

A Review on Quince (*Cydonia oblonga*): A Useful Medicinal Plant

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Abstract: Plants have the capability to produce an extensive variety of chemical compounds that in turn exert important biological functions and modify different pathological conditions in both human and animals. In this way medicinal plants mediate their effects through Chemical compounds and these processes are identical to those already well understood for the chemical compounds in conventional drugs. The quince (*Cydonia oblonga*) is the sole member of the genus *Cydonia* in the family Rosaceae (which also contains apples and pears, among other fruits). It is a small deciduous tree that bears pome fruit, similar in appearance to a pear and bright golden-yellow when mature. The present review described in general the medicinal effects, chemical profile, other properties and importance of the quince plant (*Cydonia oblonga*).

Key words: Quince • *Cydonia oblonga* • Medicinal Plant

INTRODUCTION

An enormous number of plants possess medicinal effects. World Health Organization has scheduled over 21000 plant species used around the world for therapeutic and medicinal purpose [1]. Medicinal plants have been recognized and used throughout olden times since the human history. These medicinal plants are considered as rich resources of ingredients which are used in drug development and synthesis [2]. Medicinal plants have remained as the most affordable and easily available source of treatment in the primary healthcare system of resource [3]. Quince (*Cydonia oblonga*), is a plant having many medicinal properties. Quince (*Cydonia oblonga*) is known with different names, Urdu name “Bahee Dana”, Farsi name “Beh”, Greek name “Strythion”, and Hindi name “Bihi” belonging to Rosaceae family [4, 5]. In the present review the general medicinal effects, chemical profile, other properties and importance of the quince plant (*Cydonia oblonga*) have been described.

Origin and Distribution: *Cydonia oblonga* is shrub or small tree of the Asian genera *Chaenomeles* and *Cydonia* of the family Rosaceae. It is a spineless tree with edible fruits cultivated from ancient times in Asia and in the Mediterranean area [6, 7]. Quince fruit (*Cydonia oblonga* Mill) in terms of taxonomy belongs to the genus *Cydonia* and the Rosaceae family. This species comes from

Asia Minor. The fruits are big hairy and pear-shaped or apple-shaped, yellow color with typical flavor and aroma [8]. *Cydonia oblonga* is resident to Caucasia in western Asia. During early times, this plant extended from its wild center of origin to the countries neighboring the Himalayan mountains to the east and throughout Europe to the west, but it is probable that Quince reached the Mediterranean region only in classical times, it was used by the Romans [9]. This plants also grows in Punjab and Kashmir [10]. *Cydonia oblonga* is grown and cultivated in grounds or gardens under warm temperature and grows up to 8 m in height and 4 m width. The young branches are covered with pale greyish wool, leaves are elliptical, flowers are pink or white, fruits are bright yellowish and usually pear shaped [4].

Chemical Profile: Different chemicals like polyphenols, terpenes, organic acids, amino acids and glycosides have been isolated and identified from various parts of plant such as leaves, fruits, stem, roots, seeds and bark [11, 12]. Quince is rich in polyphenols, especially procyanidins [13]. A total of 26 polyphenolic compounds found in quince tissues were identified and obtainable: 9 flavan-3-ols ((-)-epicatechin, procyanidin B2, 3 procyanidin dimers and trimers, and 1 tetramer); 8 hydroxycinnamates, derivatives of caffeoylquinic and coumaroylquinic acid; and 9 kaempferol and quercetin derivatives [14]. Quince seeds presented a phenolic profile composed of 3-

O-caffeoylquinic, 4-O-caffeoylquinic, 5-O-caffeoylquinic and 3, 5-dicaffeoylquinic acids, lucenin-2, vicenin-2, stellarin-2, isoschaftoside, schaftoside, 6-C-pentosyl-8-C-glucosyl chrysoeriol and 6-C-glucosyl-8-C-pentosyl chrysoeriol [4, 15, 16]. Total concentration of phenolic compounds in quince leaves is higher than that in other parts of the plant [17]. During a phytochemical study of *Cydonia oblonga*, a homo-monoterpenic compound (*trans*-9-amino-8-hydroxy-2, 7-dimethylnona-2, 4-dienoic acid glucopyranosyl ester) was secluded and recognized [18]. In several samples of quince fruit six organic acids were identified: citric, ascorbic, malic, quinic, shikimic, and fumaric acids. A number of samples also contained oxalic acid [17, 19]. The seeds of quince was contained 21 identified free amino acids and the three most abundant were glutamic and aspartic acids and asparagine [15]. The β -D-gentiobioside (β -D-glucopyranosyl (1-6) β -D-glucopyranoside) and the β -D-glucopyranoside of (3R)-3-hydroxy- β -ionone have been detected and isolated from *Cydonia oblonga* fruit [20]. The common main constituents of the essential oil from leaves of *C. oblonga* in the flowering period were characterized by a high percentage of aromatic aldehyde [benzaldehyde (12.8%)], followed by fatty acid [hexadecanoic acid (7.2%)], oxygenated monoterpene [linalool (5.7%)], norisoprenoid [(E)- β -Ionone (5.1%)]. Sesquiterpene hydrocarbon [germacrene D (8.6%)] and aromatic aldehyde [benzaldehyde (4.9%)] were found to be the main components in the essential oil from leaves of *C. oblonga* in the fruiting period [21, 22]. Leaves of *Cydonia oblonga* contained high amount of calcium [23].

General Uses: All the parts of quince plant are utilized for different purposes. Wood is used for furniture, cabinet etc making [24]. Fruit is soft and juicy and is suitable for eating raw or when cooked [25]. The cooked fruit adds a luscious taste to cooked apples [26]. The influential and characteristic odour of Quince fruit has attracted great attention as a source of flavour in recent years, predominantly valued in jams, candies, sweets and brandy [27-29]. Fruit may be used as an additive in tea [30]. Main nutritional composition of quince fruit in 100 g fresh weight [31-33]. Energy (kJ) 176, Protein (g) 0.6, Acid (g) 0.9, Carbohydrate (g) 9.1, Water (g) 86.9. Ash (g) 0.6, Fibre (g) 1.9. Total lipid (g) 0.10.

Medicinal Effects: Quince (*Cydonia oblonga*) has conventionally been used as medicinal agent [34]. Some of the medicinal properties are summarized here.

Study on ethanolic extract of *Cydonia oblonga* seeds showed antibacterial activity against *Staphylococcus aureus*, *Escherichia coli* and *Staphylococcus epidermidis*. It was observed that *Cydonia oblonga* seeds have antibacterial properties on Gram-positive bacteria more than on Gram-negative bacteria. This antibacterial activity is due to tannins [35-37]. As tannins have been reported to stop the development of microorganisms by precipitating microbial protein and making them nutritional protein deficient [38]. Quince (*Cydonia oblonga*) fruit aqueous acetone extracts were evaluated by Fattouch *et al.* [39]. They investigated antimicrobial activity of the extracts against different microorganism strains. Quince peel extract was active for inhibiting bacteria growth with minimum inhibitory and bactericide concentrations in the range of 102.5×10^3 microg polyphenol/mL. Alizadeh *et al.* [40] designed a study. The aim of this study was to evaluate the antifungal effects of *Cydonia oblonga* on *Aspergillus niger*. The results clearly proved that the *C. oblonga* extracts can inhibit the growth of *A. niger*. In addition, ethnologic extract of *C. oblonga* was more effective than acetonic extracts. They concluded that *Cydonia oblonga* extracts can be effective in controlling of *Aspergillus niger*. Similar studies also conducted by Alizadeh *et al.* [41] to evaluate antifungal effect of quince fruit. *Cydonia oblonga* was used in traditional medicine to treat or prevent cardiovascular disease. Wen-ting *et al.* [42] conducted an experiment on rats to study the effect of leaf extract of *Cydonia oblonga* on blood pressure. The results proved that *Cydonia oblonga* leaf extracts notably and dose-dependently decreased blood pressure.

Janbaz *et al.* [43] planned a study to give the pharmacological explanation for the medicinal use of *Cydonia oblonga* in gut and airways diseases. In this experiment the results showed that the crude extract of *Cydonia oblonga* seeds produced atropine- sensitive spasmodic effects in isolated ileum of guinea-pig and rabbit jejunum preparations. In rabbit jejunum, crude extract of *Cydonia oblonga* seeds also showed relaxant activity at slightly higher doses. This mechanism is due to a substance contained in quince extract producing relaxation of high K⁺-mediated contraction is believed as Ca⁺ antagonist Bolton [44], and thus the spasmolytic effect of plant extract against high K⁺ similar to verapamil may demonstrate the occurrence of calcium channel blocker like constituents in the plant extract. A study was carried out by Minaiyan *et al.* [45] to investigate the effect of quince juice and quince hydroalcoholic extract on ulcerative colitis induced by trinitrobenzene sulfonic acid in rats. The results showed that these extracts were

effective to reduce inflammation and ulcer indices in this model of acute colitis. Aslam and Sial [46] conducted experiment on Wistar rats. They used hydroalcoholic extract of the fruits of *Cydonia oblonga* (quince). The purpose of study was to assess the aphrodisiac activity. They observed that after administration of the extract mounting frequency and the mating performance of the rats increased highly significantly. The extract also influenced the behavior of treated animals in comparison to non treated rats in a notable way, making them more fascinated to females. The aphrodisiac potential of *Cydonia oblonga* may be due to its secondary metabolites such as flavonoids, glycosides, tannins, and phenolic compounds present in the extract [47]. Hypercholesterolemia is recognized to have damaging effects on male reproductive function as hypercholesterolemia has been associated with testicular dysfunction in males [48-50]. Cholesterol-fed animals treated with quince leaf decoction supplement exhibited that quince leaf has a protective effect on the testes [51]. As administration of lipid-lowering agents has been shown to protect the testes and reproductive function during hypercholesterolemia [52, 53]. Several studies have been conducted to evaluate antioxidant properties of quince. Quince leaves have reducing capacity and 2, 2-diphenyl-1-picrylhydrazyl (DDPH) radical scavenging activity [54, 55]. Oliveira *et al.* (2008) [17] described *C. oblonga* fruits and leaves comprise a hopeful natural source of bioactive compounds, namely caffeoylquinic acids and quercetin and kaempferol heterosides. The antioxidant and antiproliferative activities described for these materials may be indicative for application in nutritional and pharmaceutical fields, in the prevention and treatment of free radical-mediated human chronic pathologies, such as cardiovascular diseases and cancer. Haleh [56] suggests that leaves from *C. oblonga* can be used as a immense natural and inexpensive source of bioactive compounds with major antioxidative properties along with other mechanisms of action. By modulating various cardiovascular risk factors such as atherosclerosis, smoking, endothelial dysfunction, hypertension, diabetes and hyperhomocysteinaemia, quince leaf extract may have relevance in the prevention and treatment of different pathological states of ischemic, inflammatory and hypertrophic heart disease. Aslan *et al.* [57] conducted an experiment to show hypoglycemic activities of some plants including *Cydonia oblonga*. By using oral administration of *Cydonia oblonga* (500 mg/kg) extracts for 5 days in diabetic rats caused a decrease in blood glucose levels by 33.8%.

Alpha-Amylase is one the enzymes that catalyses the breakdown of starch to maltose and finally to glucose, which is the only sugar that can be utilized by the body [58]. The inhibition of these enzymes results in decrease in blood glucose level, because mono-saccharides are a form of carbohydrates which are absorbed through the small intestine [59]. An experiment conducted by Koutba and Morsy [60] showed that extract of the unripe fruit of *Cydonia oblonga* posses a number of biological active components including sorbitol, quinic acid, pvinylphenol and cyclopropanecarboxylic acid. The last two components might be implicated in alpha amylase inhibition and in turn have hypoglycemic effect Jouyban *et al.* [61] designed a study to investigate the efficacy of quince extracts (*Cydonia oblonga*) against hyperlipidemia-induced renal injury. As dyslipidemia and hypercholesterolemia have been associated with the pathogenesis of progressive renal injury [62, 63]. The results of this study showed that cholesterol-fed rabbits had both glomerular and tubular injuries, while the basement membrane was intact. Cholesterol-fed animals treated with the quince leaf decoction supplement exhibited milder glomerular and tubular injuries. It is therefore believable that quince leaf has a protective effect on the kidneys. Khademi *et al.* [64] studied the comparative effects of atorvastatin and quince leaf extract on atherosclerosis. The results indicated the lipid-lowering effects of quince leaf analogous to atorvastatin and it can probably serve as a new possible natural product for atherosclerosis management. Shinomiya *et al.* [65] studied anti-allergic activity of quince. They examined the effect of a crude hot-water extract of quince fruit on type I allergy *in vivo* and *in vitro*. The oral administration of the quince hot water-added diet to mice for 63 days showed a significant decrease in the development of atopic dermatitis-like skin lesions under conventional conditions. Quince hotwater had an inhibitory effect on type I allergy by suppressing IgE production and IgE-mediated degranulation. These properties are due to presence of low molecular weight polyphenols in quince fruit [65]. In Europe, *Cydonia oblonga* extract along with lemon juice is one of the popular complementary therapies used for allergic rhinitis and asthma [66]. Recent studies indicated that quince seed mucilage accelerated wound healing. The study was undertaken to investigate the healing efficiency of QSM formulated as 5%, 10%, and 20% creams in eucerin base with especial attention on growth factors involving in wound healing. It was concluded that quince seed mucilage in 10-20%

Table 1: Summary of medicinal usages of different parts of quince

Part used	Medicinal uses	Reference
Leaves	Antidiabetic	Aslan <i>et al.</i> [57] and Palmese <i>et al.</i> [78]
Leaves	Antioxidant	Aslan <i>et al.</i> [57]
Leaves	Antihemolytic and free radical scavenging	Costa <i>et al.</i> [79]
Leaves	Antihyperglycemic	Teresa <i>et al.</i> [80]
Leaves	Antihyperlipidemic	Khademi [81]
Seeds	Conjunctivitis, Cough, Bronchitis,	Siddiqui <i>et al.</i> [82]
Seeds	Constipation	Ghanadi. [83]
Seeds	Migrain,nausia,common cold and influenza	Hilgert. [84]
Fruits	Antidiabetic	Tahraoui <i>et al.</i> [85]
Fruits	Cystitis	Sezik <i>et al.</i> [86]
Fruits	Emollient for the skin	Pieroni <i>et al.</i> [70]
Fruits	Headache	Gorji [87]
Fruits	Laxative	Agelet and Vallès., 2003 [88]

concentrations have a good potential for promote wound healing. Pari *et al.* (2014) [89] wound healing activity of quince leaves was also shown by Hemmati *et al.* [67] and Sabale *et al.* [68]. The ethnobotanical study exposed that quince has been used to treat diarrhea, vomit and hypertension [69] also as stomachache [70]. Chinese quince phenolics showed the powerful anti-influenza viral activity on the hemagglutination inhibition test [16]. Also used in sore throat, cough, pneumonia, intestinal discomfort, lung diseases [71]. Some other effects such as astringent, antiseptic, hepatoprotective, anti-inflammatory and anti-dysenteric, are also found [72]. The seeds of *Cydonia oblonga* have been used traditionally in diarrhea, dysentery, cough, sore throat and bronchitis [73, 74], intestinal colic and constipation [75]. Anti-cancer characteristics of the quince leaf have been reported in recent investigations [76, 77].

CONCLUSION

Discussing upon great prospects and potential of Quince explored that it is plant of immense importance may be used for different ailments. Quince plant has a hopeful future because of its medicinal activities but many medical activities still should be investigated, and these medical properties could be significant in ethno-pharmacological studies. Synthetic compounds have many demerits so plants are gift from nature that provide admirable raw material for the treatment of various diseases and disorders.

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