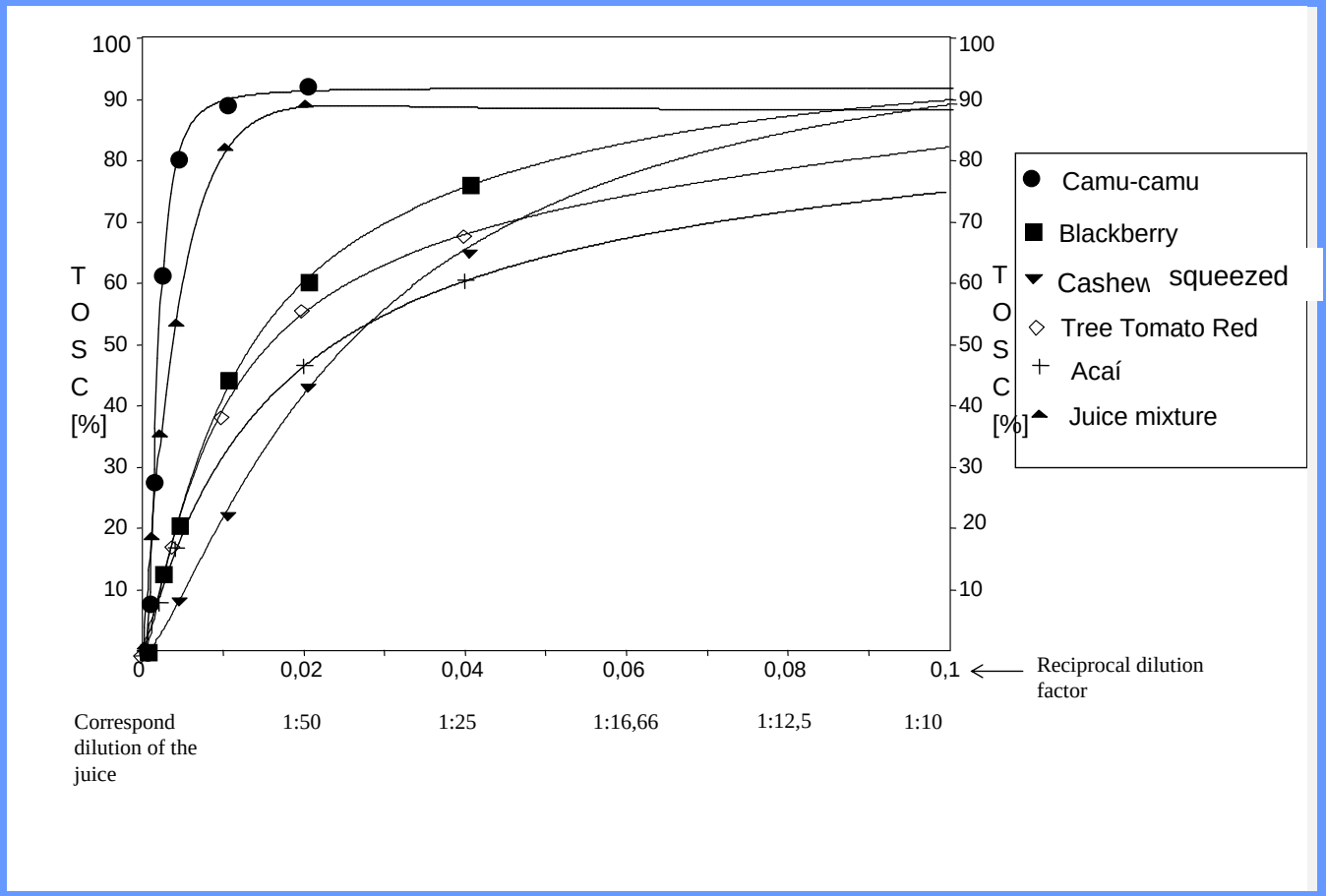
TOSC curves



TOSC curves of the fruit juice samples against peroxyl radicals

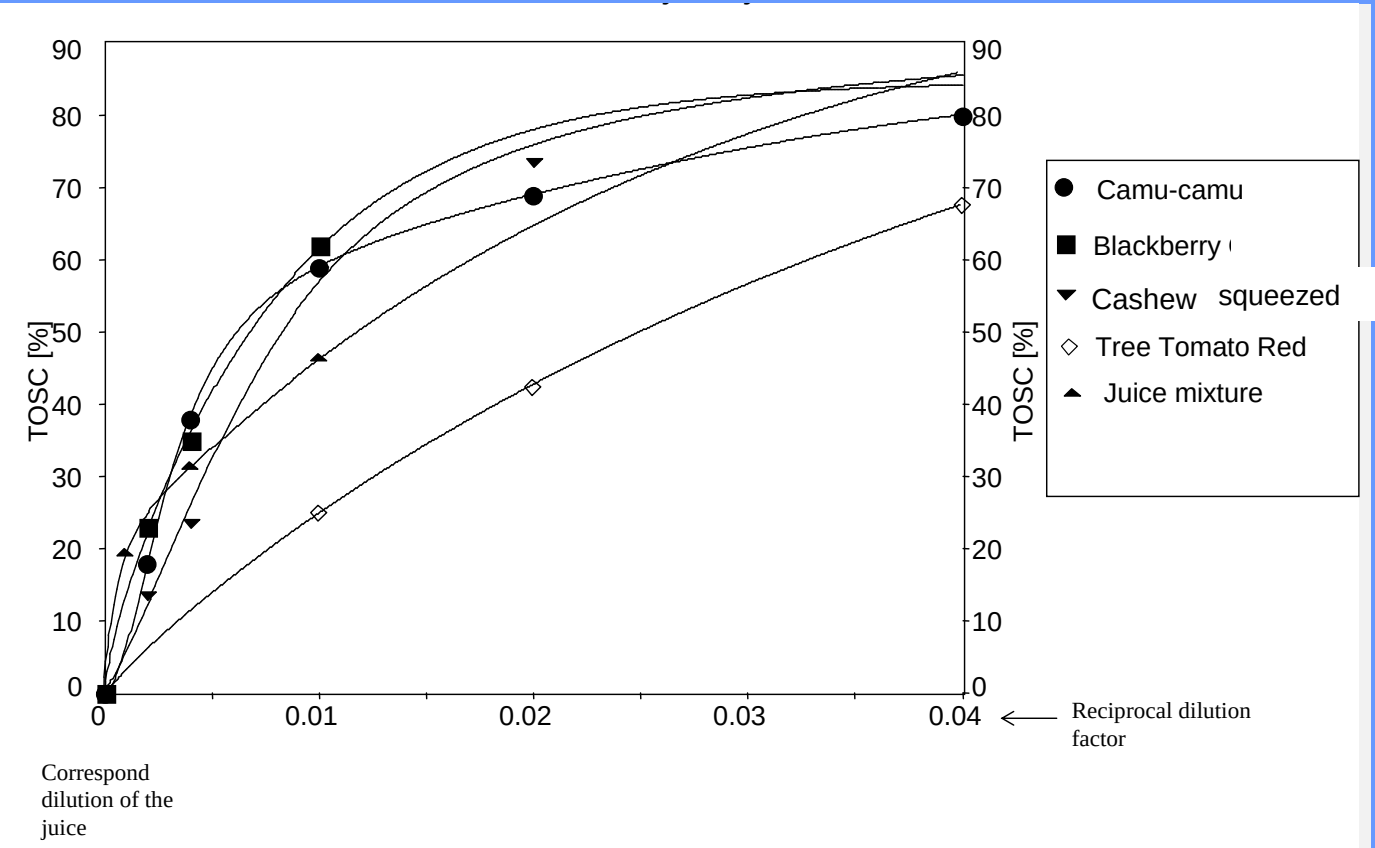
Juice mixture: 12 % camu camu, 44 % blackberry, 44 % açaí

TOSC curves



TOSC curves of the fruit juice samples against peroxynitrite radicals
Juice mixture: 12 % camu camu, 44 % blackberry, 44 % açaí

TOSC curves



TOSC curves of the fruit juice samples against hydroxyl

Juice mixture: 12 % camu camu, 44 % blackberry, 44 % açaí

TOSC-based Fruit ranking

Peroxyl radicals

Camu camu >> blackberry > açai **> red tree tomato > cashew**

Peroxynitrite

Camu camu >> blackberry > cashew = red tree tomato > açai

Hydroxyl radicals

Camu camu = blackberry > cashew = tree tomato = açai

Drawback of camu camu: extremely high ascorbic acid content

TOSC of camu camu, blackberry, acaí mix

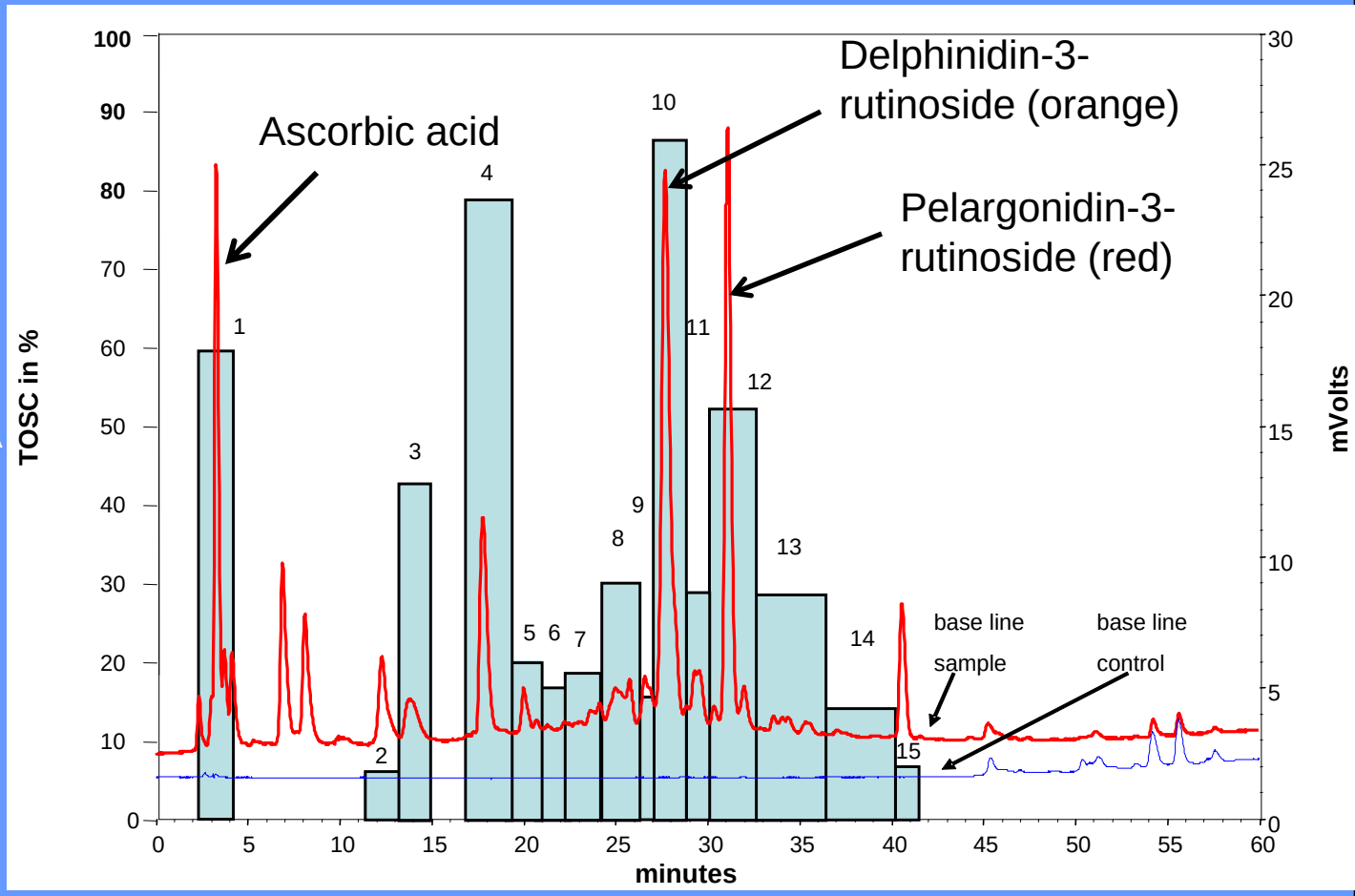
ROS TOSC value (%)	Peroxyl radicals mmol/L Trolox Equivalent (TE) 50	Peroxynitrite mmol/L Trolox Equivalent (TE) 50	Hydroxyl radicals mmol/L Trolox Equivalent (TE) 50
Camu camu	60.6	40.9	380.6
Blackberry	15.5	7.7	384.7
Acaí	11.6	4.2	57.2
Juice mixture	**43.7**	**27.8**	**267.7**

TOSC values (50% inhibition of camu camu, acai and blackberry as well as a **juice mixture of 12% camu camu, 44% blackberry and 44% açai**

HPLC fractions and TOSC values

HPLC chromatogram of the tree tomato seed jelly with TOSC values (bars) of the fractions against peroxyl radicals

Gradient elution program: 100% eluent A (water + 2% formic acid) with linear gradient of **1.6%** eluent B (acetonitrile + 2% formic acid) / min



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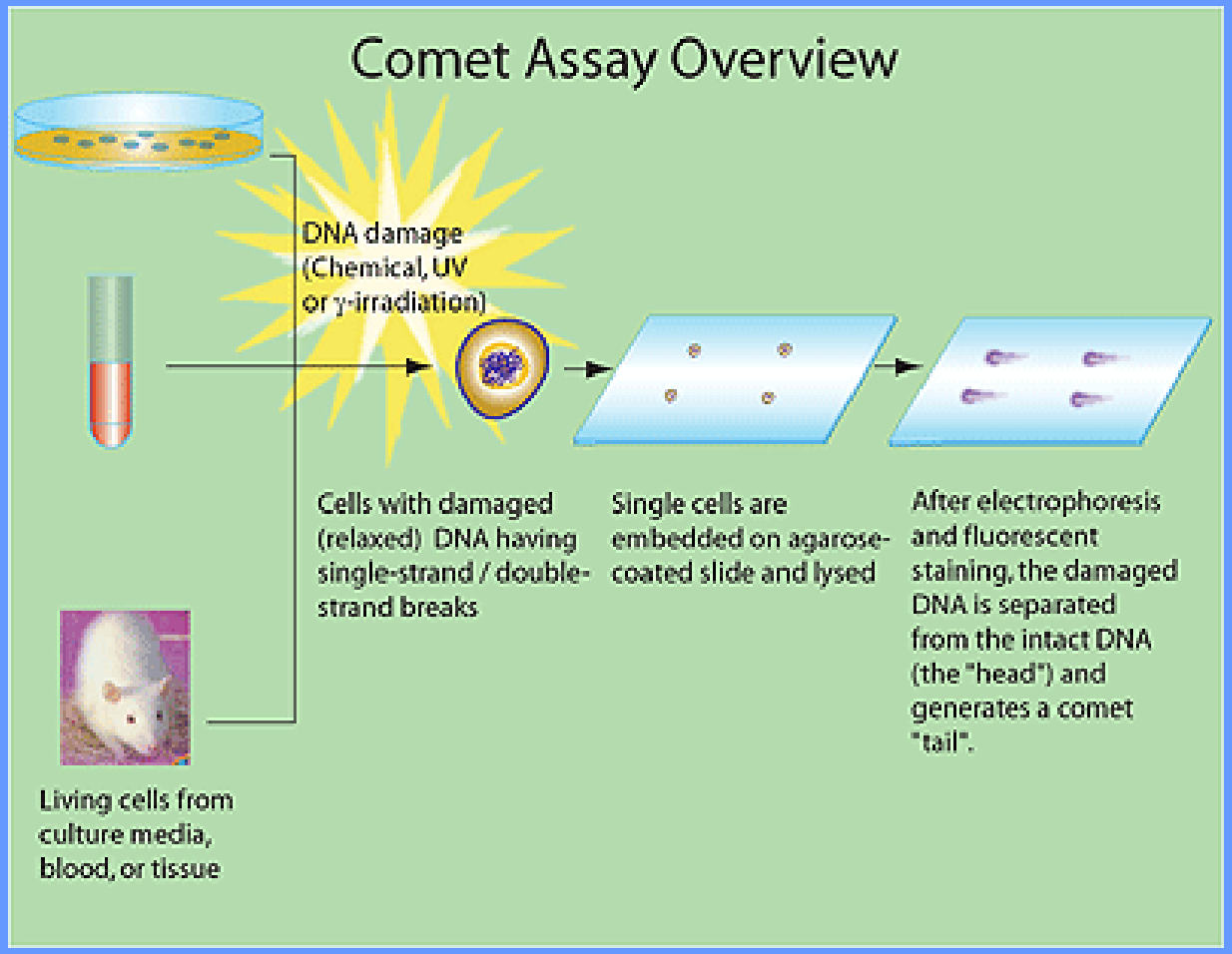
Outlook

Bioavailability assay:

- Approx. 20 healthy human subjects with low initial antioxidant capacity of blood plasma
- One day diet low in polyphenols, overnight fasting
- In the morning administration of 400 ml juice mixture
- Blood samples immediately before intake and 0.5H 1h, 2h, 3h, 5h,8h after intake of the drink
- Assessment of antioxidant capacity
- Assessment of plasma antioxidants vitamin C, uric acid, plasma albumin and, if reasonable by LC-MS of polyphenols and active metabolics
- If reasonable: comet assay

Outlook



⇒ **Indication of anticancerogenic effects possible!**

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Muchas gracias para sua atención!

Agradeço sua atenção!

Thank you very much for your attention!