

BEHIDANA (CYDONIA OBLONGA MILLER.) - A REVIEW**A. H. Ayshah Fazeenah^{1*} and Mohamed Aleemuddeen Quamri²**¹Senior Lecturer, Institute of Indigenous Medicine, University of Colombo, Sri Lanka²Senior Lecturer, National Institute of Unani Medicine, Bangalore, India.Article Received on
25 Aug. 2016,Revised on 16 Sept. 2016,
Accepted on 07 Oct. 2016

DOI: 10.20959/wjpr201611-7141

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Indigenous Medicine,
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Lanka.**ABSTRACT**

One of the great advantages of medicinal plants offers almost completely natural medicinal properties, often without the scary side effects. For several centuries, medical practitioners have recognized the therapeutic properties of certain plants' have been possessed potent remedies from broken bones to heart failure. The global demand for herbal medicinal products has increased significantly in recent years. It is estimated that, the world's population will be more than 7.5 billion in the next 10 to 15 years. *Cydonia oblonga* commonly known as "behi" which belongs to Rosaceae family. Almost all its parts such as seed, buds, bark, leaves, and fruits etc are used for medicinal purpose,

and it has been proven as antioxidant, aphrodisiac, nephroprotective, anti allergic, anti atherosclerotic, antibacterial, antihypertensive, hypolipidaemic, hepatoprotective, antimicrobial, antispasmodic, anti inflammatory and anti cancer. It is used as a single drug or as an ingredient in various formulations namely syrup, decoction, confection, semisolid preparations and pill. The present review was undertaken to assimilate the effort to explore the knowledge and comprehensively highlight the herb *Cydonia oblonga* possess multidisciplinary actions in human body. Details and facts on therapeutic uses of *Cydonia oblonga* were gathered from Unani classical texts, research articles, journal and through web search.

KEYWORDS: *Cydonia oblonga*; great advantages; medicinal properties; global demand.**1. INTRODUCTION**

Three quarters of the world population rely on herbal and traditional medicine as a basis for primary health care. Herbs and herb-derived medicines have played a crucial role in health and disease management for many centuries. Many ancient civilizations show documented

evidence for the use of herbs in the treatment of different ailments; as was seen with Mesopotamian, Indian Ayurveda, ancient traditional Chinese medicine and Greek Unani medicine.^[1] The global demand for herbal medicinal products has increased significantly in recent years. It is estimated that, the world's population will be more than 7.5 billion in the next 10 to 15 years.^[2]

Many plants have been known to produce biologically active substances, some of which are related to special flavour or taste and others are found to be useful as antioxidants, and/or antimicrobial agents.^[3] The fruit Quince (*Cydonia oblonga* Miller, *Cydonia maliformis* Miller, *Cydonia vulgaris* Pers., *Pyrus cydonia* L.) is a tree from Rosaceae family.^[4] *Behidana* is the seeds of Behi (Quince).^[5] Most varieties of quince are sour to eat and are used to make jam, jelly and quince pudding, or they may be peeled, then roasted, baked or stewed. The term "marmalade", originally meaning a quince jam, derives from "marmelo," the Portuguese word for this fruit. In Iran, quince, called *beh* (به), is used raw or in stews and some regional soups. It is also made into jam or preserve. The extra syrup in the jam-making process is saved and made into a refreshing summer drink by adding cold water and a few drops of lime to it. It can also be found pickled.^[6]

2. DESCRIPTION

Behi is a shrub, small cultivated deciduous tree^[7, 8, 9] in gardens under warm temperature,^[4] rather bushy^[7, 8, 9] and indigenous to Persia;^[8, 9] growing up to 8 m high^[7, 4] and 4 m wide^[4], but distributed throughout Europe and other countries.^[8, 9] The quince tree is native to Uzbekistan, Tajikistan, Iran, Armenia, Azerbaijan, Georgia, Pakistan, Kashmir, Afghanistan and was introduced to Poland, Syria, Lebanon, Slovenia, Croatia, Bosnia, Turkey, Serbia, Republic of Macedonia, Albania, Cyprus, Greece, Romania, Hungary, Ukraine, Moldova, and Bulgaria.^[6] It is cultivated in Afghanistan and North West Frontier province.^[8, 9] Flowering and fruiting take place during August – September.^[9] Behi leaves are simple, entire, stipules oblique, ovate. Flowers are solitary, white or pink, woolly, large. Fruits are pear or apple shaped sweet smelling, yellow in colour, juicy, fragrant, and contain a large number of plano-convex, mucilage-coated seeds, closely packed in two vertical rows, in each of the five carpellary cavities of the fruit.^[7, 10] Quince seeds are black or red in colour.^[5] The dried seeds (*Behidana*) are irregularly ovoid, plano-convex and three ribbed.^[7] The *Behidana* (Quince seeds) has been used as a medicine since ages^[11] as a laxative, astringent and anti-inflammatory.^[12] A brief review of medical literature

revealed that preparations from different parts of quince have been used as traditional remedies for cough, bronchitis, nausea, fever, diarrhea, cystitis, constipation, hemorrhoids, diabetes, hypertension.^[4]

Mizaj: *Sard va Tar* 2^[8, 9, 5]

Vernaculars Name: Unani: Bihi,^[13] Bihidana,^[10] Safarjal^[8]; English: Quince,^[7-10, 14] Quince seed,^[15, 16] Common Cydonia^[8]; Arabic: Habb-us- Safarjal^[5, 9, 15]; Persian: Behidana,^[9] Behi^[17]; Hindi: Bihi,^[8, 18, 19] Sanskrit: Amritphala;^[9, 18, 19] Kannada: Simodalibe;^[8, 9] Tamil: Shimaimathala;^[8, 13, 18, 19] Telugu: Simadanimma;^[8, 9, 18] Kashmiri: Bamsutu.^[9, 18, 19]

3. ACTIONS MENTIONED IN UNANI MEDICINE

Dafi'e nazla (anti phlegmatic), Dafi'e sual haar (dry cough suppressant),^[8, 9] Dafi'e diq (anti tuberculosis),^[8] Muzliq (soothing), Mufarrih (exhilarant),^[15] Mulattif (demulcent),^[8, 9, 10] Musakkin e hararat (heat suppressant),^[5, 8, 9, 15] Qabiz (astringent), Mulayyan (laxative), Muqavvie baah (aphrodisiac),^[5] Mushtaahi (nutrient), Mufattih (de obstruent), Muqavvie me'dda (stomachic),^[20] Muqavvie dil va dimagh (heart and brain tonic).^[17]

4. MEDICINAL USES MENTIONED IN UNANI MEDICINE

The Seed, buds, bark, leaves, and fruits of *Cydonia oblonga* are used for medicinal purpose. The plant is used internally as well as externally. Commonly used in rhinitis,^[9, 15] dryness in throat,^[8, 9, 15, 16] dry cough,^[5] tuberculosis,^[5, 15] excess sneezing,^[20] fever,^[15] dysentery, acidity in the stomach,^[9] duodenal ulcer,^[8, 9] vomiting, dysuria, haemoptysis,^[5] to reduce heat,^[17] burning tongue.^[5, 15] Internally it is used in diarrhea, dysentery,^[10, 13, 19] constipation,^[13] sore throat,^[5, 10, 11, 19] fever,^[10, 19] bronchitis.^[7, 11, 14] Externally it applied in ulcers, burns and scalds.^[11, 12, 13, 19]

4.1 Fruits are edible^[18] and They have properties of astringent, expectorant and cardiac tonic;^[19, 10] and mostly they used in jams and marmalades.^[18] **Unripe fruit** is the great astringency makes it useful as a remedy for diarrhoea, one that is safe for children. Fruit and its juice can also be taken as a mouthwash as gargle to treat mouth ulcers, gum problems and sore throats. Quince syrup is recommended as a pleasat mildly astringent digestive drink.^[14] Fruits, pulp and sedes are soothing and demulcent; used in irritable bowel syndrome, diarrhoea, dysentery, constipation and an irritable conditions of the mucous membrane.^[13]

4.2 Seeds contain significant quantities of mucilage and are helpful both in treating bronchitis and as a bulk laxative.^[14] **Seeds** are mucilaginous,^[18] and have a property of demulcent. They used in diarrhoea, dysentery, sore throat and fever^[19, 10] Powdered seeds are used for removing dandruff.^[10] Due to its mucilaginous quality it is used as a demulcent vehicle for other medicines, specially for skin lotions both as a remedy for skin conditions and of cosmetic lotions; also used as a stabilizer in dairy preparations.^[18] Mucilage used as external application for scalds and ulcers.^[19]

4.3 Leaves, buds and bark are astringent^[10, 19] Leaf, bud and bark- astringent. Fruit expectorant. Mucilage used externally for scalds, ulcers and burns.^[13] The phenolic extract of quince leaf has properties of free-radical scavenging and anti haemolytic activities.^[3] The phenolic extracts from leaves of *Cydonia oblonga* can be used as a better and cheaper source of bioactive compounds and may have relevance in the prevention of diseases in which free radicals are implicated.^[22] Further, the leaves of *Cydonia oblonga* has been utilized in traditional medicine as antitussive, antipyretic, sedative and antidiarrheic properties.^[22]

4.4 The hot water extract of quince (*Cydonia oblonga*) has an inhibitory effect on a broad range of the late phase immune reactions of mast cells.^[23] The polyphenolic extracts of fruit from *Cydonia oblonga* has been proved that it has antioxidant, antimicrobial (antibacterial and anti-influenza viral), and anti-ulcerative properties.^[22] The methanolic extract of fruit of *Cydonia oblonga* has been proved that it has antioxidant properties against oxidative haemolysis of human erythrocytes.^[24]

5. IN TRADITIONAL MEDICINE

The phytochemistry of quince is under study for several possible medical uses.^[4] In subcontinental Indo-Pakistan, quince seeds are known as *Bihi Dana*. They are used by herbalists for mucus, rashes and ulcerations. A gel prepared from the seeds soaked in water is used for throat and vocal cord inflammation, as well as for skin rashes and allergies. In Malta, a jam is made from the fruit (*gamm tal-isfargel*). According to local tradition, a teaspoon of the jam dissolved in a cup of boiling water relieves intestinal discomfort. In Iran and parts of Afghanistan, the quince seeds are collected and boiled and then ingested to combat pneumonia.^[6]

Dosage mentioned in Unani literature: Seeds 3- 5 Maashas (grams)^[15, 20]

Substitute: Isapghol^[8, 5, 15]

Compound formulations (Unani medicine): Laooq e behidana, Banadiq e buzoor, Sharbat eejaz^[8, 9], Jawarish e safrjal^[8], Habb e shaqeeqa, Habb e sil, Habb e surfa qavi, Qurs e kaknaj, Laooq e nazli, Laooq e sapistan, Laooq e shamoon.^[9]

6. MEDICINAL USES IN ETHNO MEDICINE

Internally it is used in Diarrhea, Dysentery,^[10, 13, 19] Constipation,^[13] Sore throat,^[5, 10, 11, 19] Fever,^[10, 19] Gonorrhea, Bronchitis.^[7, 11, 14]

Externally it applied in ulcers, burns and scalds.^[11, 12, 13, 19]

7. CHEMICAL COMPOSITION

Seed kernel contains glycoside amygdalin,^[13, 19] tannin, mucilage (about 22%), ash (1.3%) and fatty oil (14-19%);^[13] buds contains a cyanogenetic glycoside; bark and shoots yield hydrocyanic acid^[13, 19] and distillation.^[13] In Greece, a tea prepared by boiling dry seeds in water is given in cystitis. The major water-soluble polysaccharide in the mucilage of seeds contains a high proportion of glucuronic acid residues. The fruit contains pectin (yield 0.53% fresh weight) and is similar to that of Apple. Ionone glycosides, along with octadienoic acid and its diol have been isolated from the fruit.^[13] Fruit juice contain thiamine, riboflavin, nicotinic acid, vitamin B6, inositol, pantothenic acid, folic acid and biotin.^[13]

8. PRECAUTIONS AND ADVERSE REACTIONS

The drug sometimes produces dryness in the stomach,^[15, 17] which causes weak digestion. Also it can reduce the function of kidneys.^[5] As a corrective can use *Kahnd* in Garmi me' dda; and Misri,^[5] Qand sufaid, Badiyan, Saunf^[8] or Shakkar and Badiyan^[15] in Sardi me' dda.^[8, 15]

9. ETHNOPHARMACOLOGICAL STUDIES

Researchers have reported that different biological activities of *Cydonia oblonga* in various *in vitro* and *in vivo* test models. These have been highlighted in detail in following headings.

9.1 Aphrodisiac activity

Aslam et al. (2014) investigated the aphrodisiac activity of the hydroalcoholic extract of the fruits of *Cydonia oblonga* Mill. (Quince) in Wistar rats. The sexually active male rats were divided into four groups of six animals. The extract was administered orally in the dose of 500 mg/kg and 800 mg/kg body weight per day as a single dose for 28 days. The observed parameters were mounting frequency, assessment of mating performance and orientation activities towards females, towards the environment, and towards self. The results showed

that after administration of the extract, mounting frequency and the mating performance of the rats increased highly significant.^[25]

Ashrafi et al (2013) investigated the effect of quince leaf (*cydonia oblonga miller*) decoction on testicular injury and impaired spermatogenesis induced by hypercholesterolemia in rabbits. Eleven mature New Zealand white male rabbits were randomly divided into three groups: Group 1 (hypercholesterolemia, n=3), Group 2 (hypercholesterolemia plus quince treatment, n=6) and Group 3 (control, n=2). Groups 1 and 2 received a cholesterol-enriched diet for six weeks and the Group 2 received *C. oblonga* leaf decoction as drinking supplement for six weeks. After 6 weeks, a normal diet was substituted in groups 1 and 2 for another six weeks. Group 3 (control group) was maintained throughout the study on a regular diet. At the end of the 12th week, after light microscopic study of resected testes of the animals, they concluded as the quince leaf decoction protected rabbit testes and spermatogenesis from damage induced by hypercholesterolemia.^[26]

9.2 Kidney protecting effects

Jouyban et al. (2011) investigated the effect of ethanolic extract of quince leaf on renal injury induced by hypercholesterolemia in rabbits. Eleven adult New Zealand white male rabbits were randomly divided into three groups and they were kept under constant laboratory conditions with respect to humidity, illumination and temperature for two weeks prior to the study. Group 1 received a cholesterol-enriched diet. Group 2 received a cholesterol-enriched diet plus *C. oblonga* leaf decoction as drinking supplement and the Group 3 received a regular diet without cholesterol enhancement or quince leaf decoction. The results 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 plausible that quince leaf has a protective effect on the kidneys. It is concluded that the probable protective effects of quince leaf decoction on the hypercholesterolemia induced renal injury might be attributed to both its antioxidants and lipid lowering effects.^[27]

9.3 Anti allergic effects

Shinomiya et al. (2009) studied the anti allergic effect of hot water (HW) extract of quince fruit in mice. They divided the mice into 3 groups and treated as control diet, 2.5% quince HW added diet and 5.0% quince HW added diet respectively. They observed the development of atopic dermatitis-like skin lesions in mice, serum levels of IgE and the

release of β -hexosaminidase from rat basophilic leukemia cell line. The results showed that atopic dermatitis like signs appeared on the face, ear, nose, neck and dorsal skin of mice in control group after three weeks, whereas the severity scores of the signs in quince treated mice were significantly low. The IgE levels of control and quince treated animals with 5% hot-water quince extract orally were 1635 ± 289 and 994 ± 205 ng/ml in which the difference was statistically significant ($P < 0.01$). They concluded as the quince HW had an inhibitory effect on type I allergy by suppressing IgE production and IgE mediated degranulation.^[28]

Huber et al. (2012) investigated the immunomodulatory and anti allergic properties from phenolic compounds of Citrus and Cydonia fruits in patients suffering from allergic disorders, and compared with azelastine and dexamethasone. The results showed that the degranulation of basophilic cells diminished only in the presence of Citrus, further, both Cydonia and Citrus together inhibited the production of IL-8 and TNF- α from human mast cells.^[29]

9.4 Antioxidant activity

Vaez H et al. (2014) done a literary survey on potential for prophylactic and therapeutic effects of quince leaves in reducing cardiovascular disease based on its beneficial constituents, demonstrated in other investigations including antioxidant, anti-atherogenic, anti-inflammation, anti-hypertensive and vasodilatory effects. The possible efficacy of these constituents as protective agents in CVD by influencing 1) antioxidant action and inhibitory effect on xanthine oxidase and ability to chelate metals, 2) enhancing myocardial ischemic tolerance to reperfusion injury, 3) decrease in LDL oxidation by antioxidant property and increase in HDL levels, mainly due to flavonoids, 4) antiatherogenic effects in vessels, 5) improving nitric oxide bioavailability and attenuation of endothelial dysfunction, hypertension and vascular hypertrophy by vasodilatory effects and 6) reduction of cardiac mast cell mediator release and decrease in cardiovascular inflammation. Therefore, the study suggested that the leaves from *Cydonia oblonga* can be used as a great natural and cheap source of bioactive compounds with primary antioxidative properties along with other mechanisms of action.^[30] Another study **Hamauzu et al. (2005)** Investigated the antioxidant property of phenolic extracts of Chinese quince, quince, and apple fruits. The antioxidant functions of Chinese quince and quince phenolic extracts were superior to that of chlorogenic acid standard most probably because of their high polymeric procyanidins and hydroxycinnamic derivatives respectively.^[31] **Silva et al. (2004)** reported the antioxidant activity of quince fruit and jam. They prepared methanolic extracts of quince fruit and jam

which were fractionated into a phenolic fraction and an organic acid fraction then they were analysed by high performance liquid chromatography. The phenolic fraction always exhibited a stronger antioxidant activity than the whole methanolic extract. Organic acid extracts were always the weakest in terms of antiradical activity, which seems to indicate that the phenolic fraction gives a higher contribution for the antioxidant potential of quince fruit and jam.^[32]

Magalhães et al. (2009) investigated the antioxidant potentials of methanolic extracts of quince (*Cydonia oblonga*) leaf, comparing it with green tea (*Camellia sinensis*). Methanolic extracts were prepared and phenolics content of quince leaf was determined by HPLC/UV and antioxidant properties were studied for their ability to quench the stable free radical, the induced oxidative hemolysis of human erythrocytes. Quince leaf exhibited a significantly higher reducing power than green tea (mean value of 227.8 ± 34.9 and 112.5 ± 1.5 g/kg dry leaf, respectively). Quince leaf extracts showed similar DPPH radical-scavenging activities (EC₅₀ mean value of 21.6 ± 3.5 lg/ml) but significantly lower than that presented by green tea extract (EC₅₀ mean value of 12.7 ± 0.1 lg/ml). Under the oxidative action of AAPH, quince leaf methanolic extract significantly protected the erythrocyte membrane from hemolysis in a similar manner to that found for green tea (IC₅₀ mean value of 30.7 ± 6.7 and 24.3 ± 9.6 lg/ml, respectively, $P > 0.05$).^[24]

9.5 Anti atherosclerotic activity

Khademi F et al. (2013) investigated the effect of methanolic extract of quince leaf in comparison with Atovastatin in male rabbits. 24 male rabbits were randomly divided into normal diet (n= 6) and high cholesterol diet (n= 18) groups. 8 weeks later all the normal rabbits and 3 of high cholesterol rabbits were killed and observed plaque formation in the aorta. The reminders of high cholesterol diet rabbits were divided into 3 groups (1- control, 2- atovastatin 0.5 mg/kg, 3- quince leaf extract 50mg/kg). At the end of third month the blood samples of all three groups were collected and the biochemical parameters were determined. The results showed that there is no significant difference between atovastatin and quince extract groups revealing that the lipid lowering activity of quince extract is the same as that of atovastatin.^[33]

9.6 Anti ulcerative colitis effect

Manaiyan et al. (2012) investigated the effect of quince juice and quince hydroalcoholic extract on ulcerative colitis induced by trinitrobenzene sulfonic acid in rats. Rats were grouped (n=6) and fasted for 36 h before colitis induction. TNBS was instilled into the colon with a hydroalcoholic carrier and then treatments were made for 5 days starting 6 h after

colitis induction with different doses of QJ (200, 400, 800 mg/kg), QHE (200, 500 & 800 mg/kg) orally, QJ (400 mg/kg) and QHE (200 and 500 mg/kg) intraperitoneally. Data suggest that QJ and QHE were effective to diminish inflammation and ulcer indices in this murine model of acute colitis.^[34]

9.7 Anti bacterial activity

Al Khazraji has done a research on antibacterial activity of ethanolic extract of *Cydonia oblonga* seeds against *Staphylococcus aureus*, *Staphylococcus epidermidis* and *Escherichia coli*. He observed that *Cydonia oblonga* seeds have antibacterial properties on gram +ve bacterial more than gram -ve bacteria.^[35]

9.8 Anti-Helicobacter pylori activity

Babarikina A et al. (2011) investigated the anti-*H. pylori* effect of certain food plant extracts and juices and their composition *in vitro* to enable the production of new functional food product(s) with anti-*Helicobacter* activity. *33 substances, juices and plant extracts and 35 of their combinations were tested in which Quince (Cydonia oblonga) juice demonstrated the strongest anti-H. pyloric activity followed by cranberry juice.* The obtained results offer new perspectives for development of functional anti-*Helicobacter* food product(s) for dietary management of *H. pylori* infection.^[36]

9.9 Anti hypertensive activity

Zhou et al. (2014) investigated antihypertensive effect of ethanolic extract of fruit and leaf on renal hypertensive rats and compared the effect with captopril after 8 weeks. They found that Captopril had little effect on blood rheology; whereas COM extracts reduced whole blood viscosity and improved erythrocyte deformability.^[37] Further **Abliz et al. (2012)** investigated the antihypertensive effect of *Cydonia oblonga* Mill (COM) on renovascular hypertensive rats. 60 hypertensive rats were randomly divided into 6 groups as model, captopril control, *Cydonia oblonga* mill high, medium and low three-doses, and sham operation for 8 weeks. Blood pressure of rats was measured every two weeks. They found that the *Cydonia oblonga* Mill and Captopril groups were significantly lower than ($P < 0.05$) the model group; and the Ang II levels in *Cydonia oblonga* Mill high, medium and low dose group in renal tissue were lower than the model group ($P < 0.05$).^[38]

9.10 Hypolipidaemic and Hepatoprotective effects

Abliz et al. (2014) investigated hypolipidaemic and hepatoprotective effects of *Cydonia oblonga* Mill. leaf extract on serum lipids and liver function in a rat model of

hyperlipidaemia. They randomly divided seventy healthy rats into 6 groups as normal controls, model controls, simvastatin, and low, medium and high dose *Cydonia oblonga* Mill. leaf extracts, orally for 56 days. The normal controls were fed with a normal diet and all other groups were with a high fat diet. Rat weights were recorded over time. Lipid profile as well as AST, ALT and total protein (TP) were measured in the serum after 56 days. They found that the effect of COM was similar to that of simvastatin except lipoprotein lipase and hepatic lipase, which were reduced by COM but not by simvastatin. *Cydonia oblonga* Mill. leaf extracts have hypolipidaemic and hepatoprotective effects, probably related to increasing antioxidant capacity and lipoprotein metabolism in the liver, and inhibition of lipogenesis.^[39]

9.11 Anti gastro-oesophageal reflux

Tansaz et al. (2013) observed the effect of anti gastro-esophageal reflux of fruit extract of *Cydonia oblonga* Mill. They have done a pilot study on selected 5 infants; those had reflux without any response to routine management. After a month, they found the four infants from 5 had significant changes in the symptoms of reflux such as vomiting, cough, agitation and low appetite. They had soft defecation with the extract, and they concluded as *Cydonia oblonga* is a good remedy for infant's reflux more probably because of its astringent property, which can reinforce the sphincter and inhibit the reflux.^[40]

9.12 Wound healing property

Haamid et al. (2013) investigated the wound healing effect of *Cydonia oblonga* seed extract and silver nano particles in mice infected with *Staphylococcus aureus*. They divided the mice into 6 groups of 6, and each group were treated with its special ointment (ointment of silver nano particles, ethanolic extract of Quince, acetic extract of Quince, mupirocin, vaselin and no treatment group respectively) for 11 days. Wound healing rate was measured and compared. They found that the group treated with ethanolic and acetic extracts of Quince seed's had the greatest impact on wound healing than mupirocin and silver nano particles, and they concluded as the Quince seeds extracts can be used in healing skin infections caused by *S. aureus*.^[41]

9.13 Alpha amylase inhibitor

Koutb and Morsy observed the extract of the unripe fruit of quince (*Cydonia oblonga* Miller) possess several biological active components including sorbitol, quinic acid, p-vinylphenol and cyclopropane carboxylic acid. The last two components might be implicated in alpha amylase inhibition. This privilege for this extract herein reflects a great

potentiality for application of such extract in food and drug products, with remarkable benefits for human health.^[42]

9.14 Anti cancer

Carvalho et al. (2010) investigated antiproliferative properties of methanolic extract of quince (*Cydonia oblonga* Miller) leaf and fruit (pulp, peel, and seed) against human kidney and colon cancer cells. They revealed that quince leaf and fruit extracts exhibited distinctive antiproliferative activities. The extracts from quince leaf showed concentration-dependent growth inhibitory activity towards human colon cancer cells, while no effect was observed in renal adenocarcinoma cells. Concerning the fruit, seed extracts exhibited no effect on colon cancer cell growth, whereas strong antiproliferative efficiency against renal cancer cells was observed for the highest concentration assayed.^[43]

9.15 Anti microbial

Fattouch et al. (2007) investigated antimicrobial activity of aqueous acetone extracts of Quince (*Cydonia oblonga* Miller) fruit (pulp and peel). The total phenolic content of the pulp and peel were evaluated and they found Chlorogenic acid was the most abundant phenolic compound in the pulp (37%), whereas rutin was the main one in the peel (36%). The radical scavenging potential of the extracts was determined and compared with that of synthetic antioxidants. The stronger properties corresponded to those obtained from peel material with a 70-80% inhibitory effect on DPPH radicals. The antimicrobial activity of the extracts against different microorganism strains was also investigated. Quince peel extract was the most active for inhibiting bacteria growth with minimum inhibitory and bactericide concentrations in the range of 102.5×10^3 microg polyphenol/mL. It seems that chlorogenic acid acts in synergism with other components of the extracts to exhibit their total antimicrobial activities.^[44]

9.16 Anti inflammatory

Benkhadir et al. (2012) investigated the anti inflammatory effect of a polyphenolic extract of Quince peel against Lipopolysaccharide (LPS) induced inflammation in human. Biochemical analysis showed that quince polyphenols extract inhibited the LPS-mediated activation of three major cellular pro-inflammatory effectors, and they concluded as quince peel polyphenolic extract induces a potent anti-inflammatory effect that may prove useful for the treatment of inflammatory diseases and that a quince-rich regimen may help to prevent and improve the treatment of such diseases.^[45]

9.17 Antispasmodic effect

Janbaz et al. (2013) investigated the antispasmodic activity of methanolic extract of *Cydonia oblonga* seeds in gut and airways diseases. Rabbits (1000-1500 g) and Guinea-pigs (500-600 g) of both sexes and local breed were kept, and maintained at standard environmental conditions. The animals were given the crude extract of *Cydonia oblonga* seeds and liberated access to tap water as per routine, but were kept on fasting for 01 day following the start of experiment. The results were compared with the effect of Verapamil as a standard Ca⁺⁺ antagonist. 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. They concluded as the mild spasmodic property of the *Cydonia oblonga* seed extract is caused by the activation of muscarinic receptors, while Ca⁺⁺ antagonist mechanism is possibly responsible for its antispasmodic actions seen in gut and tracheal tissues.^[46]

10. CLINICAL STUDY

A randomized single blinded placebo controlled study was conducted to evaluate the effects of combined Unani formulations in allergic rhinitis (*Nazla Haar*) with special reference to the eosinophils in nasal smear. Forty subjects diagnosed with allergic rhinitis were selected and randomly divided in to two groups as test group was obtained the decoction of *Cydonia oblonga*, *Zizyphus jujube*, *Cordia dichotoma* with syrup of *viola odorata* and the placebo controlled group was obtained sugar syrup orally. The effect of the study was assessed based on the subjective parameters (rhinorrhoea, sneezing, nasal congestion, itchy nose, mouth or throat, lacrimation, post nasal drip and headache) in three follow ups and the objective parameter nasal smear for eosinophils (NSFE) at baseline and at the end of the treatment. The test group showed a significant improvement in reducing the number of eosinophils in allergic rhinitis patients as compared to the placebo group.^[47, 48]

11. CONCLUSION

Cydonia oblonga has been in use since ancient times to treat wide range of diseases in traditional system of medicine. Experimental studies have proven its antioxidant, aphrodisiac, nephroprotective, anti allergic, anti atherosclerotic, antibacterial, antihypertensive, hypolipidaemic, hepatoprotective, antimicrobial, antispasmodic, anti inflammatory and anti cancer. The scientific studies have proven the claims of traditional system of medicine. Further more detail clinical researches are needed to explore its medicinal value in order to establish it as a standard drug.

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