A Review on Phytochemical and Pharmacological Activities of Prunus Cerasus

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Abstract

The Rosaceae family tree Prunus cerasus L. is a medicinal plant that has been extensively utilized Unani system of medicine. Prunus cerasus tree particularly berries are utilized in the urinary system to treat various disorders like UTI, cystolithiasis, dysuria and nephrolithiasis in the Unani and Ayurvedic system of medicine. So, this was a significant medicinal herb so long, & consequently, researcher was also keen to confirm the therapeutic properties. Hence numerous science-based researches have been conducted out in order to validate the phytochemicals ingredients & therapeutic activities. The purpose of such study exists to compile the facts regarding its therapeutic usage stated in Unani system of medicine it has been in use for a considerable period of time. In addition, its phytochemical and pharmacological properties are noteworthy. Investigations which have been completed various regions of the globe are also included. According to Unani literature, the fruit of this plant has been used since antiquity different ailments for example, a condition called Dysuria. Anti-bacterial, Anti-oxidant, Anti-inflammatory and per modern research, various portions of tart cherry plant have shown to be effective in diabetes, heart disorders, and skin disorder.

Keywords: *Prunus cerasus*, Flavonoids, Neuropathy, Tart cherry

Introduction

The larger part of the world's population, between 75 and 80 percent, still significantly relies on herbal medicine for primary healthcare. This is mostly because herbal medications are thought to have minimal side effects, are affordable, and are easily accessible. According to the World Health Organization (WHO), herbal remedies are used two to three times more frequently than conventional drugs globally. Since the beginning of time, people have employed plants for therapeutic purposes. Many aspects of modern medicine are based on this practise. Many popular medications currently contain plant roots since the bulk of the few successful therapies from a century ago were mostly plant-based. In medical history, which dates back to the dawn of time, there are descriptions of individuals using plants to cure the sick members of society. Nevertheless, the beginning of the industrial revolution coincided with the development of allopathic medicine. Although less popular, herbal medicine was also a successful form of therapy. The use of herbal medicines in traditional medicine was discontinued in the middle of the 20th century, not necessarily because they were ineffective but rather because they were less profitable than the more modern synthetic drugs. Early in the 19th century, herbal medicines were regarded as quackery as scientific techniques developed and gained popularity [1].

P. cerasus It is similarly referred to by further names like tart, bitter, wild, and dwarf cherries. In the field of Unani herbal medicine, it is often known as Aloo baloo. The genus of the plant is *Prunus*, its subgenus is *Cerasus*, and it belongs to the family *Rosaceae*. That other believed to have arisen as a spontaneous crossbreed among *P. avium* & *P. Fruticosa* in East Europe or the Iranian Hill, where both species intersect. The 2 hybrids subsequently reached a stable state and reproduced with each other, resulting in the creation of a distinct and unprecedented species. The Greeks were aware of cultivated sour cherries approximately 300 BC, which were obtained from *Prunus acida* and Tart cherry natural specimens found in the Black and Persian Seas. They were also highly regarded with both the Romans and Persians who brought them into UK much earlier in 1st aeons the berry remains common in the present day in Iran. In the United Kingdom, its farming was encouraged in era of Henry VIII in the sixteenth aeons. It became a common crop between Kentish cultivators & approximately 1640 more than 2-ton distinct types were reported. Colonists cultivated the first tart cherries, "Kentish Red," shortly after they landed in the United States & in the state of Massachusetts [2].

Plant of tart cherry are modest in size. The branches are dispersed & straight. The leaves were roseate and bigger quantity or equivalent to yellow leaves of potatoes. Flower is silver in color. Berries (fruits) are tiny, spherical and comparable to grapes that which is joined to little branches by light & fine wood in the set of bundles. At first, look of fruits is red but after while it turns smell similar to hue. other version is blackened [3-5] Kernel is small similar grams which contains white fluff. Bark is firm and white. Various publications suggested that plant is located in the zone of Punjab & Himalayas [3]. Latex contained in berry. Cherries appear in seasons of march to May. immature fruit is green in color & acidic in flavor; underripe fruits appear red & acidic in flavor, it has a height of 4-10 meters [1]. tart cherry tree is spread in both America and Europe for its gorgeous blossoms. In Bharat, it is believed to be cultivated in the region of Kashmir, Kumaun, and the Garhwal region at altitudes as much as 2300 meters. Tart berries cultivars are self-suitable but are expected to yield bigger harvests once cross inseminate; the crop is claimed to be almost immune to San Jose scale and is deemed to be more impervious to pests & diseases [6]. It is planted in the region of Himachal Pradesh for fruit that is edible [7].

Figure-1, Fruit of Prunus cerasus

Phytochemical composition

Chrysin, Apigenin-5-glucoside, 6,7-Dimethoxy-5,8,4'-trihydroxy flavone, Glucogenkwanin, Tectochrysin, Tectochrysin 5-glucoside, Cerasinone, Dihydrotectochrysin, Dihydrowogonin, Naringenin, Pinocembrin are the flavones found in sour cherry. Kaempferol 3-O-rutinosyl-4'-di-O-glucoside, Isoquercitrin, Kaempferol, Nicotiflorin, Kaempferol-3-rhamnoside-4'-galactoside, 5,7,4'-Trihydroxy-3'-methoxyflavanol-3-rutinoside, Rutin are Flavonols found in sour cherry. Aromadendrin, and Taxifolin are Dihydroflavonols found in sour cherry. Genistein, Genistein 5-glucoside, Prunetin 5-O-β-D-glucopyranoside, 5,7,4'-Trihydroxy iso flavone-7-glucoside are Iso flavonoids found in sour cherry [8].

Aneta Wojdyło et al; reported polyphenolic content in fruit of *Prunus creaus*, Using epicatechin, (+)-catechin, Reference points were neochlorogenic acid, 3,5-dicaffeoylquinic acid, Quercetin-3-O-glucoside, kaempferol-3-O-rutinoside, peonidin-3-O-rutinoside, pelargonidin-3-O-rutinoside, cyanidin-3,5-O-diglucoside, cyanidin-3-O-glucoside, and cyanidin-3-O-rutinoside, in that sequence. The compounds that were generated were 3-p-coumaric acid as p-coumaric acid, kaempferol derivatives as kaempferol-3-O-rutinoside, apigenin derivatives as quercetin-3-O-glucoside, and quercetin derivatives as quercetin-3-O-glucoside. Every decision was made three times. The results were given in milligrams for every 100 grams of dry materials [9].

Recent Phytochemical Studies

The tart cherry is an abundant source of bioactive chemicals found in its stems, leaves, and pomace. Portugal's Obidos liquor is made from sour cherries [10]. In methanol extracts, the following eight phenolic acids were quantified: transcinnamic, ferulic, salicylic, caffeic, tannic, chlorogenic, and gallic. Phenolic acids were found in 30.702 mg of sour cherry leaves. Additionally, it was shown that the predominant chemical in tart cherry leaves was salicylic acid (17.723 mg. g−1 dm). The lowest pcoumaric acid concentration was found in 0.046 [11]. The fruits of the tart cherry (*P. cerasus*) contain a variety of polyphenolic compounds, such as cyanidin derivatives (primarily cyanidin 3glucosylrutinoside, cyaniding 3rutinoside, and cyanidin sophoroside); peonidin 3glucoside; and derivatives of kaempferol, quercetin, and isorhamnetin, in addition to the alkaloid melatonin [12].

Traditional uses

Prunus cerasus is a complementary therapy used historically for improvement of chronic-ailments described by increase in oxidative-stress such neuropathy [13]. In literature on Unani and ethnobotany, the subsequent therapeutic activities of the fruits of tart cherry have been showed. Musakkin Safra' wa Josh Dam, Febrifuge (Musakkini-Hararat), Stomachic tonic, Hepatotonic, Mufattit-i-Hasah (Lithotriptic), Mudirr-i-Bawl (Diuretic), Mudirr-i-Hayd (Emmenagogue), Daf-e-Hararat (Antipyretic), Qabid (Astringent), Mulattif (Demulcent), Qati'-iMawad, Spermatogenic, Aphrodisiac, Brain tonic, Anti-inflammatory, Sedative and Rust inhibitors [14].

Pharmacological activity

1. Antidiabetic activity

Antidiabetic efficacy of hydro-methyl alcohol extract of tart cherry fruits. Alloxan-induced diabetes substantially depressed blood amounts of the hormone insulin, the C-peptide, entire hemoglobin and overall protein, and greatly boosted Fasting blood glucose & the hemoglobin A values. However, 100 or 200 milligrams per kilogram of bwt extract/day administered orally for a period of 60 days., abnormalities in the values of these parameters were markedly and dosedependently reversed [9]. Treatments using extract of the cherry resulting in a large drop in plasma sugar & urine microalbumin and a rise in the creatinine secretion concentration in urine. Extract of this plant is effective in decreasing the plasma sugar level [15].

2. Anti-Caner activity

A.A. Sheikh et al; reported Chemopreventive properties of *P. cerasus* opposed to human cancer cells & ascetic fluid Swiss albino & BALB/c mice models, Using MTT and SRB assays, the in-vitro anticancer potential was evaluated against five unique cancer cell lines from humans, including NCI-H322, A-549, THP-1, MCF-7, PC-3, and MCF-7[13] According to the findings, cherry extracts have anti-proliferative activity against mouse mammary tumor cell (4T1) and mammary adenocarcinoma (MCF-7) breast cancer cell lines. They also induce apoptosis, reduce ADMA levels in cell cultures with treatment of cherry extract, & have antibacterial properties against some multiple drug-resistant bacteria in vitro. These findings could open up novel therapeutic avenues for conventional anti-inflammatory products as a pretreated drug against cardiovascular disease, cancer, & conditions impervious to multiple drugs [16].

3. Antioxidant activities

Aneta Bojdylo et al; found that the leaves and fruits of sweet (*Prunus avium*) and tart (*Prunus cerasus*) cherries have significant antioxidant capacity and in vitro suppression of acetylcholinesterase (AChE), α-glucosidase, α-amylase, and pancreatic lipase activity butyl cholinesterase (BChE), cyclooxygenase (COX-1, COX-2) [17]. The discovery that sour cherries (*Prunus cerasus L.*) have significant amounts of anthocyanins that show excellent antioxidant and anti-inflammatory activities has drawn a lot of attention to this species. The ORAC and TEAC tests used to measure antioxidant activity showed that the fruit extracts had a reasonably high antioxidant capacity (ranging from 1145 to 2592 μmol TE/100 g FW), while the callus extract had a lower antioxidant capacity (688 μmol TE/100 g FW) [18].

4. Gastroprotective activity

Karim rafat et al; about *Prunus cerasus*, they reported the Gastroprotective effects of ethyl acetate extract of *Prunus cerasus* fruits and seeds in Swiss-albino male mice protected stomach mucosa from 12 Hydrochloric acid/Ethyl alcohol-induced stomach-lesions. Scs (200 mg per kilogram) has revealed the most protective against stomach-13 potential and presented similar outcomes to ranitidine (50 mg per kilogram) [19].

5. Anti-inflammatory activity

Karim rafat and et al; about *Prunus cerasus*, they reported the anti-inflammatory effects of ethyl acetate extract of *Prunus cerasus* fruits and seeds in Swiss-albino male mice against acute carrageenan-induced inflammatory pain and carrageenan-induced paw edema [19]. In animals treated with tart cherry extract (juice), a substantial disobliging impact on Cyclooxygenase -2 activity assessed in a supernatant of inadequate Freund's adjuvant elicitated macrophages from the peritoneum was identified. Tart cherry juice at a level of 10% lowered Cyclooxygenase -2 activity by 33%, whereas concentration of 50% tart cherry juice decreased Cyclooxygenase -2 activity by 41% vs control [20]. cherry oils showed their potential in vitro anti-inflammatory action, measuring the oil quantity for inhibiting the protein denaturation at 50% (IC50), The oils exhibited a greater anti-inflammatory activity than diclofenac, which was utilized as the control [21].

6.Hepatoprotective activity

Kalantari H et al; reported the Antihepatotoxic Effect of Microemulsion-Based System of *Prunus Cerasus* seeds Extract on CCL4 induced Liver Damage in Mice. Seven sets of Swiss albino mice (weighing 25 to 30 g each) were produced at random. For ten days, mice were administered oral doses of the plant extract in the ranges of the following concentrations: 2.5%, 5%, and 10% with or without Carbon tetrachloride, and their blood and livers were later employed for biochemical and histological research, respectively. According to the study's results, the hepatoprotective effect of Tart cherry seeds extract in the groups that received (treated) 2.5% ME, 5% ME, and 1000 mg per kilogram of non-ME greatly affected the raised serum enzyme activity & diverse pathological abnormalities in swiss albino mice that received Carbon tetrachloride. It was revealed that 5% ME extract and 1000 mg per kilogram of non-ME extract had essentially equal hepatoprotective effects on Carbon tetrachloride -induced hepatic damage [12]. The current experiment seeks to investigate the putative hepatoprotective impact of tart cherry on liver damage produced by injection of paracetamol to young male swiss albino rats. The tart cherry is high a source of flavonoids, polyphenols, as well as overall antioxidant substances therefore it may be having protecting effect against liver damage in swiss albino rats [22].

7.Immunomodulatory activities

Sheikh Abid et al; examine the function of ethyl acetate fraction produced from the sour cherry fruit in the modulation of immunological ability, extensive experiments were done out employing a number of *in vivo* tests. Orally administered injection of PNRS-EtOAC (25–100 mg per kilogram) enhanced both the hemagglutination antibody titre, which expresses IgM and IgG. Further, it triggered a dosage associated rise in the delay type hyper sensitivity responses (DTH) shortly after 24 hours and 48 hours in BALB/c mice. The findings in these trials indicated the immunostimulatory impact [23]. tart cherry They were extracted using methanol, water-methanol 1:1 and water, examined for In vitro immunomodulatory potential using the Nitric oxide synthase inducible test, Nitroblue Tetrazolium Reduction test. Antibacterial activity of the macrophages as well as T & B cell proliferation by MTT assay.

Results demonstrated a considerable variation in the immumodulatory actions according to the sections of tart cherry plant [24].

8. Antimicrobial activities

Tamara Krstić et al; examined the antibacterial activity of tart cherry against various microorganisms by micro dilution technique in accordance with the CLSI (Clinical and Laboratory Standards Institute). Results demonstrated that & extract display anti-bacterial action, but have little antifungal and antialgal activity against tested microorganisms. In terms of break point, superior result was observed against Gram positive bacteria. Rhodococcus equi was the most sensitive specie to both juice & extract. Juice gave well responses to: Pseudomonas aeruginosa, Salmonella Typhymurium, Acinetobacter lwoffi, and Staphylococcus aureus, while for each additional studied species extract demonstrated better activity [25]. The bactericidal activity of a methanol extract of the popular edible fruit *Prunus cerasus Linn* was examined. high-performance liquid chramtography examination of the sample verified the substantial content of anthocyanins. MIC (Minimum Inhibitory Concentrations) both Gram-positive & Gram-negative harmful bacteria was in ranges from 2 – 6.6 mg mL−1, although the time-kill test demonstrated that the antibacterial activity was observed only at doses larger than 2× MIC. Remarkably, at dosages lesser than MIC, tart cherry extract revealed an exciting result on bacterial growth and on the capability to produce biofilms. In instance, a resistant to multiple drugs Acinetobacter baumannii strain demonstrated a thirty percent rise in growth at low dosages [26].

9. Diuretic activity

Larysa V. Lenchyk et al; reported Qualitative composition and concentration of flavonoids and hydroxycinnamic acids in tart cherry (*Prunus cerasus*) fruits extract have been examined by HPLC and reported diuretic effect on rats [27].

10. Xanthine Oxidase Inhibitory Activity

As per study done by **Zhao J et al;** throughout this work, 50 percent restricting concentration (IC50) because the xanthine oxidase suppressive effect of tart cherry extracts has been identified. The xanthine oxidase inhibiting activity reported with all additions indicated that the tart cherry confined a substantial number of phytochemicals with XO inhibition capacity. Some of them, the extract of M-15 demonstrated evident action with IC50 of 2.618 mg/ml, 3.177 mg/ml and 3.940 mg/ml, while relatively mild inhibitory actions with the IC50 of 17.950, & 13.595 mg/ml, accordingly & moderate action with the IC50 of 6.495, 7.700, & 7.791 mg/ml, correspondingly. Several data show that polyphenolics have a considerable potential for reducing illnesses caused by Xanthine Oxidase action [28,29,30].

11. Melatonine lebel and enhance sleep quality.

Glyn Howatson et al; reported Total melatonin concentration was considerably raised in tart cherry fluid (juice), whereas not any changes remained detected among baseline and placebo tests. There were substantial improvements in time in bed, overall sleep time and efficacy of sleep overall (P\0.05) with supplementation *P. cerasus* fruits juice.

While there was no variation in time of the melatonin circardian rhythm, there were a tendency to greater mesor & magnitude. These observations imply that ingestion of a *Prunus cerasus* juice concentration offers a rise in exogenous melatonin that is advantageous in enhancing the length and quality of sleep in healthy men and women and could be of help in treating disrupted sleep [31].

12. Protective effect on neuronal cells.

Dae-ok Kim et al; examined the protective effects of sweet and tart cherry phenolics on neuronal cells. The range of total phenolics in 100 g of tart and sweet cherries was 92.1 to 146.8 mg gallic acid equivalents and 146.1 to 312.4 milligrams gallic acid equivalents, accordingly. The entire anthocyanins in the sweet & tart cherry reaching from 49.1 to 109.2 mg cyanidin 3-glucoside equivalents & from 30.2 to 76.6 mg, respectively. An analysis using high- HPLC demonstrated that anthocyanins, including derivatives of cyanidin & peonidin, was important phenolics. chlorogenic acid, Neochlorogenic acid, & derivatives of 4-hydroxycinnamic acid make up hydroxycinnamic acids. Additionally, the glycosides of isorhamnetin, kaempferol, and quercetin were found. The total anthocyanins estimated by summation of different peaks through the high-performance liquid chromatography & the overall anthocyanins evaluated by the pH different technique showed a positive linear correlation (r 2 = 0.985), suggesting that there was a strong agreement between the two quantification techniques for assessing anthocyanin concentrations. Because anthocyanins are present in cherries, & its phenolics contents secured neuronal cells (PC 12) against oxidative stress that damages cells inside a dose-reliant manner. [32].

13. Skin care and health promoting.

According to research completed by **Elisabete Maurício et al;** to supports the “antioxidant” claims for use of extracts of stems, leaves, and pomace of tart cherry as an effective ingredient in beauty products. Efficiency trials of extracts have been performed in human skin in order to assess the defensive benefits of the antioxidants extract towards an irritant chemical (methyl nicotinate) in ten young volunteers. findings revealed that extract is abundant with flavonoids chemicals & carbolic acids, that could be the explanation of the antioxidant capacity demonstrated *in vitro* methods [33].

14. Cardioprotective activity.

Arpad Tosaki et al; reported the properties of seeds extract derived from tart cherry kernels on the post ischemia cardiac healing remained examined in isolated functioning hearts of rats. Rats were given with varying every day dosages of the extract for fourteen days, & hearts were subsequently separated & exposed Approximately 30 minutes of worldwide ischemia preceding 120 minutes of reoxygenation. The frequency of VF &VT lowered from controlling levels of 92% & 100% approximately 50% (not remarkable) and 58% (not remarkable), 17% (P0.05), & 25% (P0.05) with dosages of 10 mg per kilogram and 30 mg per kilogram of the extract, accordingly. Lower dosages of the extract (1 & 5 mg per kilogram) did not work substantially lower the incidence of ventricular fibrillation & ventricular tachycardia following recirculation. Tart cherry kernel extract (10 & 30 mg per kilograms) substantially enhanced post ischemic healing of heart after recirculation [34].

Conclusion

This review article covers the data on *Prunus cerasus* which comprises Unani therapy explanation, botanical explanation, and modern phytochemical & pharmacological research. Significantly, the prospective benefits of Prunus cerasus peels, pomace, seeds, and kernels are utilized as an anti-cancer, anti-inflammatory, anti-bacterial, and antioxidant and better sleep quality, boosting skin care or many more pharmacological actions.

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