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BLACK PEPPER

Piper nigrum

Common Name	Black pepper
Family	Piperaceae
TCM Name	Hu jiao
Ayurvedic Name	Kali mirch, maricha
Parts Used	Fruit
Native To	India (Royal Botanic Gardens of Kew [RBGK], n.d.)

Geographic Distribution

Tropical areas around the world, including India, Southeast Asia, and some equatorial regions of Africa, Central America, and South America (RBGK, n.d.).

Botanical Description

Black pepper is a perennial, woody, climbing, spreading vine that typically grows to a height of 10-15 feet, but can reach heights of 30 feet in its native habitat (Missouri Botanical Garden, n.d.). The dark green leaves are ovate to cordate in shape, 4-5 inches long, and appear on stem nodes (Missouri Botanical Garden, n.d.). Tiny, yellow-green flowers grow from leaf-stem joints on spikes up to 4.5 inches long, followed by spherical fruits about ¼ inch in diameter that turn red when ripe (Missouri Botanical Garden, n.d.).

Key Constituents

Volatile oils (α-pinene, sabinene, β-pinene, δ-3-carene, limonene, and β-caryophyllene), alkaloids (piperine), protein, minerals (iron, calcium, phosphorous), flavonoids, lignans, aromatic compounds, vitamins (A, C, E, K, niacin, and β-carotene) (Chevallier, 2000; Dosoky et al., 2019; Meghwal & Goswami, 2012).

Sustainability Issues

Choose organic, fair-trade black pepper to support sustainable agricultural methods and improved income for farmers (Busthanul et al., 2020; Johannisson & Bengtsen, 2011).

Harvesting Guidelines

Black pepper vines usually produce the most fruit at 4-7 years of age (Happehatchee Center, n.d.). For black peppercorns, harvest the berry spikes when one or two fruits at the base turn red; this should be done while the fruit is hard and before it reaches maturity, or else ripe fruit will not be as pungent (Happehatchee Center, n.d.). Traditionally, the green drupes or unripened berries are boiled briefly before being spread in the sun to dry—this causes the berries to turn dark (Encyclopædia Britannica, 2020). For white peppercorns, allow the berries to fully ripen to their red color (Happehatchee Center, n.d.), soak in water for a week, and then strip off the dark outer covering of the pericarp (Encyclopædia Britannica, 2020). Some peppercorns are treated to retain their color; color preservation techniques include treatment with sulfur dioxide or freeze-drying (Happehatchee Center, n.d.).

Uses

A dried fruit from a tropical vine native to India and one of the world's most traded spices, black pepper has been dubbed the "king of spices" because of its global popularity and common use as a culinary herb (Hammouti et al., 2019). It may be the most commonly used spice in the world (Khalsa, 2010). Versatile, flavor-enhancing, warming, and delicious, *Piper nigrum* was once a rare and highly valued commodity kept locked up in spice cabinets and carried as currency in some places (Hammouti et al., 2019). Because it was so valuable, people had to be vigilant against adulteration; in some cases counterfeit black pepper was created by mixing oil-cake, clay, and some cayenne (*Capsicum* spp.) (Grieve, 1931/1971).

Black pepper is now found in any grocery store and on millions of dining room tables across the world. Perhaps because of its ubiquity and popularity as a flavoring agent, its place in herbalism may not immediately come to mind; however, black pepper has been used in herbalism since ancient times.

Cubeb pepper (*Piper cubeba*) and long pepper or pippali (*Piper longum*) are related species used similarly to black pepper; they yield slightly less pungency and each offer their own special uses (Khalsa, 2010). Betel (*Piper betel*) leaves are combined with areca (*Areca catechu*) nut and mineral lime and chewed as a stimulant in South and Southeast Asia (Rai et al., 2011). Kava kava (*Piper methysticum*) is also related to black pepper; it is primarily utilized as a euphoric relaxant (Sinadinos, 2008).

Late 19th-century Physiomedicalist practitioner Dr. William Cook (1869) noted the use of black pepper to stimulate local and general circulation, for atonic conditions of the stomach, and for topical application in cases of gangrene. Practitioners of that time commonly isolated the alkaloid piperine through chemical procedures. Cook (1869) described a unique preparation dubbed "confection of black pepper," which contained 2 ounces of pepper, 3 ounces of caraway (*Carum carvi*), and 15 ounces of honey, which was consumed to stimulate the lower bowels in cases of indolent fistula and bleeding hemorrhoids.

Early 20th-century British herbal historian Maude Grieve (1931/1971) emphasized black pepper's ability to stimulate the mucous membranes, especially in the rectum and urinary organs, and noted it could ease constipation and also inhibit griping induced by laxatives. She reported historical use for supporting a prolapsed rectum, and addressing gonorrhoea, atonic dyspepsia, flatulence, nausea, diarrhea, cholera, scarlatina, tinea capitis, and vertigo. Grieve (1931/1971) also noted that black pepper could accentuate the effect of quinine.

Black pepper has been extensively utilized in Ayurveda both historically and in current practice. In Sanskrit it is called *maricha*, "sun," referring to its hot and dry qualities, echoing that of the sun (Lad, 2012).

Ayurveda classifies black pepper as energetically pungent or hot, drying, and light, which can balance *kapha dosha* (which is cold and wet); it can also balance *vata* (cold and dry) if combined with moistening herbs or preparations and used in moderation (Khalsa & Tierra, 2008; Lad, 2012). Black pepper may increase *pitta*, which is hot, moist, and light (Lad, 2012). It is also a diuretic with strong drying effects in the body (Khalsa, 2010). Black pepper is a circulatory stimulant and vasodilator that moves blood and energy through the body (Khalsa, 2010). It can also support microcirculation in capillaries, which may benefit those suffering from cirrhosis, hepatitis, skin conditions of a stagnant nature, cold and congested uterus conditions, dysmenorrhoea, or amenorrhoea (Pole, 2006). Those with atherosclerosis may benefit from the circulatory support and detoxifying effects of black pepper (Khalsa, 2010).

Along with ginger (*Zingiber officinale*) and long pepper (*Piper longum*), black pepper is one of the three ingredients in the ubiquitous ayurvedic formula, *trikatu* ("three pungents"), which is sometimes considered a more energetically balanced way to administer the benefits of black pepper (Khalsa, 2010). This trio of herbs is also included in many complicated traditional ayurvedic formulas (Webb, 2010). *Trikatu* is frequently utilized for lack of appetite or chronic indigestion (Lad, 2012), as well as many types of respiratory conditions (Khalsa, 2010). It stands out as a support for *kapha*-type asthma of a cold and wet nature (Khalsa, 2010). Ayurvedic herbalist David Frawley (2000) has employed *trikatu* with honey in cases of delayed menstruation due to cold, congested, sluggish conditions, or benign tumors or benign cysts in the breasts or uterus.

While black pepper is hot and can aggravate hot digestive conditions in excess, it is included in many formulas for *pitta*, including a famous ayurvedic formula called *avipattikar*, which is used for *pitta*-type people (those prone to excess heat) with tendencies for increased acidity in the gastrointestinal tract and burning esophagus problems or peptic ulcers (Khalsa, 2010). In this formula, the heat of black pepper is balanced by the addition of raw brown sugar as well as a number of cooling herbs (Khalsa, 2010).

Ayurveda tells us that black pepper increases *agni*, the fire of digestion (Webb, 2010). *Agni* then burns up *ama*, toxic metabolic by-products with a heavy, sticky nature thought to be the root of many chronic and acute diseases, blocking the assimilation of nutrients and the flow of energy in the body (Frawley, 2000). Herbalists K. P. Khalsa and Michael Tierra (2008) refer to black pepper as the "most respected alterative" (p. 212) and "foremost detoxifier" (p. 105).

Black pepper is often used in herbal formulations as a catalyst or carrier to help "direct" or "carry" other herbs in a formula or nutrients from food, enhance their effectiveness, improve their bioavailability, or help the body assimilate them (McBride, 2010). An example of black pepper's catalytic action is seen in research showing that compounds in black pepper enhance the bioavailability of curcumin, an antioxidant and anti-inflammatory constituent in turmeric (*Curcuma longa*), by up to 2000% (Shoba et al., 1998). Carefully read the safety section below, as black pepper may alter metabolism of some medications and nutrients in undesirable ways. Black pepper may make intestinal mucosal tight junctions less permeable to large molecules (leaking in the tight junctions is considered the crux of leaky gut syndrome), and can improve absorption of nutrients in the gut (Jensen-Jarolim et al., 1998; Stansbury, 2018b).

Black pepper can also support a healthy appetite and stimulate the digestive process (Pole, 2006). It has carminative effects and can address issues as diverse as "bloating, belching, burping, farting, constipation, distension, indigestion, nausea, stomach ache, and stomach cramps" (McBride, 2010, p. 37). Esteemed ayurvedic herbalist Dr. Vasant Lad (2012) suggests combining a pinch of black pepper with hing (*Ferula foetida*) for intestinal colic pain.

The taste of black pepper on the tongue triggers the stomach to release hydrochloric acid, which is needed to digest protein, and stimulates digestive enzymes in the pancreas (Srinivasan, 2007). Black pepper's stimulating effect can have a gentle aperient effect to ease constipation due to sluggishness or cold digestion (McBride, 2010). It is commonly added to *kapha*-aggravating foods, such as those with rich, oily, creamy, heavy, raw, or cold qualities, to improve their digestion and prevent the formation of *ama* (Frawley & Lad, 1986; McBride, 2010). It is also used in Ayurveda along with other pungent herbs to support weight reduction in those with diabetes (Frawley, 2000).

Black pepper is an anthelmintic (McBride, 2010; Pole, 2006). Parasite growth can be encouraged by low *agni* (weak digestive fire), and black pepper as well as other hot herbs can be a key tool for boosting *agni* and supporting overall digestive health (Frawley, 2000). Piperine, an important constituent in black pepper, has demonstrated an efflux pump inhibitory ability, which can counteract an antibiotic resistance mechanism in bacteria (Chavarría et al., 2016).

Black pepper also has an affinity for the respiratory tract (Khalsa, 2010) and is considered a rejuvenative for the respiratory system, especially in cold-bodied people such as those with a predominantly *vata* or *kapha* constitution (Pole, 2006). Herbalists sometimes include small amounts of black pepper in formulas for cold and flu, where it serves as a diaphoretic to stimulate sweating, especially in those with chills or feelings of coldness (Frawley, 2000).

Respiratory congestion in the sinuses or lungs, especially of a cold, wet nature, can be counteracted by black pepper (Khalsa & Tierra, 2008; Pole, 2006). Herbalists use black pepper as an antimicrobial for bacterial sinusitis (Khalsa, 2010), bronchitis, pneumonia, or sore throat (Pole, 2006). Black pepper's drying, warming, penetrating, and clearing effects support those with asthma worsened by cold and damp conditions (Khalsa, 2010). Ayurvedic practitioner Sebastian Pole (2006) notes its use for intermittent fevers, for which he combines black pepper with bitter and cooling herbs.

Herbalist Kami McBride (2010) suggests mixing ¼ teaspoon black pepper and 1 teaspoon of honey with a cup of hot water as an expectorant for a wet cough, while Dr. Lad (2012) writes of using a similar blend for colds, cough, or sinus congestion. This blend is used to help dry up excess secretions (Frawley & Lad, 1986). Black pepper is commonly mixed with ghee to stimulate digestion (McBride, 2010) or to soothe abdominal distension, defecation difficulty, a hoarse voice, or laryngitis (Lad, 2012). As with all herbs, black pepper's constituents rapidly degrade when exposed to air and light, so it is best to grind whole peppercorns over food or into teas just prior to consumption.

The root of *Piper nigrum* has traditionally been used for abdominal tumors in Thailand, and reports show the fruit has been utilized in formulas for respiratory and gastric cancers in China (Wang et al., 2014). Piperine has been found to inhibit the growth of several types of tumor cell lines *in vitro* (Wang et al., 2014). This constituent also inhibited mammosphere formation and inhibited breast stem cell self-renewal without causing toxicity to differentiated cells *in vitro*, indicating a potential protective action against breast cancer (Kakarala et al., 2010). Piperine also inhibited the proliferation of both androgen-dependent and androgen-independent prostate cell lines *in vitro* (Samykutty et al., 2013).

Piperine has also demonstrated 5α-reductase inhibition *in vitro*, an action that can decrease lower urinary symptoms due to prostate enlargement by inhibiting the local conversion of testosterone into a stronger androgen (Hirata et al., 2007).

Additionally, piperine has antioxidant properties and has been found to protect against oxidative damage by inhibiting free radicals and reactive oxygen species as well as positively influencing antioxidant enzymes (Vasanthi & Parameswari, 2010). Antioxidants can slow oil rancidity in preserved foods and also provide a metabolic buffer when consuming rancid or oxidized oils, such as those in fried foods. Researchers have found piperine to exhibit hepatoprotective effects against oxidized lipids (Koul & Kapil, 1993) and other sources of liver toxicity (Sabina et al., 2010). Its efficacy in protecting the liver has been compared to that of silymarin, a constituent in milk thistle (*Silybum marianum*) (Khalsa & Tierra, 2008; Sabina et al., 2010), but clinical studies are needed to further investigate this effect in humans.

Black pepper has anti-inflammatory effects and contains constituents known to modulate the endocannabinoid system, which plays an important role in regulating many homeostatic functions within the body (Russo, 2016). β-caryophyllene, which may comprise up to 35% of the volatile oils in black pepper, is an agonist for cannabinoid receptor type 2 (CB2), an anti-inflammatory and immunomodulatory receptor, leading to potential wide-ranging anti-inflammatory applications for pruritus, dermatitis, or fibrosis in organs including the liver and heart (Russo, 2016). Piperine, like cannabidiol (CBD) or capsaicin, desensitizes transient receptor potential vanilloid 1 (TRPV1) receptors, which are known to regulate temperature and pain responses; thus, it may benefit those with "neuropathic pain (causalgia, complex regional pain syndrome, migraine), burns, irritable bladder, interstitial cystitis, prostatitis, chronic pelvic pain, fibromyalgia, inflammatory bowel disease, irritable bowel syndrome, pancreatic pain, and various dermatological pruritic conditions" (Russo, 2016, p. 3).

Naturopath Dr. Jill Stansbury (2020) notes research on piperine from black pepper and other *Piper* species indicating the anticonvulsant effects of this constituent. While most of the research so far has focused on animal studies (e.g., Mishra et al., 2015), piperine's anticonvulsant action may have the potential to benefit those with epilepsy (Stansbury, 2020). This action may be due to piperine's modulatory effect on several neurotransmitters, such as serotonin and norepinephrine, which are known to play a role in the physiology of convulsions (Mishra et al., 2015). Piperine is also a monoamine oxidase inhibitor and can increase the levels of brain monoamines, which is associated with possible antidepressant effects (Derosa et al., 2016).

Topical application of black pepper can bring skin boils to a head (Frawley & Lad, 1986), indicating a rubefacient effect. Similarly, topically applied black pepper essential oil enhanced vein visibility and palpability prior to insertion of intravenous catheters in a clinical study of patients with hard-to-find veins, when compared to hot packs with or without vigorous tactile stimulation (Kristiniak et al., 2012). Also, when combined with narrowband ultraviolet B (NB-UVB), topical piperine improved repigmentation in a study of 63 patients with vitiligo more effectively compared to NB-UVB alone (Shafiee et al., 2018).

Black pepper essential oil is occasionally used by herbalists with care not to irritate the skin. When properly diluted, it can be applied topically for neuralgic and arthritic pain with cold swollen joints (Pole, 2006). Herbalist Brigitte Mars (2001) notes that its aroma can ease nicotine withdrawal and stimulate the emotions. A small study of 20 daily users of nicotine found that inhaling black pepper essential oil for 2 minutes when craving nicotine reduced the craving more than inhalation of angelica (*Angelica archangelica*) essential oil (Cordell & Buckle, 2013). Another study of 48 cigarette smokers found inhaling black pepper essential oil was more effective than menthol or control in reducing cravings (Rose & Behm, 1994).



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Adult Dose

Food or tea: Up to 1.5 g/day in single doses ranging from 0.3-0.6 g ("Black pepper," 2007).

Safety

Use caution in those with signs of excess heat or *pitta*, or in those with inflammatory conditions of the gastrointestinal tract or skin rashes (Khalsa & Tierra, 2008). Use only culinary amounts of black pepper during pregnancy (Brinker, 2010). Black pepper may alter metabolism of some drugs, increasing absorption and bioavailability of some and decreasing that for others, so it should be used with caution and under the guidance of a physician, if at all, by those taking pharmaceutical medications (Brinker, 2010; Derosa et al., 2016). Piperine increases cytochrome P450 enzyme expression, which metabolizes a large number of pharmaceuticals and herbal supplements (Brewer & Chen, 2017). Black pepper may interact with antiretroviral drugs (Fasinu et al., 2015).

A constituent called safrrole, which is found in very small amounts in black pepper as well as other herbs like basil, star anise, nutmeg, and ginger, demonstrated mutagenic effects in various animal studies when administered via injection (e.g., Wrba et al., 1992). However, this is not generally considered of clinical relevance because it does not reflect the reality of how humans ingest this herb nor observed effects of thousands of years of traditionals use. Research data on humans and whole black pepper in fact indicates that black pepper is anticarcinogenic (Liu et al., 2010). In any case, safrrole content significantly decreases when peppercorns are cooked and dried according to traditional preparation methods (Faraq & Abo-Zeid, 1997).

Ways to Use



Actions

Alterative Anticarcinogenic Anticonvulsant Anti-inflammatory Antimicrobial Antioxidant Antitumor Anthelmintic Aperient Carminative Circulatory Stimulant Diaphoretic Digestive stimulant Diuretic Expectorant Hepatoprotective Rubefacient Vasodilator

Taste

Pungent Spicy

Energy

Hot Dry

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- [Lessons from black pepper: Piperine and derivatives thereof](#)
- [Overview of the anticancer potential of the "king of spices" *Piper nigrum* and its main constituent piperine](#)
- [PipeNig «-FL, a fluid extract of black pepper \(*Piper nigrum* L.\) with a high standardized content of trans-β-caryophyllene, reduces lipid accumulation in 3T3-L1 preadipocytes and improves glucose uptake in C2C12 myotubes](#)
- [Piper nigrum and piperine: An update.](#)
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- [Piperine activates human pregnane X receptor to induce the expression of cytochrome P450 3A4 and multidrug resistance protein 1](#)
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- [Spices for prevention and treatment of cancers](#)
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- [A systematic review on black pepper \(*Piper nigrum* L.\): From folk uses to pharmacological applications](#)
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- [Testosterone 5alpha-reductase inhibitory active constituents of *Piper nigrum* leaf](#)
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Where to Buy

- Black peppercorn at Harmonic Arts
- Black pepper powder at Mountain Rose Herbs

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