

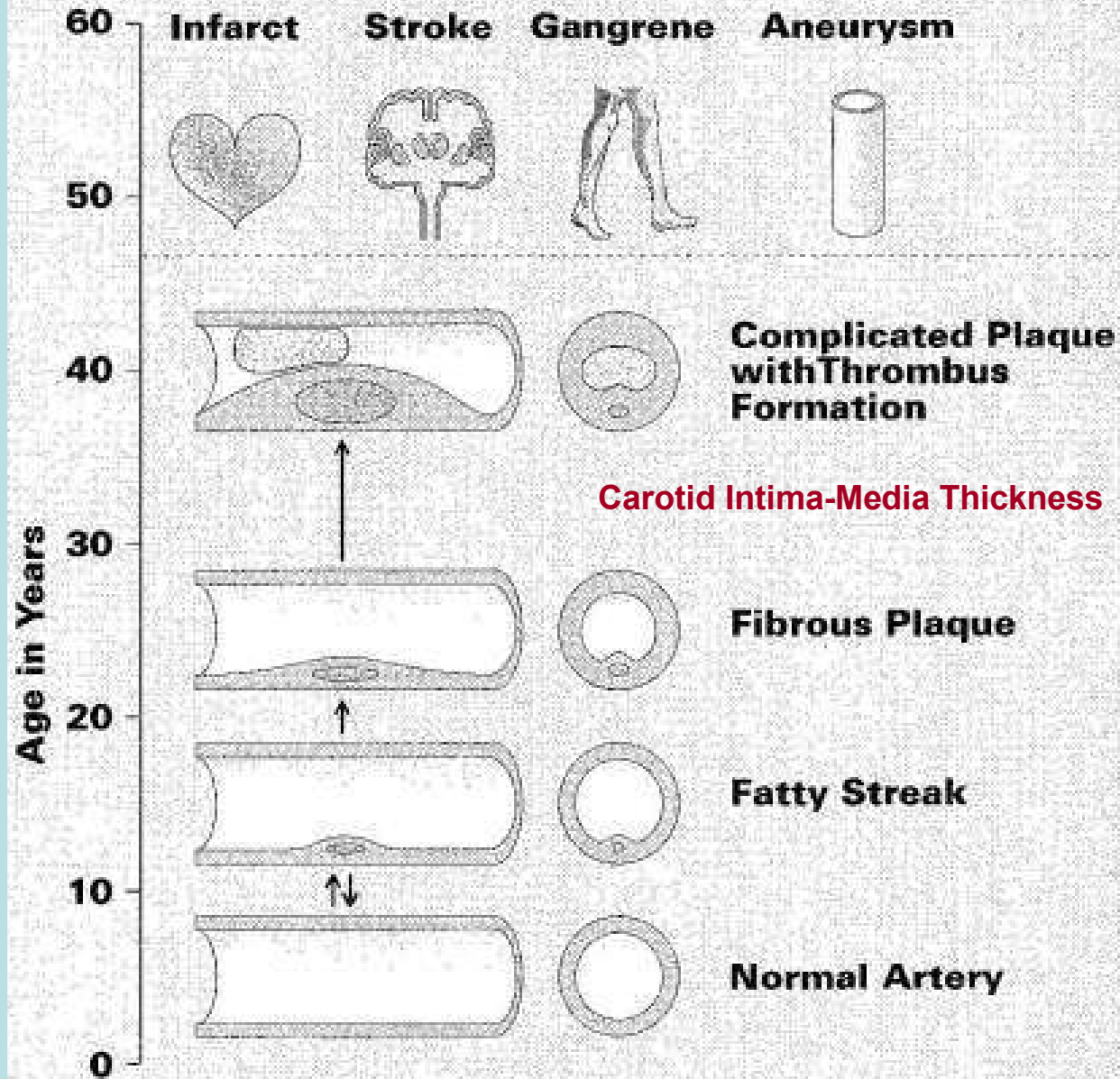
**בירור הרכב החומרים מונעי החמצון בחלקים שונים של  
פרי הרימון ע"י סריקה של 29 זני רימונים שונים**



יום עיון למגדלי רימונים, מכון וולקני, פברואר 2008

מוקדש לזכרו של משה זמירי ז"ל

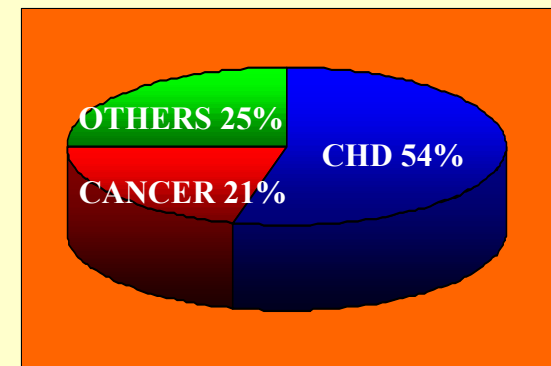
# Clinical Manifestation



**Atherosclerosis lesion development**

Thrombus formation

**Percent of mortality  
In western countries**

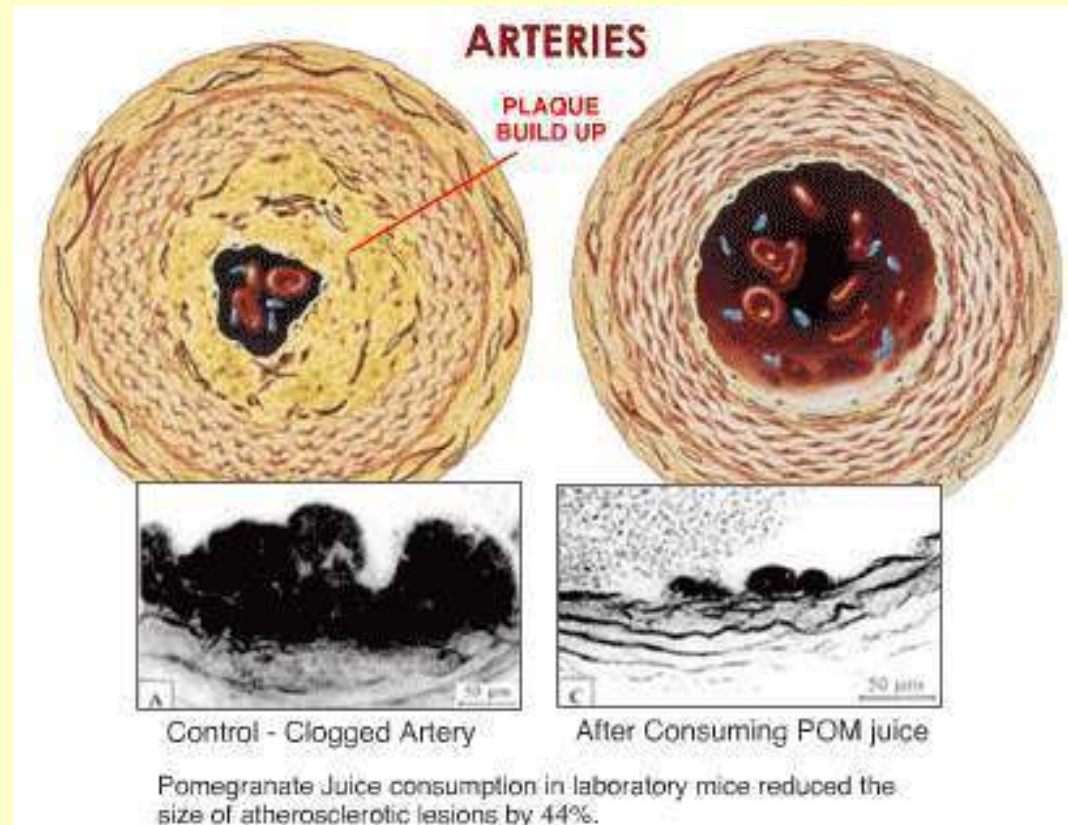


Recent biological studies have been proven that certain compounds in the pomegranate juice has been shown to:

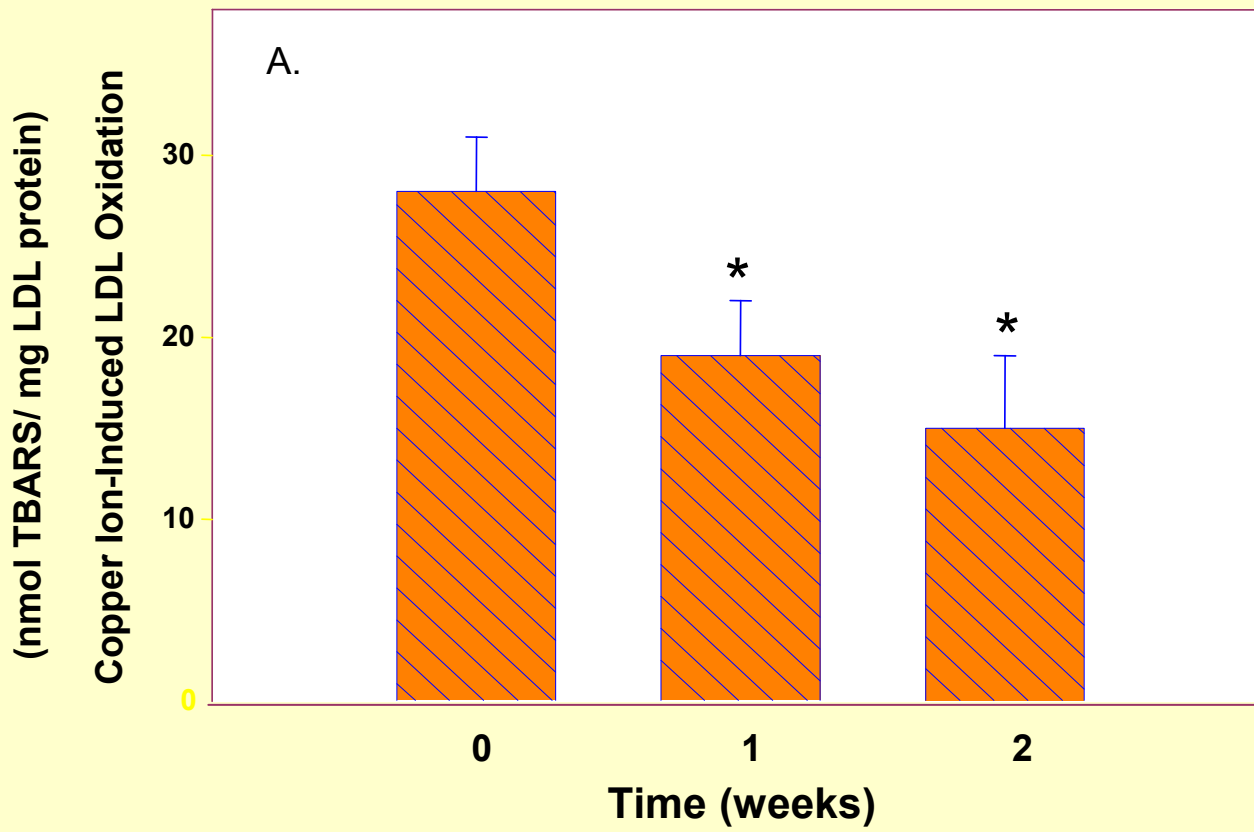
Reduce blood pressure; Reduce LDL oxidation; Reduce the atherosclerosis formation

**Moreover: consumption of pomegranate juice can lead to reduction of the atherosclerosis lesion**

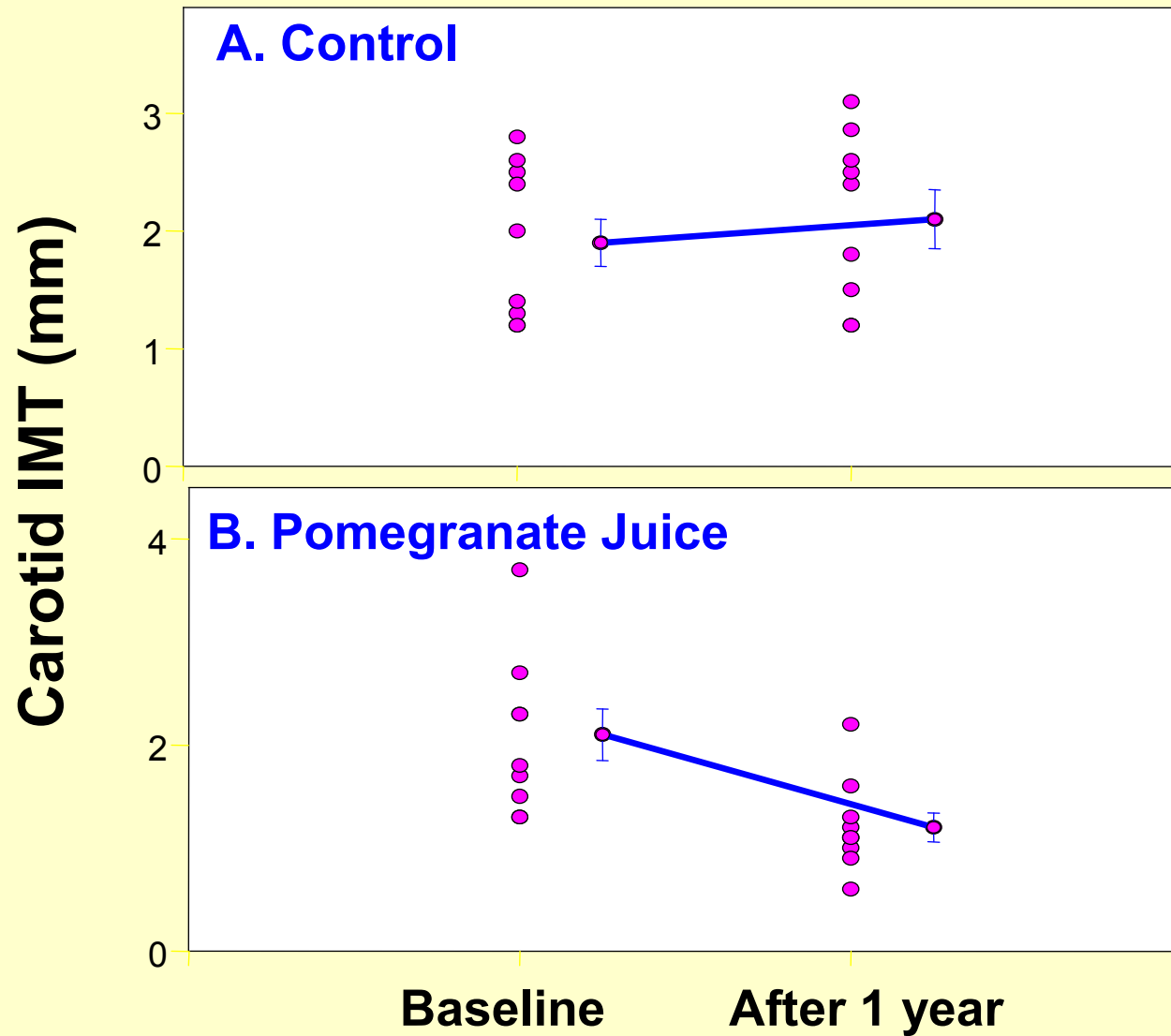
Prof. Miki Aviram



# Pomegranate Juice Consumption by Healthy Volunteers Reduces LDL Oxidation

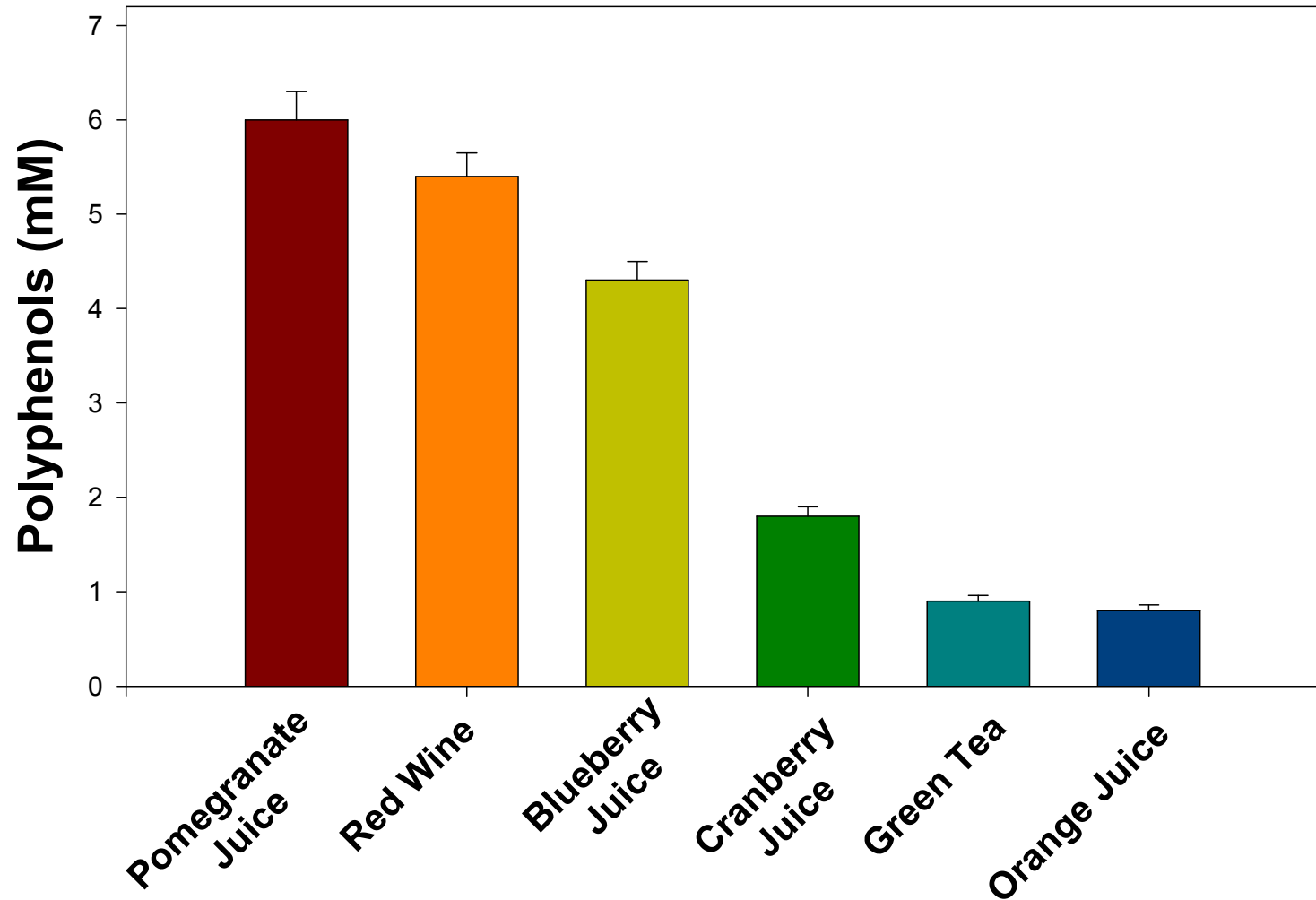


## Pomegranate Juice Consumption by Patients with Carotid Artery Stenosis Reduces Carotid Intima-Media Thickness (IMT)

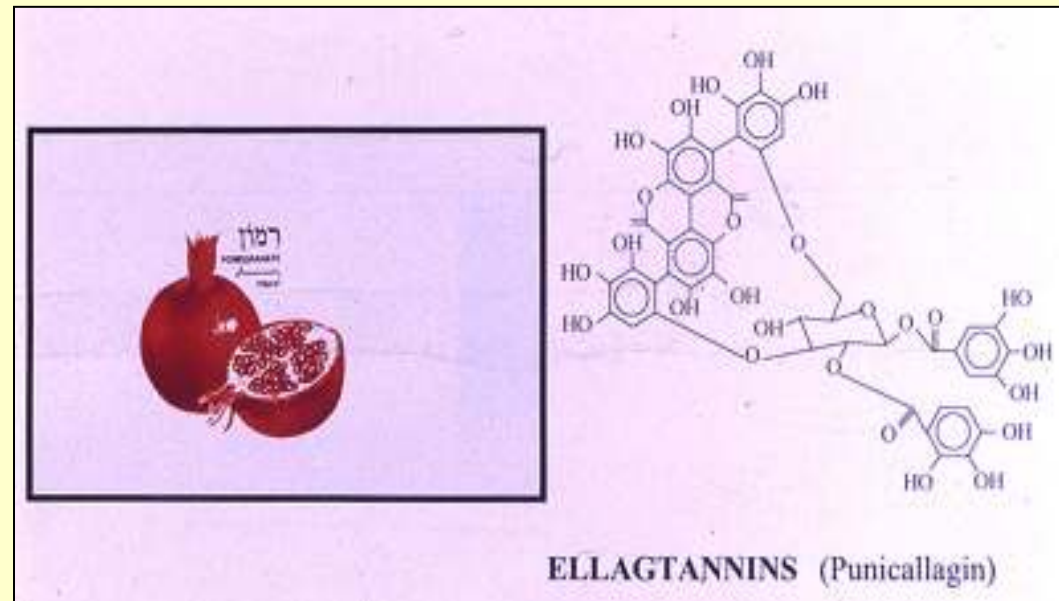


These activities are attributed to the Pomegranate high levels of antioxidant activity and its high total polyphenol content

### Total polyphenols content of several fruit juices



Most of the data derived from one pomegranate cultivar called 'wonderful'



Our main objectives:

1. To compare the levels of antioxidants, total polyphenols, anthocyanins and four major hydrolysable tannins in 29 pomegranate cultivars.
2. To verify where the bioactive compounds are localized in the fruits (arils, lamellas, seeds, peels), and examine their chemical nature and their antioxidant activity.



P.G. 112-13



C13

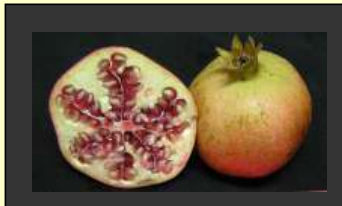


P.S. 21



PG128-29

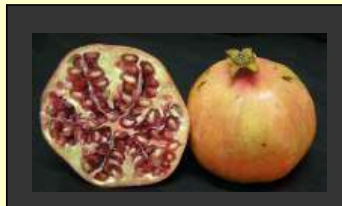




PG 100-1



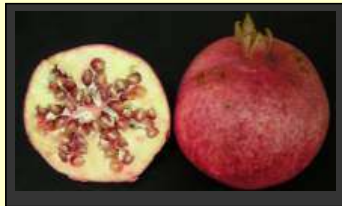
PG 101-2



PG 102-3



PG 103-4



PG 104-5



PG 105-6



PG 106-7



PG 108-9



PG 109-10



PG 112-13



PG 114-15



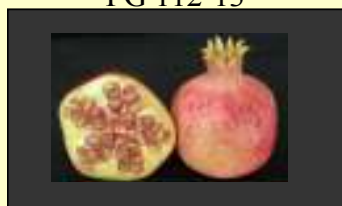
PG 116-17



PG 118-19



PG 119-20



PG 120-21



PG 121-22



PG 123-24



PG 127-28



PG 128-29



PG 130-31



A17



C13



C14



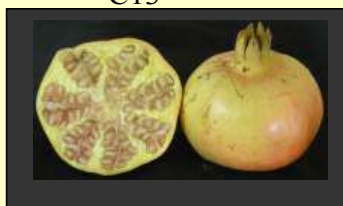
C133



ERS



PS21



PS23



XBS



Camel

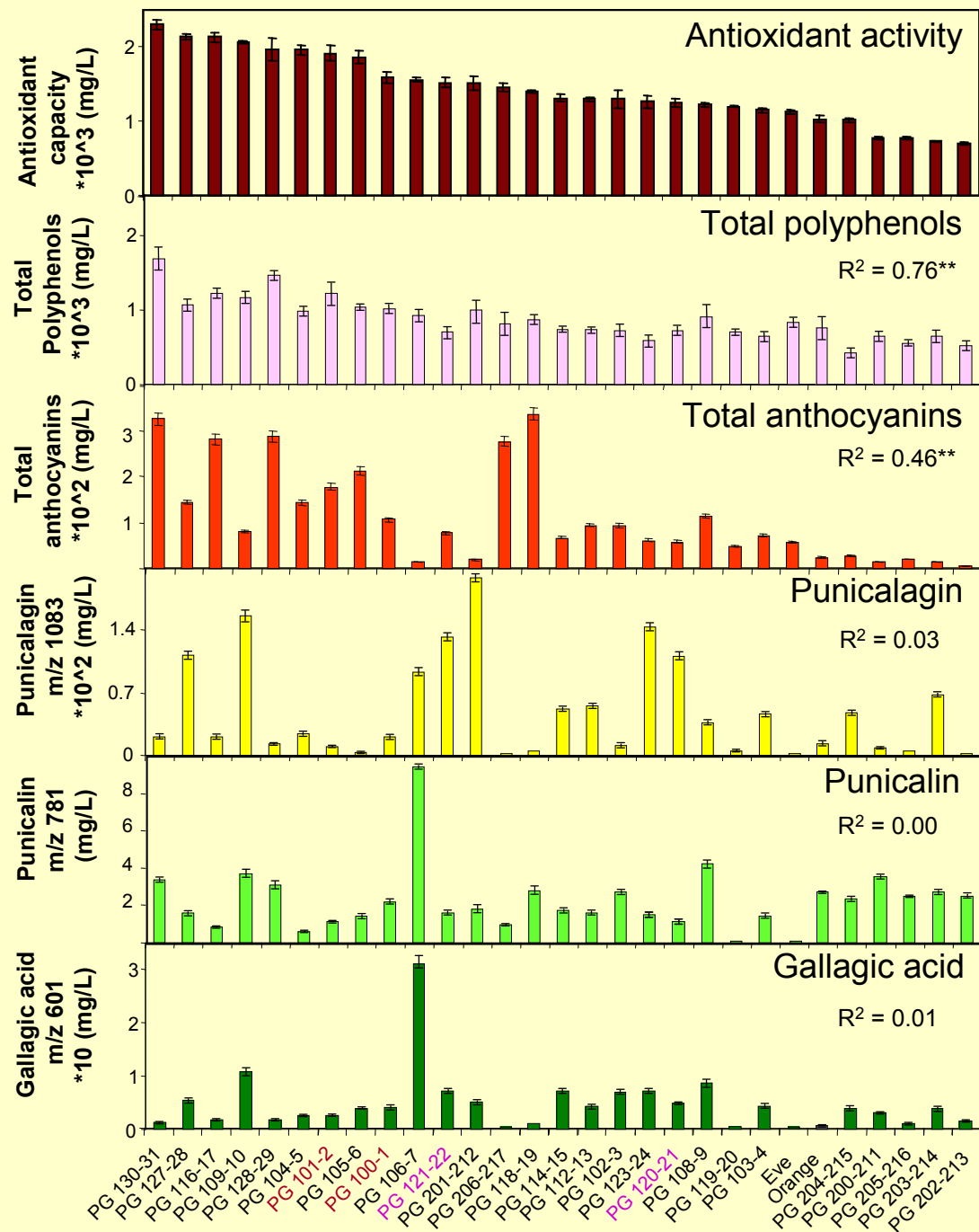
2006



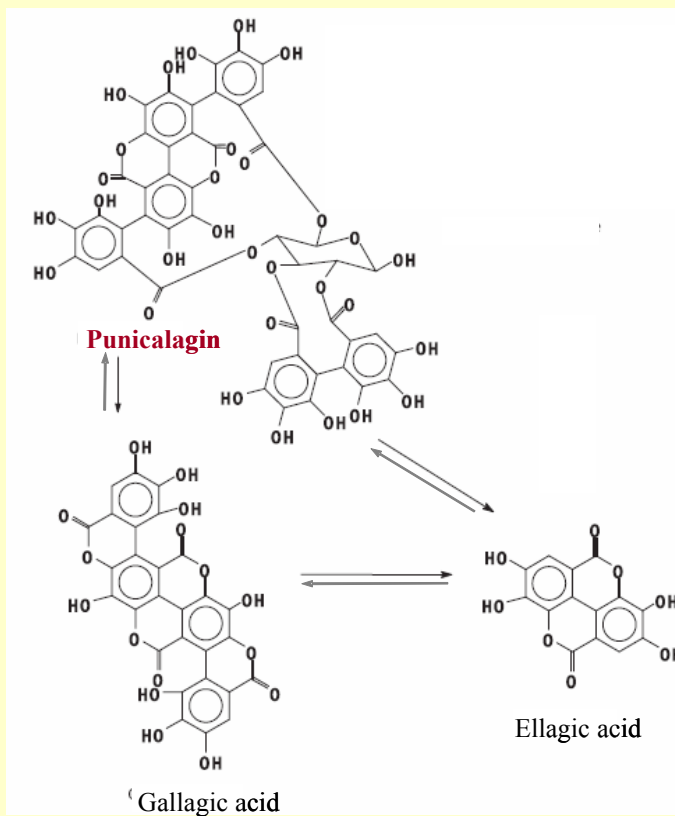
Two different juices and two different homogenates were pretreated from each cultivar:

1. Arils juice
2. Juice prepared by Juice extractor
3. Homogenate prepared from the whole fruit
4. Homogenate prepared from the peels



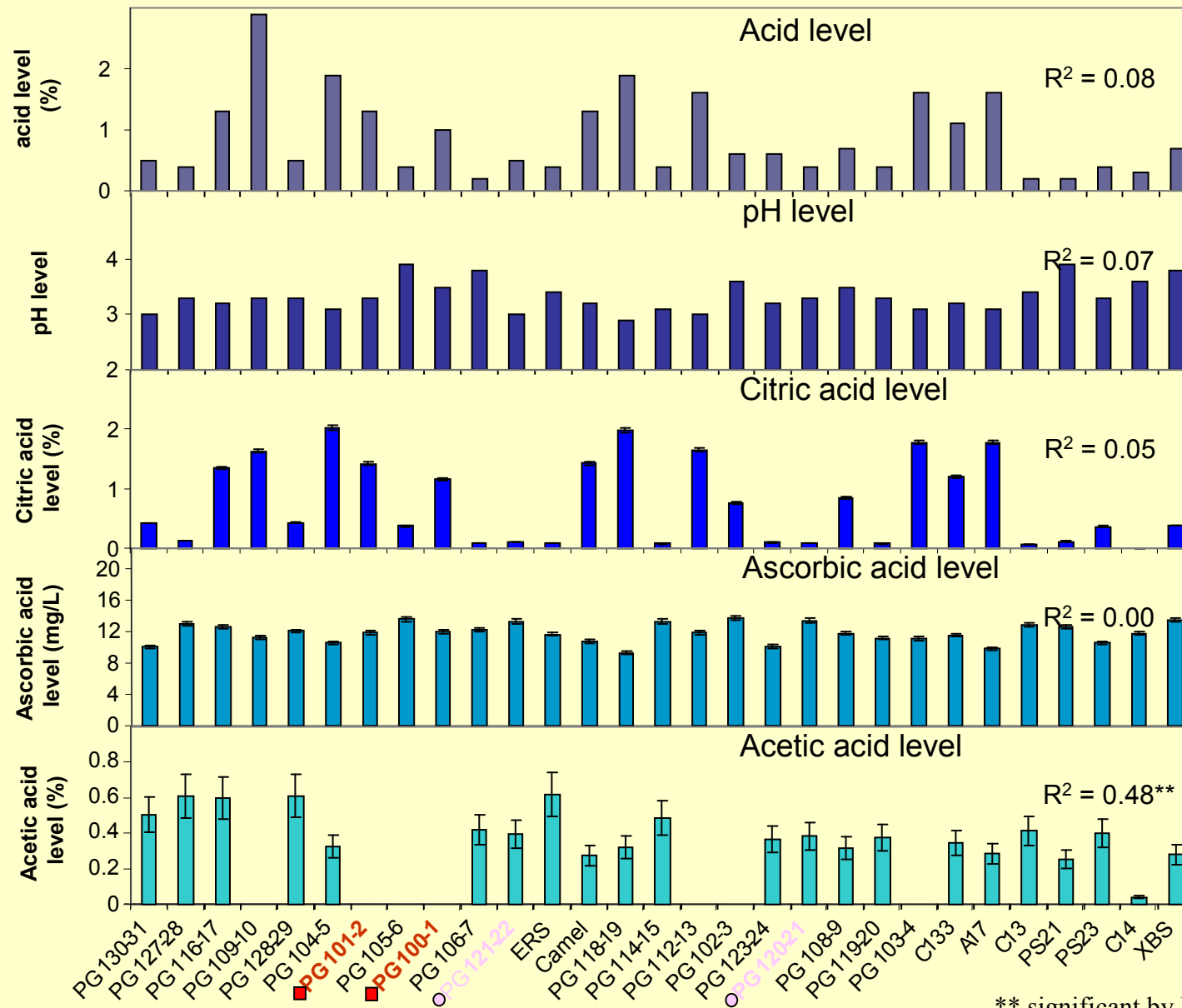


Antioxidant activity, total polyphenols, total anthocyanins, and the level of hydrolysable tannins in **aril juices**



\*\* significant by Pirson test , $\alpha=0.01$

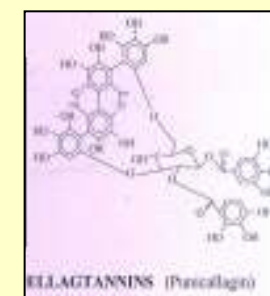
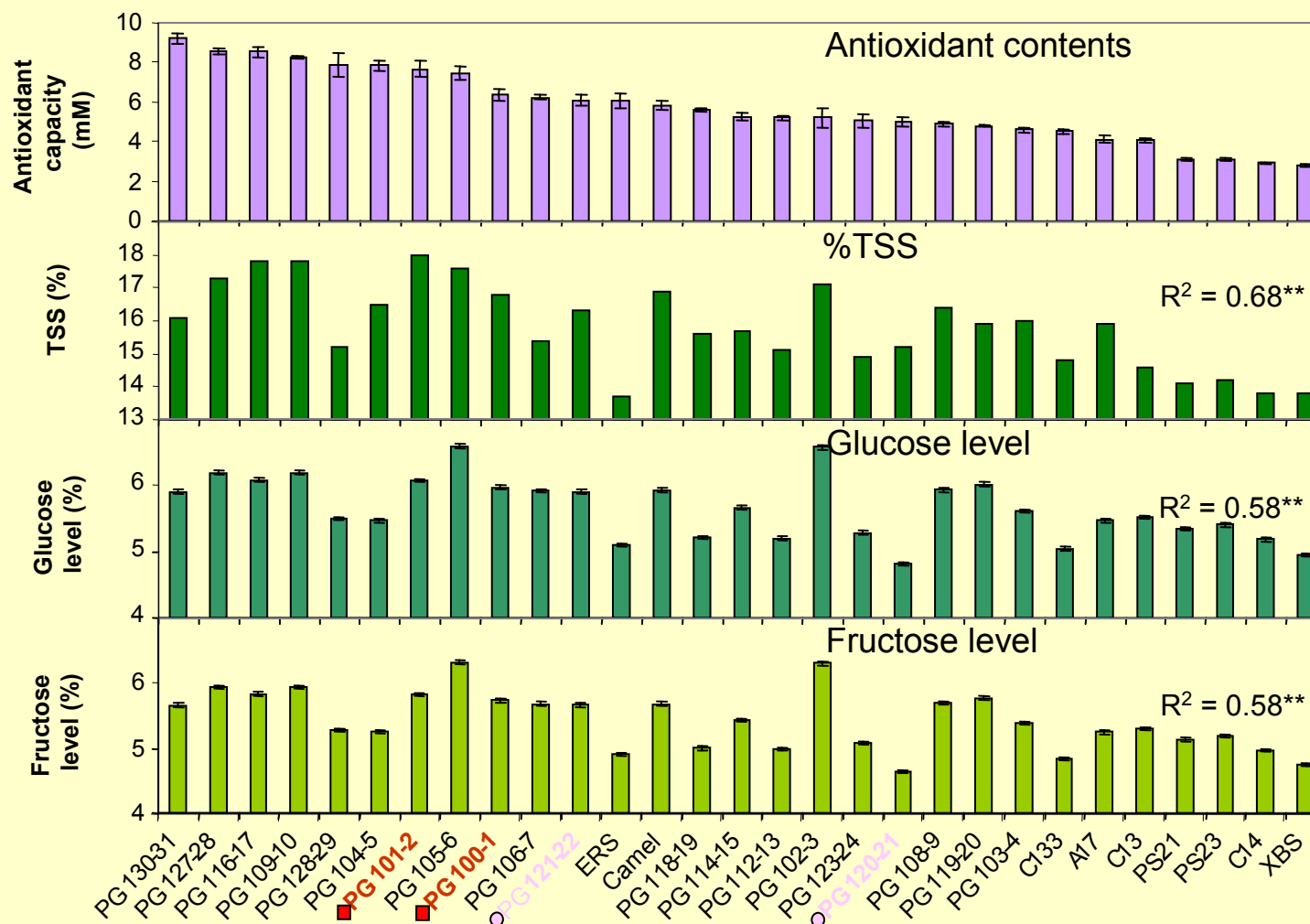
**No positive correlation was found between the acid level and the content of organic acids in the aril juices**



Obtained by HPLC

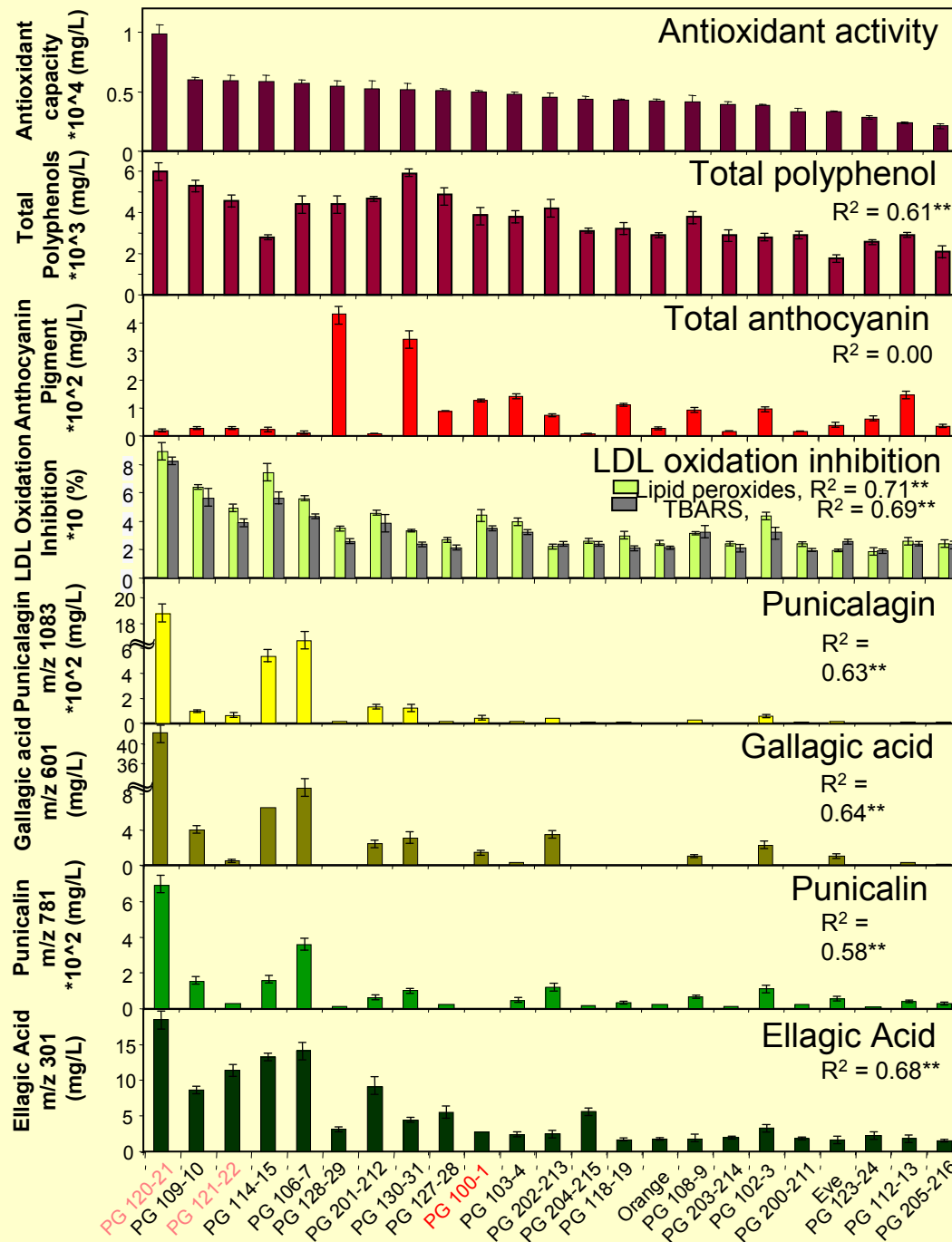
\*\* significant by Pirson test , $\alpha=0.01$

**Positive correlation was found between the TSS and the content of Glucose and fructose in the aril juices**

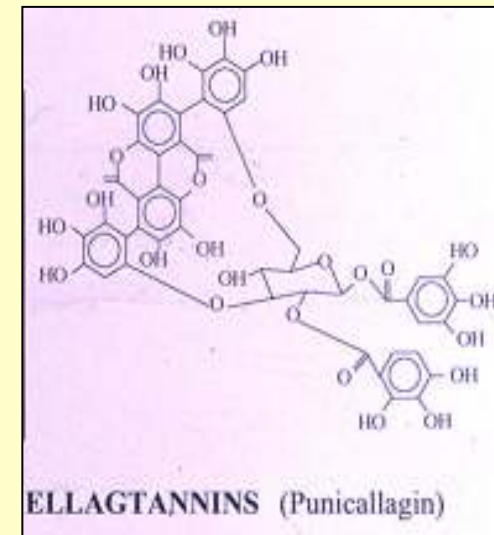


Obtained by HPLC

\*\* significant by Pirson test,  $\alpha=0.01$



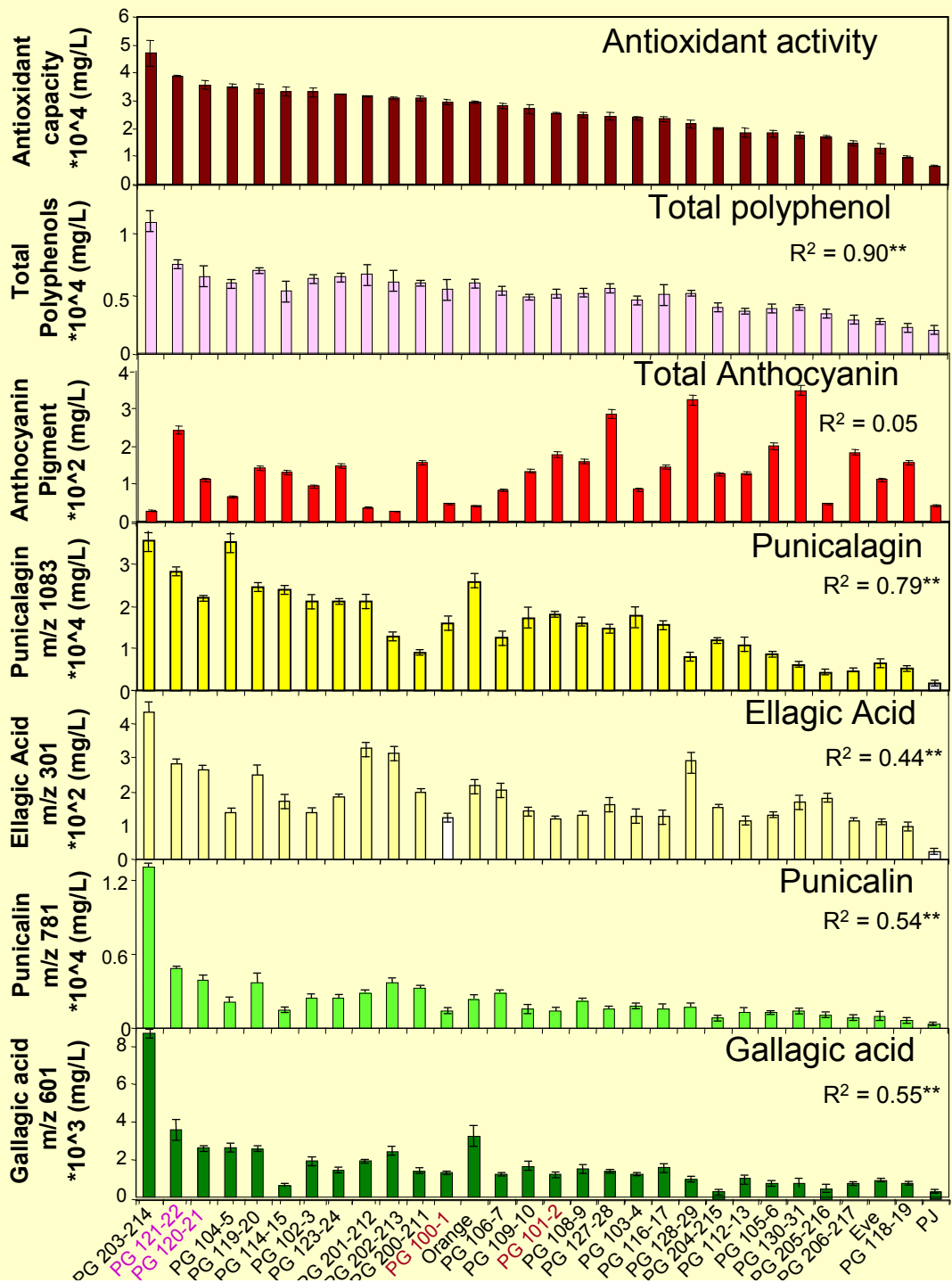
Antioxidant activity,  
 total polyphenols,  
 total anthocyanins,  
 and the inhibitory effect on  
 LDL oxidation in juices  
prepared by juice extractor



The antioxidant was increased  
 by 5 fold compare to juice  
 prepared only from arils



\*\* significant by Pirson test, α=0.01

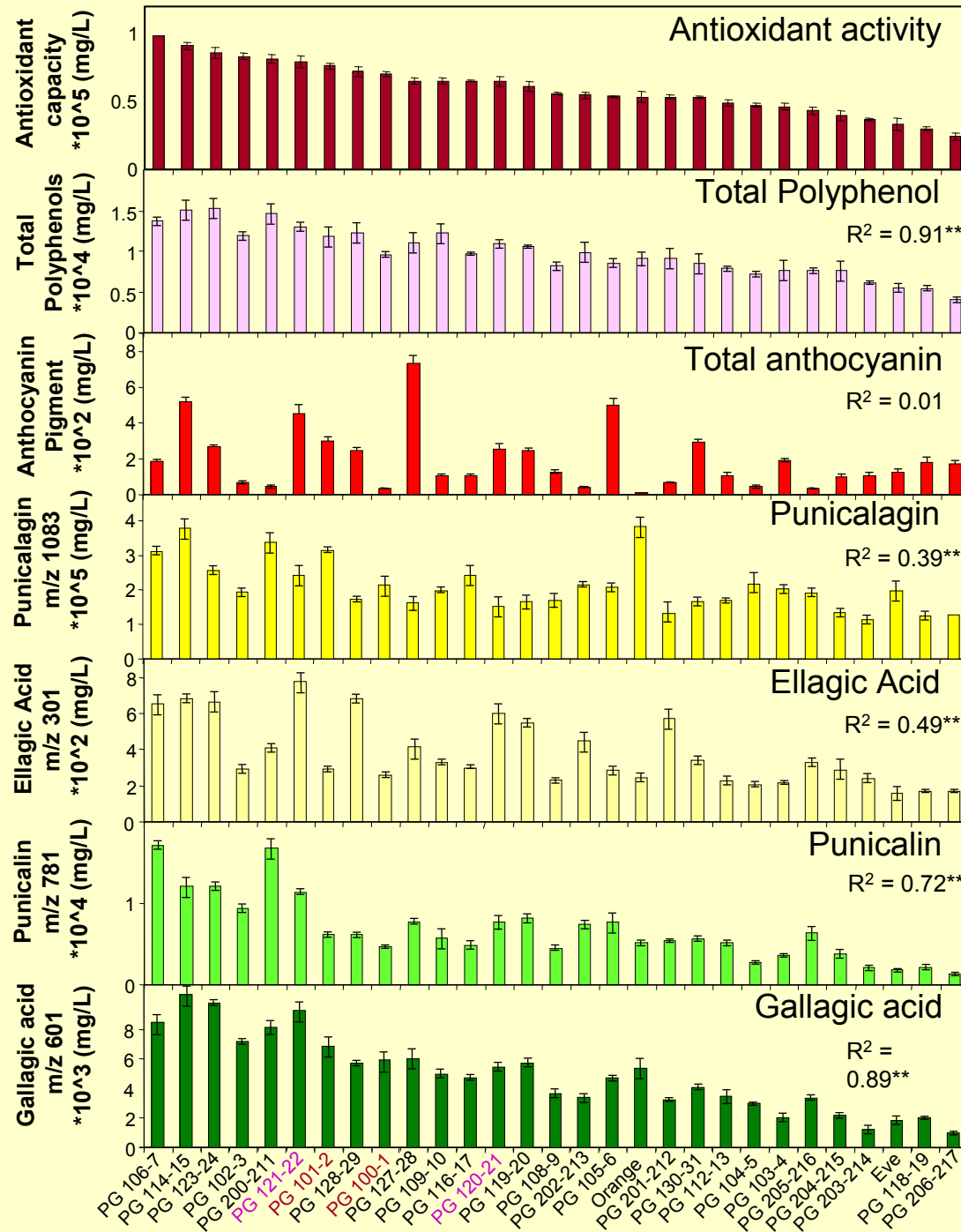


Antioxidant activity, total polyphenols, total anthocyanins, and the inhibitory effect on LDL oxidation in homogenates prepared from the whole fruit



The antioxidant was increased by 20 fold compare to juice prepared only from arils

\*\* significant by Pirson test,  $\alpha=0.01$



Antioxidant activity, total polyphenols, total anthocyanins, and the inhibitory effect on LDL oxidation in homogenates prepared from the peels

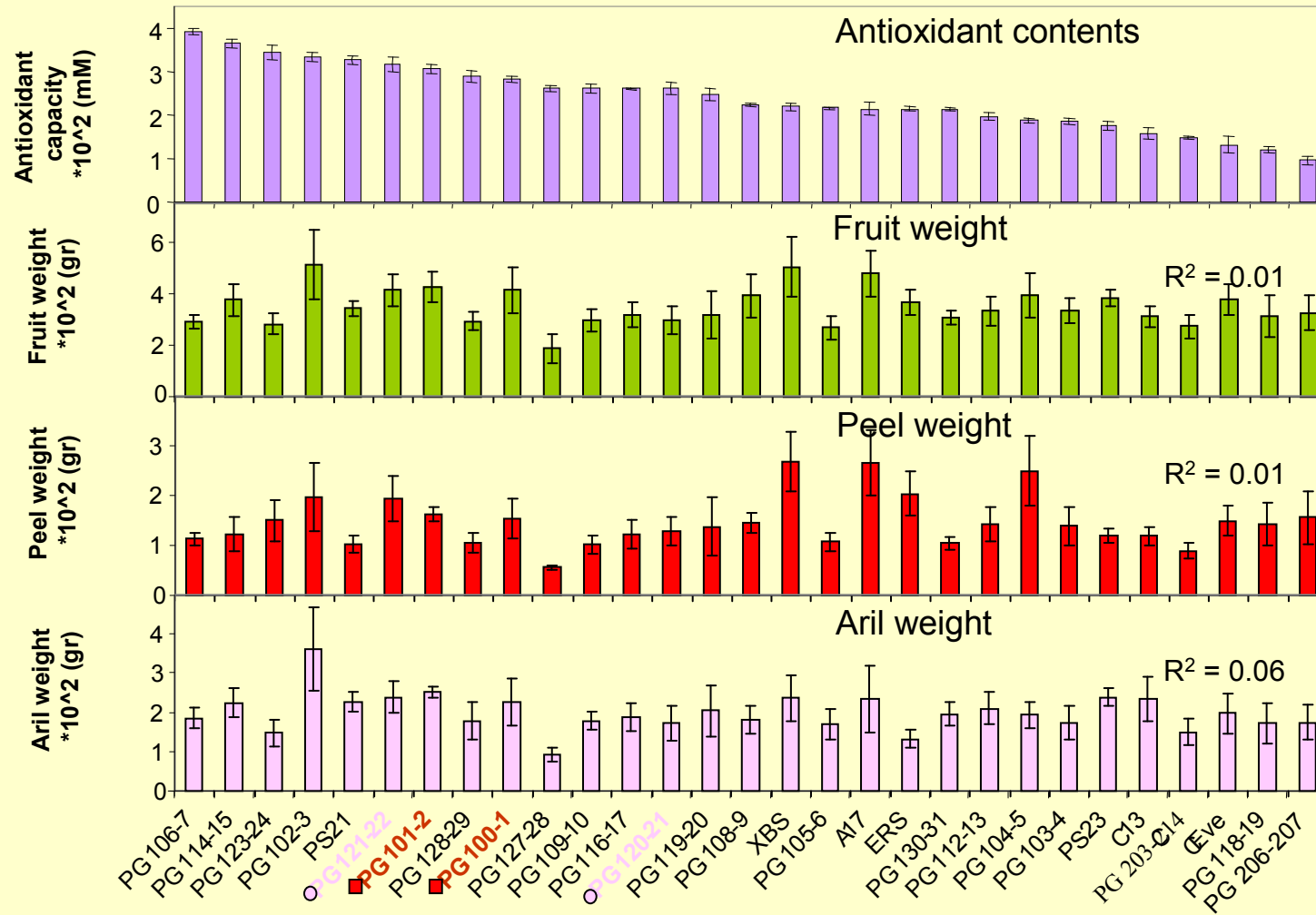
The antioxidant was increased by 40 fold compare to juice prepared only from arils



\*\* significant by Pirson test,  $\alpha=0.01$



# The antioxidant level is not correlated to the % of the peels from the fruits



## Summary

1. In arils juice- the antioxidant activity appear to be related to polyphenols and anthocyanins. This is accordance with other data demonstrated that in colored figs, apple, peaches and grapes the antioxidant level is significantly higher then in green fruits.



2. In homogenate prepared from the whole fruit, the level of the antioxidant increased by 20-fold suggested that the peels contributed significantly to antioxidant activity.
3. The predominant type of polyphenolic compounds extracted from the peels are the hydrosalbe tannins, composed mainly from punicalagin isomers, punicalin, gallagic acid and ellagic acid.



The study enlarge our knowledge about the natural variation of the antioxidant content and the compounds that give this activity.

It also identify the location and concentration of some phytochemical that have antioxidant activity in pomegranate fruits.

In the future, such information will enable breeders to select and breed genotypes having higher levels of health beneficial compounds and also provide useful information for addressing consumer choices for healthier products



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Prof. Miki Aviram, Technion, Faculty of Medicine, Haifa

Dr. Hamutal Borochoy, Mop Arava, Eilat

Dr. Igal Bar-Ilan, Migal, Kiryat Shmona

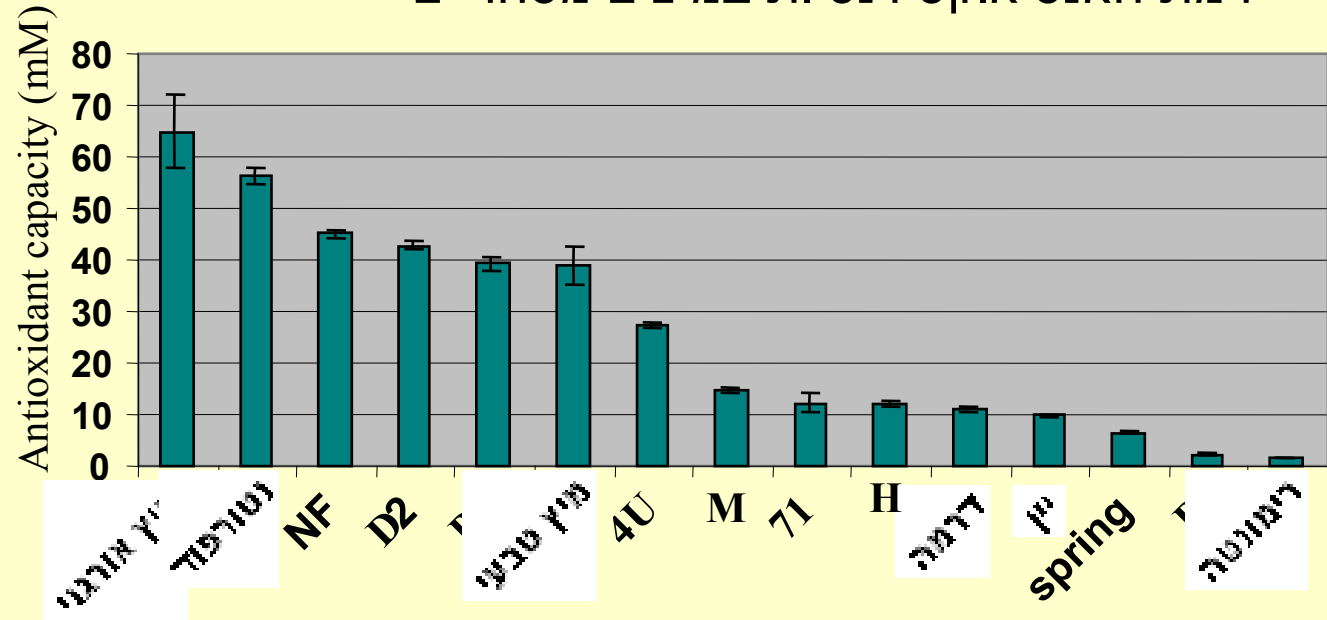
Prof. Ruth Ben-Arie, The fruit storage laboratory, Kiryat Shmona





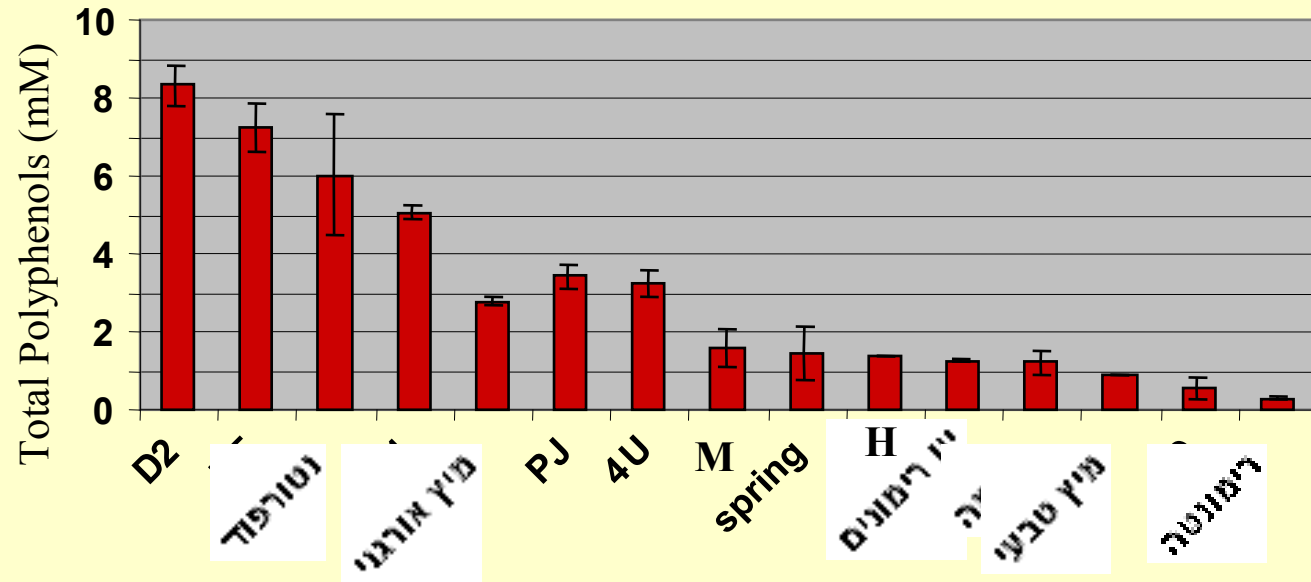
תודה על ההקשבה

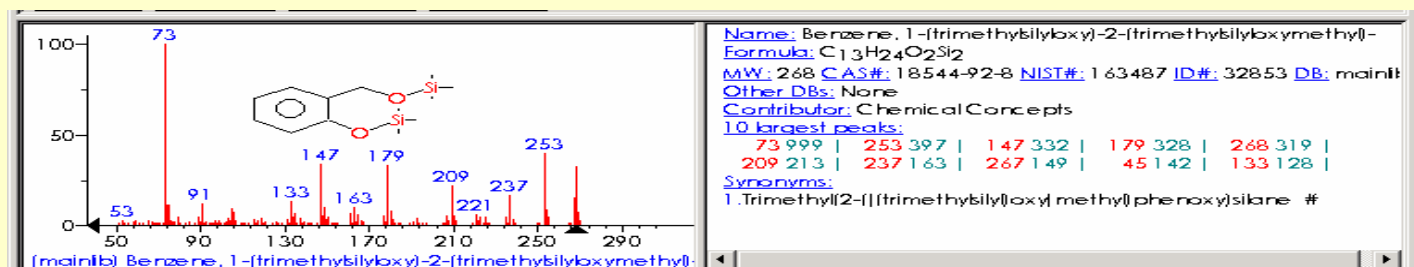
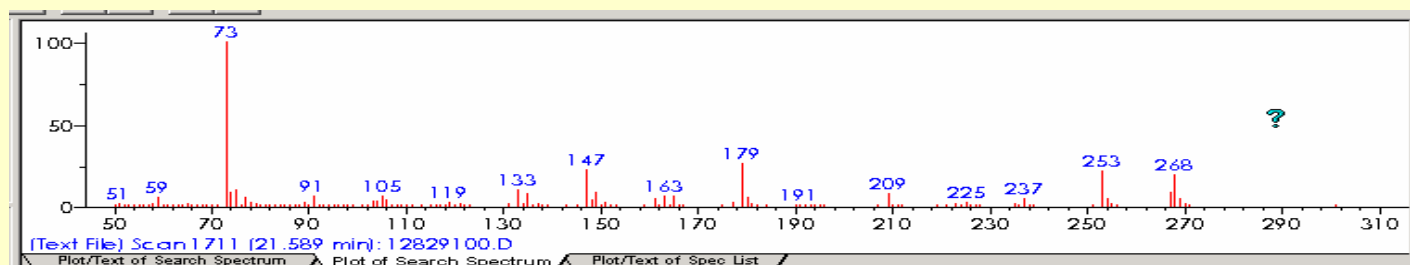
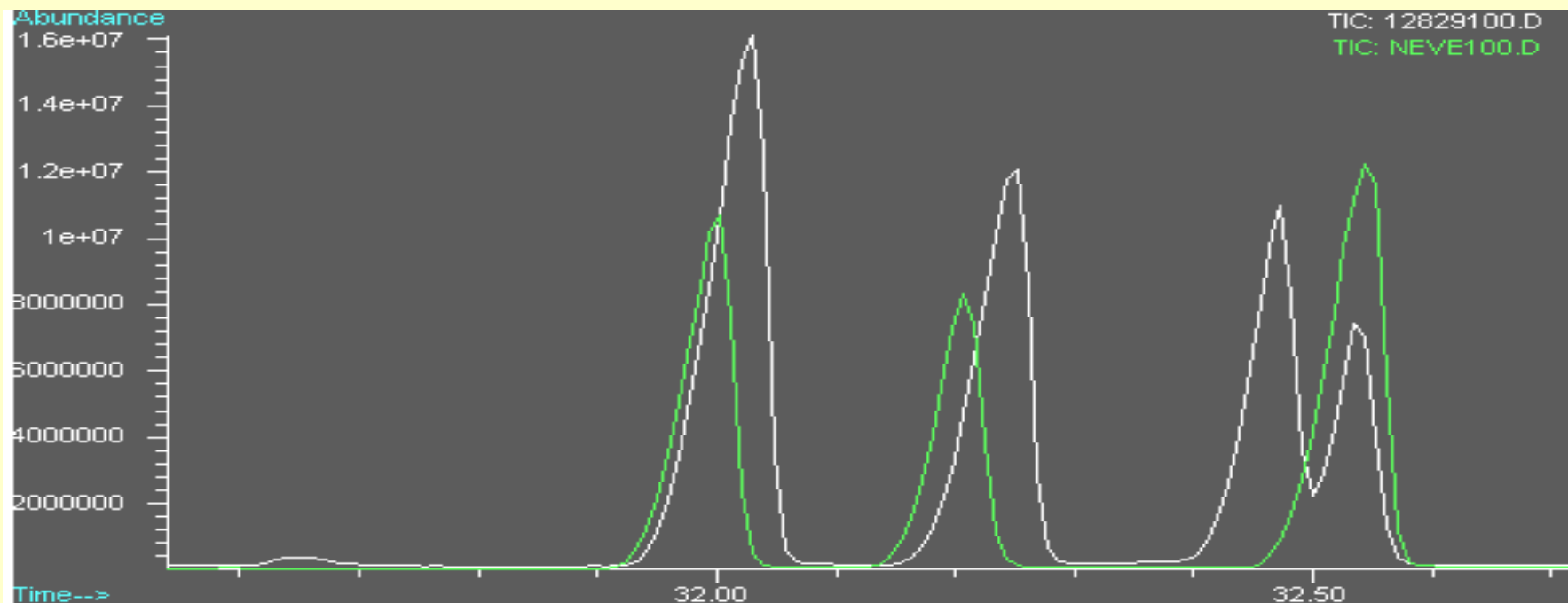
## רמת האנטיאוקסידנטיות במיצים מסחריים



NF – נטורפוד  
 מיץ אורגני מסחרי  
 D2 מיץ רימונים נסחט במסחטה  
 PJ מיץ מיקי מהול לשתייה  
 M- תרכיז רימונים ממולי  
 71- מיץ טרי מגרגירים בלבד  
 H- כנ"ל  
 יין רימונים- יקב דלתון  
 מיץ טבעי- מעמוס

## רמת הפוליפנולים במיצים מסחריים



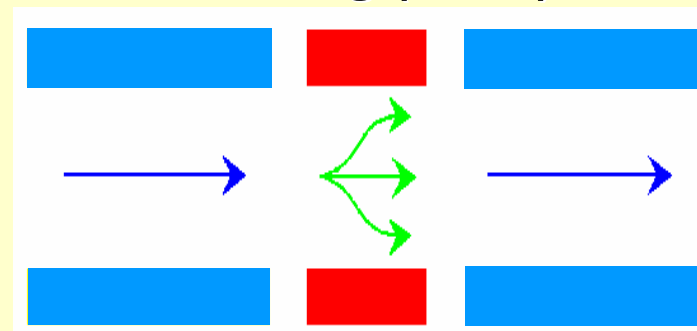




The identity of the hydrolysable-tannins obtained by using **Multiple Reaction Monitoring (MRM)** method of LC-MS-MS, according to their mother and daughter ions.

The Mother ion was fragmented by argon using different collision energies to daughter ions. The level of the typical daughter ion was then measured.

### Multiple Reaction Monitoring (MRM)



Q1

Q2

Q3

Single Ion m/z

Collision

Single daughter Ion m/z