



Mediterranean pine nuts from agroforestry systems - an opportunity for rural development

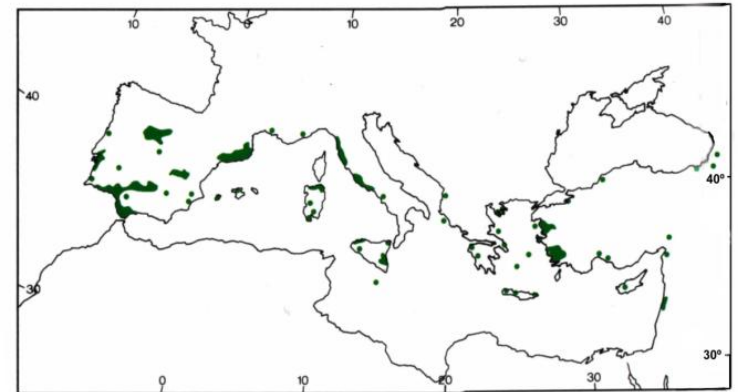
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The Mediterranean stone pine *P. pinea*



- **0.7 Mha** stone pine forests around the Mediterranean, half of which are recent afforestations (after 1850).
- **Introduced**, mainly as ornamental, in other bioregions (California, Chile, Argentina, South Africa, Australia, New Zealand).
- **Since Palaeolithic** used for timber, fuel, and large, edible seeds:

the pine nuts



The Mediterranean pine nuts



- One of the world's top-ten nuts
- Main forest product of the stone pine forests
Higher (and annual) profit for forest owner than from timber.
- Mean cone yield about 200-1 000 kg/ha in forests
Render 8-40 kg shelled pine nuts.
- High market value
2-3 €/kg in shell, 15-30 €/kg shelled, retail price 50–60 €/kg.
- Gourmet and Health food
Flavour, 35% proteins, only 50% fat, omega-3 and -6 fatty acids.



Grafted orchards for pine nut production

- Nearly all the production is still harvested **from the wild (0.7 Mha)**.
 - *Forestry: No horticultural techniques. No defined cultivars.*
- Last 20 years
 - *Clonal selection of plus trees with high cone yield in forests.*
 - *Grafted trials: Selection of best-performing clones in each agro-climatic zone.*
 - *2012: Legal release of superior clones as tested basic materials for graft scions.*
 - *Increasing use in **agroforestry systems** for cone production (still < 1 000 ha).*
 - *cone yield up to 2 000 kg/ha in grafted orchards.*



Pine nuts from agroforestry systems

- **Agroforestry systems:** an integrated approach that **combines trees with crops or pastures**, creating more diverse, productive, profitable, healthy, and **sustainable land-use systems** – a chance for **endogenous rural development** .
- **Stone pine:** requires **open growth** for optimized cone production: **ideal for AFS**.
 - *...performs well on poor soils without watering,*
 - *...needs reduced cultural practices,*
 - *...is affected by few pests or diseases,*
 - *...resists drought and frost.*



More than 20 pine species with edible kernels in the world:

<i>Eu/As</i>	<i>P. pinea</i>	– Mediterranean pine nuts
<i>Eu</i>	<i>P. cembra</i>	– Swiss or Arolla pine nuts
<i>As</i>	<i>P. sibirica</i>	– Red Cedar or Siberian pine nuts
<i>As</i>	<i>P. koraiensis</i>	– Chinese pine nuts
<i>As</i>	<i>P. gerardiana</i>	– Chilgoza or Pakistani pine nuts
<i>Am</i>	<i>P. cembroides, edulis, etc.</i>	– Pinyon pine nuts



- Virtually all of them are still wild crops, or gathered from rural groves, not from horticultural plantations or orchards, hence the **limited supply does not satisfy the increasing demand** (traditional Arabic cuisine, Health Food).

International pine nuts markets

More than 20 pine species with edible kernels in the world:

- | | | |
|--------------|------------------------------------|---|
| <i>Eu/As</i> | <i>P. pinea</i> | – Mediterranean pine nuts (6 000 t) |
| <i>Eu</i> | <i>P. cembra</i> | – Swiss or Arolla pine nuts |
| <i>As</i> | <i>P. sibirica</i> | – Red Cedar or Siberian pine nuts (oil!) |
| <i>As</i> | <i>P. koraiensis</i> | – Chinese pine nuts (mixed with others sp.) |
| <i>As</i> | <i>P. gerardiana</i> | – Chilgoza or Pakistani pine nuts |
| <i>Am</i> | <i>P. cembroides, edulis, etc.</i> | – Pinyon pine nuts |



• Very different TASTE, dietary values, and processing quality = different products

- P. pinea*** – Mediterranean pine nuts (only true “*Pinienkerne*” (D))

- 33-38% Proteins
- 5-6% Carbohydrates
- 46-51% Fat
- Low content of pinolenic acid



- P. gerardiana*** – Chilgoza or Pakistani pine nuts (perfectly cylindrical, dark dry tip)

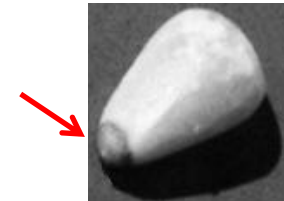
- 12-14% Proteins
- 4% Carbohydrates
- 51-61% Fat



- P. koraiensis*** – Chinese pine nuts (broad triangular, brown cap around the tip)

- 17-18% Proteins
- 12% Carbohydrates
- 65-67% Fatty acids
- 12% Pinolenic acid (*enteroendocrine appetite suppressant*)

**PINE MOUTH SYNDROME:
Metallic taste disturbance**



- The risk of eating Chinese pine nuts: the PINE MOUTH SYNDROME**
 - An unpleasant **bitter, metallic taste disturbance**, that appears 1-3 days after consumption and **lasts for days or even for weeks**, sometimes combined with food aversion and other symptoms.
- Several hypotheses, still under discussion:
 - Rancidity due to inadequate processing, storage, and packaging?*
 - Irritating terpenoid compounds from mingled inadequate pine seeds (**P. armandii**/masson.)?*
 - Pinolenic acid, taxoleic, and other rare polyunsaturated fatty acids that stimulate the enteroendocrine system to produce cholecystokinin, a hormone for bile release?*
- Food security issue**, underestimated by authorities, negative impact on commerce



PINE MOUTH SYNDROME (Chinese pine nuts)

- **PINE MOUTH SYNDROME exclusively from Chinese pine nuts**, no other pines.
- BUT Chinese pine nuts exports hold about **80% of world's market** for pine nuts.
- **ALL** pine seeds are sold the same as ***pine nuts*** (*Pinienkerne, pignoli, piñones, pignons, etc.*).
- EUROSTAT and Codex Alimentarius **do not differentiate species**, and re-exports among countries **hamper the traceability** of origin and quality of the product.
- Often, neither the geographic origin, nor even the species of imported pine nuts are reported on product labels – therefore they are **difficult to trace by consumers** in spite of the disparate range of prices, qualities and **health issues**.
- Even European distributors confound the species, **selling cheaper Chinese or Pakistani pine nuts as true Mediterranean pine nuts**.



Fraud!
50 €/kg



- **Incompliance with current legal requirements for food labeling and traceability**

Regulation (EC) 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety “...from farm to fork”

- **Roadmap for true Mediterranean pine nuts, an *epicurean nut***

- *Organize Regional Forest Owners / Growers / Pine Nuts Industry Associations and Cooperatives.*
- *Set Regional and National traceability systems for pine nut production and supply chain.*
- *Fulfill High Quality Standards in production, processing, and trade in European producers.*
- *Improve Product Profile as Traditional or Organic Food Labels for true Mediterranean pine nuts.*
- *Better protection and marketing under “Geographical Indication” brand.*



Thank you for your attention



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