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Apricot- A New Source of Chemically Active Constituents: A Medicinal Overview

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Apricot is the member of Rosaceae family, belonging to the Prunus Lannesiana, genus of Prunophora Focke, subgenus and section of Armeniaca (Lam) Koch section. commonly apricot trees are small to medium-sized that can reach a height of 14 metres. The wood and spurs of a one-year-old Prunus are thinner, twiggy, and have a shorter lifespan. Apricot is cultivated over a long time ago and it have various chemical and physiological activity, it contains essential amino acids made up of 33–35% of the overall amino acids, in the apricot kernel, Arginine (21.7–30.5) and leucine (16.2–21.6) were the two most important necessary amino acids (mmol/100 g meal), whereas glutamic acid (49.9–68.0) was the most common non-essential amino acid. Apricots has many medicinal values and are also used in a various way, including fresh fruit, vinegar, liquor, wine, flavouring agents in food or baby food, sauce, juice, jam and dried fruit for canning. The dried fruit and concentrate fruit juice of the Japanese apricot is used to make a cancer-preventive and cancer-curing beverage. The apricot kernels are used to make cosmetics, medications, and perfumes, while the pits are utilised for making fuel. A liquid soap containing apricot kernel oil is used to treat dermatitis. In addition, bitter apricot is used in several bakery & confectionery items such as cakes pies cookies pastries along with their derivatives to enhance their taste and aroma. It has high potassium content which helps in controlling blood pressure and cholesterol levels. The product also contains fibre, iron, calcium, and vitamin C & A which helps in lowering the risk of cancer and heart diseases. Apricot kernel oil has been found effective for skin conditions on its own or blended with other carrier oils like sunflower seed oil or argan oil due largely lessening inflammation caused by acne lesions blackheads pimples pustules sores rashes etc.

Keywords: Apricot; Apricot kernel; Rosaceae.

Cultivation and Production

Apricot species are varying according to the categorization scheme. Usually, six different species are identified, Prunus brigantina Vill., Prunus holosericeae Batal, Prunus armeniaca Lannesiana, Prunus mandshurica (Maxim), Prunus sibirica Lannesiana, Japanese apricot Prunus mume (Sieb.) Sieb. & Succ.

Nikolai Ivanovich Vavilov (a prominent Russian and Soviet agronomist, botanist) divided apricots into three origin zones: 1) the Chinese centre (Central and Western China)[71], 2) the

Central Asiatic centre (Afghanistan, northwest India and Pakistan, Kashmir), 3) Kostina which further categorised the cultivated apricots into four broad eco-geographical groupings based on their adaptability: (1) Central Asian, (2) Iran-Caucasian, (3) European, and (4) Dzhungar-Zailij. A large number of local cultivars are cultivated in this area[37].

Prunus Armeniaca cultivation began over 3,000 years ago in China and has since expanded throughout the southern parts of Asia. Around the first century BC, apricot cultivation was brought to the Mediterranean region via Iran or Armenia, however further transfers from the Middle East, particularly to Southern Europe, have occurred more recently. As a result, Spanish cultivars might be descended from Arab-introduced North African genotypes[55]. Apricots were first brought to England and Virginia in the 17th century as a consequence of trade and commerce. The Spaniards (a native or inhabitant of Spain) later brought apricot to California in the 1769-1840. The Japanese apricot originated in South east China, where the climate was comfortably high at temperature and more humidity in environment than that of Prunus armeniaca[7]. It's also been grown for almost 3,500 yrs., and other varieties may still present in mountain regions. In Japan, since ancient times prunus mume has been grown as ornamentals. After Japanese people discovered that Prunus mume (a Japanese variety of apricot fruits) having curative powers then fruit farming increased rapidly and expanded throughout the country.

There are just a handful commercially cultivated apricot varieties in the world. Instead, some cultivars are often grown in just one part of country, and mostly are unknown and outsider of that area. Turkey produces the highest number of apricots in the world (538,000 metric tonnes per year).

Morphology

In its native habitat, commonly apricot trees are small to medium-sized that can reach a height of 14 metres. The wood and spurs of a one-year-old Prunus are thinner, twiggy, and have a shorter lifespan than those of another Prunus. Serrate edges and long red-purple petioles characterise the leaves, which are ranges from elliptic to cordate. Apricots have perfect, perigynous flowers with four to six petals and around thirty stamens, produced singly or double at node. The apricot blossom, has double ovules and a single seed in most of the varieties. Pollen sterility has been reported on multiple occasions. The floral buds are developed in late of spring and in early of summer. Between 300 to 1,200 hours of chilling time (below 7°C) are required to begin flowering. Because the requirement of heat is so minimal after cooling, apricots blossom early in most climates. In early spring, the flowering period lasts for one to two weeks. Winter low temperatures are tolerated by dormant trees, but emergence from hibernation in an early stage causes freezing damage to blooms and even tree mortality is also shown in some developing stage where late freezes occur.

As a result of the early blossom habit, apricots are susceptible to frost harm, and as a result, the production area is constrained by the threat of spring frost. The drupe of apricot has one rocky endocarp which surround seed, a fleshy mesocarp, and an exocarp (fruit skin). The freestone or clingstone fruits of common apricot having oval to round shape and a glabrous epicarp. Flesh of fruit can be sweet or sour, and the colour of the flesh is generally orange, however there are a few varieties of white-fleshed fruit. Climacteric fruits take 3 to 6 months to grow, depends on the varieties. Mature fruits of apricot are sensitive to the touch and therefor particularly sensitive to microorganisms which causes degradation. The Prunus mume is a large tree that can be approximately 10 metres in height in rare occasions. Depending on the different varieties, the types of petals also vary. Petals can be single or many, and can be whitish or pinkish. Flowers have a single carpel or group of fused carpels usually differentiated into an ovary with two ovules and over 40 to 50 stamens. The size of the fruit varies from 5 to 50 g depending on the variety.

Physical qualities of kernel

The hard, outside section of the pit's accounts for around 35,000 metric tonnes per year, while the kernels within the pits account for 7500 metric tonnes per year[1]. The proportion of apricot kernel and the pit are ranges between 18.8 and 38.0 percent, as determined by [(pits)/ (pits + kernels)] 100[2–11]. Apricot kernels have an average length of 14.0–19.17 mm, a width of 9.99–10.20 mm, a thickness of 3.3–6.27 mm, a geometric mean diameter of 9.89–10.31 mm, and a mass of 0.471–0.482 gm. The range of weight for 100 kernels is 28.72–65.13 gm. [7,9,10]. Physical qualities of apricot kernels are so important for mechanical processing[14].

Chemical constituents

The chemical composition of apricot kernels is shown in Table-I. The protein content of apricot kernels has been found to range from 14.1 to 45.3 percent[2,4,6,7,14–18]. The proteins of apricot kernel comprise 84.74 percent albumin, 7.66 percent globulin, 1.16 percent prolamin, and 3.52 percent glutelin, according to a PAGE analysis (polyacrylamide gel electrophoresis)[65]. Non-protein nitrogen accounts for 1.17 percent of total nitrogen, whereas other proteins account for 1.85 percent[7]. According to SDS-PAGE analysis, proteins have a 315 nm fluorescence spectrum (emission max), 280 nm UV absorption ($ë_{max}$) and having 4 sub-units with the mol. size of 58600, 37400, 25200, and 16500 based on study of SDS-PAGE[19].

Essential amino acids made up of 33–35%[15] of the overall amino acids in the apricot kernel. Arginine (21.7–30.5) and leucine (16.2–21.6) were the two most important necessary amino acids (mmol/100 g meal), whereas glutamic acid (49.9–68.0) was the most common non-essential amino acid[4]. Table-II shows the numerical values of kernel flour and protein isolated in the protein digestibility tests (in vitro). The carbohydrate content of apricot kernels has been recorded differently as 25.5 percent (w/w)[20], 17.3 percent[6], and 18.1–27.9 percent [4]. Undefatted kernels had a total sugar content of 4.10 percent, while defatted kernels had a total sugar content of 7.76 percent[7]. The percentage of invert sugar was 6.01 percent[10].

Table 1. Chemical Composition of Apricot Kernels[a]

Oil contains (percentage)	Protein contains (percentage)	Ash contains (percentage)	Arginine contains (milli mol/ 100 gm)	Leucine contains (milli mol/ 100 gm)	Glutamic acid contains (milli mol/ 100 gm)	Reference
42.0–52.0	18.8	2.4				15
	23.4–26.0	1.4–2.0				16
42.0–48.9	32.1–37.7		22.3–29.5	15.8–20.9	50.2–65.1	4
31.7–50.3	14.0–17.1	2.1–2.4				14
28.0–65.9	20.2–40.7					2
51.9	21.1	3.1				6
51.0–53.3	23.0–24.0	2.1–2.4				7
55.9	22.3	2.1				18
44.3–45.1	21.7	3.0				17
45.8–51.2	23.8–27.4	2.2–2.8				8

[a]These data represent different varieties of cultivars.

Table 2. Digestive Protein Values[a] of Apricot Kernel Flour, Kernel Protein Isolates, and Casein (*In vitro)* (7)

	Digestive Proteine[b] (in percentage)		
Enzymes	Casein	Kernel flour	Kernel protein isolates
Trypsin	73.2 ± 2.4	31.1 ± 2.5	67.7 ± 3.0
Pepsin	32.6 ± 3.2	31.4 ± 3.0	33.1 ± 3.0
Pancreatin	96.0 ± 2.0	34.9 ± 2.8	96.1 ± 2.5
Pepsin-pancreatin	99.2 ± 0.3	95.6 ± 1.1	97.9 ± 1.5

[a]These data represent a number of cultivars.
[b]Data are mean ± SD.

Table-I shows the apricot kernels oil content ranging from 28.71% to 65.73 percent [2,4,6–8,14,15,17,18]. Table-III shows the oleic (58.3–73.4 percent) and linoleic (18.8–31.7 percent) primary FAs [6–8,14,17,22–25]. The contents of saturated fatty acid (7.2–8.3%) and unsaturated fatty acid (91.5–91.8%) [10,14], as well as neutral lipids, glycolipids and phospholipids - 95.2–95.7%, 1.2–1.8% and 2.0% respectively have been reported [10]. Kernel oil also found campesterol, stigmasterol and sitosterol - 11.8mg/100 gm, 9.8 mg/100 gm and 177.0 mg/100 gm respectively [27]. Table-IV contains shows the refractive index, specific gravity, iodine value, saponification value and unsaponifiable content values of apricot kernel oil. Unsaponifiable matter [4,10,28,29], saponification number [12,21,28], iodine value (90.0–103.5), specific gravity of 0.876–0.929 and having refractive index oof 1.390–1.475 [8,10,21] are the ranges.

Apricot kernels contain the cyanogenic glycoside amygdalin, along with low levels of prunasin. Amygdalin which is used to cure cancer in humans is found in kernels of almond at a concentration of 3–4% by wt. [31, 32]. According to other studies, bitter apricot has very high content of amygdalin (as 5.5 g/100 g) but very low in sweet apricots in comparison to bitter one [15].

HCN concentrations in wild apricot kernels are high (180-200 mg/100 gm), whereas HCN levels in domestic bitter apricot cultivars are low (11-12 mg/100 gm) [33 & 35]. Poisoning can occur if you consume too many apricot kernels (more than 1 mg/L –CN in your blood). HCN has been reported to have a lethal dosage of 0.5 mg/g [36].

Drawback

Apricots have a few drawbacks, despite its many positive qualities, such as their beauty,

Table 3. Fatty Acid Profile of Apricot Kernels[a] (in percent)

Palmitic acid (16:0)	Palmitoleic acid (16:1)	Stearic acid (17:0)	Oleic acid (17:1)	Linoleic acid (17:2)	Linolenic acid (17:3)	Reference
4.5	0.1-0.2	0.3	69.1	25.9	0.2	6
8.6	1.3	1.3	56.4	31.8	0.1	22
4.6–6.5	0.5–0.8	1.0–1.2	69.2–71.5	19.0–24.1	0.1–1.5	8
4.5	0.2	0.4-0.5	66.4	28.7	0.1	7
3.4–4.0		2.0–2.2	69.1–72.9	20.1–23.5		17
4.5–4.9		0.1–0.3	66.7–72.0	23.0–27.8		23
6.0	1.6	0.2	60.1	31.2		24
6.4	0.7	0.6	73.0	19.6		26
4.7	0.8	0.7	62.2	31.8		25
6.2–8.5	1.0–2.1	1.1–1.9	58.3–67.1	24.9–32.0		14

[a]These data represent different varieties of cultivars.

Table 4. Oil[a] properties of apricot kernel

Saponification value	Unsponifable content (percentage)	Specific gravity (gm/cm^3)	Iodine value	Refractive index (at 20°C)	References
190.1	0.87	0.878–0.880	92–100	1.470–1.471	10
194.3–198.9		0.913	105	1.471	7
	0.35–1.55		103		29
	0.57–0.90		104–112		4
188.1–188.8	0.20–1.00	0.920	91.9–94.6		28
		0.932–0.933	106	1.479	8

[a]These data represent different varieties of cultivars.

Table 5. Mineral and Vitamin Content of Apricot Kernels[a] (mg/100 gm)

Sodium (Na)	Potassium (K)	Calcium (Ca)	Magnesium (Mg)	Iron (Fe)	Zinc (Zn)	Manganese (Mn)	Nickel (Ni)	Cobalt (Co)	Thiamine	Riboflavin	Niacin	Vit C	α-Tocopherol	δ-Tocopherol	Reference
36.0	565	2.1	295	3.01	2.35	0.45	0.12	0.002							30
									0.11-0.39	0.20-0.30	2.02-6.08	1.05-2.15			
37.0	474	2.3	112	2.15	3.12										14
													6.0	32.1	27
				1.06-7.50	1.18-4.20										8

[a]These data represent a number of cultivars.

excellent flavour, and ease of eating, as well as their versatility and lack of production for enough quantity as indeed. In comparison to other summer fruits, apricots are more susceptible to illness [35]. Crop levels fluctuate, resulting in erratic market availability, and the limited selection of cultivars allows for only a brief market presentation. Furthermore, customers are frequently dissatisfied by insufficient fruit quantity and maturity, resulting in relatively low consumption rate when compared to other summer fruits (e.g. Mango, orange, blue berries etc.)[75]

Medicinal uses

The nutritional value of an apricot varies depending on whether it is raw or dry. Apricots is a good source of vitamin C, beta-carotene, and a few minerals when eaten raw [63]. Dried ones, on the other hand, are high in pro-vitamin A, niacin, vitamin E, iron, potassium, manganese, and calcium, among other minerals. Dried apricots are also high in dietary fibre, for approximately to 7% of its total weight.

Evidence-based medicinal uses of apricots

1. Improves vision or eyesight
2. Prevents nervous system disorders
3. Fights anaemia
4. Relieves constipation
5. Prevents cancer
6. Improves heart health

Improve Vision or Eyesight

Apricots have this characteristic due to the presence of vitamin A in combination with other vitamins and minerals. Its consumption helps to maintain strong vision. It adds radiance and attractiveness to the eye. Vitamin A aids in the protection of the eye's surface. It has been shown to be beneficial in the treatment of dry eyes in several trials. Vitamin A, in conjunction with other antioxidants, helps to reduce the risk of macular degeneration, which causes visual loss [1].

Vitamin A is known as the "eye vitamin." And apricots, particularly dried apricots, are high in this nutrient. So, if you want to improve your vision and prevent a variety of eye illnesses like night blindness, eye dryness, loss of visual acuity, and eye itching, adding apricots to your diet can help.

Prevents Nervous System Disorders

Because of its high content of B-group vitamins, apricots may help to avoid a variety of nervous system illnesses. The nerve cells in the brain require thiamine. Riboflavin assists in the normal metabolism of iron, a mineral required for blood cell production. Niacin also has a crucial function in the neurological system, and a lack of it can cause dementia and mood swings. Folates play a critical role in the prevention of neural tube abnormalities.

Apricots may aid in the maintenance of nervous system balance due to their high content of B-group vitamins. It might help those with anxiousness, anxiety, and even asthenia.

Fights Anaemia

Apricot consumption may be beneficial in cases of anaemia caused by iron deficiency. When the body is iron deficient, red blood cells cannot be formed in adequate quantities. Anaemia is a condition marked by symptoms such as weakness, weariness, and light-headedness.

Apricots, especially dried apricots, have a high iron content. It also has a fair percentage of copper in it. Iron, as previously stated, is directly involved in the creation of red blood cells, whose low count causes anaemia. Copper has also been shown to enhance iron absorption in the circulation in studies.

The connection between copper and iron is quite strong. In reality, there are some circumstances when iron deficiency anaemia cannot be alleviated by consuming iron but may be effectively treated by consuming copper [63].

Relieves Constipation

Apricots, particularly dried apricots, can aid with constipation. This is because it has a high level of fibre. Fiber helps to relieve constipation by bulking up the stool and enhancing the peristaltic activity of the gut, which helps to move stool down the colon.

If you're having trouble passing bowels, one or two apricots may work as a laxative to put a grin on your face.

Prevents Cancer

Apricot has been discovered to have powerful antioxidant effects. Antioxidant-rich foods assist to lower our risk of cancer by combating the actions of free radicals, which interact with body cells and can cause cancer to flourish. Furthermore, apricots are high in vitamin C, which helps to strengthen the body's immunity.

You may increase your defence against disease-causing organisms while also lowering your chance of acquiring any sort of cancer by include one or two apricots in your diet [27].

Improves Heart Health

A study published not long ago discovered that eating bitter apricot seeds can help avoid cardiovascular disease. In human volunteers, apricot consumption was observed to lower total cholesterol and LDL cholesterol levels.

LDL cholesterol in excess is extremely damaging to the cardiovascular system. It can clump in our arteries and eventually impede blood flow to key organs like the heart and brain, resulting in heart attacks and strokes.

Furthermore, apricots have very low fat and salt content, which are two of the most detrimental elements to heart health. On the other hand, it includes a substantial quantity of potassium, a mineral that helps regulate blood pressure and regulates pulse.

Apricots are also used in a variety of ways, including fresh fruit, vinegar, liquor, wine, flavouring agents in food or baby food, sauce, juice, jam and dried fruit for canning. Bitter apricot kernels are also used to treat asthma and cough [50], as well as for new born viral pneumonia and large intestinal diseases as a traditional medicine in China. The dried fruit and concentrate fruit juice of the Japanese apricot of Prunus mume is used to make a cancer-preventive and cancer-curing beverage. A liquid soap containing apricot kernel oil is used to treat dermatitis. Apricots are more valuably farmed for their seed's oil and edible seeds in some Asian countries in comparison to apricot grown for their fruit value. Crushed apricot stone shells are being investigated as an alternative to anthracite coal in water treatment filters. The kernels are used to make cosmetics, medications, and perfumes, while the pits are utilised for making fuel.

Extract of apricot is also used as a flavouring agent that is derived from apricots. It is used to add a fruity flavour to foods and beverages. Apricot extract has a number of health benefits, including reducing inflammation and protecting the heart.

Bitter Apricot Extract- Bitter apricot extract is a dark brown powder made from the pits of bitter or sour apricots. It has been used as an ingredient in various food products and medicines for thousands of years. The extraction process varies according to regional traditions but generally includes solvent-based processes, alcohol extraction, and water distillation among others.

The extensive usage of bitter apricot extract in various functional foods and beverages such as juices, cocktails, snacks & cereals, dairy products, meat & poultry products among others. In addition, bitter apricot is used in several bakery & confectionery items such as cakes pies cookies pastries along with their derivatives to enhance their taste and aroma [74].

Sweet Apricot Extract

Sweet apricot extract is a concentrated fruit flavour derived from the kernels of apricots [20]. It has high potassium content which helps in controlling blood pressure and cholesterol levels. The product also contains fibre, iron, calcium, and vitamin C & A which helps in lowering the risk of cancer and heart diseases.

The cosmetics industry also holds considerable potential owing to increasing consumer awareness regarding personal care product ingredients including colours preservatives etc. Apricot kernel oil (AKO) has been found effective for skin conditions on its own or blended with other carrier oils like sunflower seed oil or argan oil due largely lessening inflammation caused by acne lesions blackheads pimples pustules sores rashes etc [74].

CONCLUSION

Apricot has rich in minerals including catechin & chlorogenic acid. Taste and aroma compounds include sucrose, glucose, organic acids, terpenes, aldehydes and lactones. The dried Apricot containing more quantity of vitamins & minerals in comparison with raw Apricot. It has very good medicinal value because of its chemical composition.

Apricot contains a several minerals like Zn, Ca, Cu, Fe, Mg, Na, Mn, P, and K, whose amount varies between raw apricot & dried apricot. It also a very good source of fat-soluble vitamins (e.g.-A, E, K) & water-soluble vitamins (e.g. -B1, B2, B3, B5, B6, B9, C). Apricot kernel is also a very good source of oil and fibre as well as of dietary protein.

Apricot kernels are also containing poisonous compound amygdalin which is a cyanogenic glucoside isolated from apricot kernel and seeds of other plants of the family Rosaceae.

It has some following important medicinally uses:

• Good for Eyes (Due to Vitamin A & beta-carotene).
• It is rich source of antioxidants [61] & minerals.
• It helps in constipation (Due to high fibre).
• It helps in anaemia (due to iron value of apricot).
• It helps asthma patient [64].
• It is good for skin disorders because it has antioxidant properties & also containing most useful vitamins (Vit E) for skin [72].
• It also helps in weight loss & bone strengthen.

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