

Spices

Definition:

Spices are aromatic vegetable products of tropical origin that are used for seasoning or garnishing foods and beverages.

Condiments, on the other hand, are spices or other flavourings having a sharp taste and are usually added to food after cooking. When the aromatic vegetable product comes from a temperate plant, it is considered as a culinary herb as in the case of bay leaves, coriander, cumin, dill, fennel, fenugreek, mustard seed, parsley, sage, rosemary and thyme, to mention a few. Essences are aqueous or alcoholic extractions of the essential oils.

Characterization:

1. They are pungent with strong odour and sweet or bitter taste.
2. They are hard or hardened parts of plants (such as pepper, cinnamon, cloves, cardamom, ginger, turmeric, nutmeg and mace, allspice and vanilla).
3. In ancient times, they were valued as basic components of incense, embalming preservatives, ointments, perfumes, antidotes against poison, cosmetics and medicines, and were little used in food.

Production

There are about 70 spices cultivated in different parts of the world but nine (pepper, ginger, cloves, cinnamon, cassia, mace, nutmeg, allspice (pimento) and cardamom) account for as much as 90 per cent of the total world trade—pepper being the most important. The most important technological change in the early years of the twentieth century was the successful dehydration of onions and garlicks. Since these are a convenient flavouring, there has been a tremendous rise in the popularity of dried onions and garlicks during the past few decades.

In India, the major spices produced are pepper, cardamom, ginger, turmeric and chillies. Pepper is one of the most important Indian Spices, referred as to “king of spices” and also termed as ‘black gold of India’. Cardamom is referred as the ‘queen od spices’, earning a lot of foreign exchange for the country. The important minor spices grown in India are ajowan, aniseed, caraway, celery, coriander, cumin, dill, fennel, fenugreek, garlic, onion, saffron and vanilla. The important Indian states growing spices are Kerala, Karnakata, Tamil Nadu, Andhra Pradesh, Maharashtra, Odisha, rajasthan and Bihar.

During the middle ages, spices were considered important medicines. However, today relatively a few are to be found in the official drug lists, and these are used primarily for imparting a pleasant taste to otherwise disagreeable medicines. A few spices have antiseptic and carminative properties too.

Apart from their culinary uses, spices are used as flavouring agents in beverages, as active ingredients in Ayurvedic medicines, as colouring agents for textiles and as important constituents in cosmetics and perfumery products.

Spices cannot be classed as foods since they contain practically no nutritive value, but impart aroma and flavour to food. The importance of spices in our daily diet is as follows:

- To give an agreeable flavor and aroma to otherwise monotonous insipid food, particularly in the tropics where it consists mainly of starchy grains or roots, thereby adding greatly to the pleasure of eating
- To stimulate and increase the flow of the gastric juices and for this reason they are aftern termed as food ‘accessories’ or ‘adjuncts’
- To camouflage or disguise the slightly unpleasant taste of many dries meats and to increase the rate of perspiration, thus having a cooling effect on the body.

The flavouring, preservative and antiseptic properties of some of these spices are primarily due to the presence of volatile oils, but are occasionally due to other aromatic substances, such as alkaloids as in pepper.

Spices are employed either as whole or in powdered form depending upon the requirement of the dish, but are almost invariably (except for chillies) imported in the crude state.

Spices can be grouped according to different systems of classification, such as botanical analogies or families, economic importance (that is, major and minor spices), similarity in methods of cultivation), similarity in methods of cultivation or similarity in plant parts, such as root, rhizome, bark, flower, fruit, seed and leaves.

1. Ginger

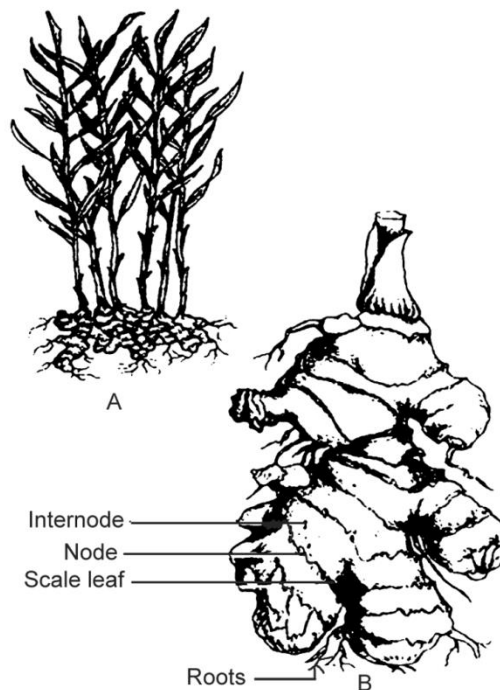
Zingiber officinale Rosc. (n = 11)

Family: Zingiberaceae

Ginger consists of dried and digitately branched rhizomes (commercially known as “hands” or “races”) of *Zingiber officinale*, indigenous to South-East Asia where it has been used by the Chinese and since ancient times. It was one of the earliest Oriental spices known to Europe having being obtained by the Greeks and Romans through Arab traders. The Arabs introduced the plant from India to East Africa in the thirteen Century and the Portuguese carried it to West Africa and other parts of the tropics on the sixteenth century.

India is the primary producer, consumer and exporter of ginger in the world, chiefly being produces in the states of Karnataka, Assam, Arunachal Pradesh, West Bengal, Sikkim and Madhya Pradesh. Cochin ginger and Calicut ginger are the two popular varieties of ginger.

The ginger plant is an erect, perennial herb with a thick, hard, laterally compressed, often palmately branched rhizome, covered with small, scale leaves and fine fibrous roots. The leafy shoots are annual, erect, usually 60-90 cm tall and are closely invested by the sheathing leaf bases. The leaves are alternate, linear-lanceolate, about 5-20 cm long. The pale yellow flowers are borne singly in the axils of large greenish bracts of the spike (terminating a scape) that arises directly from the rootstock.



Plants of ginger (*Zingiber officinale*) showing the rhizome, (B) close-up of the rhizome from which the dried ginger is made.

The crop is propagated commercially by portions of the rhizome 2.5 to 5 cm long, with at least one viable bud. Ginger is a soil-exhausting crop, requiring heavy fertilization. It is usually grown on smallholdings and is mainly cultivated in the tropics from sea level to 1500 m, with a consistently warm and moist climate, ample sunshine and heavy rainfall. Sandy, clayey or lateritic loams are best suited for the crop.

Harvesting is done nine to ten months after planting when the leaves begin to turn yellow. The roots and adhering soils are removed from the rhizome. Externally, the rhizomes are pale yellow, faintly orange or yellow-orange in colour, and greenish yellow inside. In addition, it requires curing after harvesting. Rhizomes appear on the market in the following two forms:

- **Dried or cured ginger:**

The method of preparation of dried ginger varies in different producing countries. Two important grades of dried ginger are recognized in the spice trade, scraped or peeled ginger (also known as uncoated ginger) and unscraped or coated ginger.

The first quality of Jamaica ginger is carefully scraped and dried in the sun for five to six days. Scraped Jamaica ginger is right buff in colour with very delicate aroma and flavor. In some countries, the rhizomes are plunged into boiling water for a few minutes (scalded) and are then sun dried with or without peeling. Liming has been found to improve the colour and appearance and also protects the spices from mildew and other pests. In addition, the rhizomes are sometimes bleached by sulphur fumes.

Preserved or green ginger:

It is prepared by boiling the tender, peeled rhizomes in water, after which they are boiled and sold in sugar syrup. Crystallised ginger is produced in the same way, but is dried and dusted with sugar. Much of the preserved and crystallised ginger is now exported from Hong Kong. Chinese ginger with low pungency and aroma is mainly used for this purpose.

The characteristic aroma of ginger is due to a volatile oil (ginger oil), while the pungent taste for which ginger is so highly esteemed is due to the presence of a non-volatile oleoresin, gingerin.

Minute sacs containing essential oil and resin are distributed throughout the rhizome, but mainly in the epidermal tissue. For this reason, excessive scraping of the rhizome should be avoided. Unpeeled ginger constitutes the best source for extracting the essential oil and oleoresin. Of all ginger grades, the West-African variety is known for its pungency and gives the highest yield of essential oil and oleoresin. In general, the yield of essential oil varies from 1.5 to 3 per cent, but yields as high as 4.0 per cent have been obtained from ginger samples taken from Sierra Leone. The principal constituents of ginger are zingiberone, zingiberol, chavicol, cineole, geraniol, d-camphene and d- β -phellandrene. The non-volatile fraction of ginger—the oleoresin, gingerin contains compounds such as gingerol, zingerone and shagaol.

Ginger is available ground, cracked (broken bits) or whole and is used in cookery mainly as a flavouring agent. Powdered dry ginger is an important component of curry powder. In Indian homes, it is largely used when pickled in salt. Dry ginger is employed for the manufacture of several by-products, such as ginger oil, ginger essence, ginger oleoresin, tinctures and vitaminised effervescent ginger powder used in soft drinks. The Western countries generally prefer gingerale (the US) and ginger wine.

To a small extent, it is also used in medicinal and veterinary preparations, particularly in India and the Far East. Taken internally, it is a stimulant and carminative. Ginger oil, obtained as a result of steam distillation, is a pale yellow essential oil which has a limited use in food flavouring and perfumery, but in recent years, it has been increasingly used in men's

toilet lotions. Oleoresin of ginger is commercially more important, and is mainly used to flavour soft drinks.

2. **Turmeric**

Curcuma longa L. (2n = 62, 63, 64)

Syn. *C. domestica* Val.

Family: Zingiberaceae

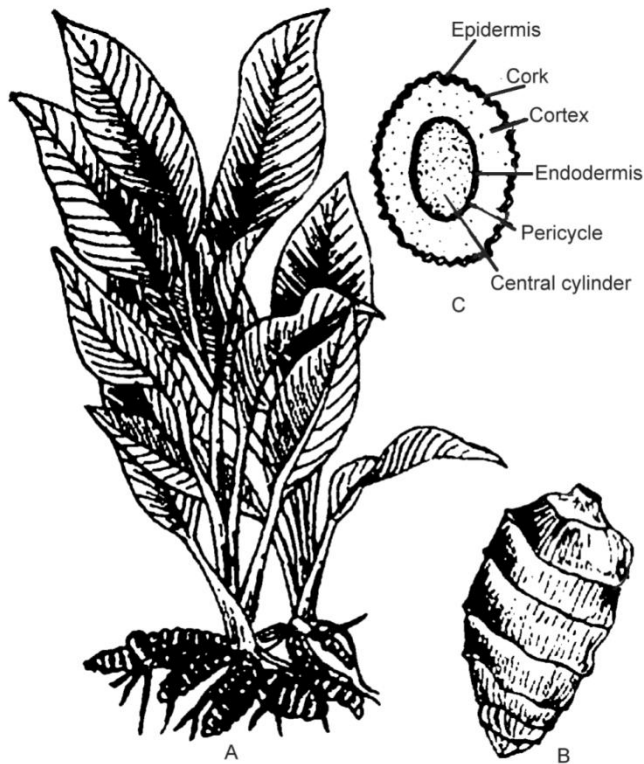
Commercially turmeric is the dried and processed rhizomes of *C. longa*, indigenous to southern Asia where it has been highly esteemed as a condiment, dyestuff and medicine since time immemorial. It is not known in the wild state. Turmeric is one of the most important and ancient Indian spices and a traditional export article. The world production of turmeric stands at around 1.1 million tonnes. India is by far the largest producer, consumer and exporter, accounting for about 90 per cent of the world production and 60 percent of the world's exports.

The major turmeric growing states in India are Andhra Pradesh (60 per cent), Tamil Nadu (13 percent) and Odisha (12 percent). Some other states producing turmeric are West Bengal, Karnataka, Maharashtra, Assam and Kerala. Indian turmeric is considered the best in the world because of its high "curcumin" content, which is known for its antitumor, antioxidant, anti-amyloid and anti-inflammatory properties.

Turmeric is a robust, tropical, perennial herb with a central or main thickened rhizome "bulb" bearing a number of cylindrical primary and secondary or even tertiary rhizomes. The thick short stem sends up tufts of large, broad, lanceolate, bright green leaves with long leaf stalks and an acuminate apex. The flowers are pale yellow, borne in a dense but short spike (shorter than the leaves) terminating the stem. Turmeric is a sterile triploid.

The plant is propagated vegetatively. Both 'bulbs' and 'fingers' are used as 'seed' (planting) material. In India, the crop is best planted in April or May, often grown on ridges. It thrives best on a hot, moist tropical climate in well-drained friable soil, from sea level up to about 1050 m. The crop is harvested 9-10 months after when the lower leaves develop a yellow colour. The main rhizome along with the finger-like offshoots, is usually carefully dug out by hand and the fibrous roots are cut off. Green turmeric has to be cured and processed before it is marketed. Curing consists of boiling the rhizome in water over a slow fire until they become soft. A few leaves of turmeric are usually added to the water in a cooking vessel. Addition of a little cow dung is known to intensify the colour of the product. The cooked rhizomes are spread out in thin layer in the sun for five to seven days for drying. Finally, they are polished by rotating them in polishing drums. The resultant product is graded into 'fingers', 'round' and 'splits' - the former fetching the higher premium in the spice trade.

Cured and finished turmeric is deep yellow to orange yellow in colour and has a distinctive pungent flavour. Rhizomes are rough, hard and possess numerous encircling ridges or ‘annulations’ and produce a metallic sound when broken. In a cross section, the endodermis is clearly visible separating the cortex from the central cylinder, and the cut surface is waxy, horny and resinous in appearance.



(A) Turmeric plant (*Curcuma longa*) with finger-like rhizomes that are used as a condiment and for dyeing, (B) rhizomes are rough, hard and possess numerous encircling ridge-like rings or annulations, (C) cross section of the finger.

The characteristic musky odour is due to the presence of essential oils (5-6 per cent), of which the main constituents are d- α -phellandrene, d-sabinene, borneol, zingiberene and sesquiterpenes. The colouring is due to curcumin.

In India, turmeric is largely used as a spice. Only a small is used for other purpose. A fine yellow powder obtained by grinding orange yellow and waxy rhizomes combines the properties of a spice and a brilliant yellow dyestuff.** It is an important constituent of curry powders (a blend of numerous spices and herbs). Turmeric is used as a colouring matter in pharmacy, confectionery and food technology. Like saffron, an alcoholic solution of turmeric is used for colouring and flavouring margarine, butter, cheese, fruit drinks and beverages. Rice, coloured yellow with turmeric, is used on ceremonial occasions. Turmeric, for many centuries, has been used as a vegetable dye to give a rich yellow colour to silk, cotton and wool. In many countries, it is

widely used for dyeing leather, fibre, paper and other articles like toys. Yellow turmeric paper can be used for testing alkalinity.

*Curcumin, the the yellow colouring principle, is pmplicated to lessen the chance of Alzheimer's disease—a degenerative brain disorder causing senility.

Turmeric powder is adulterated with yellow earth, rice or maize, sand, talc, grit: while the whole turmeric is polished with lead chromate or metanil yellow



Turmeric plant in flower. The flowers are borne in a dense but short spike (shorter than the leaves) terminating the stem.

In India, turmeric has been used for centuries as a spice and a food preservative, and also for its various medicinal properties. Its bright yellow colour is due to a group of compounds called curcuminoids (polyphenols), which include “curcumin” (diferulomylmethane), makinf upto 90 percent of the total curcuminoids content. The other two constituents are demethoxycurcumin and bisdemethoxycurcumin. In addition, it contains sugars, proteins, resins and volatile oils, such as tumerone, atlantone and zingiberone. Turmeric is an excellent source of minerals like manganese and iron, and also a good source of vitamin B6— all the three nutrients are essential for the formation of red blood corpuscles.

Like vitamins C, E and beta-carotene, curcumin is a very powerful antioxidant that scavenges free radicals from our body. Thus, it may help combat different kinds of cancers, including prostate, breast, skin and colon. Additionally, it has anti-inflammatory, anti-diabetic, anti-bacterial, antifungal and anti-viral activities.

The protective effects of turmeric on the cardiovascular diseases include

- a. Lowering of LDL or 'bad cholesterol', total cholesterol and triglyceride levels in the blood stream.
- b. Stops platelets from clumping together, thus preventing blood clots or plaque from building up along the arteries walls that cause atherosclerosis (hardening or blocking of arteries), which leads to heart attacks and strokes.

It has been reported that the curcuminoids in turmeric stimulates the immune system to destroy brainclogging, beta-amyloid proteins that lead to Alzheimer's (a neurodegenerative) disease that gradually destroys a person's memory and ability to reason and make judgements). Further, it stimulates bile production, thus increasing the body's ability to digest fats, improving digestion and also eliminating toxins from the liver, like alcohol.

Medicinally, it is used to aid digestion, as a tonic and as a blood purifier. Boiled with milk and sugar, it is taken as a remedy for the common cold. Externally, its application tends to suppress the unwelcome growth of hairs on the skin of women. Turmeric powder and water are used in cosmetics in India and elsewhere in south-eastern Asia. It is still used on auspicious occasions in Hindu religious rituals or observances.

Oil of Curcuma, derived by steam distillation of dried turmeric, is used as a flavouring and also in perfume.

Other economically important of the genus include mango ginger (*C. amada* Roxb.), East Indian arrowroot (*C. angustifolia* Roxb.) wild turmeric or yellow zedory (*C. aromatica* Salisb.) and zedoary [*C. zedoaria* (Berg.) Rosc.]. The rhizome of *C. aromatica* are light yellow in colour, and are used in medicine and as a local dye.

3. **Cinnamon**

Cinnamomum verum J. S. Presl (n = 12)

Syn. *C. zeylanicum* Garc.ex Blume

Family: Lauraceae

Cinnamon and cassia, two of the oldest known spices were earlier used mainly for embalming, but are now among the valuable spices. Cinnamon represents the dried inner bark of *Cinnamomum verum*, indigenous to Sri Lanka and South India. It has been used since antiquity as a breath-sweetener and a general tonic. For centuries, it has been employed in Oriental temples to counteract the strong unpleasant odour of burning flesh. It is said that Emperor Nero in ad 65 buried a year's supply of Rome's cinnamon at the funeral rites of his wife, Poppaea.

Cinnamon was one of the oldest trade items from the Far East. The Arabs carried it by a land route to Arabia and from there to Egypt and Europe, but they jealously concealed the source of cinnamon and how they obtained it. Later, the Portuguese, the Dutch and the British controlled the monopoly) of the cinnamon trade in succession. At present, Sri Lanka is the largest producer of “True” or Ceylon cinnamon, accounting for 90 per cent of the global production of 13 950 tonnes, even though the tree is also commercially grown in hilly pockets of Kerala, Karnataka and Tamil Nadu. In India, cinnamon is grown in Brazil, the Caribbean, Seychelles Islands and Madagascar. In India, cinnamon is grown in some hilly pockets of Kerala, Karnataka and Tamil Nadu.

C. verum is a small, evergreen tree, usually attaining a height of 9-12 m, sometimes reaching up to 18 m in Sri Lanka and South India where it is native. It is usually grown as a ‘coppiced’ or ‘cut back’ bush under cultivation. The leaves are large (12.5-17.5 cm in length), leathery, bluntly pointed, dark glossy green above and dull grey-green below with three or five prominent ribs. The leaves are highly aromatic. The flowers are small, yellow and inconspicuous, producing dark



(A) A flowering branch of *Cinnamomum verum*. The leaves are large, leathery with three or five prominent ribs, (B) ‘The quill of commerce’.



purple or black, one-seeded ovoid berries, about 1 to 2 cm long. The plants are generally raised from seeds sown first in the nursery but can also be propagated from cuttings. The cinnamon plant grows best in sheltered situations from almost sea level up to an elevation of about 1000 m where average rainfall is 200-250 cm and mean temperature about 27 °C. A hot and moist climate is considered ideal for its

cultivation. Two to three years after planting, the plants are cut back or ‘coppiced’ to induce the formation of new shoot from the suckers, which in due course are pruned to leave six to eight plants per bush. The first crop of cinnamon is obtained around two years later when the plants have reached a height of 2.0-2.5 m. The plants are cut close to the ground following the monsoon rainfall as it facilitates the peeling of the bark. Each coppicing produces new shoots, which in turn are ready for cutting in three years’ time.

Two longitudinal slits are made lengthwise in the severed shoots and the bark is peeled off in three-foot lengths with the help of specially designed tools. The bark is then firmly tied together in bundles and left to ‘ferment’ for 24 hrs. The corky outer layer of the bark is then carefully scraped off and allowed to dry, which makes it contract and curl inward in the form of hollow tube-like structures- ‘the quills of commerce’. Good quills should about 1 cm wide and 4 mm

thick. After final drying, the smaller quills are inserted into the larger quills, forming compound quills. The chips and refuse (the waste) left after the collection of quills are used for the extraction of an essential oil.

Cinnamon has a pleasing, fragrant odour and a warm, sweet, aromatic taste. The use of cinnamon as a spice has declined considerably in recent years owing to the synthesis of cinnamic aldehyde. However, it is still used for flavouring cakes and pastries, in beverages and as a constituent of curry powder. Stick cinnamon, an important ingredient in pickling, may be used to add flavour to stewed prunes. Chalk mixture in combination with cinnamon powder is quite effective for the treatment of diarrhoea. The bark contains 0.5 to 1.5 per cent essential oil (cinnamon bark oil). Its chief constituent is cinnamic aldehyde (60-75 per cent). The oil is often used for flavouring confectionery, pharmaceuticals, soaps and dental operations. On the other hand, cinnamon leaf oil contains 70-95% eugenol and is generally preferred to clove oil for the synthesis of vanillin.

Ceylon cinnamon has a negligible amount of coumarin (0.04 per cent), a compound that is known to be a blood thinner. In contrast, cassia cinnamon has high coumarin content, that is, 5 per cent, but if taken in large amounts can lead to liver damage.

Much of the cinnamon consumed in the US today comes from different species, such as Saigon cinnamon (*Cinnamomum loureirii* Nees), Chinese cassia (*C. cassia* Nees ex Blume) and Indonesia cassia or Padang cassia (*C. burmannii* Nees ex Blume). The former yields finest quality cassia, since it has the highest percentage of the essential oil (1.0-2.5 per cent). Cassia bark resembles true cinnamon but is coarser, thicker and has a more intense aroma. Unlike cinnamon, it has a higher essential oil content and is not so delicately flavoured. Cassia is actually the whole bark, as the outer bark is not removed. The US annually imports substantial amounts of cassia from Indonesia.

Indian cassia is obtained from *Cinnamomum tamala* (Buch.-Ham.) Nees and Eberm. Its leaves (tejpat) are also used extensively in North India as a spice. The leaves of *C. obtusifolium* Nees (known as *tezput*) are used for flavouring purposes, especially cooked rice.