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A review of apple and its medicinal uses in Unani Medicine

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Abstract

Tuffah (Apple) is a well-known fruit used throughout the world for its nutrition and unique taste. Apple is primarily used as diet but has some pharmacological activities, although it has more dietary constituents as compared to drug constituents. Like other fruits and vegetables, it also contains dietary fiber which is linked to lower the risk of cardiovascular diseases, obesity and gastrointestinal disorders. Additionally, its strong antioxidant property found to be inhibit cancer cell proliferation, decrease lipid oxidation, and lower cholesterol. Unani physicians have described its medicinal importance as cardiogenic, cardioprotective, digestive, tonic for vital organs and anthelmintic. This paper is aimed to review the pharmacological details of apple according to Unani and ethnobotanical literature along with its pharmacognostical details. Some scientific and pharmacological studies on health benefit of apple have also been summarized.

Keywords: *Tuffah*, Antioxidant, Cell proliferation, Cardiogenic

Introduction

Apple is the most important temperate fruit crop that has been cultivated in Asia and Europe from antiquity. The genus *Malus* has, according to most authorities, 25–30 species and several subspecies of so-called crabapples [1]. The cultivated apple, *Malus domestica* Borkh is interspecific hybrid complex of allopolyploid origin [2]. This fruit of Rosaceae family is considered medicine as well as food from ancient time. China is currently the world's largest apple producer. The consumption of apple and its processed products or extracts rich in polyphenols have been linked to reduced risk in cancer, cardiovascular disease, diabetes, and many other diseases [3-5]. Apples, and especially apple peels, have been found to have a potent antioxidant activity and can greatly inhibit the growth of liver cancer and colon cancer cells [6].

Taxonomical classification

Kingdom: Plantae
Phylum: Spermatophyta
Subphylum: Angiospermae
Class: Dicotyledonous
Order: Rosales
Family: Rosaceae
Genus: *Malus*
Species: *Domestica* [7]

Synonyms

Malus communis DC; *Malus pumila* Mill; *Malus sylvestris* Hort; *Pyrus pumila* L. *Pyrus Malus* L; *Malus dasycphylla* var. *domestica* [8-10].

Vernacular names

English: Apple tree
Arabic: Tuffahh
Brazil: Maca, Macanzeira
China: Ping Guo
French: Pomme, Pommier. Pommier Commun
German: Apfel, Apfelbaum
Hindi: Seb,

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Sanskrit: Badara, Seba. Seva
 Tamil: Applepazham
 Italian: Mela, Melo
 Sindhi: Sof
 Bangla: Sittu [4, 11-14]

Wajah Tasmiyah (Etymology)

The name is derivate from Latin *Mālus* “apple” domestica, feminine nominative of domesticus “domestic” [15].

Habitat and distribution

M. domestica is cultivated throughout temperate areas of the world. The plant is best adapted to the cool-temperate zone between about 35-50° latitude, in areas with high light intensity, warm days and cool nights, found in Asia, Africa, Europe, Central and North America and Himalaya. *M. domestica* is thought to have originated in Central Asia where its primary ancestor, *M. Sieversii*, is native to the foothills between Western China and the former Soviet Union [16-20].

Mahiyat (Morphology)

The apple tree is small and deciduous, reaching 5-12-meter-

tall, with a broad, often densely twiggy crown. Branchlets brown, tomentose when young, glabrous when old. Stipules caducous and lanceolate. Leaves, alternate, simple, ovate, or broadly elliptic 5-11 cm x 3-6 cm. both surfaces densely puberulous when young, adaxially glabrescent, pinnately veined, apex acute, base broadly cuneate or rounded margin serrated on 2-5 cm petiole.

Flowers in 3-7 flowered corymb at the apices of branchlets 3-4 cm across, pedicel tomentose bracts linear lanceolate, caducous. Flower hypanthium tomentose; Sepals lanceolate-deltoid, longer than hypanthium, tomentose. Petals 5 white with tinge of pink, obovate, base shortly clawed, apex rounded, stamens 20, unequal: Ovary 5-loculed with 2 ovules per locule, style 5, tomentose at the base. Pome subglobose, Obovoid to ellipsoid, variable size and colour, 5-10cm diameter, pale green, yellow, pink to red, impressed at the base, sepals persistent and fruiting pedicel short and thickened.

Seeds are small and black-brown [4, 13, 16]

Apple is a mature or ripened ovary/ovaries fused together with many closely associated parts. In apple, five ovaries of the flower are imbedded in tissue which, along with thalamus or carpel tissue, becomes fleshy and edible [21].



Fig 1: Matured Fruits of *Malus domestica*



Fig 2: Plant of *M. domestica*

Husool (Cultivation and collection)

Apples are the most important and most widely cultivated fruit of the temperate regions. They can be grown in a wide range of climates, although the average yearly temperature should be above 7.5°C. Apples thrive in a wide range of soils but not in poor acid soils or heavy clay. They prefer well-drained heavy loams with pH 5.0-7.5 and good humus content. Apple trees are best adapted to areas where the average winter temperature is near freezing for at least 2 months, to allow the trees a dormant period. For good production apples need at least 600 mm precipitation. They require most of the water in the fruiting period. An apple tree is growing from an apple seed [22-24].

Hisas Mustamla (Part Used)

Fruit are used for medicinal purpose [4, 11-13, 16].

Mizaj (Temperament)

Seb Sheerin (sweet apple) is Hot in 1st degree and Wet in 2nd degree while Tursh (bitter apple) is Cold and Dry in 1st degree and Mekhosh (sweet and sour) is Moatadil [4, 11-13].

Miqdar Khurak (Dose)

Dose of apple in the form of Sharbat (syrup) is 4 tola (50 gram) [11, 2, 13].

Muzir Asrat (Adverse Effects)

Apple produces amnesia, flatulent, lethargy and harmful effect for lung [4, 11-13].

Musleh (Corrective) and Badal (Substitute)

The harmful effects of apple are corrected by Gulqand, Darchini (Cinnamomum zeylanicum), Honey, Sikanjabeen, and Kholanjan (Alpinia galangal). Behi (Cydonia oblonga) is used as a substitute of Apple [12, 13].

Afaal (Pharmacological Actions)

Apple is used in traditional medicine and by some tribal peoples as Mufarreh (Exhilarant), Muqawwi Qalb (Cardiotonic), Muqawwi Meda (Stomachic), Tonic for visceral organs, Qabiz (Astringent), [11] Qatil Deedan (Anthelmintic), Antiallergic, Antiallopecic, Antiandrogenic, Dafe Iltehab (Anti-inflammatory), Antimelanogenic, Mane Takassud (Antioxidant), Antiproliferant, Antiviral, Dafe Ufoonat (Antiseptic), Aperitif, Apoptotic, Kasir Riyah (Carminative), Muhafiz Qalb (Cardioprotective), Khatim (Cicatrizant), Chemoprotective, Mulattif (Demulcent), Cyanogenic, Mudirr Baul (Diuretic), Mumallis (Emollient), [12, 25, 26] Muhafiz Azaae Hazm (Gastroprotective), Lypolytic, Hypotensive, Mubarrid (Refrigerant), Tyrosinase Inhibitor, Hypouricemic, Mulayyin (Laxative), [10, 13] Hypolipidemic, Antiatherosclerotic, Antihypercholesteremic, Dafe Jaraseem (Antimicrobial), Anti hyperglycemic, Dafe Asthama (Antiasthmatic) and Anxiolytic [14, 27].

Istemalat (Therapeutic Uses)

Apple juice is used in melancholic diseases, mania, palpitation, dry cough, bloody diarrhea, [11] insanity and painful red eye [13]. Its pulp, marmalade and juice is also useful in anaemia, alcoholism, allergy, cardiomyopathy, and cancer of colon, breast and lung, asthma, arthritis, dermatosis, dropsy, dyspnea, heart diseases, herpes, halitosis, high BP, pertussis and pneumonia [10]. Apple juice delays the aging process and is effective against

Alzheimer's disease [28]. Eating whole fruit or its juice is effective in palpitation and breathlessness. It is said that apple juice along with wine and meat is very useful in syncope. In US, the infusion of apple tree bark is given during intermittent and bilious fever. The poultice made of rotten apple is commonly used in weak and rheumatic eye. In France, the roasted pulp is used over the inflamed eye. Sour or ripe apple is used over warts to remove them [16, 27]. Apple syrup is useful in the nausea and vomiting caused due to Mirra Safra (bitter yellow bile). Apple pulp, juice and leaves are an effective remedy as cardiotonic and exhilarant [4].

Kimiyawi Ajza (Chemical Constituents)

Apple is a rich source of phenolic and other phytochemicals like Catechins, epicatechin, Phloridzin, quercetin, anthocyanidins, chlorogenic acid, and hydroxycinnamates, which are widely present in the peel, flesh, and seeds [29]. Catechins, epicatechin, and procyanid and polyphenols maintain cholesterol levels and are effective for cardiovascular health [30]. Fruit is a rich source of sugars, vitamins, dietary fibers, and phenolic compounds which possess anticarcinogenic, antidiabetic, and cardio active properties [31]. Apple also contains alanine, alpha and beta alanine, adenine and arginine [32].

Pharmacological studies**Cardiovascular activity**

The effect of diet supplementation with 20% of three Portuguese apple cultivars containing distinct phenolic and fibre concentrations, on serum lipid profile and OXLDL of male Wistar rats fed a cholesterol-enriched diet (2%) was evaluated by Serra *et al.*, (2012) [30]. After 30 days, only Bravo de Esmolfe apple (an apple variety) was able to decrease significantly serum levels of triglycerides, total and LDL cholesterol concentrations (reductions of 27.2%, 21.0% and 20.4%, respectively, in relation to the cholesterol-enriched diet group). The levels of OXLDL were also significantly improved with the consumption of this apple variety (reductions of 20.0% and 11.9%) in relation to the cholesterol-enriched diet group and control group, respectively, as well as with Malapio da Serra apple (reductions of 9.8%) in relation to the cholesterol-enriched diet group.

Ant atherosclerotic effects of apple polyphenols and fibers were investigated by Auclair *et al.*, (2008) [33] in Apo lipoprotein E-deficient mice. A crude apple polyphenol extract and low-viscosity apple fibers isolated from cider apples were administered separately or in association with the diet. After 4 months of supplementation, lipemic and oxidative stress biomarkers were measured and atherosclerotic lesions assessed by histomorphometry. Total plasmatic cholesterol and triacylglycerol levels were not affected by supplementation, and hepatic cholesterol level was lower in the group supplemented with both fibers and polyphenols. Uric acid concentrations and antioxidant capacity (FRAP) in plasma were reduced in all groups supplemented with polyphenols or fibers. The mean lesion area was reduced by 17, 38, and 38%, respectively, for the polyphenol, fiber, and polyphenol + fiber groups.

The effect of methanolic extract of apple peel (APME) and aqueous extract of apple peel (APAE) on Arsenic trioxide (5 µM) induced toxicity in the H9c2 cardiac myoblast cell line was studied by Vineetha *et al.*, (2014) [34]. Cellular status of

innate antioxidant enzymes, level of ROS, mitochondrial superoxide, glutathione and intracellular calcium with ATO and apple peel extracts was estimated. Both APME and APAE prevented the alteration in antioxidant status induced by ATO in H9c2 cells and revealed the protective property of polyphenol-rich apple peel extract against ATO induced cardiac toxicity via its antioxidant activity.

Antioxidant Activity

Polyphenols isolated from frozen and dried apple peels were studied by Loodu *et al.*, (2013) [35]. The ethanolic extracts of apple peels were fractionated by reversed phase chromatography using gradient elution of 20-100% aqueous ethanol. The collected fractions were analyzed by ultra-pressure liquid chromatography coupled with tandem mass spectrometry (UPLC-MS). The total phenolic content and antioxidant capacity of each fraction were evaluated by various methods and found that polyphenols fractionated using frozen apple peel extract had significantly higher FC, FRAP and DPPH scavenging values than those of dried apple peel. The flavonol-rich fractions inhibited fish oil oxidation by 40-62% at a total phenolic concentration of 200 µg/ml. The fractionated polyphenols from both dried and frozen apple peel showed higher inhibition of lipid oxidation compared to α -tocopherol, butylated hydroxytoluene and crude apple peel extracts.

Two apple skin extracts (ASE) were examined by Rupasinghe *et al.*, (2010) [36] for their antioxidant properties to inhibit lipid oxidation in aqueous Eicosapentaenoic acid (EPA) emulsions and bulk fish oil. The ASE were effective in reducing the oxidation induced by heat, UV light and peroxy radical, when the extent of oxidation of the emulsions and bulk oil was measured by using the ferric thiocyanate test, the thiobarbituric acid reactive substances assay and Rancimat. On the basis of total phenolic concentration of extracts, removal of sugars and organic acids (ASE 2) from crude ethanol extract of apple skins (ASE 1) enhanced the antioxidant properties in both the emulsion and bulk fish oil systems.

Antiproliferative Activity

The antiproliferative effects of apple peel extract (APE) were evaluated in variety of cancer cell types by Shaw *et al.*, (2010) [37]. The result showed significant reduction in the viability of a variety of cancer cell lines. Further, a significant decrease in growth and clonogenic survival of human prostate carcinoma CWR22Rnu1 and DU145 cells and breast carcinoma MCF-7 and MCF-7:Her18 cells. Also, the antiproliferative effects of APE were found to be accompanied by a G0-G1 phase arrest of prostate and breast cancer cells. Furthermore, APE treatment resulted in a marked concentration-dependent decrease in the protein levels of proliferative cell nuclear antigen, a marker for proliferation. In addition, APE treatment resulted in a marked increase in maspin, a tumor suppressor protein that negatively regulates cell invasion, metastasis, and angiogenesis.

Hypocholesterolemic activity

The effect of apple supplementation on blood lipid level in cholesterol-fed male rat was studied by Nouri *et al.*, (2011) [38]. Three groups of male rat (ten each) were used. The first group was Control group, consumed basic diet. The second groups consumed two % cholesterol in diet. Group three

consumed apple (20%) for one month beside the fatty diet. After one month, TC, LDL, TG and HDL concentrations were measured. In G2, TC, LDL and TG concentrations were significantly increased compared with control group. Supplementation of apple in G3 decreased TC and LDL concentrations when compared with G2.

Conclusion

Tuffah (Apple) is an important nutritional and medicinal plant obtained from the *Malus domestica* of Rosaceae family, which is claimed for the treatment of various cardiac and psychological ailments as well as respiratory and gastrointestinal disorders by Unani physicians from ancient time. From the above review work it can be clearly concluded that the new researches also validated the use of this plant in palpitation, dyspnea, obesity, fatty liver and Alzheimer diseases.

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