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Cooperation to Implement Innovative Methods for the
Assessment of Medicinal Plants with Central Roles in
Pharmaceutics, Agriculture and Nutrition



UNIVERSITY of CALABRIA

Influence of geolocation on the composition of phytocomplexes

Department of Pharmacy, Health and Nutritional Sciences

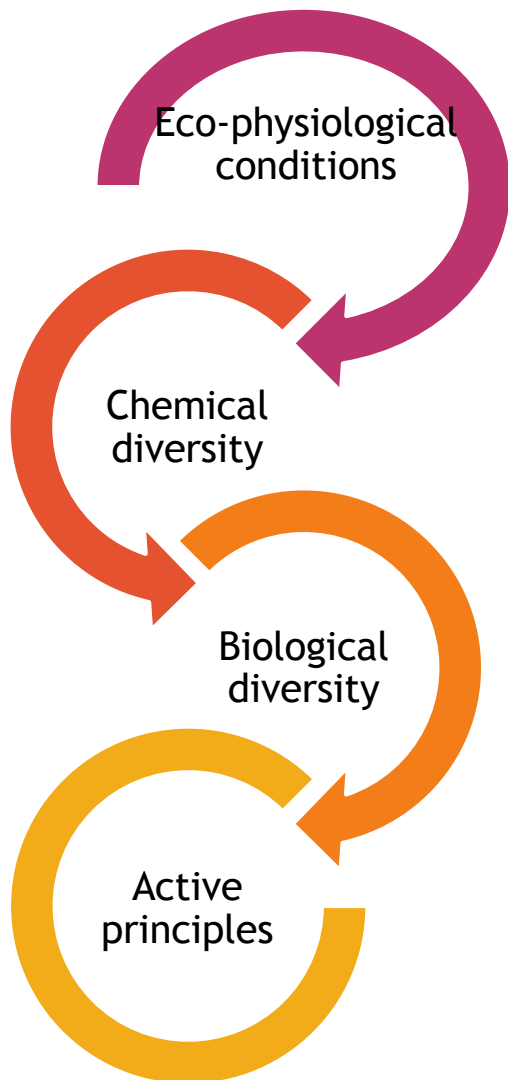


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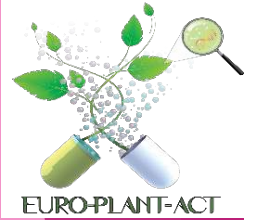


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Biodiversity



- ✓ *Specie diversity*
- ✓ *Environmental diversity*
- ✓ *Biological diversity*



Climate- temperature-
soil constitution

different
biological activity

Phytocomplex

Synergies or antagonisms of action

Content of active ingredients in dynamic relationship with various factors.



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IVERSITY – Vol. 8 (2011)

Factors, Chemical Composition, and
Antioxidative Properties of Caper Species Growing Wild in Calabria (South
Italy)

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Capparis sicula

Biodiversity

CHEMISTRY & BIODIVERSITY – Vol. 8 (2011)

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Table 1. Collection Sites of Calabrian Caper Samples, Italy

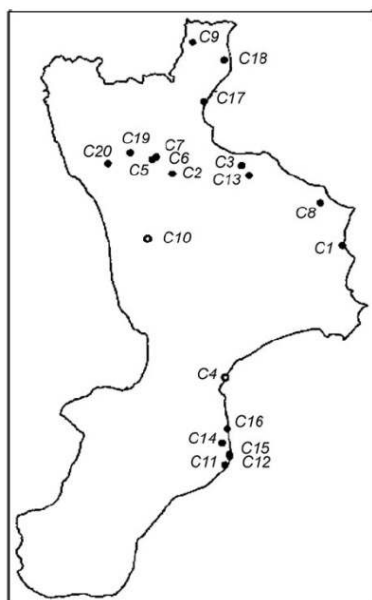


Fig. 1. Map of collection sites of Calabrian caper. ○: *Capparis orientalis* and ●: *Capparis sicula* ssp. *sicula*.

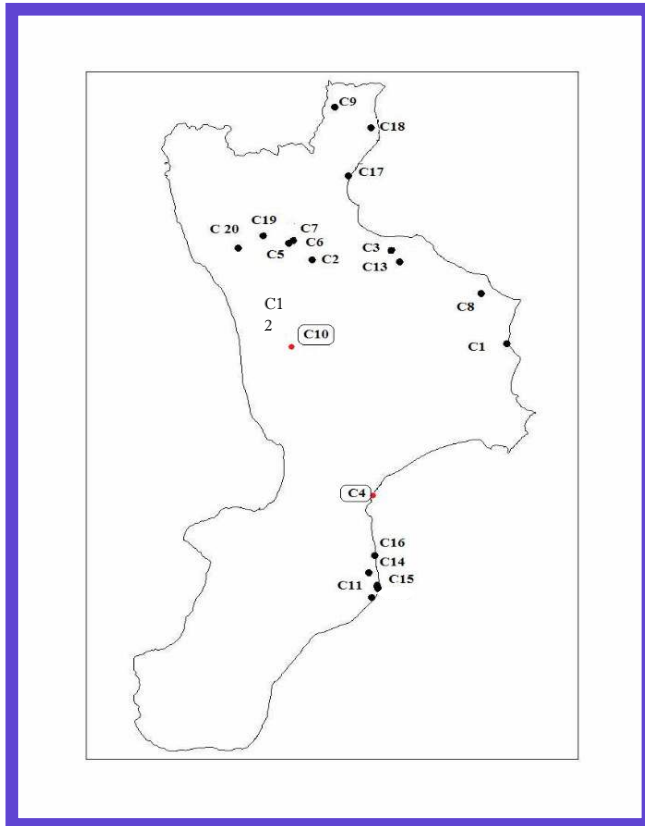
Sample	Collection site	Substrata	<i>Capparis</i> species
C1	Strongoli, close to road ss 106	Clay soil	<i>C. sicula</i> VEILL. ssp. <i>sicula</i>
C2	Valley Galatrella	Clay soil	<i>C. sicula</i> VEILL. ssp. <i>sicula</i>
C3	River Colognati	Calcareous rocks	<i>C. sicula</i> VEILL. ssp. <i>sicula</i>
C4	Close to Copanello village	Granodiorite sea cliff	<i>C. orientalis</i> VEILL.
C5	Close to Tarsia village close to cemetery	Clay soil	<i>C. sicula</i> VEILL. ssp. <i>sicula</i>
C6	Close to Tarsia village close to cemetery	Bricks wall	<i>C. sicula</i> VEILL. ssp. <i>sicula</i>
C7	Close to Tarsia village	Clay soil	<i>C. sicula</i> VEILL. ssp. <i>sicula</i>
C8	Castle of Crucoli village	Stony wall	<i>C. sicula</i> VEILL. ssp. <i>sicula</i>
C9	Close to Oriolo village	Calcareous rocks	<i>C. sicula</i> VEILL. ssp. <i>sicula</i>
C10	Castle Svevo Cosenza town	Stony wall	<i>C. orientalis</i> VEILL.
C11	Cape Stilo on the Light house	Stony wall	<i>C. sicula</i> VEILL. ssp. <i>sicula</i>
C12	Castle San Fili	Stony wall	<i>C. sicula</i> VEILL. ssp. <i>sicula</i>
C13	Close to Paludi (Rossano) village	Calcareous rocks	<i>C. sicula</i> VEILL. ssp. <i>sicula</i>
C14	Close to Guardavalle village	Stony wall	<i>C. sicula</i> VEILL. ssp. <i>sicula</i>
C15	Close to Guardavalle village	Clay soil	<i>C. sicula</i> VEILL. ssp. <i>sicula</i>
C16	Close to S. Catterina village	Clay soil	<i>C. sicula</i> VEILL. ssp. <i>sicula</i>
C17	Villapiana village	Clay soil	<i>C. sicula</i> VEILL. ssp. <i>sicula</i>
C18	River Amendolara	Calcareous rocks	<i>C. sicula</i> VEILL. ssp. <i>sicula</i>
C19	Close to Roggiano Gravina village	Clay soil	<i>C. sicula</i> VEILL. ssp. <i>sicula</i>
C20	Close to Malvito village	Granites rocks	<i>C. sicula</i> VEILL. ssp. <i>sicula</i>





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Upparis sicula subsp. *sicula*



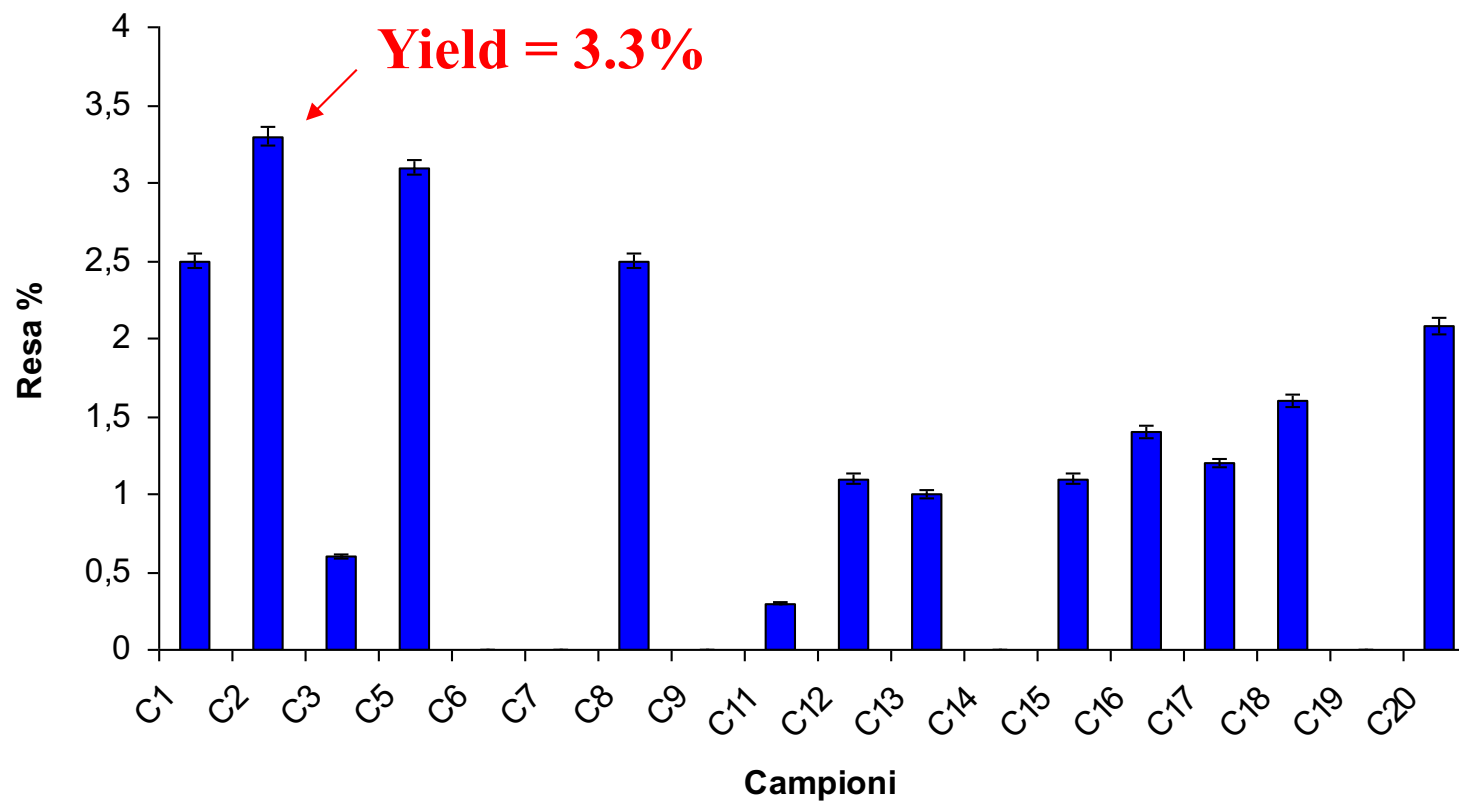
Map Calabria Region

	Collection site	S
C1	Strongoli, ss 106 (KR)	cal
C2	Vallone Galatrella (CS)	calanchi
C3	Tor. Colognati (CS)	calcare
C4	Copanello (CZ)	diorite, granodiorite
C5	Tarsia cimitero (CS)	calanchi
C6	Tarsia cimitero (CS)	muro, mattoni
C7	Tarsia (CS)	calanchi
C8	Crucoli castello (KR)	muro, pietra calce
C9	Oriolo 550 m.alt. (CS)	calcare
C10	Castello svevo di Cosenza	muro, pietra calce
C11	Faro Punta Stilo (CZ)	muro, pietra calce
C12	Castello San Fili (CS)	muro, pietra calce
C13	Paludi (Rossano) (CS)	calcare
C14	Contrada Sic. Guardavalle (CZ)	muro, secco calce
C15	Guardavalle (CZ)	calanchi
C16	S. Caterina (CZ)	calanchi
C17	Villapiana (CS)	calanchi
C18	Fiumara Amendolara (CS)	calcare
C19	Roggiano Gravina (CS)	calanchi
C20	Malvito (CS)	rocce silicatiche

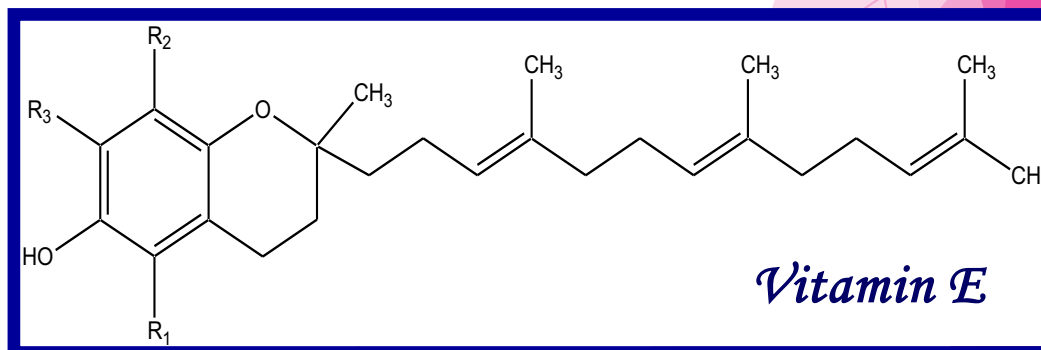


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Yield % Vitamin E



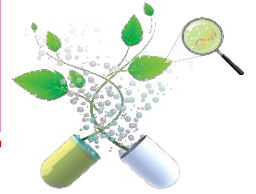
Capparis sicula subsp. *sicula*





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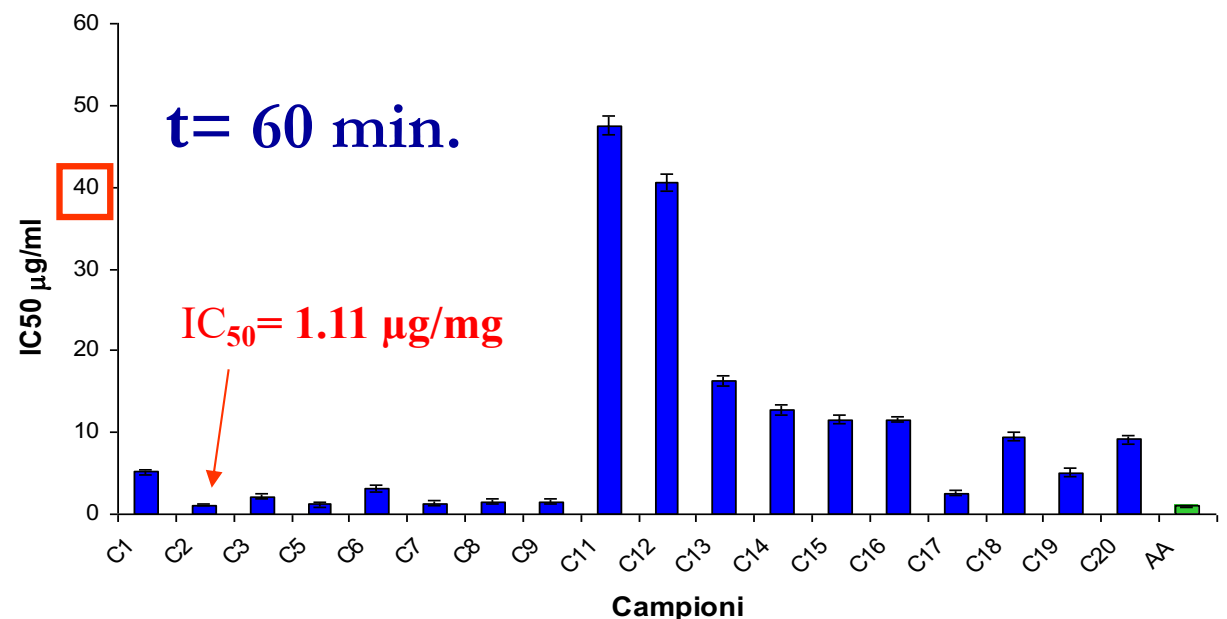
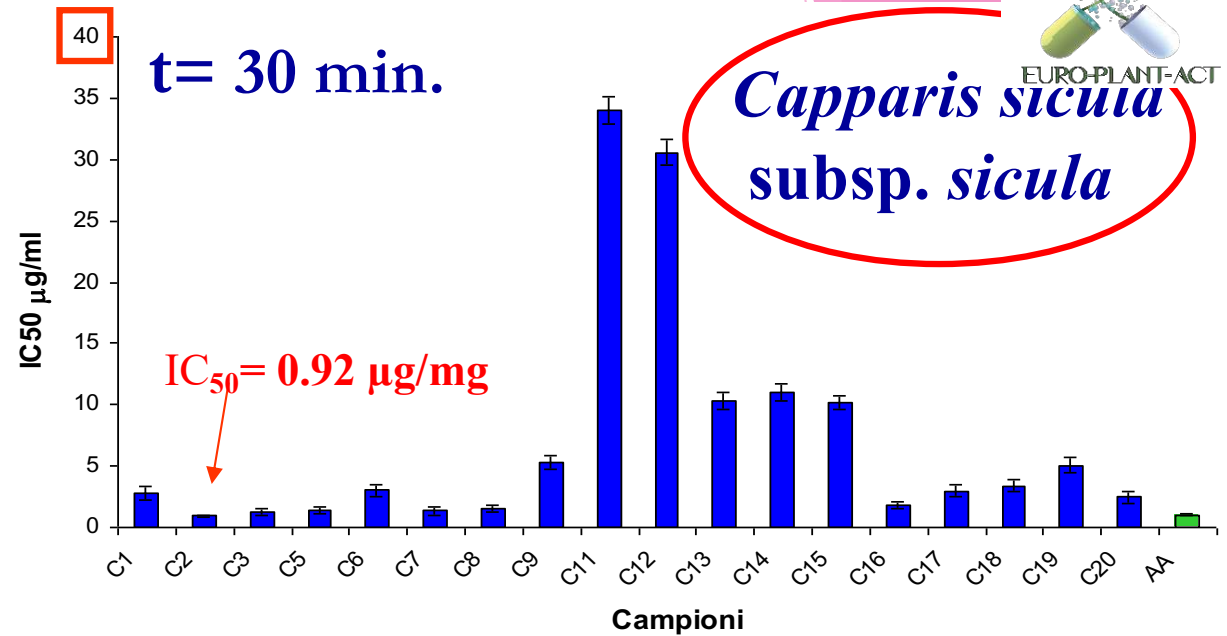
arotene bleaching test



EURO-PLANT-ACT

Capparis sicula
subsp. *sicula*

CAMPIONI	IC ₅₀ 30 min µg/ml	IC ₅₀ 60 min µg/ml
C1	2.78	5.14
C2	0.92	1.11
C3	1.29	2.16
C5	1.4	1.16
C6	3.03	3.22
C7	1.33	1.31
C8	1.58	1.5
C9	5.3	1.5
C11	34.01	47.53
C12	30.58	40.53
C13	10.34	16.33
C14	11.07	12.79
C15	10.2	11.59
C16	1.79	11.59
C17	2.95	2.54
C18	3.38	9.5
C19	5.05	5.11
C20	2.45	9.17
AA	1	1





Antiproliferative activity against human tumor cell lines and toxicity test on Mediterranean dietary plants

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Cynara cardunculus ssp. *cardunculus*

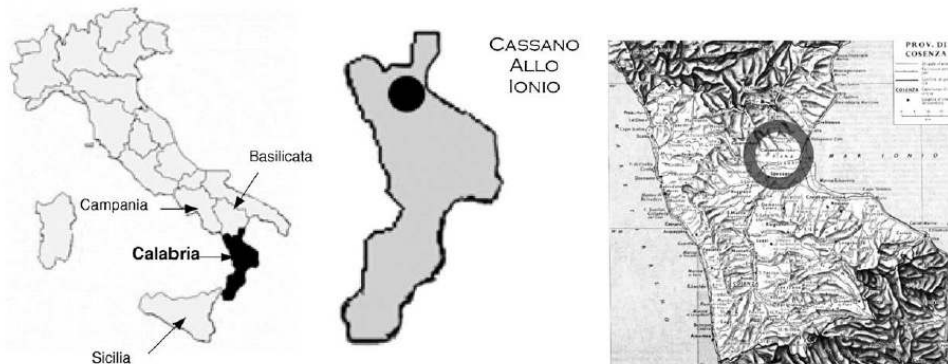


Fig. 1. Geographical location of the field research area in the Calabria region, Italy (latitude 39°44'1", longitude 34°2'18").

Table 1
Latin names, common name, plant part used, collection date of the studied plants

Voucher specimen	Scientific name (family)	Common name	Plant part used	Use in diet	Collection date
CLU 18048	<i>Borago officinalis</i> L. (Boraginaceae)	Borage	Leaves	Mixed soup, boiled, fried	May 2005
CLU 18060	<i>Capparis sicula</i> Veill. (Capparaceae)	Caper	Leaves, fruits	Boiled, fried, preserved in olive oil	May 2005
CLU 18061	<i>Carduus pycnocephalus</i> L. (Asteraceae)	Italian Thistle	Stems	Boiled, fried	May 2005
CLU 18051	<i>Cichorium intybus</i> L. (Asteraceae)	Chicory	Leaves	Boiled, raw in salads	April 2005
CLU 18051	<i>Cichorium intybus</i> L. (Asteraceae)	Chicory	Roots	Boiled	April 2005
CLU 18047	<i>Clematis vitalba</i> L. (Ranunculaceae)	Old Man's Beard	Leaves	Fried	April 2005
CLU 18059	<i>Cynara cardunculus</i> L. ssp. <i>cardunculus</i> (Asteraceae)	Wild Artichoke	Leaves, capitula	Boiled, fried, roasted, stewed	April 2005
CLU 18058	<i>Echium vulgare</i> L. (Boraginaceae)	Viper's Bugloss	Leaves, flowers	Boiled	May 2005
CLU 18057	<i>Foeniculum vulgare</i> Miller ssp. <i>piperitum</i> (Ucria) Cout. (Apiaceae)	Wild Fennel	Leaves	Fried, mixed soup, preserved in olive oil, spice	May 2005
CLU 18053	<i>Lepidium sativum</i> L. (Brassicaceae)	Cress	Leaves	Raw in salads	April 2005
CLU 18056	<i>Malva sylvestris</i> L. (Malvaceae)	Mallow	Leaves	Boiled	May 2005
CLU 18055	<i>Mentha aquatica</i> L. (Lamiaceae)	Mint	Leaves	Spice, liqueur	April 2005
CLU 18054	<i>Papaver rhoeas</i> L. ssp. <i>rhoeas</i> (Papaveraceae)	Poppy	Leaves	Boiled	April 2005
CLU 18052	<i>Picris hieracioides</i> L. (Asteraceae)	Hawkweed oxtongue	Leaves	Raw in salads	April 2005
CLU 18050	<i>Raphanus raphanistrum</i> L. ssp. <i>raphanistrum</i> (Brassicaceae)	Radish	Leaves	Boiled, fried, preserved in olive oil, roasted, stewed	May 2005
CLU 18049	<i>Sonchus oleraceus</i> L. (Asteraceae)	Rush crimps	Leaves	Boiled, fried, raw in salads, mixed soup	March 2005

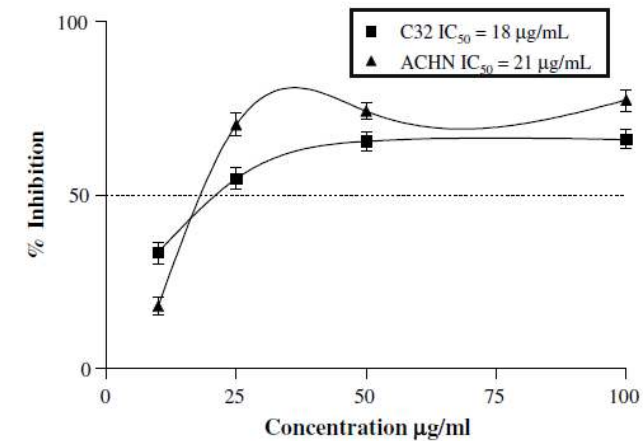


Fig. 2. Antiproliferative activity of *Cynara cardunculus* ssp. *cardunculus* hydroalcoholic extract on ACHN (renal cell adenocarcinoma) and C32 (amelanotic melanoma cells). Values were means \pm SEM of triplicates. $p < 0.05$ at the analysis of variance, as compared with controls.

Antiproliferative

Phenolics and Phytosterols



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Food Chemistry 102 (2007) 1096–1104

Food
Chemistry

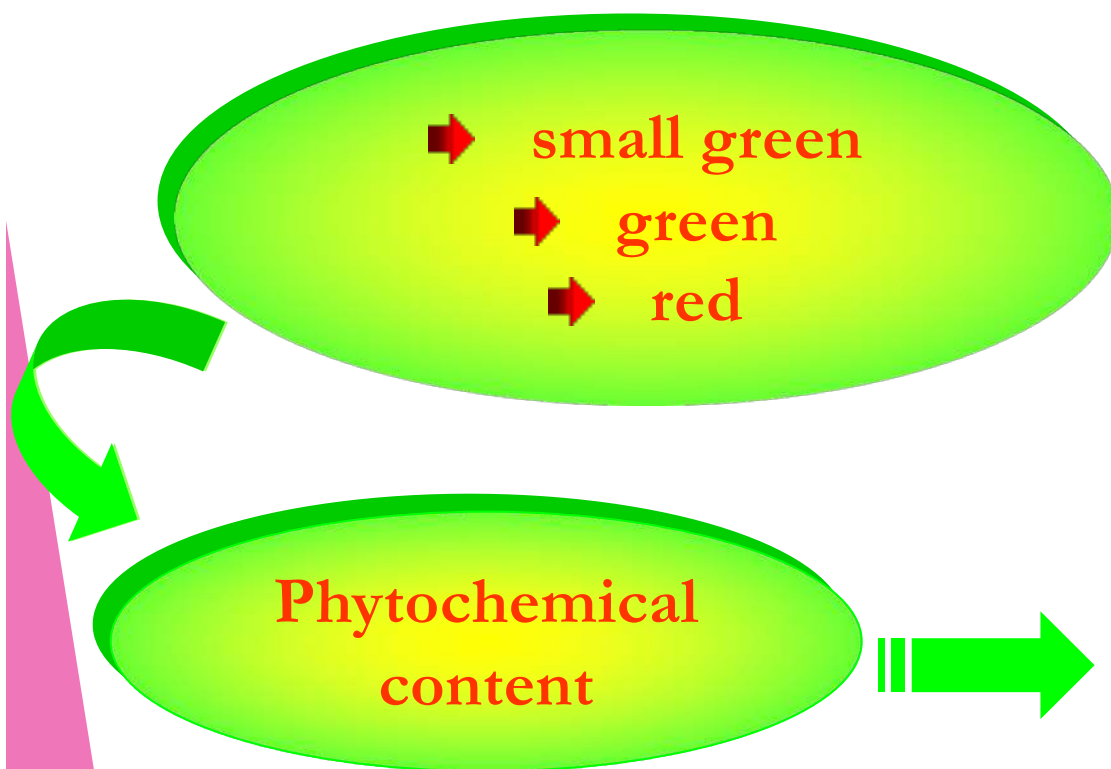
www.elsevier.com/locate/foodchem



Chemical and biological variability of hot pepper fruits
(*Capsicum annuum* var. *acuminatum* L.) in relation to maturity stage

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Comparative Study on the Chemical Composition, Antioxidant Properties and Hypoglycaemic Activities of Two *Capsicum annuum* L. Cultivars (*Acuminatum* small and *Cerasiferum*)

Rosa Tundis • Monica R. Loizzo • Federica Menichini • Marco Bonesi • Filomena Conforti • Giancarlo Statti • Damiano De Luca • Bruno de Cindio • Francesco Menichini

Food Research International 45 (2012) 170–176



Contents lists available at SciVerse ScienceDirect

Food Research International

journal homepage: www.elsevier.com/locate/foodres



Air-dried *Capsicum annuum* var. *acuminatum* medium and big: Determination of bioactive constituents, antioxidant activity and carbohydrate-hydrolyzing enzymes inhibition

Rosa Tundis^a, Monica R. Loizzo^{a,*}, Federica Menichini^b, Marco Bonesi^a, Filomena Conforti^a, Damiano De Luca^c, Francesco Menichini^a

LWT - Food Science and Technology 53 (2013) 370–377



Contents lists available at SciVerse ScienceDirect

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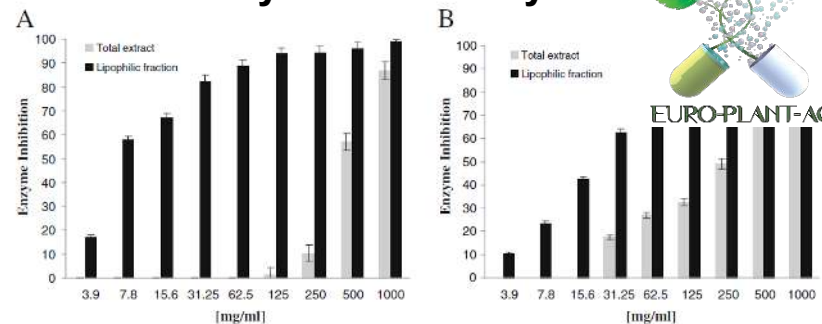
journal homepage: www.elsevier.com/locate/lwt



Antioxidant and hypoglycaemic activities and their relationship to phytochemicals in *Capsicum annuum* cultivars during fruit development

Rosa Tundis*, Federica Menichini, Marco Bonesi, Filomena Conforti, Giancarlo Statti, Francesco Menichini, Monica R. Loizzo

α-amylase inhibitory activity



EURO-PLANT-ACT

Table 1

Total phenols, carotenoids, capsaicin and dihydrocapsaicin content in *C. annuum* var. *acuminatum* medium and big.

Phytochemicals	<i>C. annuum</i> var. <i>acuminatum</i> medium	<i>C. annuum</i> var. <i>acuminatum</i> big
Phenols (mg/100 g dw)	843.7 ± 2.6	748.7 ± 3.7
Carotenoids (mg/100 g dw)	324.7 ± 1.3	191.7 ± 1.0
Capsaicin (mg/g dw)	1.4 ± 0.01	0.9 ± 0.02
Dihydrocapsaicin (mg/g dw)	0.5 ± 0.03	4.7 ± 0.02

Data represents the mean ± standard deviation S.D. (n = 3); dw: dried weight.

Table 1

Total phenols, flavonoids, carotenoids, capsaicin and dihydrocapsaicin content of *Capsicum annuum* cultivars as affected by maturity.

<i>C. annuum</i> cultivars		Phenols (mg CA/100 g of FW)	Flavonoids (mg QE/100 g of FW)	Carotenoids (mg β-C/100 g of FW)	Capsaicin (μg/g of FW)	Dihydrocapsaicin (μg/g of FW)
Fiesta	I	781.4 ± 25.8	115.7 ± 11.0	43.8 ± 16.7	677.7 ± 11.4	195.5 ± 10.3
	M	668.6 ± 15.2	34.9 ± 9.8	325.1 ± 29.8	1280.2 ± 44.2	422.5 ± 9.6
Orange Thai	I	941.2 ± 31.1	107.6 ± 5.5	56.0 ± 21.3	315.5 ± 12.9	242.9 ± 14.7
	M	679.6 ± 29.8	61.5 ± 13.4	181.0 ± 9.9	1043.1 ± 35.5	855.0 ± 18.8
Acuminatum	I	951.2 ± 12.6	93.1 ± 25.9	37.3 ± 12.1	300.1 ± 21.5	100.7 ± 12.5
	M	648.6 ± 22.5	56.8 ± 10.3	414.1 ± 45.6	1167.8 ± 23.1	332.7 ± 11.6
Cayenne Golden	I	1207.5 ± 43.3	110.2 ± 24.5	41.7 ± 15.8	208.3 ± 17.8	196.2 ± 13.5
	M	666.0 ± 27.8	39.0 ± 8.9	130.6 ± 31.2	415.8 ± 12.2	545.8 ± 13.6

Values represent means (n = 3) ± S.D.

I: immature stage.

M: mature stage.

CA: chlorogenic acid.

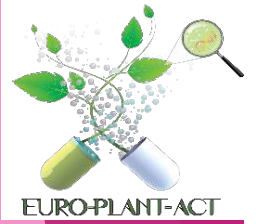
QE: quercetin.

β-C: β-carotene.

FW: fresh weight.



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Pharmaceutics, Agriculture and Nutrition



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Interactions between supplements/foods and drugs

Department of Pharmacy, Health and Nutritional Sciences





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DEFINITION OF NUTRITION

Nutrition is the set of processes by which the body receives and transforms the nutrients contained in food.

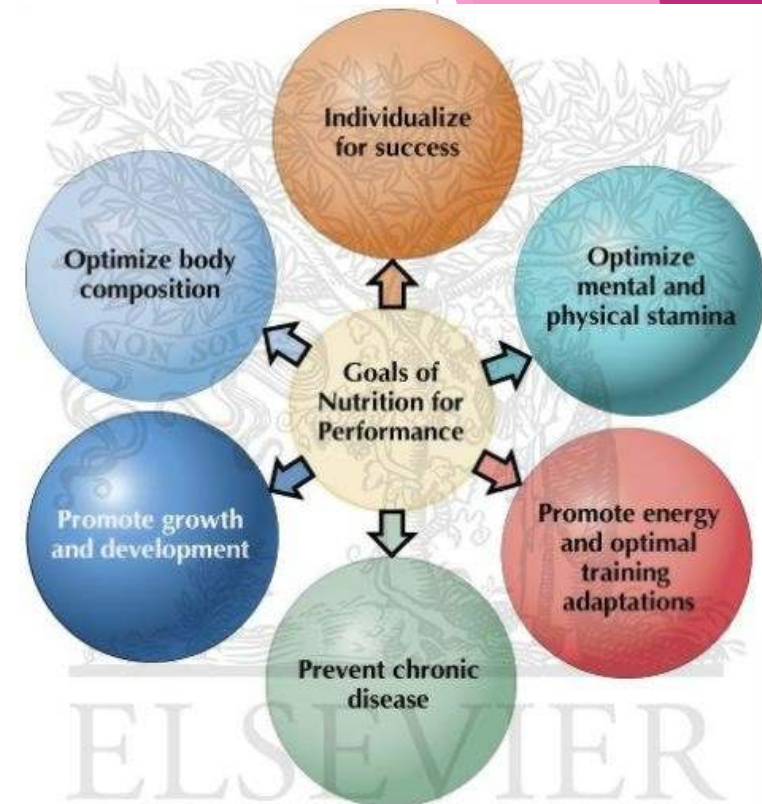
Different from the concept of **Supply** which expresses the form and methods in which nutrients are supplied to the human body.

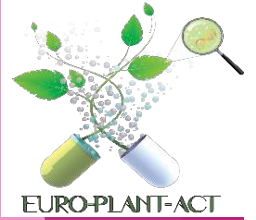




Nutrition and basic goals

- ▶ Satisfy the body's energy needs in order to carry out life processes (all require energy).
- ▶ Meet the growth needs for the maintenance of existing structures.
- ▶ Optimize the complex mechanisms of regulation and control of the mentioned processes that require energy or the formation and maintenance of structures.





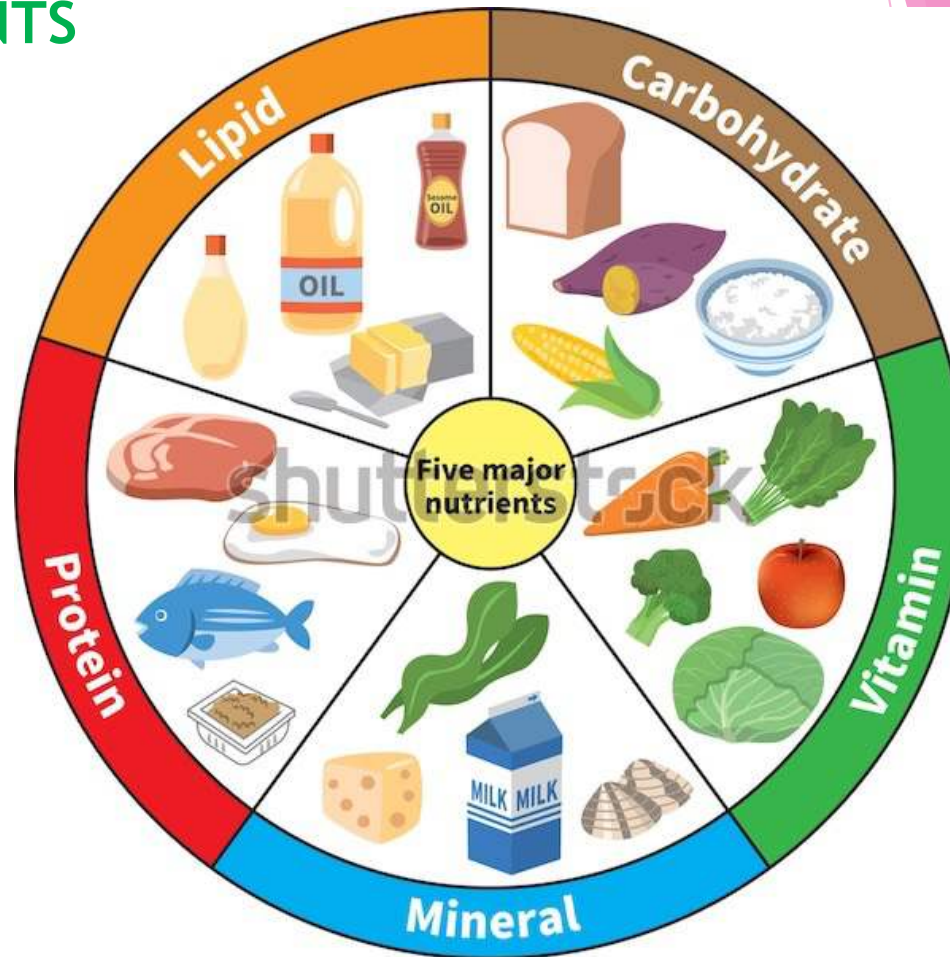
CONSTITUENTS OF FOOD

- 1) **Nutrients**
- 2) Antinutrients
- 3) **Non nutrients**
- 4) Any newly formed substances
- 5) **Any contaminants**
- 6) Any added substances (additives)



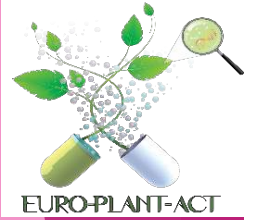
FUNCTIONS OF NUTRIENTS

- ▶ **PLASTIC** function
- ▶ **ENERGETIC** function
- ▶ **PROTECTIVE** function





ANTI-NUTRITIONAL SUBSTANCES



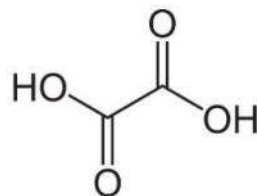
They are substances that negatively interfere with the absorption or action of nutrients.

Examples:

- 1) **oxalic acid** ($\text{HOOC} - \text{COOH}$, an organic acid contained in some plants) hinders the absorption of calcium, iron and other metal ions,
- 2) **avidin** (an egg white protein) interferes with the absorption of vitamin B8 (biotin),
- 3) the **isothiocyanates** ($-\text{N} = \text{C} = \text{S}$) of crucifers interfere with the absorption of the iodide ion (they are goiters).



Oxalic acid



Oxalic acid (H₂C₂O₄), or oxalate, is a harmful substance found in many foods.

Oxalate is the toxic metabolite of some fungi (such as *Aspergillus niger*), and is contained in high and sometimes dangerous quantities in various plant species such:

- **rhubarb**, alpine or friar rhubarb, false rhubarb;;
- **sorrel**, or alleluja, and other vegetables of the Oxalis family, from which the name oxalic acid is derived, the quantities contained are really important (about 16% by weight);
- the common phytolacca, also called **amaranth**, sanguinella, Spanish vine;
- spinach and chard, which also contain a significant amount of nitrates;
- *Halogeton glomeratus*, a spontaneous grass of the cold-arid areas of the United States, dangerous for grazing cattle;
- fruits and vegetables, such as potatoes and a particular type of Ribes, *Ribes grossularia*, initially grown on a large scale for its richness in vitamin C.

Aspergillus niger



Rhubarb



Sorrel



Amaranth



Spinach

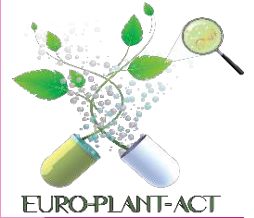


Ribes





NON-NUTRITIONAL SUBSTANCES



They are substances without nutritional value present in food. However, some non-nutritional substances are bioactive and have pharmacological properties (we also speak of "nutritional pharmacology").

Examples:

- 1) fibers (vegetable substances such as cellulose and hemicellulose)
- 2) methylxanthines (caffeine, etc.),
- 3) organic sulphides (garlic allyl sulfide).
- 4) **Phytochemicals** (polyphenols, terpenes, alkaloids)





When you take prescription or over-the-counter (OTC) medications, do you also take a vitamin, mineral, or other dietary supplement? Have you considered whether there is any danger in mixing medications and dietary supplements?



There could be. Certain dietary supplements can change absorption, metabolism, or excretion of a medication. If that happens, it can affect the potency of your medication, which means you may get either too much or too little of the medication you need.



Don't Assume "Natural" Means Safe



Dietary supplements are widely used and include vitamins, minerals, and other less familiar substances—such as amino acids, botanicals, and botanical-derived ingredients.

Combining dietary supplements and medications could have dangerous and even life-threatening effects.

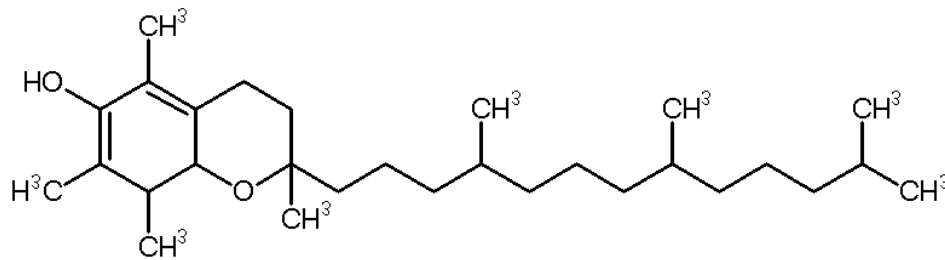
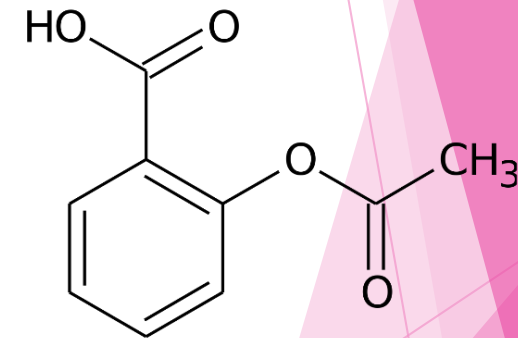
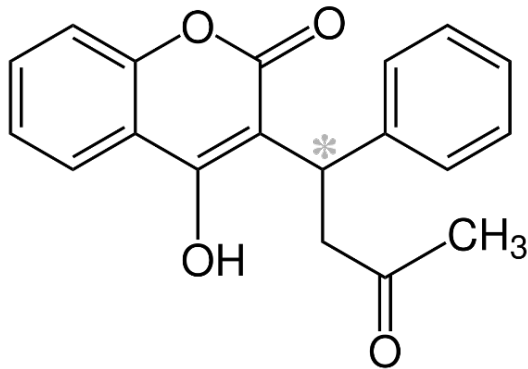
Birth control pills are less effective when taken with St. John's wort, an herbal supplement.





Warfarin (a prescription blood thinner), ginkgo biloba (an herbal supplement), aspirin, and vitamin E (a supplement) can each thin the blood.

Taking any of these products together may increase the potential for internal bleeding or stroke.





Precautions for Children and for Those Who Are Pregnant or Breastfeeding

Children, in particular, could be harmed by taking both supplements and medicines. Children's metabolisms are unique, and at different ages they metabolize substances at different rates. For kids, ingesting dietary supplements together with other medications make adverse events a real possibility.

If you're pregnant or breastfeeding, you'll want to discuss any dietary supplements with their health care professional.





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