Almonds and Almond Oil Health and Beauty Benefits

The almond (*Prunus amygdalus*, syn. *Prunus dulcis*) is a species of tree classified in the subgenus *Amygdalus*, from the genus *Prunus*. *Prunus* is a genus of trees and shrubs in the flowering plant family Rosaceae that includes plums, cherries, peaches, nectarines, apricots and almonds.

The subgenus *Amygdalus* is distinguished from the other subgenera by corrugations on the shell (*endocarp*) surrounding the seed. The genus *Prunus* has a cosmopolitan distribution, being native to the North American temperate regions, the neo–tropics of South America, and temperate and tropical regions of Eurasia and Africa.

DESCRIPTION OF THE ALMOND

The almond is a deciduous tree (trees and shrubs that seasonally shed leaves, usually in the autumn) growing to 10–15 feet (3–4.5 m) in height, with a trunk of up to 12 inches (30 cm) in diameter. The young twigs are green at first, becoming purplish where exposed to sunlight, then gray in their second year.

LEAVES

The leaves are 3–5 inches (8–13 cm) long, with a serrated margin and a 1 inch (2.5 cm) *petiole* (the stalk that attaches the leaf blade to the stem). The fragrant flowers are white to pale pink, 1–2 inches (3–5 cm) in diameter with five petals, produced singly or in pairs and appearing before the leaves in early spring. The optimal temperature for flower growth is between 59–86 °F (15–30 °C).

FLOWERS

The tree buds must have a *chilling requirement* (the minimum period of cold weather after which a fruit–bearing tree will blossom) of 200 to 700 hours below 45.0 °F (7.2 °C) to break dormancy. Almonds begin bearing a marketable crop in the third year after planting. Trees reach full bearing 5–6 years after planting.

FRUIT

The almond tree fruit is a *drupe* (a type of fruit in which an outer fleshy part surrounds a single hardened shell (*pyrena*) with a seed inside) and 1+⅛–2+⅜ inches (3.5–6 cm) long. These fruits usually develop from a single carpel, and mostly from flowers with superior ovaries. Almonds are not true nuts because "nut" implies that the shell *does not open* to release the seed inside (indehiscent). The fruit mature in the autumn, 7–8 months after flowering.

The outer covering, consists of an outer *exocarp* (skin) and *mesocarp* (flesh). This outer cover, which is fleshy in other members of *Prunus* (plums and cherries), is instead a thick, leathery, gray–green coat (with a downy exterior), called the *hull*.

SEED

Inside the hull is a woody endocarp which forms a reticulated, hard shell (like the outside of a peach pit). Inside the shell is the edible seed, commonly called a “nut”. Generally, one seed is present, but occasionally two occur.

After the fruit matures, the hull splits and separates from the shell, and an *abscission layer* (the shedding of parts of an organism, such as a leaf, fruit, flower, or seed) forms between the stem and the fruit to allow the fruit to fall from the tree. During harvest, mechanized tree shakers are used to expedite fruit fall for collection.

TAXONOMY OF THE ALMOND

SWEET

The seeds of *Prunus dulcis* var. *dulcis* are predominantly sweet but some individual trees produce seeds that are slightly bitter. The genetic basis for bitterness involves one single gene, the bitter flavor is *autosomal recessive*, both these aspects make this trait easier to domesticate.

The superfamily of enzymes P450 (*cytochromes P450*) monooxygenases (enzymes that incorporate one hydroxyl group into substrates in many metabolic pathways) are involved in the amygdalin biosynthetic pathway.

the sweet flavor trait in almonds is caused by a point mutation in a basic helix–loop–helix (bHLH) that prevents transcription of the two *cytochrome P450* genes through a *transcription factor* (a protein that controls the rate of transcription from DNA to messenger RNA, by binding to a DNA sequence).

BITTER

The fruits from *Prunus dulcis* var. *amara* are always bitter, as are the kernels from other species of genus *Prunus* (to a lesser extent), such as apricot, peach and cherry. The bitter almond is slightly broader and shorter than the sweet almond and contains about 50% of the fixed oil that occurs in sweet almonds.

Bitter almonds also contain the catalyzing enzyme *emulsin* which, in the presence of water, acts on the two soluble *glucosides* (a *glycoside* chemically derived from glucose):

1. *Amygdalin* (a naturally occurring chemical compound found in plants, most notably in the kernels of stone fruits, and in the roots of manioc).
2. *Prunasin* (a *cyanogenic* glycoside related to *amygdalin*) that yields glucose (sugar), cyanide and nearly pure *benzaldehyde* (the essential oil of bitter almonds). This is the chemical that causes the bitter flavor.

Toxicity in Bitter Almonds

Bitter almonds may yield 4–9 milligrams of *hydrogen cyanide* per almond and contain 42 times higher amounts of *cyanide* than the trace levels found in sweet almonds. The source of the cyanide content in bitter almonds is caused by the *enzymatic hydrolysis* of amygdalin (a process in which adding water to enzymes facilitate the severing of molecular bonds).

Extract of bitter almonds was once used medicinally but even in small doses, the effects are severe and even lethal, especially in children. The *cyanide* content must be removed before consumption. The acute oral lethal dose of cyanide for adult humans is reported to be 0.2–1.6 mg/lbs. (0.5–3.5 mg/kg) of body weight (approximately 50 bitter almonds), for children, consuming just 5–10 bitter almonds may be fatal.

Symptoms of bitter almond toxicity include *vertigo* (a condition in which a person has the sensation that they or objects around them are moving, when they are not). Vertigo often feels like spinning or swaying and it may be associated with nausea, vomiting, perspiration or difficulty walking. Vertigo is the most common type of dizziness, and it feels worse when the head is moved.

Almonds may cause a food allergy (an abnormal immune response to food). Symptoms of a food allergy may range from mild to severe, and may include itchiness, swelling of the tongue, vomiting, diarrhea, hives, trouble breathing or low blood pressure. The reaction typically occurring within minutes to several hours of exposure.

Almonds may also cause a food intolerance (an often delayed detrimental reaction or hypersensitivity to a food) that produces symptoms in one or more body organs and systems. Cross–reactivity is common

with peach allergens (a type of antigen that produces an abnormally vigorous immune response in which the immune system fights off a perceived threat that would otherwise be harmless to the body).

Cross–reactivity is also common with *lipid transfer proteins* (also known as plant LTPs or PLTPs). A group of highly–conserved proteins of about 7–9kDa found in higher plant tissues, they facilitate the shuttling of *phospholipids* and other fatty acid groups between cell membranes.

Cross–reactivity is also common with tree nut allergens (a hypersensitivity to dietary substances from tree nuts and edible tree seeds including almonds, Brazil nuts, cashews, chestnuts, filberts/hazelnuts, macadamia nuts, pecans, pistachios, shea nuts and walnuts).

Symptoms of cross–reactivity range from mild local signs and symptoms. Symptoms like *oral allergy syndrome* (or *pollen–food allergy syndrome*). A type of allergy classified by a cluster of allergic reactions in the mouth and throat in response to eating certain fruits, nuts, and vegetables. Or Symptoms of *contact urticaria* (also known as hives). A kind of skin rash with red, raised, itchy bumps that may burn or sting and may appear on different body parts, lasting from minutes to days.

Other signs and symptoms of cross–reactivity can be severe and systemic. These include *anaphylaxis* (a serious, potentially fatal rapid onset allergic reaction). Anaphylaxis typically causes any of the following: an itchy rash, throat closing or severe tongue swelling, both of which can obstruct and stop breathing. Anaphylaxis is a medical emergency that requires immediate medical attention regardless of the use of emergency medication.

Other severe reactions are *urticaria* and *angioedema* (swelling of the skin or mucous membranes occurring in the face, tongue, larynx, abdomen, arms or legs). As well as other severe gastrointestinal and respiratory symptoms.

Almonds are susceptible to *aflatoxin*–producing molds. Aflatoxins are various potent and poisonous *carcinogens* (agents that promote the development of cancer) and *mutagens* produced by certain molds. Aflatoxins are particularly produced by the *Aspergillus* species, mainly *Aspergillus flavus* (from the Latin meaning “yellow”). *A. flavus* is a *saprotrophic* and *pathogenic* fungus best known for its colonization of cereal grains, legumes, and tree nuts; the infectious rot typically develops during harvest, storage, and/or transit.

Aspergillus parasiticus (an unspecialized *saprophytic* mold) also produces aflatoxins. It is mostly found outdoors in areas of rich soil with decaying plant material as well as in dry grain storage facilities. Environmental stress can upregulate aflatoxin production by *A. parasiticus*. This stress can occur when the fungus grows on plants that become damaged due to insect or bird activity, drought or by exposure to poor weather conditions.

In humans, exposure to *A. parasiticus* aflatoxins can cause delayed development in children and produce serious liver diseases and/or *hepatic carcinoma* in adults. The fungus can also cause the infection known as *aspergillosis* in humans and other animals. *A. parasiticus* is of agricultural importance due to its ability to cause disease in corn, peanut and cottonseed crops.

These two are the best known and most intensively researched *mycotoxins* in the world. Mold contamination may occur from the soil, previously infested almonds or almond pests such as the navel–orangeworm. High levels of mold growth typically appear as a gray–black filament–like growth. ***It is unsafe to eat mold–infected tree nuts***.

Some countries have strict limits on allowable levels of aflatoxin contamination of almonds and require adequate testing before the nuts can be marketed on their soil. The European Union (EU), for example, introduced a requirement in 2007 that all almond shipments be tested for aflatoxin. If the levels do not

meet strict safety regulations, the entire consignment may be reprocessed to eliminate the aflatoxin content or it must be destroyed.

THE PHYTOCHEMISTRY OF ALMONDS

Typical of nuts and seeds, almonds are a source of *phytosterols* (similar to cholesterol, they serve as structural components of biological membranes of plants) such as *beta–sitosterol* (β–sitosterol), *stigmasterol*, *campesterol*, *sitostanol*, and *campestanol*.

Almonds contain *polyphenols* in their skins (testa) consisting of *flavonols*, *flavan–3–ols*, *hydroxybenzoic acids* (refers to several related chemical compounds: *salicylic acid*, *o–hydroxybenzoic acid*, *m–hydroxybenzoic acid*, *p–hydroxybenzoic acid*) and *flavanones* (*flavonoids* that occur in plants as *glycosides*) analogous to those of certain fruits and vegetables.

THE ETYMOLOGY OF ALMOND

The word almond is a loanword (a word assimilated, "borrowed", from one language into another) from Old French (late 8th to mid–14th centuries) *almande* or *alemande*. Which is descended from *amandula*, *amindula* (3rd to 6th centuries CE). Which is modified from the Classical Latin (around 75 BC) *amygdala*. The adjective *amygdaloid* from Late Latin ("like an almond, almond–like") is used to describe objects which are roughly almond–shaped, a shape which is a combination of a triangle and an ellipse.

Amygdala is in turn borrowed from Ancient Greek (1500 BC to 300 BC) *amygdálē* "ἀμυγδάλη" (cf. *amygdala*, an almond–shaped portion of the brain that is considered part of the limbic system). Ultimately becoming *amygdales* "almonds" in Late Old English (mid–5th century). The Arabic name for almond is لوز "lauz" or "lūz". In some parts of the Levant and North Africa, it is pronounced "loz", which is very close to its Aramaic origin.

ORIGIN AND DISTRIBUTION OF ALMONDS

The almond tree prospers in a moderate Mediterranean climate that typically has dry summers and wet winters. Although the precise origin of the almond is controversial, since estimates for its emergence span across wide geographical regions. Some sources indicate that its origins were in Central Asia between Iran, Turkmenistan, Tajikistan, Kurdistan, Afghanistan and Iraq. Other sources claim its origins in an eastern Asian sub–region between Mongolia and Uzbekistan.

But both botanical and archaeological evidence indicates that almonds originated and were first cultivated in West Asia (Southwest Asia), particularly in countries of the Levant (a historical geographical term referring to a large area in the Eastern Mediterranean region of West Asia, the core territory of the political term "Middle East"). The wild form of domesticated almond also grew in parts of the Levant.

Other estimates specified Iran (botanical evidence points this as a possible origin center) and Anatolia (present day Turkey) as origin locations for the almond. Almond cultivation was spread for centuries by humans along the shores of the Mediterranean Sea into northern Africa and southern Europe, and more recently to other world regions, notably California. Selection of the sweet type from the many bitter types in the wild marked the beginning of almond domestication.

The wild ancestor of the almond used to breed the domesticated species is unknown. The species *Prunus fenzliana*, grown by early farmers, may be the most likely wild ancestor of the domesticated almond, in part because it is native to the Caucasus areas of Turkey, Armenia, Azerbaijan, Iran, and Turkmenistan, where it was first domesticated. *Prunus fenzliana* prefers to grow at 4,593–11,482 feet (1400–3500 m) above sea level.

CULTIVATION OF THE ALMOND

Almonds were one of the earliest domesticated fruit trees, due to the ability to produce quality offspring entirely from seed, without using suckers and cuttings (before "grafting"). Grafting or graftage is a relatively new horticultural technique whereby tissues of plants are joined so as to continue their growth together. The upper part of the combined plant is called the *scion* while the lower part is called the *rootstock*.

Domesticated almonds appear in the Early Bronze Age (3000–2000 BC), such as the archaeological sites of Numeira (modern day Jordan). Another well–known archaeological example of the almond is the fruit found in Tutankhamun's tomb in Egypt (c. 1325 BC), probably imported from the Levant. An article on almond tree cultivation in Spain can be found in Ibn al–'Awwam's (also known as Abu Zakariya Ibn al–Awwam) lengthy handbook on agriculture, *Book on Agriculture* (in Arabic *Kitāb al–Filāḥa*).

Ibn al–'Awwam was an Al–Andalus agriculturist who flourished in Seville, Spain in the later 12th century. His handbook is the most comprehensive treatment of the subject in medieval Arabic and Spanish, and one of the most important medieval works on the subject in any language. Of the European countries that the Royal Botanic Garden Edinburgh reported as cultivating almonds, Germany is the northernmost, though the domesticated form can be found as far north as Iceland.

ALMOND VARIETIES

Almond trees are small to medium sized but commercial cultivars can be grafted onto a different rootstock to produce smaller trees. Varieties include:

- "Nonpareil"—originated in the 1800s. A large tree that produces large, smooth, thin–shelled almonds with 60–65% edible kernel per nut. Requires pollination from other almond varieties for good nut production.
- "Tuono"—originated in Italy. Has thicker, hairier shells with only 32% of edible kernel per nut. The thicker shell gives some protection from pests such as *Amyelois transitella* (the navel orangeworm). A monotypic snout moth genus with a single species, endemic to the tropical Western Hemisphere, including the southern U.S.). This varietal does not require pollination by other almond varieties.
- "Mariana"—used as a rootstock to produce smaller trees.

BREEDING OF ALMOND TREES

A "breeding program" is the planned breeding of a group of animals or plants, usually involving multiple individuals and extending over several generations utilizing artificial and natural breeding methods. Almond breeding programs have found the "high shell–seal" trait. High shell–seal provides resistance against the *Aspergillus* species and against the development of their toxins. Plant disease resistance protects plants from pathogens in two ways:

a) by pre–formed structures and chemicals
b) by infection–induced responses of the immune system

Relative to plants, "disease resistance" is the reduction of pathogen growth on or in the plant, while the term "disease tolerance" describes plants that exhibit little disease damage despite substantial pathogen levels. Disease "outcome" is determined by the three–way interaction of the pathogen, the plant and the environmental conditions.

Pollination of Almond Trees

The most widely planted varieties of almond are self–incompatible (a general name for genetic mechanisms that prevent self–fertilization in sexually reproducing organisms). These varieties encourage outcrossing and *allogamy*. Since these trees require pollen from a tree with different genetic characters in order to produce seeds, almond orchards must grow mixtures of almond varieties.

Additionally, the pollen must be transferred from flower to flower by insects requiring commercial growers to ensure there are enough insects to perform this task. The large scale of almond production in the U.S. creates a significant problem of requiring rather large swarms of pollinating insects. Additional pollinating insects will need to be brought to the trees.

Pollination management is the horticultural practices that accomplish or enhance pollination of a crop, to improve yield or quality, by understanding of the particular crop's pollination needs, and by knowledgeable management of pollinators and pollination conditions.

The pollination of California's almonds is the largest annual managed pollination event in the world, with over 1 million hives (nearly half of all beehives in the U.S.) being brought to the almond orchards each February. Much of the supply of bees is managed by pollination brokers, who contract with migratory beekeepers from at least 49 states for the event.

This business was heavily affected by “colony collapse disorder” (the abnormal disappearance of the majority of worker bees in a colony, leaving behind the queen, food, and nurse bees to care for the young) at the turn of the 21st century. Colony collapse caused a nationwide shortage of honey bees, increasing the price of insect pollination (*entomophily*).

While such disappearances have occurred sporadically throughout the history of apiculture, there has been a drastic rise in reports of large–scale colony collapse of the western honey bee, *Apis mellifera*. Beekeepers in most European countries had observed a similar phenomenon since 1998, especially in Southern and Western Europe. The phenomenon became more global when it affected some Asian and African countries as well.

To partially protect almond growers from these costs, researchers at the Agricultural Research Service (ARS), part of the United States Department of Agriculture (USDA), developed self–pollinating almond trees that combine this character with food quality characters such as a flavor and yield.

Self–pollinating almond varieties exist, but they lack some commercial characters. Ultimately, through natural hybridization between different almond varieties, a new variety of self–pollinating almond with a high yield of commercial quality nuts was produced.

The Issue of Sustainability for Almond Production

California produces about 80% of the world's almond supply. Almond production in California is concentrated mainly in the Central Valley. A broad, elongated, flat valley that dominates the interior of California. It is 40–60 mi (60–100 km) wide and runs approximately 450 mi (720 km) from north–northwest to south–southeast, inland from and parallel to the Pacific coast. It covers approximately 18,000 sq. mi (47,000 km^2). This region’s mild climate, rich soil, abundant sunshine and water supply make for ideal growing conditions.

According to the California Almond Growers Exchange (CAGE) almond production in California has become unsustainable. Almond cultivation requires the use of pesticides as well as high amounts of land and water. A *single almond* requires roughly 1.1 US gallons (0.92 imperial gallons; 4.2 liters) of water to grow properly.

In the early 21st century, climate change and other human activity factors caused persistent droughts and extreme temperatures in California. These persistent droughts made difficult to produce almonds in a sustainable manner. As regulations related to water supplies have changed, some growers have left the industry or destroyed their current almond orchards and replaced them with younger trees or a different crop entirely.

This has led to a lower supply and increased prices. Pistachios, a member of the cashew family (originating in Persia) requires less water. The table below shows sustainability strategies currently being implemented by the Almond Board of California and almond farmers.

Agricultural Resources	Tree and soil health (the state of a soil meeting its range of ecosystem functions as appropriate to its environment; the health of soil arises from favorable interactions of all soil components that belong together, as in microbiota, plants and animals), and other farming practices.
Minimizing Impacts	Minimizing dust production during the harvest.
Pollinators	Bee health, specifically the best–known bee species, the western honey bee for its pollination.
Water Consumption	Irrigation guidelines for farmers. Irrigation is the practice of applying controlled amounts of water to land to help grow crops, landscape plants, and lawns. Irrigation has been a key aspect of agriculture for over 5,000 years and has been developed by many cultures around the world.
Food Safety	Food safety.
Resource Consumption	Use of waste "biomass" (a term used in several contexts: in ecology it means living organisms, and in "bioenergy" it means matter from recently living organisms) as coproducts with a goal to achieve "zero waste". Bioenergy is a type of *renewable* energy with potential to mitigate climate change. In the context of bioenergy, biomass can be defined as only from plants, from plants and algae or from plants and animals. The majority of biomass used for bioenergy comes from plants. Zero waste, or *waste minimization*, is a set of principles focused on waste prevention that encourages redesigning resource life cycles so that all products are repurposed and/or reused. The goal of this movement is to avoid sending trash to landfills, incinerators, oceans, or any other part of the environment.
Energy Consumption	Use of "solar energy" (radiant light and heat from the sun that is harnessed using a range of technologies such as solar power to generate electricity, solar thermal energy, and solar architecture) during processing. Solar energy is an essential source of renewable energy.
Jobs	Job development.
Research	Support of scientific research to investigate potential health benefits of consuming almonds. The *scientific method* is an empirical method for acquiring knowledge that has characterized the development of science since at least the 17th century. The scientific method involves careful observation coupled with rigorous skepticism, because cognitive assumptions can distort the interpretation of the observation. *Scientific*

	inquiry includes creating a hypothesis through inductive reasoning, testing it through experiments and statistical analysis, and adjusting or discarding the hypothesis based on the results.
Best Practices	International education about sustainability practices.

DISEASES AND PESTS OF THE ALMOND

DISEASES

Almond trees can be attacked by an array of damaging microbes, fungal pathogens, plant viruses and bacteria.

PESTS

The pavement ant (*Tetramorium caespitum*) is a species of ant in the family *Formicidae*, The southern fire ant (*Solenopsis xyloni*), also known as the Californian fire ant or cotton ant, is a stinging fire ant native to southern parts of the U.S., and the best known species of *Solenopsis* thief ants (*Solenopsis molesta*). They get their names from their habit of nesting close to other ant nests, from which they steal food.

They are also called grease ants because they are attracted to grease. All are seed predators (*granivory*), a type of plant–animal interaction in which *granivores* feed on the seeds of plants as a food source, often leaving the seeds damaged and not viable. *Bryobia rubrioculus* mites are best known for their damage to this crop.

PRODUCTION OF ALMONDS

Almonds are sold shelled or unshelled. Shelling almonds refers to removing the shell to reveal the seed. Blanched almonds are shelled almonds that have been treated with hot water to soften the seedcoat. This coating is then removed to reveal the white embryo (the initial stage of development for a multicellular organism). Once almonds are cleaned and processed, they can be stored over time.

In 2022, world production of almonds was 3.6 million tonnes (metric tons), led by the U.S. Secondary producers were Australia and Spain.

Almonds (with shell), 2022

	Country	**Tonnes**
	United States	1,858,010
	Australia	360,328
	Spain	245,990
	Turkey	190,000
	Morocco	175,763
	World	**3,630,427**

Source: The Food and Agriculture Organization Corporate Statistical Database (FAOSTAT) website disseminates statistical data collected and maintained by the Food and Agriculture Organization (FAO) of the United Nations (UN)

United States

In the U.S., production is concentrated in California where 1,000,000 acres (400,000 ha) and six different almond varieties were under cultivation in 2017, with a yield of 2.25 billion lbs. (1.02 billion kg) of shelled almonds.

California production is marked by a period of intense pollination during late winter by “rented” commercial bees transported by truck across the U.S. to almond groves, requiring more than half of the total U.S. commercial honeybee population. The value of total U.S. exports of shelled almonds in 2016 was $3.2 billion.

All commercially grown almonds sold as food in the U.S. are sweet cultivars. The U.S. Food and Drug Administration (FDA) reported in 2010 that some fractions of imported sweet almonds were contaminated with bitter almonds, which contain *cyanide*.

Mandatory Pasteurization of Almonds in California

The USDA approved a proposal by the Almond Board of California (ABC) to pasteurize almonds sold to the public after tracing cases of *salmonellosis* (a symptomatic infection caused by *Salmonella* type bacteria, and the most common form of food poisoning) caused by consumption of almonds.

After publishing the rule in March 2007, the almond pasteurization program became mandatory for California producers effective September 1st, 2007. Raw, untreated California almonds have not been available in the U.S. since. California almonds labeled "raw" must be steam–pasteurized or chemically treated with *propylene oxide* (PPO).

Propylene oxide is an acutely toxic and carcinogenic organic compound classified as Group 2B ("possibly carcinogenic to humans") by the International Agency for Research on Cancer (IARC). The ABC claims that PPO residue dissipates after treatment. The U.S. Environmental Protection Agency (EPA) reports that propylene oxide has been detected in fumigated food products. Consumption of contaminated food is another possible route of exposure to PPO.

Treatment with PPO does not apply to imported almonds or almonds sold from the grower directly to the consumer in small quantities. This treatment is also not required for raw almonds sold for export outside of North America.

The USDA–approved marketing order was challenged in court by organic farmers organized by the Cornucopia Institute, a Wisconsin–based farm policy research group. According to the Institute, this almond marketing order has imposed significant financial burdens on small–scale and organic growers and affected domestic almond markets.

- In September 2008, the Institute filed a lawsuit challenging the USDA’s marketing order.
- In early 2009 a federal judge dismissed the lawsuit on procedural grounds.
- In August 2010, a federal appeals court ruled that the farmers have a right to appeal the USDA regulation.
- In March 2013, the court vacated the suit on the basis that the objections should have been raised back in 2007 when the regulation was first proposed.

Australia

Australia is the largest almond production region in the Southern Hemisphere. Most of the almond orchards are located along the Murray River (the country's longest river) spanning 1,558 mi (2,508 km) in the southeast.

Its tributaries include five of the six longest rivers corridor in New South Wales (a state on the east coast, bordering Queensland to the north, Victoria to the south, and South Australia to the west), Victoria, and South Australia (a state in the southern central part of the continent, covering some of the most arid parts of the country); with a total land area of 380,048 sq. mi (984,321 km^2). South Australia is the fourth–largest state and territory by area, and second smallest by population.

SPAIN

Spain has diverse commercial cultivars of almonds grown in Catalonia (an autonomous community, designated as a *nationality*), Valencia (the capital of the province and autonomous community of the same name), Murcia (a city in the southeast, the capital and most populous city of the autonomous community of the region, and the seventh largest city in the country), Andalusia, and Aragón (an autonomous community in the northeast). Aragón is coextensive with the medieval "Kingdom of Aragon", it comprises three provinces: Zaragoza, its capital, Huesca and Teruel.

As well as the Balearic Islands (an archipelago in the western Mediterranean Sea, near the eastern coast of the Iberian Peninsula). The archipelago forms a province and autonomous community. Palma de Mallorca being its capital and largest city. Production in 2016 declined 2% nationally compared to 2015 production data.

The "Marcona" almond cultivar is recognizably different from other almonds and is marketed by name. The tree is very productive. The kernel is short, round, relatively sweet, and delicate in texture with a hard shell. The origin of the Marcona almond is unknown, but it has been grown in Spain for a long time.

CULINARY USES OF ALMONDS IN WORLD CUISINES

Almonds are available in many forms, such as whole, slivered or ground into flour. Almond pieces around 1⁄16–⅛ in (2–3 mm) in size, called "nibs", are used for special purposes such as decoration.

While almonds are often eaten on their own, raw or toasted, they're also used in many cuisines as an ingredient in culinary dishes.

Almonds are a common addition to *muesli* (a cold Swiss breakfast dish) or oatmeal. The primary ingredient in muesli is rolled oats, traditionally set to soak overnight in milk or cream and eaten the next morning with the addition of other grains, nuts, seeds, and fresh or dried fruits, and a dash of citrus juice or honey for sweetness.

Since the 19th century almonds have been used to make bread, almond butter, cakes and puddings, candied confections, almond cream–filled pastries, *nougat*, cookies (the French *macaroons*, the Italian *biscotti* and the Arab, Balkan or Ottoman *qurabiya*, or *kourabiedes*), and cakes (the French *financiers*, the Hungarian *Esterházy torte*, named after Prince Paul III Anton Esterházy de Galántha, 1786–1866), and other sweets and desserts.

A wide range of classic sweets feature almonds as a central ingredient. Marzipan was developed in the Middle Ages. It is a confection consisting primarily of sugar and almond meal, sometimes augmented with almond oil or extract. Marzipan is used in a number of elegant cakes and desserts.

Princess cake (a traditional Swedish layer cake consisting of alternating layers of sponge cake, pastry cream, and a thick–domed layer of whipped cream) is covered by a layer of rolled marzipan (similar to *fondant*) giving it a smooth, rounded top, as is *Battenberg cake*.

France

In French cuisine, alternating layers of almond and hazelnut *meringue* (traditionally made from whipped egg whites, sugar, and an acidic ingredient such as lemon, vinegar, or cream of tartar) are used to make the dessert *dacquoise*.

The *pithivier* (a round, filled, double crust pie with puff pastry, has the appearance of a hump and is traditionally decorated with spiral lines drawn from the top outwards with the point of a knife and scalloping on the edge), named after the French town of Pithiviers is one of many almond cream–filled pastries.

Germany

In Germany, Easter bread called *Deutsches Osterbrot* is baked with raisins and almonds.

Greece

In Greece almond flour is used to make *amygdalopita* (a cake made with wheat flour, butter, eggs and pastry cream). It is one of the most common *glyka tapsiou* (dessert dishes like pies and breads baked in baking pans). Almonds are used for *kourabiedes*, a Greek version of the traditional *quarabiya* almond biscuit.

A soft drink known as *soumada* is made with "Orgeat" syrup, a sweet syrup made from almonds and sugar with a little rose and/or orange flower water. It has a pronounced almond taste.

Saudi Arabia

In Arabian cuisine, almonds are commonly used as a garnish for *mansaf* (traditional from Jordan), a dish made of lamb cooked in a sauce of fermented dried yogurt and served with rice or bulgur. In Saudi Arabia, almonds are a typical garnish for the mixed rice dish *kabsa* (or *makbūs*/*machbūs*), a dish that originates from Saudi Arabia or Yemen. It is commonly regarded as a national dish. It can also be found in regions such as southern Iran, and Gaza in Palestine.

Iran

Almonds are added to some foods, cookies, and desserts, or are used as decoration. The young fruit of the almond tree can be eaten whole when they are still developing and fleshy on the outside and the inner shell has not yet hardened (green almonds). The fruit is somewhat sour, but is a popular snack (called *chaqale bâdam*) on street markets in parts of the Middle East, eaten dipped in salt or with dates to balance the sour taste. Green almonds are available only from mid–April to mid–June in the Northern Hemisphere. Pickling or brining can be employed to extend the fruit's shelf life.

Candied almonds called *noghl* (*nuql*, or *mlabbas*), are a traditional Syrian, Iranian and Afghan confection. They're made by boiling sugar with water and rose water and then coating roasted almonds in the mixture. *Noghl* are served alongside tea and coffee. Also, sweet almonds are used to prepare special food for babies, named *harire badam*.

In Iran, roasted nuts are served on special events, for example, during *Nowruz* (or *Navroz*) parties, the Iranian or Persian New Year. It is a festival based on the Northern Hemisphere spring equinox, which marks the first day of a new year on the Solar *Hijri* calendar.

Italy

In Italy, *colomba di Pasqua* (a traditional Easter bread) is made with almonds. It is a counterpart of the two well–known Italian Christmas desserts, *panettone* and *pandoro*. Bitter almonds are the base for *amaretti di Saronno* (a type of *amaretto*), a bitter–sweet flavored macaroon, traditional to the Italian

municipality of Saronno. It is one of many types of traditional *amaretti*, but the only one made with apricot kernels.

Toasted Almonds are a common choice as the nuts to include in *torrone* (a Mediterranean nougat confection typically made with honey, sugar and egg whites). It is usually shaped into a rectangular or round shape. It is usually eaten as a dessert around Christmas in both Italy and Spain.

In Sicily, sponge cake is covered with marzipan to make *cassatella di sant'Agata* (a traditional pastry from Catania) made during the Festival of Saint Agatha, held yearly on February 3–5. A similar traditional cake is *cassata siciliana* (composed of a round sponge cake moistened with fruit juices or liqueur and layered with ricotta cheese and candied fruit). It has a shell of marzipan, pink and green colored icing, and decorative designs). Marzipan is dyed and crafted into realistic fruit and vegetable shapes to make *frutta martorana* (resembling those of the provinces of Palermo and Trapani).

Morocco

In Morocco, marzipan is the main ingredient in pastry fillings, and other desserts. Fried blanched whole almonds are also used to decorate sweet *tajines* (a North African dish, named after the earthenware pot in which it is cooked) such as lamb with prunes.

Southwestern Berber regions of Souss and Essaouira (known until the 1960s as Mogador), a port city in the western Moroccan region of Marrakesh–Safi, on the Atlantic coast) are known for *amlou*, a spread made of almond paste, argan oil, and honey.

Almond paste mixed with toasted flour, honey, olive oil or butter, anise, fennel, sesame seeds and cinnamon is used to make *sellou*, a sweet snack known for its long shelf life and high nutritional value. This snack is also called *zamita* in Meknes (one of the four Imperial cities located in northern central Morocco, and the sixth largest city by population in the kingdom). And *slilou* in Marrakech (one of the four imperial cities, the fourth–largest city and the capital of the Marrakesh–Safi region).

Sharbat billooz, a common beverage, is made by blending blanched almonds with milk, sugar and other flavorings.

India

In Indian cuisine, almonds are the base ingredients of *pasanda*–style and Mughlai (the Mughal Empire was an early modern empire in South Asia) curries (a dish with a sauce or gravy seasoned with spices, mainly associated with South Asian cuisine, not to be confused with leaves from the curry tree).

Pasanda, also called *parche*, is a popular dish from North India, Rampur, Hyderabadi and Pakistani, derived from a meal served in the court of the Mughal emperors. The word is a variation on the Hindi–Urdu word "pasande" meaning "favorite", which refers to the prime cuts of meat traditionally used in the dish. The word "pasande" is borrowed from Persian.

Badam halva is a sweet made from almonds with added coloring. Almond flakes are added to many sweets (such as *sohan barfi*), and are usually visible sticking to the outer surface. Almonds with added salt are also sold as a snack.

Almonds form the base of various drinks which are said to have a “cooling” effect.
Almond “sherbet” or *sherbet–e–badaam*, a fizzy, sweet powder, usually eaten by dipping a lollipop or licorice, using a small spoon, or licking it from a finger, is a common summer drink.

Israel

In Israel almonds are used as a topping for cookies (cookies made of tahini, flour, sugar and butter and usually topped with almonds or pine nuts) or eaten as a snack.

SPAIN

In Spain, *Marcona* almonds are usually toasted in oil and lightly salted. They are used by Spanish confectioners to prepare a sweet called *turrón* (a Mediterranean nougat).

In Andalusian regional cuisine, the Christmas confection *pan de Cádiz* (or *turrón de Cádiz*) is filled with marzipan and candied fruit. In Spanish "pan" means bread, a name probably given to the dish due to its rectangular appearance. There are many different recipes, but the basic ingredients are always marzipan and candied fruit. The origins of the dish are likely the marzipan rolls with fruit made in Cádiz, Spain during the 19th century.

UK

In British cuisine, almonds are used for dessert items such as Bakewell tart (a variant of Bakewell pudding), a confection consisting of a shortcrust pastry shell beneath layers of jam, frangipane, and a topping of flaked almonds, closely associated with the town of Bakewell in Derbyshire. And Battenberg (or Battenburg) cake, a light sponge cake held together with jam and covered in marzipan, when cut in cross section, the cake displays a distinctive two–by–two check pattern colored pink and yellow.

NUTRITION INFORMATION OF ALMONDS

Almonds are 4% water, 22% carbohydrates, 21% protein, and 50% fat. The almond is a nutritionally dense food, providing a rich source (20% or more of the Daily Value, DV) of the B vitamins *riboflavin* (B_2) and *niacin* (B_3), *tocopherol* (vitamin E), and the essential minerals calcium, copper, iron, magnesium, manganese, phosphorus, and zinc. In a 3+½–ounce (100 g) serving, almonds supply 2,420 kilojoules (579 kilocalories) of food energy.

Almonds are a moderate source (10–19% DV) of the B vitamins *thiamine* (B_1), *pyridoxal 5'–phosphate* (B_6), *folate* or *folic acid* (B_9), *choline* (B_4), and the essential mineral *potassium* (K). They also contain substantial dietary fiber, monounsaturated omega–9 fatty acid (*oleic acid*) and polyunsaturated omega–6 fatty acid (*linoleic acid*).

Nutritional value per 3.5 oz. (100 g)	
Energy	2,423 kJ (579 kcal)
Carbohydrates	21.6 g
Starch	0.7 g
Sugars	4.4 g
Lactose	0.00 g
Dietary fiber	12.5 g
Total Fat	49.9 g
Saturated	3.8 g
Monounsaturated	31.6 g
Polyunsaturated	12.3 g
Protein (these amino acids are used in the biosynthesis of proteins)	21.2 g
Tryptophan	0.214 g

Threonine	0.598 g	
Isoleucine	0.702 g	
Leucine	1.488 g	
Lysine	0.580 g	
Methionine	0.151 g	
Cystine	0.189 g	
Phenylalanine	1.120 g	
Tyrosine	0.452 g	
Valine	0.817 g	
Arginine	2.446 g	
Histidine	0.557 g	
Alanine	1.027 g	
Aspartic acid	2.911 g	
Glutamic acid	6.810 g	
Glycine	1.469 g	
Proline	1.032 g	
Serine	0.948 g	
Vitamins and Minerals		
Vitamins	**Quantity**	**%DV†**
Vitamin A equiv.		
beta–Carotene	1 µg	0%
lutein zeaxanthin	1 µg	
Vitamin A	1 IU	
Thiamine (B_1)	0.211 mg	18%
Riboflavin (B_2)	1.014 mg	78%
Niacin (B_3)	3.385 mg	21%
Pantothenic acid (B_5)	0.469 mg	9%
Pyridoxal 5'–phosphate (B_6)	0.143 mg	8%
Folate or *folic acid* (B_9)	50 µg	13%
Choline (B_4)	52.1 mg	9%
Ascorbic acid (Vitamin C)	0 mg	0%
Cholecalciferol and *ergocalciferol* (Vitamin D)	0 µg	0%

Tocopherol (Vitamin E)	25.6 mg	171%
Phytomenadione (Vitamin K)	0.0 µg	0%
Minerals	**Quantity**	**%DV†**
Calcium (Ca)	264 mg	20%
Copper (Cu)	0.99 mg	110%
Iron (Fe)	3.72 mg	21%
Magnesium (Mg)	268 mg	64%
Manganese (Mn)	2.285 mg	99%
Phosphorus (P)	484 mg	39%
Potassium (K)	705 mg	24%
Selenium (Se)	2.5 µg	5%
Sodium (Na)	1 mg	0%
Zinc (Zn)	3.08 mg	28%
Other Constituents		
Water	4.4 g	
USDA Database FoodData Central Search Results		
†Percentages estimated using U.S. recommendations (RDI) for adults, except for potassium, which is estimated based on expert recommendation from The National Academies of Sciences, Engineering, and Medicine (NASEM), also known as the National Academies, is a congressionally chartered organization that serves as the collective scientific national academy of the U.S.		

ALMOND BYPRODUCTS

ALMOND MILK

Almonds can be processed into a milk substitute (also called non–dairy milk, plant–based milk, nut milk, grain milk, legume milk and alternative milk) called almond milk; the nut's soft texture, mild flavor, and light coloring (when skinned) make for an efficient analog to dairy. As well as a soy–free choice for people who are lactose intolerant (the inability to digest lactose, a sugar found in dairy products) and vegans (people who choose diets that do not contain any ingredients that come from animals).

Raw, blanched, and lightly toasted almonds work well for different production techniques, some of which are similar to that of soy milk (a plant–based milk produced by soaking and grinding soybeans, boiling the mixture, and filtering out remaining particulates producing a stable emulsion of oil, water, and protein) some of which use no heat, resulting in raw milk (milk that has not been *pasteurized*, a process of heating liquid foods to kill pathogens for safe consumption and extending its shelf life).

Almond milk, along with almond butter and almond oil, are versatile products used in both sweet and savory dishes.

Almond Flour and Skins

Almond flour or ground almond meal (both made from ground sweet almonds with a consistency like corn meal) is often used as a gluten–free alternative to wheat flour (gluten is a mixture of *prolamin* proteins found in wheat, barley, rye, and oats to whom some people have an allergy or intolerance) in cooking and baking. Almond flour is usually made with blanched almonds, whereas almond meal can be made with raw or blanched almonds.

The *phenolic* compounds in almonds and almond skin *prebiotic* (compounds in food that foster growth of beneficial microorganisms such as bacteria and fungi in the gastrointestinal system) dietary fiber have commercial interest as food additives (preservatives) or dietary supplements (of natural or synthetic origin).

Almond Syrup

Historically, almond syrup was an *emulsion* (a mixture of two or more liquids that normally do not mix) of sweet and bitter almonds, usually made with barley malt syrup (an unrefined sweetener processed by extraction from sprouted, malted barley).

"Orgeat" syrup (a sweet syrup made from almonds and sugar with a little rose and/or orange flower water), was originally made with a barley–almond blend or a syrup of orange flower water (a clear aromatic by–product of the distillation of fresh bitter–orange blossoms for their essential oil) and sugar, often flavored with a synthetic aroma of almonds.

"Orgeat" syrup is an important ingredient in the "Mai Tai" (a cocktail made of rum, Curaçao liqueur and lime juice) and many other "Tiki" drinks (rum–based mixed drinks popular of Tiki culture). Due to the *cyanide* found in bitter almonds, modern almond syrups are only produced from sweet almonds. Such syrup products do not contain significant levels of *hydrocyanic acid* (a chemical compound that is a highly toxic and flammable liquid that boils slightly above room temperature), so are generally considered safe for human consumption.

Almond Oil

There are two types of almond oil. Bitter almond oil, which has a strong smell and is used in soaps, aromatherapy and massage therapy. It is safe to use on the skin and hair but can be toxic if you eat or drink it. Sweet almond oil comes from sweet almonds. It is commonly used as an ingredient in many skin and hair care products, and for cooking and baking. Each type has different benefits and uses.

In a journal article published in 2020 almond oil was declared to be a "powerhouse of nutrients" since it is a rich source of vitamin E, vitamin A, manganese, riboflavin, folic acid and vitamin B_6. Sweet almond oil tends to be used in skincare products and is known to be a carrier oil, which means it can help deliver lipid–soluble bioactives. In a 2021 updated review on efficacy and benefits of sweet almond, evening primrose and jojoba oils in skin care applications.

Almonds are a rich source of oil, with 50% of kernel dry mass as fat. In relation to total dry mass of the kernel, almond oil contains 32% monounsaturated *oleic acid* (OA, an omega–9 fatty acid), 13% *linoleic acid* (LA, a polyunsaturated omega–6 essential fatty acid), and 10% saturated fatty acid (mainly as *palmitic acid*, PA). *Linolenic acid*, a polyunsaturated omega–3 fat, is not present. Almond oil is a rich source of vitamin E, providing 261% of the Daily Value (DV) per 100 ml.

When almond oil is analyzed separately and expressed per 100 g as a reference mass, the oil provides 3,700 kJ (884 kcal) of food energy, 8 g of saturated fat: 81% of which is *palmitic acid* (PA), 70 g of *oleic acid* (OA), and 17 g of *linoleic acid* (LA).

Almond Oil Extraction

There are two common methods used to make almond oil: chemical extraction or *expeller pressed* (cold press). Though chemical extraction produces the highest oil yield, it does so at the sacrifice of the almond oil's taste, quality, and nutrients.

Characterization of physico–chemical and bioactive properties of oils of some important almond cultivars by cold press and *soxhlet* extraction. Different extraction methods may be used, although the cold press method is usually preferred since it yields a higher quality oil.

Cold–pressed methods produce higher quality products because they allow the oils to maintain their physical and chemical properties better. Cold–pressed almond oil is extracted from almonds by pressing them with a modern steel press at room temperature. As a consumer, choosing an expeller–pressed oil can help ensure you are making the most of the nutritional and quality benefits available.

Sweet *vs.* Bitter Almond Oil

It is important to note that almond oils made for consumption are considered sweet almond oils. A type of oil known as bitter almond oil can be made from a different type of almond. Bitter almond oil is sometimes used in soap and massage therapy, but it has toxic properties when ingested. All of the almond oil benefits we describe are based on sweet almond oil.

- **Sweet almond oil** is extracted from the fruit of the *Prunus amygdalus dulcis* almond tree.
- **Bitter almond oil** comes from the fruit of a different variety of the same species: *Prunus amygdalus amara*.

Almond Oil Processing

After extraction, some almond oils undergo additional processing to make them "refined". These steps utilize high temperatures, high pressures, chemicals and deodorization measures to give the almond oil several advantages, including the following making the oil tasteless, giving the oil a higher smoke point and ensuring the oil maintains its nutrient content.

Unrefined oils, like roasted almond oil, do not undergo these processing steps. As a result, they maintain lower smoke points and more full–bodied flavors. Both refined and unrefined almond oil can be beneficial for health applications depending on your taste preference and smoke point needed.

Oleum amygdalae, the fixed oil, is prepared from either sweet or bitter almonds, and is a *glyceryl oleate* with a slight odor and a nutty taste.

It is almost insoluble in alcohol (*ethanol*) but readily soluble in *chloroform* (*trichloromethane*, a very volatile, colorless, strong–smelling, dense organochloride and a common solvent and a powerful general anesthetic, euphoriant, anxiolytic, and sedative when inhaled or ingested, it is miscible with many solvents but only slightly soluble in water) or *ether* (*diethyl ether*, an organic, colorless, highly volatile, sweet–smelling and extremely flammable liquid compound, it is commonly used as a solvent, and was formerly used as a general anesthetic).

Almond oil is obtained from the dried kernel (seed) of almonds. Sweet almond oil is used as a carrier oil in aromatherapy and cosmetics while bitter almond oil, containing *benzaldehyde*, is used as a food flavoring and in perfume.

Almond oil, also known as bitter almond oil, is a carrier oil obtained from almonds (*Prunus amygdalus*), apricot Kernels (*Prunus armeniaca*), and almond syrup. This oil contains a toxic substance known as hydrogen cyanide, which must be neutralized before it is safe for use.

Natural oils of *Prunus* species, commonly called bitter almond oils, are famous in the flavor and fragrance industry for their sweet, powerful and typical almond aroma with a pleasant cherry note. In the fragrance industry, they are increasingly used in fine fragrance in alcoholic perfumes. In the flavor industry, they are widely and traditionally used in carbonated beverages, alcoholic beverages, baking and confections.

Nutrition Information of Almond Oil

Nutritional value per 100 g	
Energy	3,699 kJ (884 kcal)
Total Fat	100 g
Saturated	8.2 g
Monounsaturated	69.9 g
Polyunsaturated	17.4 g
omega–3	0
omega–6	17.4 g
USDA Database FoodData Central Search Results	
†Percentages estimated using U.S. recommendations (RDI) for adults, except for potassium, which is estimated based on expert recommendation from The National Academies of Sciences, Engineering, and Medicine (NASEM), also known as the National Academies, is a congressionally chartered organization that serves as the collective scientific national academy of the U.S.	

ALMONDS IN WORLD CULTURE

The almond is highly revered in some cultures. The tree originated in the Middle East. In the Bible, the almond is mentioned ten times, beginning with the Book of Genesis (the first book of the Hebrew Bible and the Christian Old Testament) 43:11, where it is described as "among the best of fruits".

IN JUDAISM

In the Book of Numbers 17 (the fourth book of the Hebrew Bible and the fourth of five books of the Jewish Torah), Levi (the third of the six sons of Jacob and Leah, and the founder of the Israelite Tribe of Levi and the great–grandfather of Aaron, Moses and Miriam) is chosen from the other tribes of Israel by Aaron's rod (refers to any of the walking sticks endowed with miraculous powers carried by Moses' brother, Aaron, in the Torah), which brought forth almond flowers.

The almond blossom supplied a model for the *menorah* (a seven–branched candelabrum) which stood in the Holy Temple (or the Temple in Jerusalem, refers to the two religious structures that served as the central places of worship for Israelites and Jews).

Described in the Book of Exodus 25:33–34; 37:19–20 (the second book of the Bible, it narrates the origin myth of the Israelites leaving slavery in Biblical Egypt after chosen as his people by their God, Yahweh) as "three cups, shaped like almond blossoms, were on one branch, with a knob and a flower; and three cups, shaped like almond blossoms, were on the other … on the candlestick itself were four cups, shaped like almond blossoms, with its knobs and flowers".

Many Sephardic Jews (a Jewish diaspora population associated with the Iberian Peninsula) give five almonds to each guest before special occasions like weddings.

In Christianity

Similarly, Christian symbolism often uses almond branches as a symbol of the virgin birth of Jesus (is the Christian and Islamic doctrine that Jesus was conceived by his mother, Mary, through the power of the Holy Spirit and without sexual intercourse); paintings and icons often include almond–shaped haloes (called a *mandorla*, usually synonymous with *vesica*, a lens shape, is an almond–shaped *aureola*, i.e. a frame that surrounds the totality of an iconographic figure) encircling the Christ Child (Jesus Christ from infancy to age 12) and as a symbol of Mary (an important figure of Christianity, she was a first–century Jewish woman of Nazareth, the wife of Joseph and the mother of Jesus).

The word "luz", which appears in Genesis 30:37, sometimes translated as "hazel", may actually be derived from the Aramaic (a Northwest Semitic language that originated in the ancient region of Syria and quickly spread to Mesopotamia, the southern Levant, southeastern Anatolia, Eastern Arabia and the Sinai Peninsula) name for almond "luz", and is translated as such in the New International Version (a translation of the Bible into contemporary English, released in 1978 with a minor revision in 1984 and a major revision in 2011) and other versions of the Bible.

The "Entrance of the flower" (*la entrada de la flor*) is a deep–rooted festivity that traces back to the 17th century, celebrated on February 1st in Torrent (a city located within the city of Valencia in Spain, and the largest municipality of the *Horta Oest comarca*), in which the *clavarios* and members of the *Confrerie* of the Mother of God deliver a branch of the first–blooming almond tree to the Virgin.

The Health and Beauty Benefits of Almonds and Almond Oil

Almonds are energy–dense and rich in monounsaturated fat, fiber, vitamins, minerals and phytonutrients. Almonds are included as a good source of plant–based protein among recommended healthy foods by the U.S. Department of Agriculture (USDA).

Almond oil is a potent source of antioxidants, vitamins and other nutrients found in almonds that are vital for skin and hair health. Ancient Chinese and Ayurveda practices historically used almond oil to help soothe and soften the skin and to treat minor wounds and cuts. In Ayurveda, almond oil is thought to have aphrodisiac properties. Today, it is not uncommon to find almond oil in a wide variety of cosmetic and beauty products.

1. Improved Heart Health

The condition of your heart directly impacts how efficiently your body functions. Some types of fats—like saturated and trans–fats—negatively impact your health. The American Heart Association recommends almonds for their heart–healthy fats. A 2019 scientific review of clinical research indicated that regular consumption of almonds may reduce the risk of cardiovascular (heart) disease.

One serving (1Tbsp.) of almond oil provides 10g of monounsaturated fat, a healthy fat that in moderate quantities and paired with a healthy lifestyle, positively influences overall health. Almond oil has anti–inflammatory and immunity–boosting properties.

In a 2005 randomized controlled trial substituting carbs with monounsaturated fats in a healthy diet lowered blood pressure, improved lipid levels and reduced the risk of cardiovascular disease. Monounsaturated fats can decrease low–density lipoprotein "bad" cholesterol (LDL) and increase high–density lipoprotein "good" cholesterol (HDL). Another 2015 randomized controlled trial showed that a diet rich in unsaturated fats has been linked to many health benefits, including a reduced risk of heart disease.

A scientific review of studies in 2012 shows that the benefits of eating almonds goes beyond its *hypocholesterolemic* effects. The unique nutrient composition of almonds is beneficial towards reducing

the risk of chronic degenerative diseases, particularly in populations with metabolic syndrome and *diabetes mellitus* (Type II). Almonds and almond oil lower other risks associated with cardiovascular disease and diabetes, such as body weight, glucose homeostasis, inflammation and oxidative stress.

A 2011 systematic review of studies found the positive effects of monounsaturated fatty acids on cardiovascular risk factors by lowering high blood pressure, one of the risk factors for heart disease. Another 2011 review of studies determined that a Mediterranean diet rich in olive oil led to obesity, metabolic syndrome and Type II diabetes. Switching to almond oil would help reduce the incidence of obesity.

2. Good Source of Vitamin E

The human body needs a variety of vitamins and minerals to carry out daily functions, including vitamin E (*a–tocopherol*) referring to a group of fat–soluble compounds with antioxidant properties. As an antioxidant, vitamin E protects your cells at a molecular level by fighting off "free radicals". Free radicals are molecules in the environment that cause damage (*oxidation*) to cells contributing to cardiovascular disease and cancer. Antioxidants, like vitamin E also support immune function. Just 1 Tbsp. of almond oil contains 27 percent of your recommended daily vitamin E intake.

3. Blood Sugar Maintenance

The term "blood sugar" refers to the level of glucose in your bloodstream, which supplies energy to your cells. Keeping blood sugar levels normal is crucial to help prevent the risk of diabetes and heart disease. A review of studies published in 2006 found that the monounsaturated fats in almonds and almond oil helped stabilize blood sugar in adults with Type II diabetes. Another comprehensive review of studies in 2021 suggests that oils rich in monounsaturated and polyunsaturated fats, like almond oil, may help with blood sugar control in people with Type II diabetes.

4. Healthy Weight Maintenance

It may seem counterintuitive to add fats to your diet for the purpose of weight loss, but “healthy” fats like monounsaturated fats can help do just that. A 2015 study on the effects of unsaturated fatty acids on weight loss, body composition and obesity related biomarkers, showed that a diet high in monounsaturated fats promoted benefits on weight loss and body composition in women with obesity.

A 2016 journal article linked diets high in monounsaturated fats to a lower risk of endometrial cancer. A 2004 clinical trial linked the effects of moderate–fat (from monounsaturated fat) and low–fat weight–loss diets to the lower serum lipid profile in overweight and obese men and women. In fact, a 2016 review of 24 studies including 1,460 people found that a diet high in monounsaturated fats was more effective than a high–carb diet for weight loss.

5. Skincare

The *stratum corneum* is the outermost layer of the epidermis and serves as the barrier for the rest of the dermal layers. A journal article published in 2011 supports the idea that strengthening this layer helps to protect underlying skin and tissue to optimize skin health and appearance. The monounsaturated fatty acids in almond oil support functions such as building cell walls and helping the body absorb vitamins A, D, E and K to help to repair the skin's natural barrier, lock in more moisture and reduce irritation.

Sweet almond oil contains vitamin A (*retinol*), which stimulates the production of new skin cells (stimulate collagen production) and smooths the appearance of fine lines. Sweet almond oil also contains zinc, an essential nutrient for healing acne and other scars, although zinc is more effective when ingested as part of a healthy diet.

Almond oil has emollient (moisturizing) and *sclerosant* (an agent that targets hardened body tissues) properties that can improve complexion and skin tone. Manufacturers of mass–produced almond oil (*oleum amygdalae*) products for skin and hair advise that it's fine to use these overnight and as a daily face moisturizer. Almond oil also has powerful antifungal properties, making it a useful tool to combat athlete's foot and other fungal infections like ringworm.

A 2013 scientific review of studies showed that that honey is an antiseptic, antimicrobial, antipyretic, anti–inflammatory, antiallergenic, antitoxic, sedative, laxative, antianemic and antioxidant. Honey has healing, moisturizing and blood–purifying properties. It promotes hydration, is easily digestible, stimulates immunity and is beneficial for all types of skin conditions. Combining almond oil with honey, for example, may help increase its effectiveness.

Avocado oil is another excellent option that can be used in combination with almond oil. Avocados contain a number of different nutrients that are beneficial to skin health, including vitamin E. Several preclinical studies suggest that avocado components may protect skin health by enhancing wound healing activity and reducing UV damage.

6. **Skin Conditions**

Almond oil is generally safe for sensitive skin because it is non–irritating and lightweight, so it absorbs quickly. Historically, almond oil had been used in Ancient Chinese, Ayurveda and Greco–Persian schools of Medicine to treat dry skin conditions like psoriasis, acne, eczema and dermatitis because of its moisturizing properties. In general, there is good evidence that moisturizers improve eczema. Common topical treatments for these conditions include steroid creams, which have concerning long–term side effects.

In a 2018 study, people who used hand cream made with sweet almond oil to treat *dyshidrotic dermatitis pompholyx* (chronic dry hands) found that it relieved the symptoms of burning, stinging, redness and itch. The zinc content can help smooth rough, calloused skin.

There was another study in 2018 on the Short– and long–term effects of two emollients on itching and skin restoration in *xerotic eczema* (also known as *asteatotic eczema*), which causes the skin to become particularly dry, cracked, and itchy. The study found that emollients containing refined almond oil helped relieve itching and improved the skin's barrier function.

7. **Skin Cleanser**

Sweet almond oil is excellent at retaining moisture, opening up pores and purging the skin of toxins. Sweet almond oil can also safely remove makeup. One of the best benefits of using sweet almond oil for the skin is that it is *non–comedogenic* (will not clog pores), plus it is an anti–inflammatory.

8. **Acne**

Every individual's acne is different. This is because acne is rooted in a variety of interrelated factors. One of these factors is inflammation. Inflammatory molecules appear at all stages of an acne lesion's development. In addition, the redness and soreness associated with most acne lesions comes from inflammation.

Another factor linked to acne is vitamin deficiency. A lack of antioxidants like vitamins A, C and E can impair the skin's ability to fight inflammation. Almond oil has anti–inflammatory, antibacterial, antioxidant and antifungal properties that can help fight both inflammation and vitamin deficiency. It can boost antioxidant levels and help with scarring.

Our bodies naturally produce an oily substance called sebum, which is important for the skin barrier. However, if your skin produces too much sebum, it can easily trap dirt and clog pores, causing acne. A pilot study was conducted in 2009 to compare lipid components of *sebum* from unaffected and acne–affected individuals. The subjects with acne had more (59%) sebum than the control subjects. Free fatty acids were the only lipid group that was reduced in the sebum of acne subjects. The specific lipid that differed the most between the two groups was *squalene* (a precursor of cholesterol).

Almond oil is both a good moisturizer and a good emollient for acne–prone skin. Moisturizers are miscible and supply water to the skin. Emollients, rather than adding moisture, they help the skin retain it by improving its barrier function. However, if you've found that other oils have made your acne worse, you may want to avoid almond oil. The Food and Drug Administration (FDA) cautions that oil from moisturizers may worsen acne, but dermatologists still advise moisturizing.

9. Dry Skin

The fatty acids found in sweet almond oil benefit dry skin by helping it retain moisture and keeping it hydrated, while its vitamin E content soothes irritation. Appling a little sweet almond oil onto dry, cracked lips will lock in moisture for soft, plump lips. Something all–natural on your lips is far better than any toxic petrochemicals or harmful palm oil.

10. Brittle Nails

The proteins found in sweet almond oil can moisturize cuticles and strengthen soft, brittle nails.

11. Reducing Scars

Wound healing after injury or surgery can create scar tissue. Researchers have noted the anti–inflammatory properties of almond oil, which could help reduce the appearance of post–surgical scarring, as well as scarring from acne.

A 2010 study in plastic and reconstructive surgery found that almond oil reduced *hypertrophic* scarring, smoothing and evening out the color and texture of the skin post–operatively. Almond oil's anti–inflammatory property helped ease post–operative swelling, reducing the formation of scar tissue.

12. Eliminate Stretch Marks

Stretch marks (*striae distensae*, syn. *striae gravidarum*), are a common skin condition often caused during pregnancy, puberty, rapid weight gain, or other medical conditions with rapid skin expansion. These marks can appear on the abdomen, buttocks, and upper legs. A number of topical treatments have been advertised for the prevention of stretch marks, especially *striae rubrae* (early stretch marks).

One 2010 study found that the therapeutic properties of bitter almond oil reduced the visibility of stretch marks and prevented them from developing in the future, demonstrating skin lightening and healing capabilities. A 2012 study found that daily massage with bitter almond oil reduced stretch marks during pregnancy and the itching experienced while the skin is healing.

According to a 2016 randomized controlled trial, sweet almond oil showed effective prevention of stretch marks in *primiparous* women. A 2017 study on the effects of a mixture of aloe vera gel and sweet almond oil on stretch marks in *nulliparous* women indicated that the mixture could reduce the itchiness of stretch marks and their spread. For existing stretch marks, regular massage with almond oil on the skin may help fade their appearance while also toning and softening the skin.

13. Reduce UV Damage

One of the best ways to protect your skin from sun damage is daily use of sunscreen with a minimum SPF of 30, according to the American Academy of Dermatology Association (AAD). The Centers for

Disease Control and Prevention (CDC) recommends covering the skin when outdoors, staying in the shade and using sunscreen.

UV radiation (UV light) is classified as a "complete carcinogen" because it is both a mutagen and a non–specific damaging agent. It has properties of both a tumor initiator and a tumor promoter. These rays can also speed up the aging process, leading to the formation of wrinkles, and the appearance of *hyperpigmentation* (dark spots). Some of the other concerning effects of UV radiation include inflammation, immune changes and impaired wound healing.

In one 2000 animal study, positive effects of utilizing topical and oral vitamin E (a nutrient found in almond oil) on pigmentation and skin cancer induced by ultraviolet irradiation were found. In another 2007 animal study almond oil was found to reduce signs of *photoaging* caused by UV radiation.

A journal article published in 2014 found that almond oil might be effective at creating a low–cost sunscreen with organic ingredients accessible to the developing world. Almond oil is a natural effective barrier with an SPF of 15, which is comparable to commercial SPF 15 sunscreens.

14. Aging Skin

Almonds as well as their oil are loaded with vitamin E, which is a powerful antioxidant. Oxidative stress (when your body doesn't have enough antioxidants to fight off free radicals) is a major cause of the deterioration of your skin's natural barrier and collagen content. One way to stave off oxidative stress is with the use of antioxidants.

Collagen, the protein responsible for keeping our skin youthful, forms an even layer of padding under the skin. As we age, fine wrinkles begin to appear due to the thinning of the skin and unevenness in the collagen padding underneath. The vitamin E in sweet almond oil can provide the amino acids required to maintain collagen content. While almond oil can improve the skin's moisture, tone and texture, it isn't likely to deliver skin–tightening results.

15. Reduce the Appearance of Dark Circles Under the Eyes

Under eye dark circles are a telltale sign of sleep deprivation, stress, allergies, aging or illness. Dark circles can appear when the skin underneath the eyes is thinner, making the blood vessels more visible. Thinner skin loses moisture more easily and can become dehydrated more quickly.

The anti–inflammatory and antioxidant properties of almond oil can lighten the dark circles under your eyes and reduce under–eye puffiness. Almond oil contains retinol and vitamins E and K, which can keep the delicate skin under your eyes hydrated without irritating it, causing the dilated blood vessels causing the discoloration to contract.

16. Earwax Removal

Earwax plays a vital role in protecting your ears and keeping them free of foreign particles. Some older individuals and younger children may experience abnormal earwax build–up. Excess build–up can mute hearing by up to 10 decibels. Almond oil can be a safe and simple solution to help remove excess earwax build–up. Warm up a few drops of almond oil to help soften the earwax and use a rubber syringe bulb to dislodge it from the ear canal.

17. Haircare

The Mayo Clinic reports that diet and vitamin intake are major contributing factors to healthy hair. Using almond oil in your hair benefits both its appearance and health. Nut oils like almond help to lubricate the hair and protect it from breakage or split ends. When incorporated into a shampoo, almond oil gives hair a natural sheen.

Almond oil is an emollient, so it can be used to soften and moisturize dry hair. It has been reported to increase the elasticity of the hair as it fills the gap between cuticle cells. Adding a pea–sized amount of almond oil to the ends of your hair may help hydrate it and smooth frizz.

Almond oil has fatty acids that are rich in double bonds and hence has shown to protect against UV radiation induced structural damage. These consist of monounsaturated fatty acid (*oleic acid*) and polyunsaturated fatty acid (*linoleic acid*). It also consists of *linolenic acid*, *stearic acid* (which may help condition hair), *palmitic acid* and is a rich source of vitamin E. It is also rich in vitamin B_7 (*biotin*), which may promote healthy, strong hair growth.

18. Hair Loss

One 2011 review of studies found that applying almond oil directly to the scalp helped reverse hair loss.

19. Dandruff

As dead skin cells accumulate on the skin of your scalp, they can lead to dandruff and even inhibit healthy hair growth. Almond oil can be used as a scalp treatment. Its antibacterial and fungicidal properties make it effective at balancing the yeast that causes dandruff as well as helping reduce inflammation and soothe the skin.

20. Cooking with Almond Oil

Almond oil is best used for low–heat baking, in salad dressings, and as a finishing oil to add a mild, nutty flavor. It is not recommended for high–heat cooking because, like unrefined or virgin oils, high heat will break it down and it will lose its delicate flavor and nutritional value.

Refined oils can be used for roasting or sautéing because they have been processed to tolerate a much higher heat, up to 420°F (215°C). Look for unrefined or virgin almond oil. Unrefined oil retains more of the nutrients that are beneficial for your skin, hair and overall health.

21. House Cleaning

You may add a few drops of almond oil to other natural cleaning agents such as vinegar and baking soda to create a homemade scrub for bathroom tiles, shower walls, baths and basins.

THE THERAPEUTIC USES OF ALMOND OIL

Thanks to its antioxidant and anti–inflammatory properties, almond oil has many uses. Some people add sweet almond oil to smoothies, while others use it topically as part of their daily skin and hair care routine.

1. **Makeup Remover:** add ½–1 tsp. sweet almond oil to your palm. Using your fingertips, gently apply the oil to desired areas. Use cotton balls or warm water to remove excess oil. Follow by washing your skin with your usual cleanser.
2. **Cleanser:** gently massage 2–3 drops sweet almond oil onto your face, and gently wipe off with a warm, damp cloth. Alternatively, use sweet almond oil as a carrier oil by mixing it with any essential oil known to benefit the skin, such as rosehip, lavender, rose geranium, or lemon at a ratio of 3 drops essential oil for every 1 oz. sweet almond oil. Apply the oil mixture to damp skin and rinse with warm water.
3. **Moisturizer:** apply 2–3 drops sweet almond oil after cleansing and drying your skin as usual, massaging it in upward circular motions all over your face.
4. **Spot Treatment:** apply 2–3 drops sweet almond oil to problem spots such as wrinkles or dry patches, nails and cuticles and gently massage it into your skin until it is absorbed.

5. **For Dark Circles:** mix 2 drops avocado oil and 4 drops sweet almond oil and gently massage it (massage helps increase blood circulation) onto the dark circles under your eyes before bed. Wash off the next morning. Alternatively, mix 4–5 drops sweet almond oil and 1 tsp. honey and do the same. Raw, unprocessed, organic honey is best for this purpose. *Caution: this treatment may smear over your pillow and in your hair*. For best results, do this daily for at least 3 weeks.
6. **Under–Eye Treatment:** gently massage a few drops of sweet almond oil underneath your eyes to help soften and moisturize the area. Wash off the next morning.
7. **Scrub:** mix 2 Tbsp. sweet almond oil and 1 Tbsp. sugar for a facial scrub. Or mix 2 Tbsp. sweet almond oil and 1 Tbsp. salt for a body scrub. To use, massage the scrub into your skin with some warm water and rinse.
8. **Moisturizing Bath:** add 2–3 Tbsp. sweet almond oil to a hot bath.
9. **Massage Oil:** mix sweet almond oil with a few drops of lavender essential oil and massage into the skin.
10. **Lotion Boost:** add a few drops of sweet almond oil to the bottle and use normally.
11. **Hair Mask:** apply sweet almond oil directly to the scalp to create a nourishing hair mask.
12. **Smooth Frizz:** apply ½–1 tsp. to your hair and gently massage from the roots to the tips. Leave on for 20–30 minutes, or overnight, to hydrate and smooth the hair shaft.

Choosing an Almond Oil

Sweet almond oil is available in stores and online as pure oil. You can also find it as an ingredient in many cosmetic and hair care products, including: soaps, lotions, body butters, lip balms, facial cleansers, body washes, skin brightening serums, and shampoos and conditioners.

Most health food, specialty stores, pharmacies and big box stores carry almond oil. You can find cosmetics and personal care products containing almond oil as an ingredient. You can also find almond oil and products online; however, *always buy from reputable sources*. Some things to consider when choosing an almond oil are which benefits you hope to get, your skin and hair type, and how much you are willing to spend.

Storing Almond Oil

Check the "best buy," "use by" or any other expiration date on your almond oil before buying it. Once you open it, almond oil will usually last about six months to one year, depending on how it's stored. Like other oils, almond oil has a shelf life and needs to be stored properly. It isn't necessary to refrigerate almond oil. However, if your kitchen tends to be rather warm, it might be a good idea to store your almond oil in the fridge.

Most oils, like olive and avocado, can be stored at room temperature. Oils can go rancid over time—especially if they are exposed to oxygen, light and heat. To prevent almond oil from going rancid and extending its shelf–life, keep it stored in a cool, dark place away from light and heat.

PRECAUTIONS

Do not use almond (sweet or bitter) oil if you have a nut allergy. Almond oil contains nut allergens and may trigger an allergic reaction if ingested or applied topically. Practice extra precautions when using almond oil if you suffer from eczema–this condition may increase the chances of experiencing an allergic reaction.

Almond oil should always be from organic pollinator–friendly almonds (if available). Bitter almond oil can be used in essential oil diffusers and various aromatherapy practices. *Never ingest bitter almond oil*.

People with acne–prone skin who have not had luck with other kinds of oils may want to avoid applying almond oil directly to the skin of the face, as it may block pores and cause breakouts. Almond oil's hair benefits should be limited to head and body hair. Avoid eyelashes and eyebrows.

Beware that there have been reports of some homemade or DIY recipes for eye cosmetics shared on blogs and social media (YouTube channels, Facebook, Pinterest, Instagram and TikTok) *do not always include* reputable ingredients or techniques.

Almond oil is generally safe for anyone to use topically on their hair and skin. When applying almond oil topically, always perform a 24–hour skin patch test first using 1–2 drops, read how for further details. Store in tightly–sealed dark glass containers in a cool, dark place away from light.

Do not apply almond oil directly to broken or damaged skin. Do not apply directly to open wounds. Never use almond oil in eyes or in mucous membranes. If you experience an allergic reaction (externally or otherwise) after using almond oil, discontinue use immediately and consult your physician.

Many sources suggest using sweet (*never* bitter) almond oil in food recipes and ingesting it in a variety of ways. If you wish to utilize this product in this way, first consult with your primary care or naturopathic physician before ingesting it in any way.

Pregnant and nursing women should consult their physician prior to using almond oil. In one multicenter study in 2012 preterm delivery was linked to the daily application of almond oil during pregnancy.

Do not use almond oil on children. Some brands clearly label their essential oils “KidSafe” on the bottle if it can be used on children ages 2–10. As with all carrier oil and essential oil products, be aware of the quality of what you purchase and always buy from reputable, well–sourced manufacturers.

Almond oil has *no known* medicinal interactions. In general, essential oils should never be used by people who suffer from *epilepsy*, as they could be overstimulating to the central nervous system (CNS), potentially leading to seizures.