

A trial for innovative development of food science and technology through agricultural sciences.

Nutraceutical benefits of natural products produced in
Seto inland sea area

Graduate School of Agriculture, Kagawa University
Hirotoshi Tamura, Prof. Food Chemistry

Development of new systems and products by the staff in Faculty of Agriculture, Kagawa University



pomology



Agricultural engineering

olericulture



agronomy



1,800ml

Sciences in biology, Environment, plant pathology, food and chemistry



Ornamental Horticulture

Biotechnology, micropropagation



Marine culture



1) Phytogene frontier

Phytogene sciences for getting resistance to environmental stress

2) Biochemistry and chemical biology

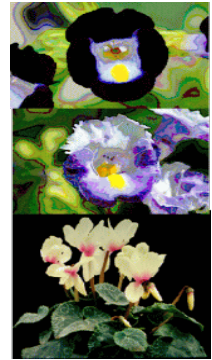
Understanding of biological activities by chemistry and biochemistry aspects

3) Food safety and nutraceutical science

Food safety and molecular nutrition studies for local food industries.

4) Agricultural resources and technology

Production technology of beneficial crops, fruits and vegetables fitting local climate

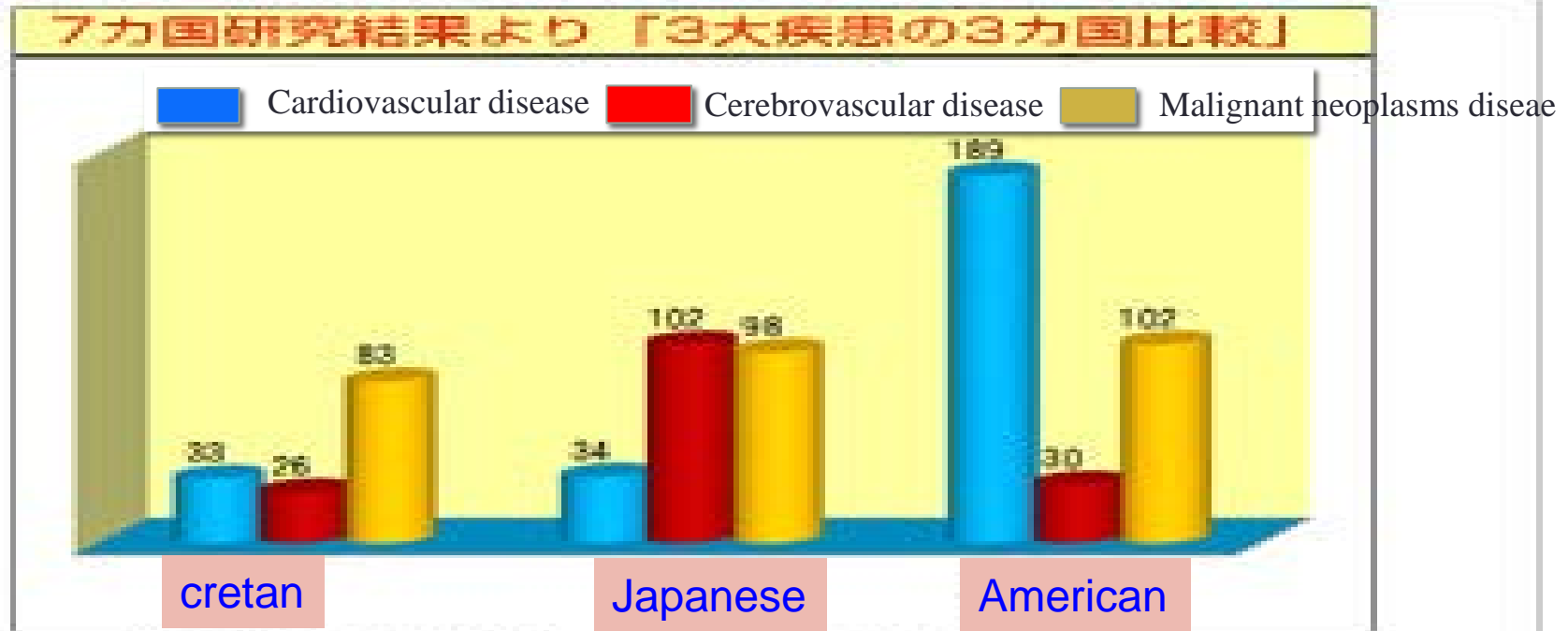


Possibility of agricultural business

- Tentative target: Olive oil production in Kagawa
- 1) metabolites in pomace portion of olive have several biological benefits for human health.
- 2) there are some varieties
- 3) seasonal change of metabolites and harvest time
- 4) there is the limitation of plantation. Mediterranean climate is required.
- 5) slightly high cost for consumers, but good tastes and characters like wines.

Character of mediterranean diets

Mediterranean diets is said to be healthy foods. So, people who live in mediterranean and used to have those foods as their daily meal did not have so many life-style related disease. Normally olive oil is common in the diets.



W. C. Willett: Eat, Drink, and Be Healthy より引用
 研究期間: 1960年代, 対象者: 中年男性, 人数: 10万人当たり

SETO IS ABUNDANT OF USEFUL FOODS MATERIALS

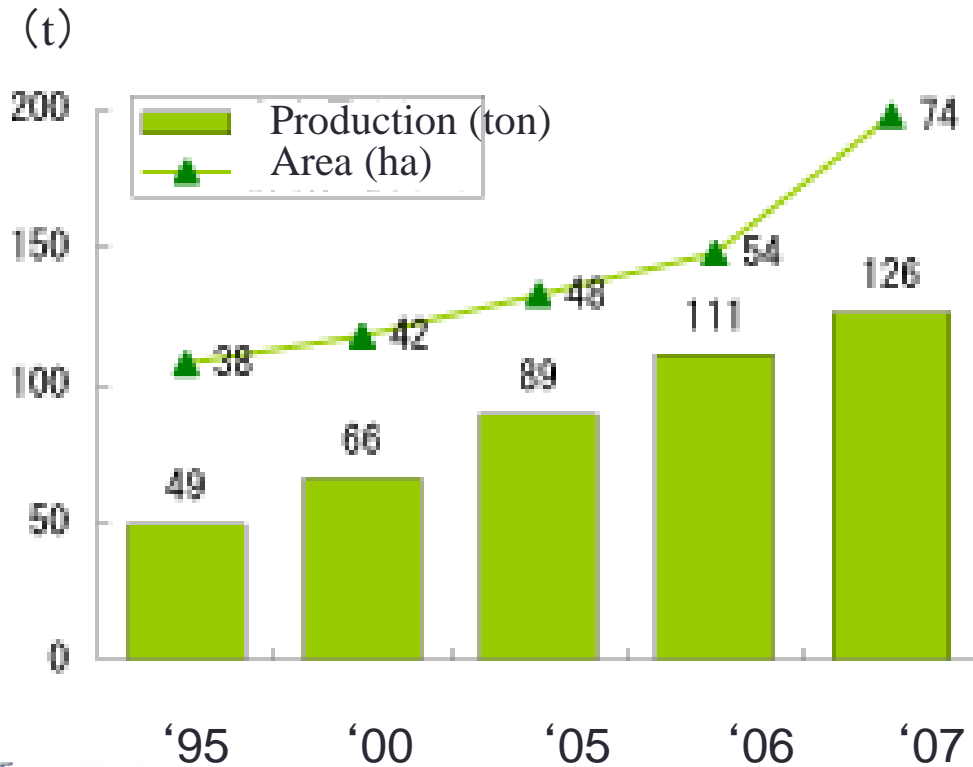


Cancer is the top of mortality in Japan (28.7%)
Allergy is spreading at 30% of the total population.

A half of People has *Helicobacter pylori* in stomach.

Patience of diabete disease is No 2 in Kagawa

Olive production in Japan



World production of olive oil in 2009

Spain	1,200,000
Italy	540,000
Greece	348,000
Siria	150,000
USA (California)	50,000
Japan (Kagawa)	140* (t)



Shodoshima Olive production association started in 2006

Anti-arteriosclerosis, whitening effect, anti-pylori, antioxidant, anti-allergy activities

Products: yellowtail and beef with olive fat.

Candy, tea, cosmetics and supplements



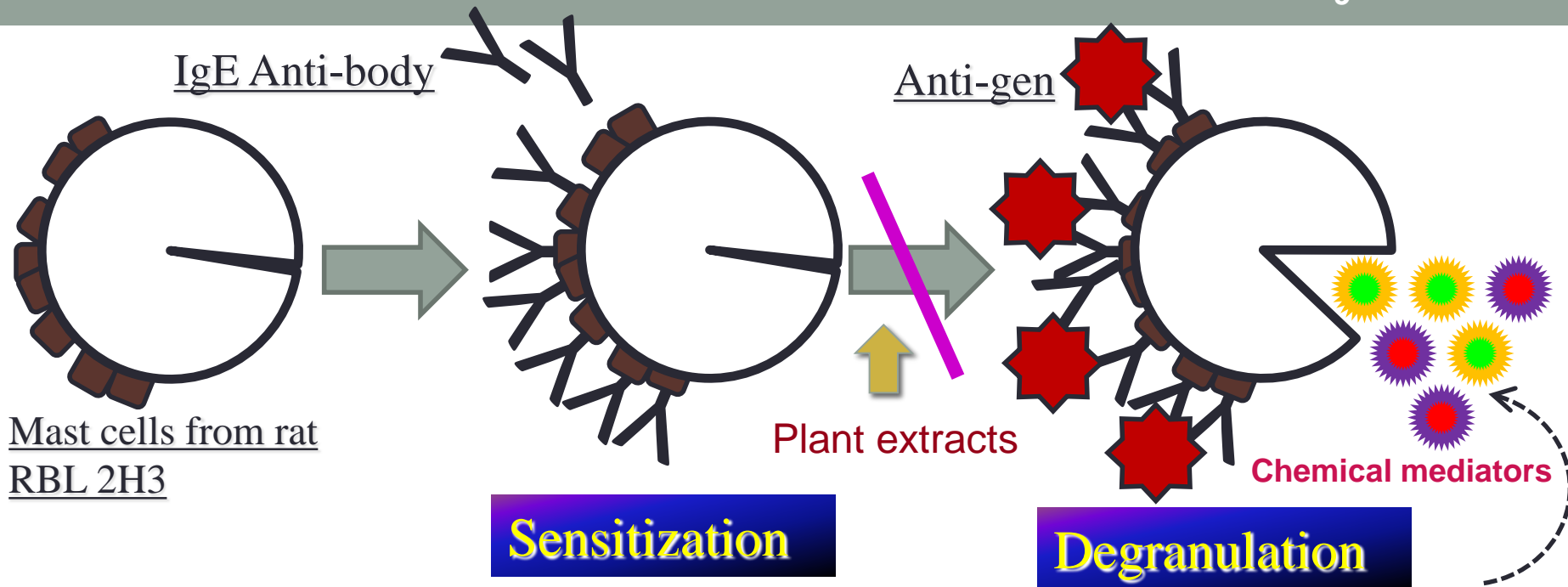
Significance of food allergy in Japan

- A half of Japanese may have some kinds of allergies.
- Patients are increasing year by year in Japan. It becomes one kind of popular social problems. Thailand is not so serious problems in the society.
- Food packages have to display a list of food materials that has related some serious food allergies.

Hypothesis:  food habits changed our tolerance to food allergy

- 1) Bitter taste of olive is one kind of character of extra virgin oil
- 2) Vegetables is not bitter and astringency





- Dilatation of blood vessels
- Hyperlucency

Physiological active substances

- Histamine
- Leukotriene
- Serotonin etc

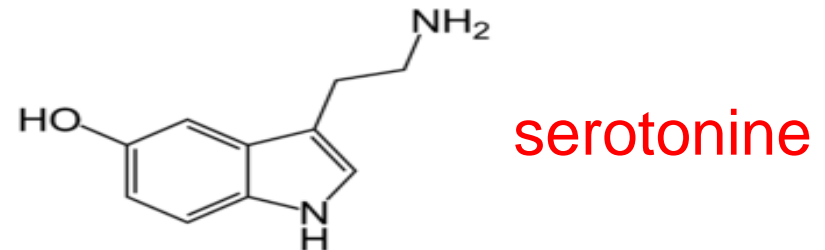
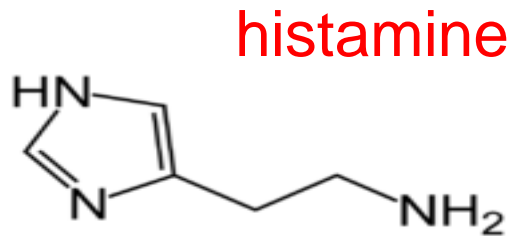
- Edema
- Pruritus



Drug design against Allergy

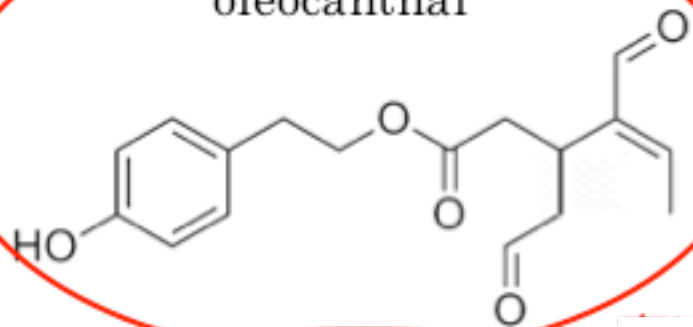


- Steroid drug
 - Anti-Histamine drug
- side effects

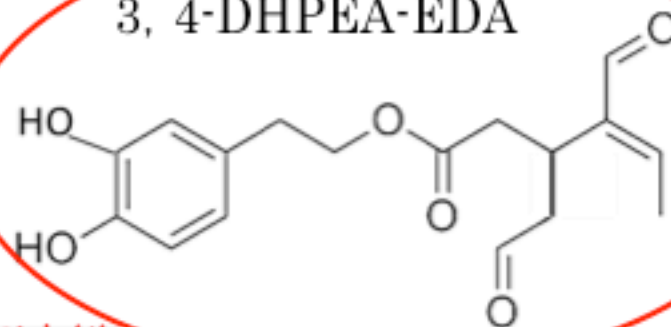


- Anti-Allergic drug
- few side effects

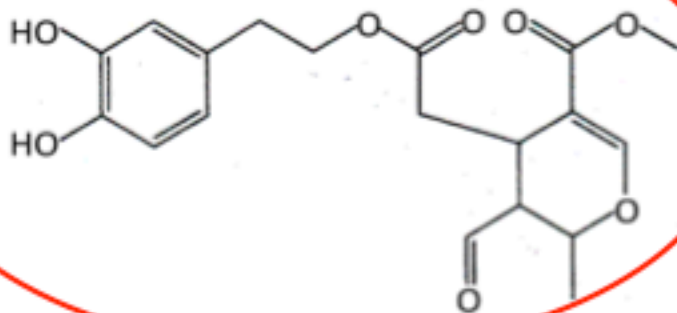
oleocanthal



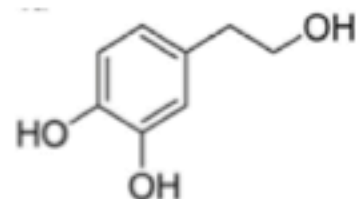
3, 4-DHPEA-EDA



3, 4-DHPEA-EA



hydroxytyrosol



Metabolites in pomace of olive fruit are unique in biological activities such as antioxidant, anti-inflammatory, anti-allergic, whitening, anti-pyrolin and other activities.

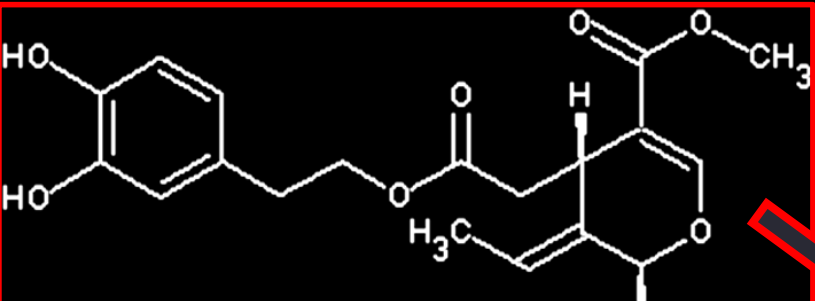
Comparison of the activities of oleuropein aglycone with crude extracts of olive pomace

Pomace extract [$\mu\text{g}/\text{mL}$]	200	400	600	800
Contents of oleuropein aglycone [$\mu\text{g}/\text{mL}$]	7.6	15.2	22.8	30.4
β -hexosaminidase Releasing rate[%]	100	70.55	36.59	28.09

Activity of pure oleuropein aglycone

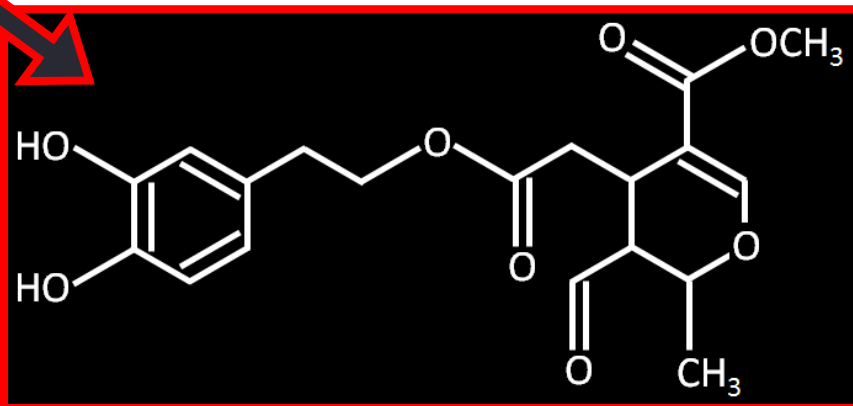
Pure Oleuropein aglycone [$\mu\text{g}/\text{mL}$]	10	20	50	100
β -hexosaminidase Releasing rate [%]	93.71	42.17	17.25	8.65

Active chemical in olive was determined to be oleuropein aglycone



Oleuropein

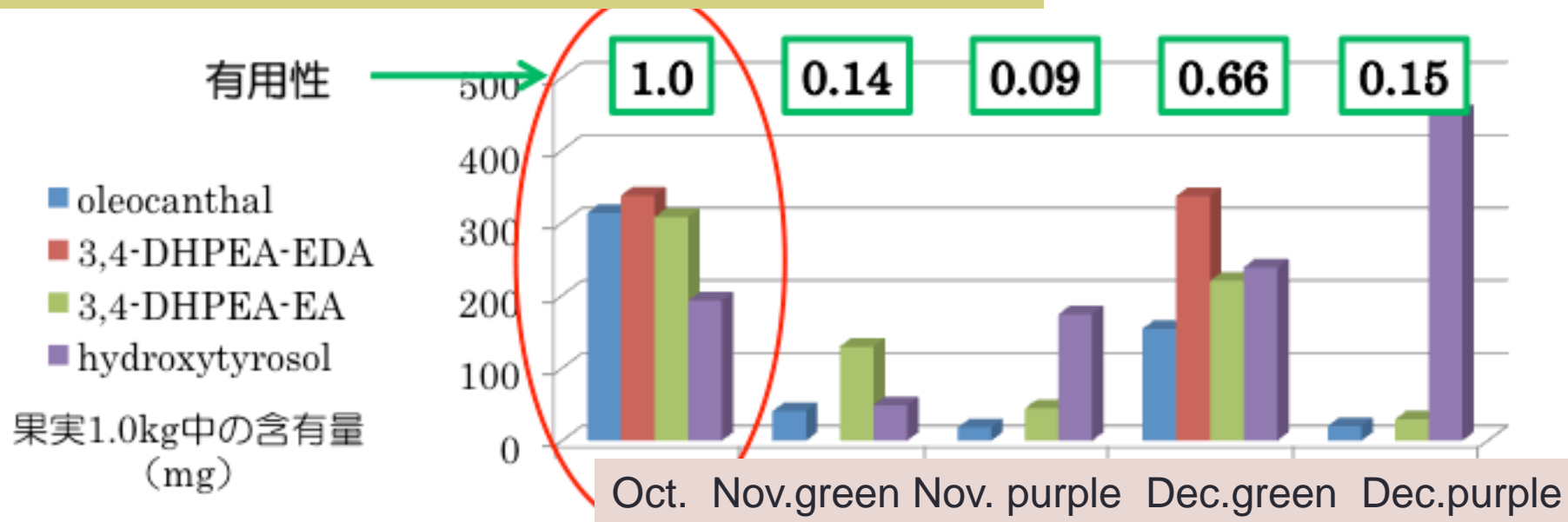
Chemical change after removing a glucose



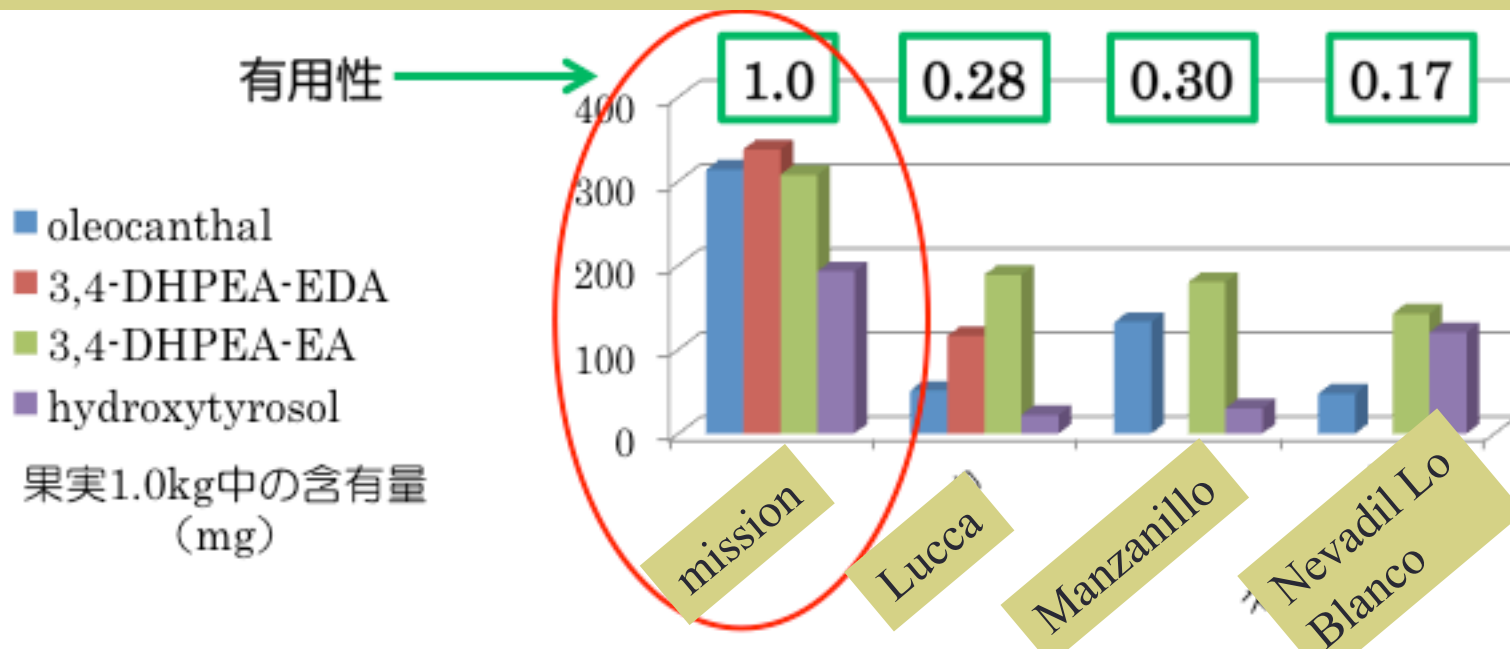
Oleuropein aglycone

Active chemical in olive pomace was proved.

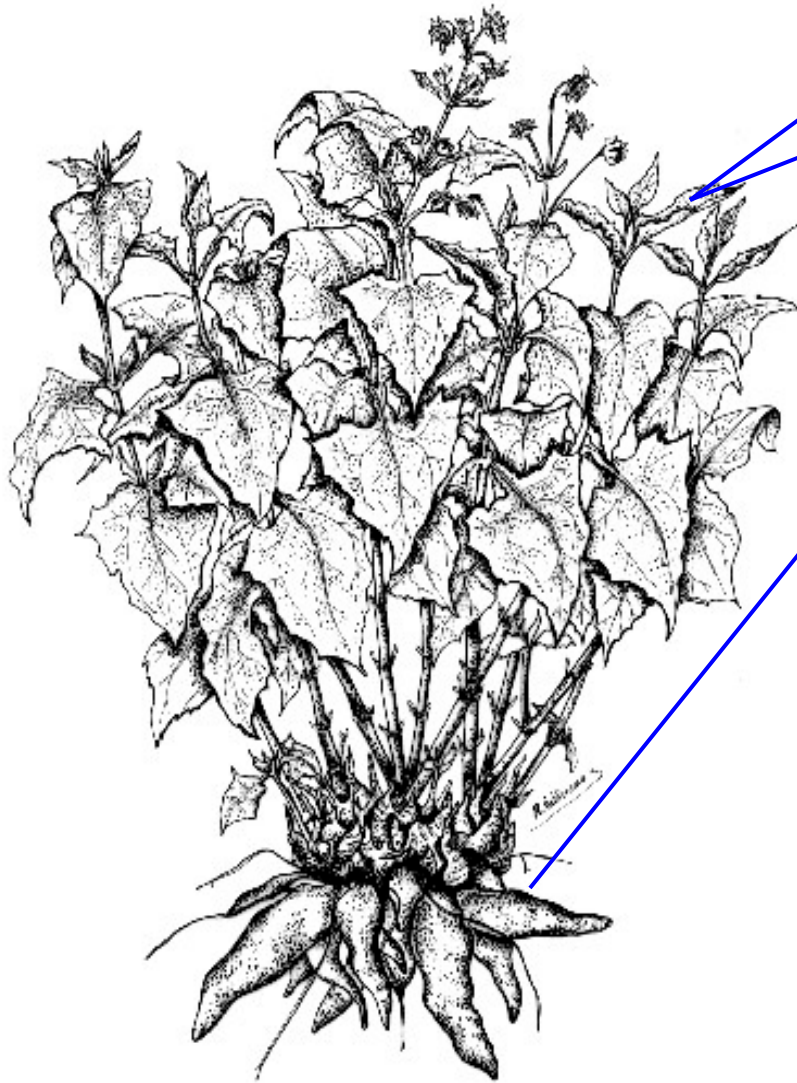
Comparison of metabolites during maturation



Comparison of metabolites in the different varieties of olive plants



Meaning of chemicals in yacon



Anti-glycemic

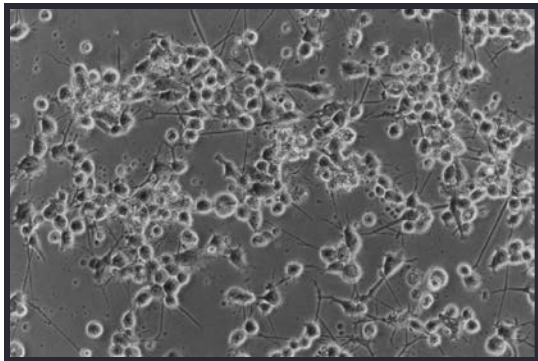
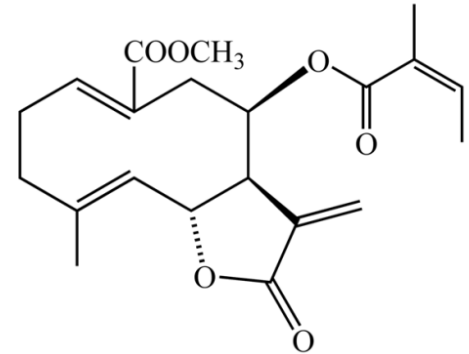
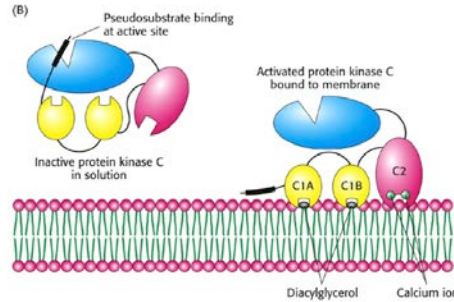
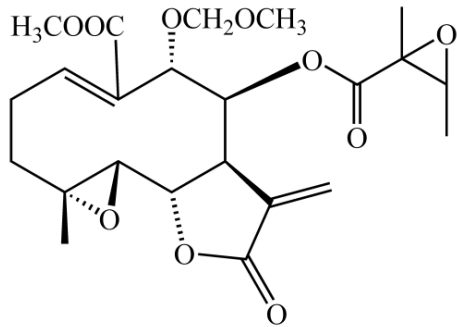
Antioxidant

Chlorogenic acid
Caffeic acid and derivatives

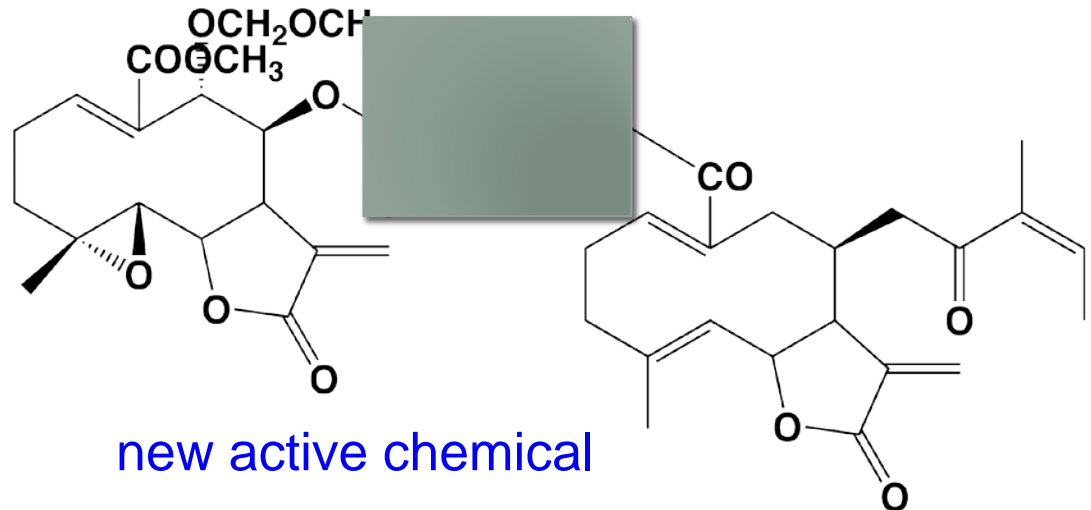
Fructooligosaccharides (FOS)



Anti-cancer promotion activity was tested



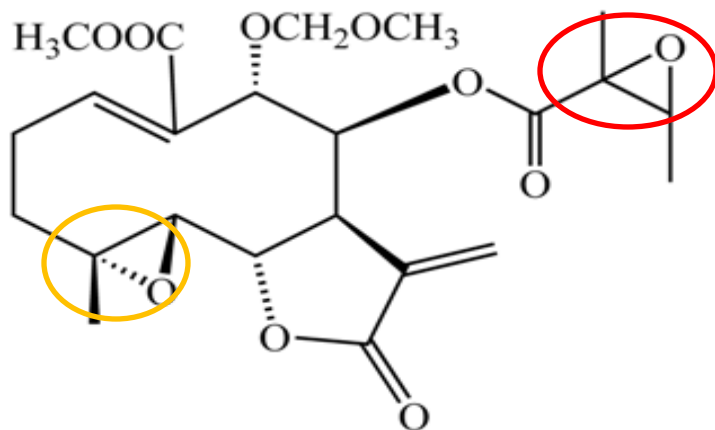
Deformation of cells



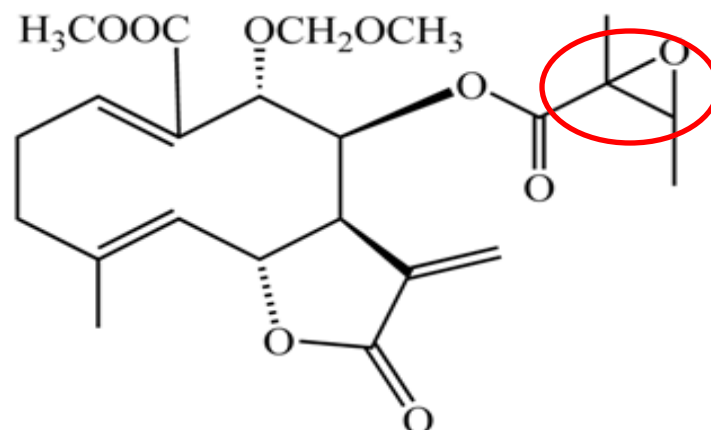
new active chemical

We would like to correlate the dose effects of SLs to anti-deformation with protection of TPA promotion of PKC binding.

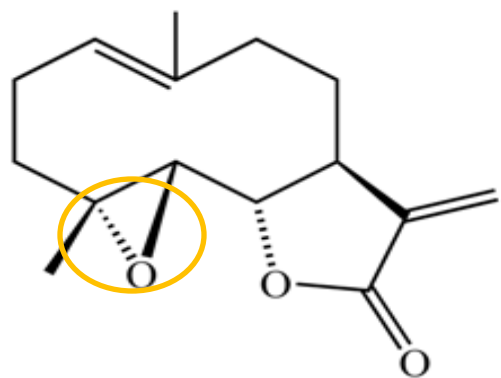
Structure – activity relationship



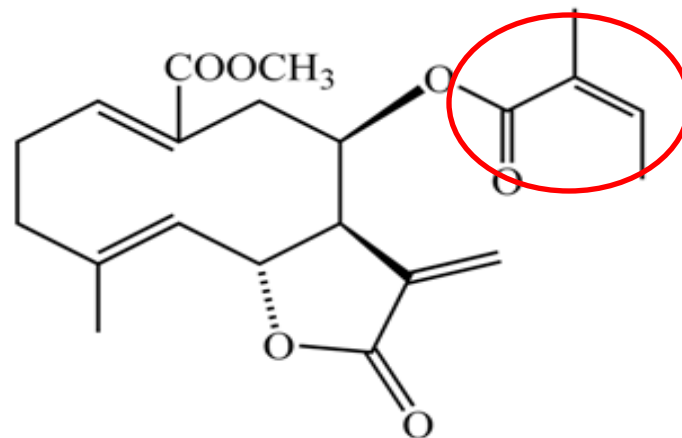
enhydrin (1)



uvedalin (2)



parthenolide (4)



sonchifolin (3)

Agricultural science innovation to the local industries.

- 1) value addition to some varieties of food materials
- *Nutraceutical benefits will be added to some varieties. Collaboration among agricultural production, health science, food processing technology will offer valuable varieties.*
- 2) wasting material changes to useful bioresources.
- *Environmentally friendly usage of food material gives economical merits and decrease CO₂ consumption.*
- 3) sextic sector of industries. *(1st sector*2nd sector*3rd sector)*
- *Agriculture, food processing and agro-business (Food system) must be considered the collaboration one another to innovate local agricultural production.*
- *Local issues will be considered well by researchers.*

Difference of food habits in countries

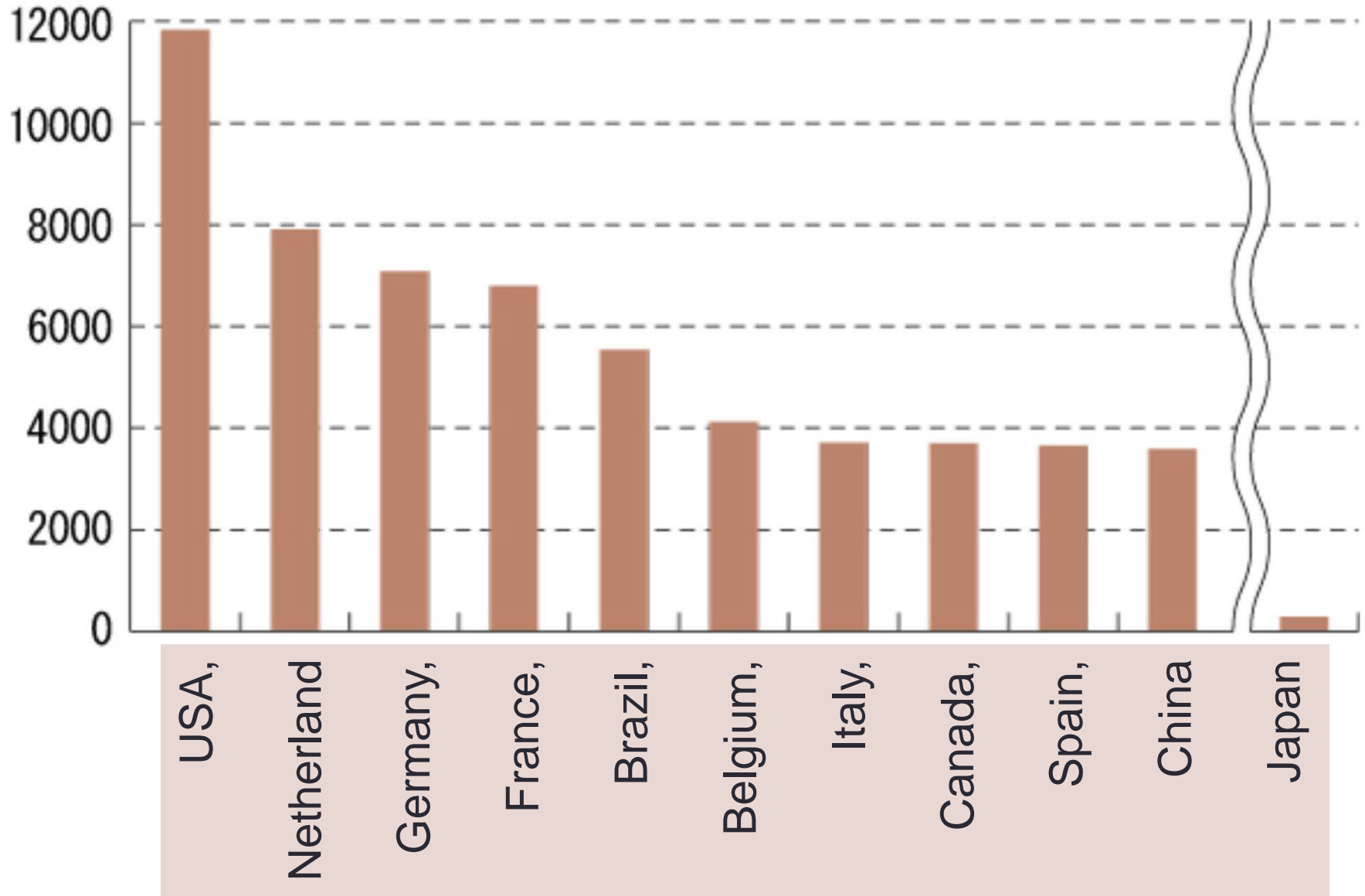


Cereals &
Plant and fish
proteins



Meat and
fatty foods

10million dollar



Export of agricultural products by money basis (2008).

What we can do for next steps in agricultural bussiness ?

- **Revolution in TPP.** It may give a chance to change economic trends and give more chances to agricultural production and markets.
- *Netherland is small country like Kyushu island and 46% of their land is for agricultural production. Export of agricultural products is No 2 in the world with 75.5bilion US\$. Major products are tulip(12%), potato, tomato, cucumber, beef, cheese (4.3%), tabacco (4.0%) and beer (2.4%).*
- **Innovation** of agricultural industries will realize the revolution of Japanese style of agricultural business.

A collage of fresh vegetables including a red bell pepper, an asparagus spear, and an eggplant. The background is a light, neutral color with a subtle grid pattern.

Thank you very much for your kind attention !