Cornelian cherry: an important local resource and promising health promoting fruit plant of the Black Sea Area

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BaSeFood: Sustainable exploitation of bioactive components from the Black Sea Area traditional foods

- EU FP7 project, start March 2009, end October 2012
- Coordination: University of Bologna - Italy
- 13 partner institutions
BaSeFood activities

- To investigate the knowledge base of traditional foods of the BSR, and related raw materials
- Nutrient analysis on prioritised foods; analyse bioactives in raw materials
- Bioactivity studies (in vitro, in vivo, intervention studies)
- Technological flow charts of traditional foods; retention factors
- Attitudes and perceptions of consumers and processors

To widely disseminate results and findings in order to enhance awareness and sustainable development of traditional foods of the BSR for improved health
Documenting local knowledge
- cross country comparisons
- put traditional foods in a consumers’ friendly perspective
- connecting with health promoting perspectives

General methodology for on-site surveys: mainly from qualitative research concepts
- Selecting significant groups of plants and related products (cereals, vegetables, fruits, oilseeds, herbs)
- Investigating facts in natural, rather than in experimental settings
- Retrieve evidence-based information, that is latent in diffuse knowledge but often absent official, formal scientific knowledge
- Help in generating, rather than testing hypotheses
- Help in programming and tuning possible future quantitative and experimental research

For each topic: a combination of interviews and case studies, with final intercultural comparison
Why cornelian cherry?...

• Travel around end of August !....
• Clear evidence of its importance in the traditional uses of the Black Sea Region
Family: Cornaceae

Genus Cornus: about 50-60 species, some with edible fruits: *Cornus mas*, *C. kousa*, *C. officinalis*, *C. controversa*

*Cornus mas* L.: geographic distribution

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**Fig. 1.** Approximate geographic distributions of *Cornus* major clades. BB, big-bracted dogwoods; CC, cornelian cherries; DW, dwarf dogwoods; BW, blue- or white-fruited dogwoods; BW1, *C. oblonga* and *C. pensylvanica*; BW2, *C. alternifolia* and *C. controversa*.  
**Cornus mas L.**

**Plant:** long-lived deciduous tree or shrub, height 3-8 m  
**Flowering:** very early (II)  
**Ripening:** VIII-IX

**Flower:** small, tetramerous hermaphrodite with yellow petals; four stamens and one or two inferior ovaries with two carpels

**Fruit:** drupe originated from the inferior ovary with one seed generally olive shaped 1-2 cm long, sweet sour in taste

UK: dowgwood, cornelian cherry  
IT: corniolo  
RU/UA /: кизил (kızıl)  
GE: shindi  
RO: Cornul  
BU: Обикновен дрян  
TU: Kızılçık (kızılcık)
Methods

1. Literature review. Official and “grey” literature
2. On site surveys: qualitative analyses methodologies (Jones, 1995; Pope and Mays, 1995) and Traditional botanical knowledge (TBK) investigation (Cotton, 1996). Phases:
   • **Defining the boundaries:** investigation areas individuated by means of the personal knowledge of the involved researchers, available literature and evidence.
   • **Defining a checklist of concepts:** a list of possible questions to ask:
     a) characteristics of the local populations; b) growing systems; c) exploitation; d) local knowledge about uses; e) recipes; f) evolutions.
   • **Finding key respondents:** initially individuated on the basis of previous knowledge or contacting representatives of local agricultural extension services, unions, local food processors. During the preliminary visits in local growing areas further contacts were established with other stakeholders.
   • **Interviewing:** information mainly collected by means of face to face, in-deep interviews. Specific questions from checklist of concepts adapted to individual respondents. Interactively adjusted and integrated during interviewing.

Topics

- variability, varieties
- growing systems
- uses / traditional products
- composition
Cornelian cherry variability

• Reproduction from seed for centuries
• Wide wild variability
• Wild botanic varieties:
  var. *typica* Sanadze,  var. *macrocarpa* Sanadze,
  var. *flava* Sanadze,  var. *pyriformis* Sanadze

• Local selection varieties developed by people in many countries

Surveys on natural populations, *in situ* observations and collection

Kiev Botanical Garden-Ukraine, Azerbaijan, Russia, Georgia, Iran, Serbia, Bosnia-Herzegovina, Montenegro, Turkey, Czech and Slovak Republic

Objectives:
Agronomic: high yield, frost resistance, time of ripening
Fruit quality: size, flesh/stone ratio, sugars, phenolics, anthocyanins, vitamin C
Cultivars

- Bulgaria: 2 cv: Kazanlytsky (pear shaped); Pancharevsky (1985)
- Slovakia: 2 cv (Dvin, Titus) (1989)
- Austria-USA: cv Joliko: 5.6 g (1991)
- France: 1 cv (1992)
- Azerbaijan: 2 cv (Armudi-Zogal, Ag-Zogal)
- Georgia: 17 cv
- Turkey: selection is underway
- Russia: some cultivars e.g. Mosvir1, Mosvir2

- Ukraine: from 1990, 14 varieties in the State Register of varieties (Vavilovets, Vladimirskiy, Vyudubeskiy, Grenadier, Eugenya, Helen, Coral, Marka, Lukyanovski, Nikolka, Radost, Svetlyachok, Semen, Exotic, Elegant) and several hybrids

Fruit weight from 5.5 to 7.5 g; different shape; high yielding
Topics

➤ variability, varieties

➤ growing systems

➤ uses / traditional products

➤ composition
Areas and growing systems

Ukraine

- In S. Ukraine the situation has been recently revised within BaSeFood
- Typical of the Carpathians and the Crimean peninsula
- Wild stands mainly exploited (>100000 ha reported after WW2; now apparently reduced to about 1000 ha).
- Exploitation by individual pickers and cooperatives
- A case study: herbal cooperative in the village of Petrovo
- Product sold fresh and dried and sold to processing plants

- A nursery in Donskoe is propagating most Ukrainian varieties
Areas and growing systems

Ukraine

- Conspicuous presence in W. Ukraine
- Case study in Cherna (Transcarpatia)
- Old plantation: memory of its origin lost
- Plants in rows, regularly spaced
- 5-6 different "types" reported
- Soil kept clean and dry pruning practiced
- Collectively managed by the community
- Reported to be the biggest old plantation (200 ha ca); others reported in Rokosovo and Vinogradiv and in Turnu Mare (neighbouring Romania).
Areas and growing systems

**Russia**
- Typical of the south: Caucasus, areas close to Azov sea and the Krasnodar region
- ranking fourth among wild harvested fruits, after apples, plums, sea buckthorn
- widely used in the area: uses similar to that of S. Ukraine (Crimea: former USSR)
- request of about 60 t/y in the North Ossetia-Alania and global of about 400 t/y
- yields from 5 to 20 kg/tree
- planting schemes of 4 x 2.5 m

**Georgia**
- estimation of >100000 ha forest with cornelian cherry, in lowlands or mid mountain
- grown in family orchards (about 60000 plants) or isolated plants (about 140000)
- apparently local interesting types are propagated for home use
- little or no cultural practices are applied

**Turkey**
- Mostly in the Black Sea area, NE and NW Anatolia
- about 1500000 plants estimated
- about 14000 tons fruit per year
- mostly from wild stands
Areas and growing systems

An example in the West: Italy

• Cultivated until mid XX century (sparse plants)
• in Trentino (northern Italy) hedges of cornelian cherry were used as field border hedges
• currently fruits are gathered from wild stands or plants in family orchards and gardens in some regions (Trentino, Emilia Romagna, Marche)
• small plantations have been recently established
• generally propagated by seed, with high fruit size, shape and ripening time variability
• "types" with bigger size fruits are vegetatively propagated
• the fruits are harvested by hand from the plant or from the ground shaking the plant
Topics

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- uses / traditional products
- composition
Uses

Background: from general on-site surveys

• In traditional uses, fruit preservation was a key point for fruit use
• Preserved fruit were used as such or, more often as ingredients of other products

Reduction of water content.

• dried fruits: whole or cut fruits dried
• concentrated juices (molasses): juice concentrated by slowly boiling (Turkish pekmez)
• concentrated juices and pulps: different products: jams without added sugar (Ukrainian lekvar): fruit sauces with spices (Georgian Thkemali)
• dried pulps: mashed fruit pulps, boiled, then dried in different shape (e.g. Georgian Tkhlapi)

Addition of osmotics

• Sugars. (sugar, honey, syrups).
• Salt Some sour fruits can be preserved with salt, sometimes coupled with fermentation.

Fermentation.

• Alcoholic fermentation.
• Other kinds of fermentation (e.g. lactic)
Cornelian cherry products

Dried fruits
- Drying is the more straightforward way of preservation
- almost all small size wild fruits were dried in the past

For cornelian cherry:
- all at home level (sun, open air)
- at semi-industrial level (open air, or with specific devices)
- generally dried with the endocarp

Dried cornelian cherries fruits
- are sold to firms producing food products or extracts
- can be rehydrated at home level and used in compotes
- used for herbal teas
- are ingredients of specific dishes
  - e.g. Georgian Pipina: a corn gruel seasoned with dry cornelian cherries, and savoury
  - Shindis Shechamandi: a porridge of wheat flour with dry cornelian cherry, onion, garlic and butter)
- in Italy it used to be dried, like many other wild fruits, for different preparations
Cornelian cherry products

Molasses
- No evidence of cornelian cherry molasses production registered until now

Concentrated juices and pulps
- This is the more traditional way of producing jams when sugar was not available, basically by concentration of the natural fruit sugars
  - The fruit are boiled until soft
  - peels and stones are removed by sieving
  - the pulp and juice is put to boil for many hours, until the volume is reduced to at least 1/2 - often to 1/3
- Lekvar is produced commercially in Ukraine and similar product in Turkey

Concentrated juices and pulps
- Sauces from cornelian cherry belong to this category
  - the pulp and juice are mixed, added with spices and boiled again
  - sauces are reported for Georgia and Italy

A very thick, home made plum lekvar: can be preserved also without sealed jars

Commercial cornelian cherry lekvar: sealed jars allow shorter boiling
Dried pulps

"Fruit leathers" are a very typical product of the east black sea area region

- in this area, pulps are dried in a thin layer (1-3 mm), and have the final shape of foils
- their name is fruit leathers or "fruit lavash" (lavash is a Caucasian flat bread)
  - the fruits are boiled until soft
  - peels and stones are removed by sieving
  - then the pulp is shortly boiled again, and homogenised
  - then it is poured on pans and put to dry in the sun or open air
  - when dried, it can be preserved for several months, generally rolled

An example of preparation of fruit (plum) leather (tkhlapi) in Georgia

- boil
- spread
- put in sieve
- sieve
- mix
- put to dry
Cornelian cherry products

Fruit leathers

- Fruit leathers, like Georgian Tkhlapı are typical of Georgia and Armenia
- The cornelian cherry ones are estimated also as natural remedy (see after)
- fruit leathers are a perfect way for fruit preservation
- can be consumed as they are or as ingredients of food preparation
- in this case, cornelian cherry fruit leather is alternative to the use of dry fruits

Examples of fruit leathers, Georgia and Armenia

Other

- In Italy, a dried pulp preserve from cornelian cherry is reported for the Marche region
- the initial phases of preparation were similar to that of fruit leather
- boiling was longer, to obtain a thick pulp
- this was then shaped in "bricks" that were dried with air or close to a fireplace
- slices of this were used to prepare sauces
Addition of sugar

Compotes
- Compotes are prepared in many different ways
- generally, pure cornelian cherry compotes are nowadays prepared with fresh fruits
- preserved in sealed glass jars
- in the past also dried fruit used (like at present for uzvar) fruit are put in a jar
  - a syrup is prepared with water and variable amount of sugar - generally low amount
  - the syrup is poured very hot on the fruits
  - the jars are sealed
  - or fruits are put in the syrup and sterilised in sealed jars
  - or fruit with syrup are simply put in jars, sealed and let in a warm place to form the compote
- Compotes are used as everyday soft drinks
Cornelian cherry products

Addition of sugar

Pulps preserved in sugar
- In this case, the pulp of cornelian cherry is mixed with sugar without any boiling
- the ratio of sugar to fruit is at least 1:1
  - the fruits are first left to mature well in a pot
  - then they are pressed into a sieve to remove the stone
  - the sugar is added to the pulp and mixed
  - the mass is left several days in a pan and stirred at least twice a day
  - when well homogenised, can be preserved in jars

- This preparation can be eaten as it is but, more frequently, it is used as a medicine, for the purposes later illustrated
- can be also used as a sweetener
Cornelian cherry products

Addition of sugar

Fruits in concentrated sugar syrup
- Fruits are sealed in jars with sugar syrups or various concentration
- A variant of this is to press the fruits and filter, in order to obtain only the syrup

Fruits in concentrated sugar syrup and wine
Fruits are boiled in white wine and sugar with some spices (Italy: Trentino Alto Adige)

Jams
- jams are prepared the classical way, adding sugar to fruits and boiling
- these are perhaps the less traditional of the products
- presently, they are manufactured by several artisan or semi industrial producers

Addition of salt

Fruits in brine
Not fully mature fruits are put in salty water of variable concentration, similarly to olives: a old tradition in Italy, now almost disappeared, recently resumed
Topics

- variability, varieties
- growing systems
- uses / traditional products
- composition
Cornelian cherry composition - basic characters / nutrients

- Few papers available, even if some with relevant number of samples evaluated
  - total soluble solids: range 5.0 - 24.3
  - acidity (%): 0.4 - 4.7
  - ratio TSS/A: 3.0 - 9.0 (15.6)
  - pH: 2.9 - 3.2
  - vitamin C (mg/100 g): 25.0 - 141.0

- As an average: acidic fruit
  - local knowledge: easily preserved
  - seldom used fresh
  - used for sauces (other: plums: Tkhemali Georgian; pomegranate etc.)

- Vitamin C
  - rich potential source (depending on the amount consumed)
  - preparation of supplements for USSR soldiers and seamen especially during WW2
  - kind of fruit leather; or pressed fruit cakes (lepioshka)
  - strategy: short heating; drying. No data available about retention!
Cornelian cherry composition - bioactive substances and properties

- Few papers available, few with comparison to other sources; extrapolation not easy
  - total phenolics (mg / 100 g f.w.): 281-1592
  - anthocyanins (mg / 100 g f.w.): 22-442
  - flavonoids (mg / 100 g f.w.): 81-545
  - antioxidant capacity:
    ✓ ≥ raspberry, blackberry, gooseberry, redcurrant
    ✓ ≥ blackberries, red grapes, white grapes; < hawthorn
    ✓ > strawberry, blackthorn; ≤ sour cherry
    ✓ high, variation among types

- A sour fruit!
  - seldom eaten fresh;
  - few cultivars suitable to consumption if not overripe (e.g. Elegant)

- Registered local knowledge (BaSeFood)
  - in the antiquity, doctors did not stop in Crimea (rich of cornelian cherries)
  - against haemorrhoids. Recurrent !. (flavonoids ?) eat with stones
  - against diarrhoea (saved the life of soldiers fighting dysentery) (phenolics)
  - disinfectant for female urinary apparatus, for new born babies; to clean wounds
  - sweet fruit pastes: taken in flues, against sore throat
Cornelian cherry composition – bioactive substances and properties

**Published: from local knowledge references**

- confirmed: diarrhoea, bronchitis - Turkey
- *hypoglicemisant / diabetes* - Turkey
- against fever - Croatia
- rheumatism (external and internal) - Albania

• Pieroni A., 2008. Local plant resources in the ethnobotany of Theth, a village in the Northern Albanian Alps. Genetic resources and crop Evolution 55. 1197-1214.

**Experimental or intervention studies**

- none, to the best of our knowledge

**Comment to food health claim substantiation**

- “... the substantiation required relies mainly on the availability of randomised controlled trials. Evidence from traditional uses is not considered. This is bound to lead to the loss of an important heritage...”

Concluding remarks

- Cornelian cherry is very abundant and deeply rooted in traditions of the Black sea area
- Putative health promoting properties for characters easily perceived directly
- Interesting variability is present, but not yet fully characterised and evaluated
- Less abundant and somewhat neglected in W-Europe
- Cultural comparison reveals (as for other fruit products) similar uses in the past for W Europe

- Some analytical data available on fruits
- None on products
- No retention data following processing
- Traditional products can be an efficient way of preservation and valorisation
- Possible interest of recovery and stabilisation of the production
A final traditional food meeting organised in Cesena

The program includes
- Plenary lectures from internationally-recognised speakers
- Presentations detailing the achievements of recent EU funded projects related to traditional foods
- Presentation of the BaSeFood project’s results
- Offered contributions from registered participants

Deadlines
- Early registration and title submission: July 25
- Late registration and abstract submission: September 7

Visit the congress web site: www.tfi-2012.com

We look forward to see you in Cesena