

A review on sour cherry (*Prunus cerasus*): A high value Unani medicinal fruit

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Abstract

Prunus cerasus Linn. Rosaceae is a medicinal plant that has been widely used Ayurvedic and Unani system of medicine (USM). This plant especially the fruits are used in urinary system to cure number of diseases such as urinary tract infection, nephrolithiasis, cystolithiasis, and dysuria in the USM. Since this was an important medicinal plant since long, and therefore, scientists were also curious to prove the pharmacological actions. Hence many scientific investigations have been carried out to authenticate/know the phytochemical constituents and pharmacological actions. The aim of this review is to collect the data about its medicinal uses described in USM which has been in use since long. Moreover, its phytochemical and pharmacological studies which have been done in different parts of the world are also compiled. As per Unani literature, the fruit of this plant has been in use since ancient various diseases such as 'Usr al-Bawl (Dysuria), *Qarha-e-Alate Baol*, *Hasah-al-kulya* (Nephrolithiasis), and *Hasah-al-Mathana* (Cystolithiasis) and per recent investigations, various parts of this plant is proved to be useful in diabetes, cardiac diseases, and skin diseases.

Key words: *Prunus cerasus*, sour cherry, Unani system of medicine

INTRODUCTION

Sour cherry (*Prunus cerasus*) is also known by other names such as sour, tart, dwarf or wild cherry, a traditional Unani medicine, popularly known as *Aloo baloo*. Its species is *Prunus*, sub genus is *Cerasus* and family is Rosaceae. This is thought to have originated as a natural hybrid between *Prunus avium* and *Prunus fruticosa* in the Eastern Europe or Iranian Plateau where the two species come into contact. The two hybrids then stabilized and interbred to form a new distinct species. Cultivated sour cherries were selected from wild specimens of *P. cerasus* and suspiciously distinct *Prunus acida* from around the Black and Caspian Seas and were known to the Greeks in 300 BC. They were also very popular with the Romans and Persians who introduced them into Britain long before in the 1st century AD. The fruit remains popular in modern day of Iran. In Britain, their cultivation was popularized in the time of Henry VIII in the 16th century. It became a popular crop among Kentish growers and near 1640 more than two dozen named cultivars were recorded. Colonists planted the first sour cherry, "Kentish Red," when they arrived in the America and Massachusetts.^[1]

LITERATURE REVIEW

Morphological Description in Unani System of Medicine

Trees of *P. cerasus* are small in size. Branches are scattered and straight. Leaves are reddish, more in number and similar to yellow potato leaves. Flowers are white. Fruits are small, rounded and similar to grape which is attached to the smaller branch by thin and fine wood in the pair of bunch. Initially, the color of fruit is red then after sometime it becomes musk like color. Another variety is black [Figures 1-5].^[2-4] Seeds are smaller like gram which has white pulp. Bark is hard and white. Some authors mentioned that the tree is found in the area of Punjab and Himalaya.^[2] Gum is found in its fruit. Fruits come in the month of Chait and Baisakh. Unripe fruits are green and acrid in taste; semiripped fruits are red and sour in taste, ripped fruits are black, *chashnidar*

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Figure 1: Plant of *Prunus cerasus* Linn.



Figure 4: Fruits of *Prunus cerasus*



Figure 2: Flowers of *Prunus cerasus*



Figure 5: Ripped fruits of *Prunus cerasus*



Figure 3: Leaves of *Prunus cerasus*

and slightly bitter in taste. The best fruit among all is that which is ripped and fresh.^[2-3] Three different varieties are mentioned by some other authors, in which one variety is sweet in taste, second one is sour in taste and third one is *charpara* in taste.^[3-4]

Habitat and Distribution

It is native of Europe and Southwest Asia. There were more than fifty cultivars of sour cherry in England previous to the Second World War. Presently, few are grown commercially and despite the continuation of named cultivars such as “Kentish Red”, “Amarelles”, “Griottes”, and “Flemish,” only the generic Morello is offered by most nurseries. The Morello cherry ripens in mid to late summer, toward the end of August in southern England. It is self-fertile and would be a good pollinizer for other varieties. Sour cherries require rich, well drained, moist soil for cultivation, although they demand more nitrogen, and water than sweet cherries. During spring, flowers should be protected, and trees weeded, mulched and sprayed with natural seaweed solution. This is also the time when any required pruning should be carried out. Morello cherry trees fruit on younger wood than sweet varieties, and thus, can be pruned harder. They are usually grown as standards, but can be fanning trained, cropping well even on cold walls, or grown as low bushes.^[1] Sour tree is grown in Europe and America for its ornamental flowers. In India, it is said to be grown in Kashmir, Kumaun, and

Garhwal at elevations up to 2300 m. Sour cherry types are self-compatible but are said to set better crops when cross pollinated; the crop is said to be practically immune to San Jose scale and is compare to more resistant to disease and pests.^[5] It is cultivated in Himachal Pradesh for edible fruits.^[6]

Botanical Description

The tree of sour cherry is smaller than the sweet cherry. Its height is of 4-10 m.^[1] A small tree, usually round-topped or spreading, bearing root suckers; leaves are ovate, hard, stiff and rather abruptly pointed, minutely toothed; flowers white, in cluster of 2-5 on slender pedicels,^[5] 2-4 cm long,^[7] appearing with the leaves; fruits globose, 0.6-1.25 cm in diameter, light red to nearly black, acid or sweet.^[5] Bark is bitter, astringe.^[7,8] Fruit is sour and sweetish.^[7]

Phytochemical Chemicals in *P. cerasus* (Sour Cherry)

Medicinally, sour cherries may be useful in alleviating sleep problems due to its high melatonin content.^[1] A flavanone-cerasinone- and two chalcones-cerasidine and cerasin isolated and their structures elucidated chrysin, tectochrysin, dihydrotectochrysin, Dihydroxogonine, pinocembrin, sakuranetin, naringenin, aromadendrine, taxifolin, cerasin, cerasinose, and cerasinine.^[9] 1.03% kaempferol are in leaves.^[10] Avenasterol-5-ene, Avenasterol-7-ene, sitosterol, stigmasterol and stigmast-7-enol isolated from pits; prunetin-5-glucoside are present in peduncle.^[11] Quercetin-3-O-rutinosyl-7, 3'-Obiglucoiside, kempferol-3-O-rytinoyl-4'-di-O-glucoside and two isomers of quercetin 3-O-rutinosyl-4'-di-O-glucoside are present in fresh leaves and fruits.^[12] Identification of protocatechuic, P-coumaric, ferulic and diferulic acids in shoots, tectochrysin-5-glucoside, genestein-5-glucoside are in bark.^[13] The bark of *P. cerasus* evidently contains amygdalin.^[14] The kernels contain the element of hydrocyanic acid.^[5,8,14,15] Its fruit contains malic acid >1%. Indian red sour cherry gave moisture 83.4, protein 1.1, fat 0.5, minerals 0.8, fiber 0.4, and other carbohydrates 13.8%, calcium 24, phosphorus 25, iron 1.3, potassium 320, copper 0.02, thiamine 0.08, riboflavin 0.08, nicotinic acid 0.3, and ascorbic acid 7.0 mg/100 g.^[5] Red sour cherry from the USA are reported to contain 720 IU/100 g of Vitamin A. The average malic acid content of the juice of sour and sweet cherries has been recorded as 1.40 and 0.64%, respectively. The pits of sour cherry obtained in large quantities during canning, yield 28% kernels containing 30-40% of edible oil. Sugar content in sour cherry is 10.3% and in sweet cherry 11.4%.^[5] The fatty acid composition of the edible is as follows: Myristic 0.2, palmitic 4.3, stearic 2.9, arachidic 0.8, oleic acid 49.4, and linoleic acid 42.4%.^[5] The kernel contains a glucoside prunasine (d-mandelonitrile-d-glucoside, C₁₄H₁₇O₆N, mp 147-50) belonging to the amygdalin group.^[5] The kernel press cake on steam distillation yields 1% of an essential oil similar to the oil of bitter almonds. The press

cake contains proteins 30.9, crude fat (ether extraction) 13.1, N-free extraction 42.1, and crude fiber 8.9%.^[5] The bark contains 5-7% tannin. The leaves contain amygdalin.^[5-6] On prolong hydrolysis, the gum gives aldobiouronic acid which hydrolyses into various oligosaccharides.^[5] Leaves, fruits, and barks gave flavones glycosides.^[6]

Recent Phytochemical Studies

After the survey of literature of various recent phytochemical studies following important phytochemical have been reported by researchers:

Stems, leaves, and pomace of the sour cherry (*P. cerasus* L.) are the rich sources of bioactive compounds. Sour cherry is used in the Obidos liquor from Portugal.^[16]

Eight phenolic acids were estimated in methanol extracts: Gallic, chlorogenic, tannic, caffeic, salicylic, ferulic, pcoumaric and transcinnamic. Leaves of sour cherry contained 30.702 mg of phenolic acids. It was also found that salicylic acid was a dominant compound in leaves of sour cherry (17.723 mg.g⁻¹ dm). The content of pcoumaric acid was the lowest in 0.046.^[17]

Tart cherry (*P. cerasus*) produces various kinds of polyphenolics in its fruits that include cyanidin derivatives (mostly cyanidin 3glucosylrutinoside, cyaniding 3rutinoside, cyanidin sophoroside), peonidin 3glucoside; kaempferol, quercetin, and isorhamnetin and their derivatives, as well as the alkaloid, melatonin.^[18]

Sour cherry (*P. cerasus*), Laurel cherry (*Prunus lauracerasus*), and Cornelian cherry (*Cornus mas*) fruits are widely used in Turkey, both as food and as well as traditional medicines as reported by Capanoglua *et al.* The phytochemical composition and antioxidant capacities of these three types of cherries were compared by the fruit flesh was evaluated for procyanidin concentration, subunit composition and degree of polymerization, for anthocyanin composition and for total antioxidant capacity, total phenolic content and total flavonoid content. High concentrations (up to 1 g/100 g dry weight) of long-chain procyanidins were found in Laurel cherry, whereas concentrations of procyanidins in Cornelian cherry were around 25 times lower. Surprisingly, Sour cherry (0.3 g/100 g DW) had a different procyanidin profile which was dominated by short polymers with a normal average chain length of 4 monomer units.^[19]

Total phenolic compounds (TPC) from hydroalcoholic extracts of four varieties of sour cherry (*P. cerasus* L.) grown in experimental field of Research-Development Station for Fruit growing Iași, Miroslava area. AC, determined by pH differential method, had the highest value at Engleze timpurii variety (176.2 ± 0.97 mg/100 g) and TPC, determined by the Folin-Ciocalteu colorimetric method, had the maximum value at Mocănești 16 variety (446.89 ± 0.70 mg GAE/100 g).

Based on the obtained chromatograms were identified four anthocyanins: Cyaniding (cy)-3glucoside, cy-3-rutinoside, cy-3sophoroside cy-3-glucosylrutinoside, expressed as a percentage of anthocyanins area. Anthocyanin profile obtained was not same in varieties examined and the ratio between anthocyanins varied from one variety to another.^[20]

Total anthocyanin was reported to be more in sour cherries. Mediterranean weather could have influence on high anthocyanin synthesis during ripening.^[21]

Medicinal Actions

In Unani and ethnobotanical literature the following medicinal actions of fruit of *Aloo baloo* (*P. cerasus*) have been reported:

Musakkin Safra' wa Josh Dam^[2-3,22-25], Febrifuge (*Musakkin-i-Hararat*)^[26,27], *Muqawwi-i-Mi'da* (Stomachic tonic)^[2,7,28,29], *Muqawwi-i-Jigar* (Hepatotonic)^[2,7,24], *Mufattit-i-Hasah* (Lithotriptic)^[2,4,14,30-32], *Mudirr-i-Bawl* (Diuretic)^[3,5-7,22-25,27,33,34], *Mudirr-i-Hayd* (Emmenagogue)^[3,7,22-25,35], *Daf-e-Hararat* (Antipyretic)^[7,23-34], *Qabid* (Astringent)^[2,24,26,27,34], *Jali* (Detergent)^[25,32,36-38], *Mulattif* (Demulcent)^[4,31], *Qati'-i-Mawad*^[3,30,31], *Muzayyid Mani* (Spermatogenic)^[29], *Muqawwi bah* (Aphrodisiac)^[29], *Musakkin Atash*^[28,38], *Muqawwi-i-Dimagh* (Brintonic)^[5-8,14-15,27,34], *Daf-e-iltehab* (Anti-inflammatory)^[6,34], *Musakkin* (Sedative)^[34], antioxidant.^[34]

Pharmacological Studies

Immunomodulatory activities

Ali Abid Sheikh *et al.* reported that different parts of *P. cerasus* have immunomodulatory effect. 15 different extracts of fruit were screened, the methanolic fruit extract of the *P. cerasus* fruit (Pc-MeOH-f-Ext.) showed the maximum potency and was found to be the best immune-potent even at lower concentrations.^[39] Ethyl acetate fraction (PNRS-EtOAc) obtained from the *P. cerasus* fruit in the modulation of immune responses detailed studies were carried out using a panel of *in vivo* assays.^[40]

Antioxidant activities

As per study done by Ferretti *et al.* about *P. cerasus*, they investigated antioxidant capacity of extracts of fruits from cherries using different methodological approaches. Using an ORAC (oxygen radical absorbance capacity) assay, it has been reported that the antioxidant capacity ranges from 1,145 to 1,916 μmol trolox equivalents (TE)/100 g in sour cherries.^[41] Haidari *et al.* investigated the effect of tart cherry (*P. cerasus*) juice on serum uric acid levels, hepatic xanthine oxidoreductase activity, and two noninvasive biomarkers of oxidative stress (total antioxidant capacity and malondialdehyde concentration), in normal and hyperuricemic rats. Tart cherry (*P. cerasus*) juice treatment did not cause any significant reduction in the serum uric acid

levels in normal rats but significantly reduced ($P < 0.05$) the serum uric acid levels of hyperuricemic rats in a time-dependent manner. Tart cherry (*P. cerasus*) juice treatment also inhibited hepatic xanthine oxidase/dehydrogenase activity. Moreover, a significant increase ($P < 0.05$) in serum total antioxidant capacity was seen and observed in tart cherry juice treated-rats in both normal and hyperuricemic groups. The oral administration of tart cherry juice also led to a significant reduction ($P < 0.05$) in MDA concentration in the hyperuricemic rats.^[42]

Melatonin levels and enhanced sleep quality

Howatson *et al.* reported that fruit of *P. cerasus* contain high levels of phytochemical including melatonin, a molecule critical in regulating the sleep-wake cycle in humans. Total melatonin content was significantly elevated ($P < 0.05$) in the cherry juice group, while no differences were shown between baseline and placebo trials. There were significant increases in time in bed, total sleep time, and sleep efficiency total ($P < 0.05$) with cherry juice supplementation.^[43] Tart cherry juice has modest beneficial effects on sleep in older adults with insomnia. Given that these results were achieved following only a brief treatment period (2 weeks).^[44]

Antioxidant and anti-inflammatory activities

As study was concluded by Ferretti *et al.* about fruit of *P. avium* and *P. cerasus* both contain several polyphenols that possess antioxidant and anti-inflammatory properties. Authors investigated the effect of the maturity stage on phenol content and biological properties of extract of a local Morello-type of sour cherry (*P. cerasus* L.).^[45] Cherry juice as a potent cyclooxygenase enzymes-2 inhibitor and antioxidant in the liver and blood of mice, but not in the brain thus it might potentially be used as an antioxidant and anti-inflammatory product with beneficial health-promoting properties.^[46]

Skin care and promoting health

As per study done by Elisabete Maurício, Catarina Rosado, and Diaz Diaz Lanza to validates the "antioxidant" claim for the introduction of extract of stem, leaves, and pomace of *P. cerasus* as a functional ingredients in cosmetic products. Efficacy tests of extracts were made in human skin to measure the protective effects of the antioxidant extracts against an irritating substance (methyl nicotinate) in 10 healthy volunteers. The results showed that extracts are rich in flavonoids compounds and phenolic acids, which may be the cause of the antioxidant activity showed *in vitro* tests.^[47]

Antidiabetic activities

Anitha *et al.* reported that tart cherries (*P. cerasus*) and their compounds are helpful in controlling diabetes and its complications. According to the researchers, the fruit of cherries might be useful in the prevention of Type 2 diabetes. In another study on rats, a single dose of anthocyanins decreased fasting blood glucose levels by 19% and improved

glucose tolerance by 29%. After 1 month of treatment with anthocyanins, fasting blood glucose levels had dropped to half of the pretreatment levels and glucose tolerance had improved by up to 41%.^[48] Consumption of 40 g/day of concentrated sour cherry juice decreases body weight, blood pressure, and HbA1c after 6 weeks in type 2 diabetes women and improves blood lipids in diabetic patients with hyperlipidemia.^[49]

Antimicrobial activities

Tart cherries (*P. cerasus* L.) were tested on fungus and bacterial growth. The antimicrobial activities of black sour cherry extracts were measured in culture.^[50]

CONCLUSION

This review describes the information about *P. cerasus* which includes Unani description, habitat, botanical description, medicinal actions and recent phytochemical and pharmacological studies.

P. cerasus is one of those ancient plants which have been used in USM for the treatment of the renal calculi, stone in the bladder, and burning micturition.

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