

Medicinal Value of Apricot: A Review

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Gupta, *et al.*: Apricot a medicinal plant

Herbs are one of the most important sources of medicines for humans for confronting diseases and disorders. Even after several developments in the field of allopathic system of medicine, untoward reactions could not be prevented from being an integral part of modern medicines. Plants are one of the major sources of drug discovery in modern as well as traditional system of medicines worldwide. More than 70 % of marketed drugs are either natural or semisynthetic materials derived from plants. Most literature on complementary alternative medicine worldwide either report the structure of phytoconstituents present in medicinal plants or demonstrate a mechanistic basis for the pharmacological activities possessed by them. Medicinal and therapeutic impact of apricot has not been explored so far. In this review, an attempt has been made highlight the medicinal impact of apricot and its kernel for the treatment of alimentary disorders by summarizing published literature reports till date. Apricot exhibited diversified effects on liver regeneration to myocardial ischemia reperfusion.

Key words: Apricot, complementary alternate medicine

Complementary alternative medicine (CAM) is the term for medicinal products and practices that are not a part of standard medical care. CAM included practices such as massage, acupuncture, tai chi, consumption of green tea and many more. CAM utilizes diverse classes of natural products, which required to be characterized very crucially and frequently. One of the several drug discovery approaches include isolation of phytoconstituents along with the elucidation of structure, physicochemical properties along with their biological actions and the biochemical, cellular or molecular mechanisms. Natural products are potential tools for the development of therapeutic agents for treating disease and disorders. Research has pointed out that consumption of fruit that contain carbohydrate, fat, proteins, vitamins, minerals, essential micronutrients and essential fatty acids was useful to achieve healthy body functions to perform the physical and mental tasks. Therefore, nutritionists have included fruits on second step of the food pyramid, and highly recommend fruit consumption^[1].

A number of researchers reported the benefits of consumption of different fruits that included apricot and its kernel. Additionally a number of studies elaborated the pharmacological and biological effects

of apricot. In the current review, a compiled summary of information out of published studies has been presented of which the foremost focus was on apricot and its kernel only. Apricot is also known as stone fruit, belonging to genus *Prunus*. Usually, an apricot tree is *Prunus armeniaca*, but some similar species like *P. brigantina*, *P. mandshurica*, *P. mume* and *P. sibirica* are also known as apricots^[2-4].

Description and cultivation:

Apricot is a small tree, 7-10 m tall with a trunk up to 40 cm in diameter and a dense spreading canopy. The leaves are ovate, 5-9 cm long and 4-8 cm wide, with a rounded base, a pointed tip and a finely serrated margin. The flowers are 2-4.5 cm in diameter, with five white to pinkish petals; they are produced singly or in pairs in early spring before the leaves. The fruit is a drupe similar to a small peach, 1.5-2.5 cm diameter, from yellow to orange, often tinged red on the side

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most exposed to the sun; its surface can be smooth or velvety with very short hairs. The flesh is usually firm and not very juicy. Its taste can range from sweet to tart. The single seed is enclosed in a hard, stony shell, often called a 'stone', with a grainy, smooth texture except for three ridges running down one side. The apricot is native to continental climate region with cold winters. A dry climate is good for fruit maturation. A limiting factor in apricot cultivation is spring frosts as these plants tend to flower in early spring (early March in Western Europe), meaning spring frost could kill the flowers. Furthermore, the trees are sensitive to temperature changes during the winter season. Apricot cultivars are most often grafted onto plum or peach rootstocks.

Pharmacological activity profile:

A variety of pharmacological effects of apricot and its kernel have been reported which included antiparasitic, anticancer, antiaging, antiatherosclerating, antianginal, cardioprotective, hepatoprotective, renoprotective and antioxidant (especially β -carotene). It also has been reported that apricot fruit is rich in good minerals especially K, Fe, Mg and P. Apricot is also a very good source of vitamin A, C and E and fibre. Studies also reported apricot to exhibit sedative, antispasmodic, anticestodal, antimicrobial, antimutagenic, antitussive, antiinflammatory, antinociceptive, enzyme inhibitory and tonic effects^[3-9]. Miguel *et al.* made a special mention that flavonoids have beneficial consequences in several cardiovascular and cerebrovascular diseases and also in some forms of cancer, Parkinson's and Alzheimer's diseases. In the aforementioned study, these authors also reported that flavonoids such as quercetin-3-rutinoside, quercetin-3-galactoside and quercetin-3-glucoside are the chief constituents in apricots^[10].

Cultivation and marketing statistics of apricot in Malatya province were reported by Parlakpınar *et al.*^[11]. Parlakpınar *et al.* also reported the cardioprotective activity of apricot in rats and attributed that activity to the presence of antioxidant phenolic compounds^[11]. Chemical constituents such as, phenol, minerals, vitamins, lipids and carbohydrate content of apricot might vary with the altitude, apricot species, soil structure and fertilizer use^[5]. The apricot varieties, namely Zerdali, Cataloglu, Hacıhaliloglu, Hasanbey, Kabaasi, Cekirge, Ethembey (Alyanak and Tokaloglu - more west Anatolia) and Hacikiz that are widely cultivated in Malatya^[12-17].

Gezer *et al.* reported crude oil, dry matter, crude protein, crude fibre and mineral contents as well as some physical properties such as mass, length, width, thickness, sphericity, volume, bulk density, kernel density, porosity and terminal velocity of kernels of five apricot species, which were cultivar in Malatya. These authors reported that all kernels contained high amounts of Ca, K, Na and P, which was indicative that apricot kernels useful as nutritive and an oil source^[16]. It was also reported that vitamins A, C and E and malondialdehyde (MDA) contents of apricot were better preserved on microwave drying relative to infrared drying^[4].

It was reported that a significant amount of polyphenol oxidase enzyme was extracted from the Iğdir apricot^[18]. Haciseferogullari *et al.*^[12] investigated some nutritional aspects of six apricot species that included the dry matter, ash, crude oil, crude protein, crude fibre, pH, acidity, water-soluble extract/alcohol-soluble extract, and mineral (K, P, Ca, Na and Mg) contents of completely matured fruits. They underlined that such information would be useful for the evaluation of the nutritional status of apricot fruit^[12]. It was reported that, dry matter and carbohydrates such as sucrose, glucose, fructose and sorbitol content of Malatya apricot varieties were considerably higher than the other varieties and found to be a good source of phenolic compounds. It has been also reported that maleic acid is the predominant organic acid in all Malatya apricot varieties. The authors also indicated that the potassium content of Malatya apricots was significantly high and these apricots were an important source of Mg, Zn and Se, and other functional food components with high nutritional value^[14]. In the nine apricot varieties studied, the total oil content of apricot kernels ranged from 40.23 to 53.19 %. Oleic acid contributed 70.83 % to the total fatty acids, followed by linoleic acid (21.96 %), palmitic acid (4.92 %) and stearic acid (1.21 %) as reported by Turan *et al.*^[13]. It was reported in another study that the seed oil was a rich source of P, Ca, Mg, Fe and Cu, and contained oleic acid (73.58 %), linoleic acid (19.26 %), palmitic acid (3.31 %), myristic acid (1.18 %) and stearic acid (2.68 %)^[19]. It has also been reported that apricot kernel oil caused improvement in liver antioxidant status of rats in comparison to sunflower oil, a commonly consumed vegetable oil^[20]. In another study, apricot kernel extract was shown to ameliorate colon inflammation and ulcers induced by trinitrobenzene sulfonic acid, an experimental model of colitis in rats.

Different active components and mechanisms might be involved in these beneficial effects, thus more detailed studies were needed for more accurate clarification^[9].

Kutlu and coworkers reported the hepatoprotective effect exhibited by the leaf extract against paracetamol-induced liver toxicity in rats, which was further confirmed in histopathological examinations^[21]. Ugur *et al.* isolated the following flavonoids from apricot leaves, chlorogenic acid, rutin, catechin and naringin. According to the growth season while rutin and catechin (in some apricot species chlorogenic acid) levels were shown an increase, but in some other apricot species chlorogenic acid and naringin levels were shown exponentially to decrease^[17].

Vardi *et al.* reported that apricot and/or β -carotene treatment protected against the impairment of oxidative stress and ameliorated methotrexate-induced intestinal damage^[22]. The effects of sun dried organic apricot (SDOA) supplementation to rat chow consumption on some serum mineral levels at four different rates like 1, 2, 5 and 10 % and three different periods on both genders of rats were reported by Yilmaz *et al.*^[23].

According to some reports, there was an augmentation in the K^+ levels in the serum while at the same time Ca, Mg and P levels declined with no difference in Na^+ and Fe levels in rats fed with high dose of SDOA. Chemical composition of SDOA indicated that it is poorer in mineral contents except K compared to rat chow. The most suitable supplementation is found to be 1 % SDOA for 30 d. In addition, a marked difference was noticed between P levels in the male and Fe levels in female rats^[23]. It was further reported that consumption of 1 % SDOA for 120 d SDOA showed beneficial effects in rats of either sex, especially on red blood cells, haemoglobin and hematocrit. The aforementioned reports revealed that consumption of SDOA might be beneficial for treatment, prevention and/or elimination of the risk of development of anaemias in humans^[24]. In some other studies the effects of SDOA supplementation to rat chow on serum proteins and liver enzymes was examined. SDOA content in diet inversely influenced the levels of alkaline phosphatase, acetyl transferase and total protein (TP) in rats. Considering periods of feeding, a significant role was observed on albumin, alkaline transferase and TP levels in genders. The amount of 1 % exerted beneficial effects on parameters in both sexes. However, there were no significant interaction between the amounts and the periods for which the diet was supplemented^[25]. Supplementation of food with

2.5 and 5 % SDOA in male rats and 10 % SDOA in female rats exerted significant positive effect in their daily food intake^[26]. In 2013, Yilmaz and co-workers reported, 5 % SDOA supplementation over 21 d period had beneficial effects on the regenerative capacity of remnant liver after 70 % partial hepatectomy (PH) which were similar to Ki-67 findings^[27]. In a similar fashion Yormaz and coworkers in another study reported that, before 7 and after 10 d of PH silymarin administration exhibited beneficial effect along with SDOA consumption, on remnant liver regeneration of rats^[28].

In 2015, Yilmaz *et al.* reported the effects of SDOA supplementation on the activity of oxidative stress enzymes such as superoxide dismutase, MDA, catalase, glutathione and glutathione S transferase of large intestines at three different periods in rats and also revealed that at least 1 % SDOA consumption for 30 d has beneficial effects on rats of either sex^[29]. Additionally, hepatoprotective effects were reported against acute acetaminophen overdose-induced liver histopathology in rats^[30] and ketamine induced-hepatotoxicity in rats^[31]. Ozturk *et al.* reported the beneficial effects of long-term apricot feeding on CCl_4 -induced liver steatosis and damage in rats and attributed the beneficial effects to the high free radical scavenging capacity. As a natural food, apricot appeared to have beneficial effects on non-alcoholic hepatic steatosis^[32].

Ugras and coworkers reported that after low dose irradiation on testis tissue in rats, apricot-rich diet containing 20 % supplementation significantly ameliorated the oxidative status, due mainly to its natural antioxidant activity. These prominent protective effects were observed when the diet was maintained throughout the course of time but initiated after exposure^[33]. In a similar manner, Kurus *et al.* reported that apricot-rich diet showed a significant preventive role on histopathological changes caused by alcohol in rat testis and also exerted an encouraging effect in the treatment of renal diseases^[34]. Efficient combination ratios of rat chow and apricot have been reported by Ugras *et al.*^[33]. Yurt and Celik investigated the protective effects of sulphited dried apricot and its kernel on some detoxification enzymes during exposure of rats to alcohol and concluded that apricot has a hepatoprotective effect probably by promoting the antioxidative defence systems^[35]. Apricot kernel appeared to be an important natural antioxidant source like tocopherols and phenolic compounds^[36].

The vitamins A, C, and E, β -carotene and selenium contents of apricot showed some differentiation according to the fresh and sulphur-dried production, post-harvest processing, altitude of region, cultivar or wild type and also among cultivars as reported by Munzuroglu *et al.*^[37]. Ruiz *et al.* determined the differences among apricot varieties and their flesh colour and phenolic compound as procyanidins and anthocyanins by HPLC. They reported that, the total phenolic content ranged between 32.6 and 160.0 mg/100 g of edible tissue, and further revealed that there is no correlation between the flesh colour and the phenolic content of the different cultivars^[38]. On the other hand, the same authors emphasised in their report that apricot colour has a large influence not only on consumer perception about quality but also on nutritional appreciation for their vitamin A content^[39].

Yiğit *et al.* reported that, the most effective antibacterial activity was observed in the methanol and water extracts of bitter kernels and in the methanol extract of sweet kernels of apricot against the Gram-positive bacteria^[4]. Furthermore, the methanol extract of the bitter kernels had very potent activity against the Gram-negative bacteria. Significant antifungal activity against candida species was also observed with the methanol extract of bitter apricot kernels, whereas significantly high antioxidant activity was recorded, especially in sweet kernel extracts^[40].

The Japanese apricot (*Prunus mume*) preparations prevented colonization of *H. pylori* in the gastric mucosa, hence prevent gastritis, but by unknown inhibition mechanism as reported by Miyazawa *et al.*^[3]. Jaya and Lamba reported that most effective antibacterial activity was observed in the ethanol extract of fruits against *Staphylococcus aureus* and *Bacillus subtilis*. Additionally, the ethanol extract has significant activity against *Proteus vulgaris*, *Escherichia coli* and also against *Candida albicans*. The ethanol extract showed more significant antimicrobial activity as compared to aqueous extract^[41]. In the aforementioned study it has also been reported that out of the antitubercular effect exerted by the aqueous and ethanol extracts of fruits of *P. armeniaca* (L.) evaluated on *Mycobacterium tuberculosis*, the effect of the ethanol extract is more pronounced^[42]. In another study, it was reported that the extract showed good antimicrobial activity against Gram-positive bacteria. Hence it could be conclude that dry apricot is a good source of health promoting constituents, used for therapeutic purpose^[8].

Nutritional value:

In a 100 g quantity, raw apricots appear to supply 48 calories composed of 11 % carbohydrates, 1 % protein, less than 1 % fat and 86 % water. Raw apricots are a moderate source of vitamin A and vitamin C (12 % of the daily value each). When apricots are dried, the relative concentration of nutrients is increased, with vitamin A, vitamin E, potassium and iron having daily values above 25 %.

Present review captured the recent publications by different researchers, which reflected the effects of active constituents of apricot against different disorders. Apricot appeared to have enormous potential not only to prevent diseases but also to cure some of them. There is an unmet need to exploit maximum potential in the field of medicinal plants for novel and fruitful applications, since herbal drugs are a holistic gift of the nature. Daily consumption of apricot should not be neglected, whereas over consumption of the fruit to be avoided since it could cause alterations in the neurotransmitter activity by acting on calcium ions. As discussed above there are several species available in the market and attention is a must before consumption of the apricot since it is not very clear which has the maximum nutritive value. Hence after exhaustive literature review, it could be concluded that apricot is one of the rare fruits that could serve as a useful nutritional and therapeutic agent against certain disease and disorder conditions but with certain limitations.

Conflicts of interest:

There are no conflicts of interest among the authors.

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