

# Cornelian Cherry: A Prospective Source for Phytomedicine

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## Abstract

**Cornelian cherry, *Cornus mas* L., is a prospective source for phytomedicine. Antimicrobial activity of fatty oil against gram-positive *Staphylococcus aureus* and gram-negative *Escherichia coli* were observed.**

## INTRODUCTION

Cornelian cherry (*Cornus mas* L., Cornaceae), a tall deciduous shrub or small tree from 5 to 8 m high, is chiefly observed in southern Europe with the northern limit being southern Belgium, Luxembourg, and central Germany (Lannert, 1981; Lawrence, 1985). The plant readily grows in Eastern Europe, the Mediterranean area (Italy, Spain, Portugal, Greece), Caucasus, Middle Eastern countries (Turkey, Iran), Central Asia, and South America (Asadov et al., 1990; Damirov et al., 1983; Gubanov et al., 1976; Lannert, 1981; Lawrence, 1985; Randushka et al., 1983; Roja and Smith, 1977).

Cultivation of cornelian cherry in Caucasus and Central Asia has occurred for centuries, mainly for food and medicine, but also as an ornamental and honey plant. Cornelian cherry, which is drought resistant and has a hard wood, used in many Central Asian countries for making furniture, jewelry, and traditional musical instruments. The life expectancy of cornelian cherry is 250 years (Asadov et al., 1990). The primary part of the plant used is the mature fruit. In a natural habitat, cornelian cherry can yield from 500 to 1000 kg of fruit per hectare, but in orchard plantings fruit yields can reach 5000 kg per hectare (Asadov et al., 1990; Damirov et al., 1983; Glukhov, 1974; Kharkevich, 1966;

Kuligin, 1984). The fruit has a sweet-sour, slightly astringent taste and is used primarily to make preserves, compotes, sauce, and wine (Asadov et al., 1990; Damirov et al., 1983; Gubanov et al., 1976; Lannert, 1981).

## Historical Use

In the traditional medicine system of Caucasus and Central Asia, cornelian cherry has been used for more than 1000 years (Asadov et al., 1990; Damirov et al., 1983; Efendiyev, 1964). Galenicals made from leaves, flowers, and fruit are used to treat sore throats, digestion problems, measles, chickenpox, anemia, rickets, and liver (hepatitis A) and kidney (pyelonephritis) diseases in traditional and conventional medicine (Asadov et al., 1990; Damirov et al., 1983; Lewis et al., 1977; Tzitzin et al., 1963). The juice and evaporated juice from fruit are used against diabetes (Shukurov, 1981; Sokolov and Zamotayev, 1985). Galenicals from leaves, powder from dried fruits and ground, dried drupes are widely used in treatment of diarrhea and hemorrhoids (Asadov et al., 1990; Damirov et al., 1983). Galenicals from the bark and evaporated juice are used in traditional medicine to treat skin wounds and furunculosis (Asadov et al., 1990; Damirov et al., 1983; Gubanov et al., 1976; Lewis et al., 1977; Muhammed, 1993).

## Modern Use: Chemical and Pharmacological Studies

Fruit of cornelian cherry, which continues to be used in traditional medicine, contains from 70 to 85 percent juice. The juice has approximately 10 percent tannins, 10 percent sugar, 5 percent pectin, 3 percent malic acid, 2 percent amberic acid, 1 percent ascorbic acid, plus a mixture of glycosides, carotenoids, essential oil, and minerals (K, Ca, Mg and Fe). The drupes contain 34-35 percent fatty oil. The leaves and bark contain

tannins: from 8 to 18 percent in leaves and from 7 to 9 percent in bark (Gubanov et al., 1976; Damirov et al., 1983; Asadov et al., 1990).

Scholars in the former Soviet Union noted that the flesh of fruit and seed oil are useful for recovery and regeneration of damaged of inner and outer epidermic tissues (skin and mycodermis) (Tzitzin et al., 1963; Damirov et al., 1983; Asadov et al., 1990). The flesh of fruit and seed oil have been successfully used for curing difficult to heal wounds, stomach ulcers, and colitis (Tzitzin et al., 1963; Lewis et al., 1977; Damirov et al., 1983; Asadov et al., 1990). The fruit, bark, and leaves have also demonstrated antimicrobial activity against *Staphylococcus aureus*, *Escherichia coli*, *Proteus vulgaris* and *Pseudomonas aeruginosa* (Roja and Smith, 1977; Asadov et al., 1990). Cornelian cherry is included in Pharmacopoeia of the USSR (Tzitzin et al., 1963; Glukhov, 1974; Gubanov et al., 1976; Damirov et al., 1983; Kuritz et al., 2001).

## **MATERIALS AND METHODS**

This study was conducted as part of government sponsored program (“Study of plant resources in Azerbaijan, 1986-1990”). The collaborative study of antimicrobial activity of fatty oil from drupes of cornelian cherry (*Cornus mas* L.) was done in 1988-1989, by the Institute of Microbiology and Institute of Botany in Baku (Azerbaijan) by D. Aliyeva, A. Akhmedzade and N. Mamedov.

The oils were tested against gram-positive *Staphylococcus aureus* and gram-negative *Escherichia coli*.

### **Plant Material**

Cornelian cherry fruit (*Cornus mas* L.) was gathered in the northern Caucasus and Azerbaijan (Table 1). The plant material from northern Caucasus was collected in Osetiya (forest parkland in Vladikavkaz), Russia. The plant material from Azerbaijan was collected in Tovuz district (forest parkland Velijan).

The plant material was authenticated at Caucasian Herbarium of Russian Academy of Sciences in St. Petersburg and at the Azerbaijani Herbarium of the Institute of Botany in Baku. Voucher specimens were deposited in the Caucasian Herbarium (LE) and the Azerbaijani Herbarium (BAK).

### **Oil Extraction**

From 50 to 60 g of drupes from each sample plant were shade dried and then ground in a Wiley mill. Fatty oil was extracted using hexane as an organic solvent for 24 h at laboratory temperature 22 to 24 °C (Kretovich, 1980). At the end of extraction period, hexane was removed by rotary vacuum evaporation at 40 °C under a nitrogen atmosphere. All oil samples (100 ml from each plant) were maintained under 5 °C until tested for antimicrobial activity.

### **Experiments**

Antimicrobial activity was evaluated using an agar diffusion test (Barry, 1976). Samples from each microorganism were inoculated on individual tube slants of tryptic soy agar and incubated for 24 h at temperature 37 °C. The prepared suspension of each microorganism was streaked on the surface of Mueller Hinton agar in Petri plates (9 cm diameter). After that a sterile paper disc (6 mm in diameter) impregnated with 10 µl of oil was placed on the agar surface midway between the plate center and edge. The plates with disc were inverted and incubated overnight at temperature 37 °C. The inhibition of microbial growth was determined by measuring the diameter of clear zone around each disc. All assays were done in triplicate.

## **RESULTS**

Fatty oil from drupes of cornelian cherry (*Cornus mas* L.) were found to have significant antimicrobial activity against gram-positive *Staphylococcus aureus* and gram-negative *Escherichia coli* (Tables 2, 3 and 4).

## DISCUSSION

Cornelian cherry is a valuable plant currently being domesticated in various parts of the world. The plant has been used to a limited extent in North America in ornamental and conservation plantings, but use as food and medicine has not been pursued. The plants are easily propagated, yields are relatively high, and production is reliable. Most cornelian cherry research has been conducted in Eastern Europe and countries of the former USSR, and medicinal properties of this plant have yet to be investigated in North America. Today, unique plant products, especially with proven nutritional quality, are gaining popularity in North America. Development of cornelian cherry industry in North America presents an opportunity for agricultural production of a new value-added crop.

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## **Tables**

Table 1. Plant material.

Botanical names	Common names	Location	Harvest time
<i>Cornus mas</i> L.	Kizil, Kizilnik	North Caucasus	September
<i>Cornus mas</i> L.	Zoghal, Zoghal agaci	Azerbaijan	August

Table 2. Antimicrobial activity of fatty oil from drupes of cornelian cherry (*Cornus mas* L.)

Plants	Microorganism	
	<i>S. aureus</i>	<i>E. coli</i>
	(diameter of inhibition zone, mm) <sup>1</sup>	
<i>C. mas</i> L. from Northern Caucasus	21.5	23.4
<i>C. mas</i> L. from Azerbaijan	26.4	26.6
Control (distilled water)	0.0	0.0

<sup>1</sup>Includes diameter of paper disc, 6 mm

Table 3. Minimal inhibitory concentration of fatty oil from drupes of cornelian cherry (*Cornus mas* L.)

Plants	Microorganism	
	<i>S. aureus</i>	<i>E. coli</i>
	(µl/ml)	
<i>C. mas</i> L. from Northern Caucasus	12.5	4.1
<i>C. mas</i> L. from Azerbaijan	12.2	4.0
Control (distilled water)	0.0	0.0

Table 4. Minimal bactericidal concentration of fatty oil from drupes of cornelian cherry (*Cornus mas* L.).

Plants	Microorganism	
	<i>S. aureus</i>	<i>E. coli</i>
	(µl/ml)	
<i>C. mas</i> L. from Northern Caucasus	12.5	4.1
<i>C. mas</i> L. from Azerbaijan	12.2	4.0
Control (distilled water)	0.0	0.0