Paper: 3026 Unit 5

Economic importance with special reference to

BLACK PEPPER (*Piper nigrum* Linn.)

Black pepper (*Piper nigrum* Linn.; Family - Piperaceae) is the world's most common spice and known as the "King of Spices." The word "pepper" is derived from the Sanskrit *pippali*, the word for long pepper, via the Latin *piper*, which was used by the Romans to refer both to pepper and long pepper (as the Romans erroneously believed that both of these spices were derived from the same plant). The English word for pepper is derived from the Old English "pipor." The Latin word is also the source of German *pfeffer*, French *poivre*, Dutch *peper*, and other similar forms. "Pepper" was used in a figurative sense to mean "spirit" or "energy" at least as far back as the 1840s; in the early 20th century, this was shortened to *pep*.

Pepper is a perennial vine and a native to Malabar Coast i.e. present-day Kerala in South India. In its dried form, the fruit is often referred to as peppercorns. Peppercorns, and the powdered pepper derived from grinding them, may be described as black pepper, white pepper, red/pink pepper, and green pepper.

Global Scenario

Pepper is being cultivated in developing countries across Asia and South America. Its consumption is concentrated in industrialized countries besides India. Vietnam is the largest producer of pepper, which contributes about 34% of world pepper production followed by India (19%), Brazil (13%), Indonesia (9%), Malaysia (8%), China (7%), Sri Lanka (6%) and Thailand (4%). Vietnam is also the largest pepper exporter whereas the USA is the biggest importer in the world.

Major pepper producing countries

Pepper is cultivated in about 26 countries with the majority from Asian Countries i.e Vietnam, India, Brazil, Indonesia, Malaysia, China, Sri Lanka and Thailand. Before 1999, India was the leading pepper producing country and Indonesia was on the second place. But from 1999 onwards, India lost its place to Vietnam.

International Grade of Pepper

International grades of Pepper are mainly based on the name of the producing centres - Malabar Garbled (MG1) India; Lampung Panjang, Indonesia; Sarawak kuching, Malaysia; Vietnam HCM city, Vietnam.

USES:

Medicinal Properties

Pepper from *Piper nigrum* is one of the oldest and world's most important spices. Pepper is used in certain tonic and rubefacient (causing irritation) preparations and also used as flavour ingredient in most major food products including non-alcoholic beverages, candies, baked foods, meat and meat products, Cheese, condiments and relishes.

Black pepper is one of the important spice rich in aromatic and medicinal components along with appreciable levels of several other functional components having health promoting properties. The uses of black pepper in various fields such as food processing, pharmaceutical industry etc, is increasing steadily due to its recognition as an important source of natural antioxidant having anticarcinogenic activity. It also has bioavailability enhancement nature, carminative property, anti-inflammatory action, cholesterol lowering capacity, immune enhancer ability, anti-pyretic, anti-periodic, antimicrobial and rubefacient activity.

Traditional use

In traditional medicines, this spice is also reported to have digestive power, to improve appetite, and to cure cold, cough, dyspnea, diseases of the throat, intermittent fever, colic, dysentery, worms and piles. The uses of black pepper in traditional medicine as an antipyretic and anti-inflammatory are supported by modern science. In folk medicine, black pepper is also used against epilepsy and snake bite. The 5th century Syriac Book of Medicines prescribes pepper (or perhaps long pepper) for such illnesses as constipation, diarrhea, earache, gangrene, heart disease, hernia, hoarseness, indigestion, insect bites, insomnia, joint pain, liver problems, lung disease, oral abscesses, sunburn, tooth decay, and toothaches. Pepper root, in the form of ghees, powders, enemas and balms, is a folk remedy for abdominal tumors. Chinese use the spice for urinary calculus. An electuary (a medicinal substance mixed with honey or another sweet substance) prepared from the seed is said to help hard tumors, while a salve prepared from the seed is said to help eye indurations and internal tumors.

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FENNEL (*Foeniculum vulgare* Mill.)

Fennel (*Foeniculum vulgare* L.; Family - Apiaceae), a plant largely grown as herb or for its fruits and valued for its pleasant aroma, abundant nutritional and medicinal properties. Fennel is traditionally used for medicinal and culinary purposes. The entire plant is valuable in the medicinal industry; its enlarged base is used as a vegetable; its leaves are used for culinary purposes and its seeds as a spice and for essential oil extraction. The flowers and leaves are also used to make yellow and brown dyes. Fennel pollen is the most potent form of fennel, but it is extremely expensive.

In early Sanskrit writings, fennel was known as *madhurika* and its cultivation in India is thought to date back at least to 2000 BC. To the ancient Greeks, fennel represented success and was called ‘marathon’. Fennel was also a symbol of success to the Romans and fennel leaves were used to crown victors in games. The English name fennel comes from Old English fenol, or finol. During the thirteenth century in England, fennel was considered a royal spice and was served to kings with fruit, bread and in dishes such as pickled fish seasoned with fennel seeds.

A native of southern Europe and the Mediterranean region, fennel has become naturalized along roadsides, in pastures and in other open sites in many regions, including northern Europe, Cyprus, the USA, southern Canada and in much of Asia, the Far East and Australia. Fennel is cultivated on a large scale in Romania, Russia, Germany, France, Italy, India, Argentina and USA. It is also grown in Bulgaria, China, Denmark, Egypt, Syria, Morocco and Japan. In India, the major fennel-producing states are Gujarat, Rajasthan and Uttar Pradesh, whilst many other states grow it on a small scale, such as Punjab, Tamil Nadu, Bihar, Karnataka, Maharashtra, Jammu and Kashmir. According to a data of Spice Board, India exports over 7000 tonnes of Fennel seed every year.

The genus *Foeniculum* (fennel) belongs to the family Apiaceae and the order Apiales. Three main varieties have been described: *F. vulgare* Mill. var. *piperitum* (Ucria) Cout. (bitter fennel), *F. vulgare* Mill. var. *dulce* DC Batt. et Trab. (sweet fennel) and *F. vulgare* Mill. var. *azoricum* Thell. (Florence fennel, or finocchio). Bitter fennel is grown for its fruits and essential oil, whilst Florence fennel is cultivated for its fruits, essential oil, leaves (used for culinary purposes) and enlarged leaf base (eaten as a vegetable). Sweet fennel is cultivated for its enlarged leaf base, for its fruits and for the essential oil taken from its fruits.

Uses

The bulb, foliage and seeds of the fennel plant are potential sources of different nutrients and thus all are widely used both raw and cooked in side dishes, salads, pastas, vegetable preparations, sausages, etc. Raw fennel bulb contains carbohydrates, dietary fibre, protein, vitamin B complex, vitamin C and

minerals. The fennel plant is aromatic and used as a pot herb. It is popularly used as a spice and as a vegetable, having many applications for flavouring and culinary purposes. The whole seed, powder and oil are used as adjuncts for flavouring foods, as antioxidants and as a preservative in confectioneries and beverages. Fennel seeds are largely used to give flavour to a number of foods such as soups, sauces, pickles, breads and cakes. In industry, fennel is used for flavouring and aromatizing, and as an organoleptic flavour corrector, in non-alcoholic beverages, baked goods, condiments, ice creams and liqueurs such as Anisette, and as a seasoning for prepared meats such as hot pepperoni and sweet Italian sausages.

The bulb and green 'herb' fennel are used to flavour food during cooking, or as a garnish prior to serving, especially in the Middle East and India. The bulb is a crisp, hardy root vegetable and may be stewed, braised, grilled or eaten raw. As a very good source of fibre, fennel bulb may help to reduce elevated cholesterol levels. Green bulbs and the herb itself are also used for the preparation of herbal teas or juice blends with other herbs, and are a good source of calcium, iron, vitamins B and C, folic acid and carotenes. In all cases, the leaves lend their characteristically mild, anise-like flavour.

Dried fennel seed is an aromatic, anise-flavoured spice. The seeds are brown or green in colour when fresh and turn slowly to a dull grey as the seed ages. Green seeds are best for cooking. Fennel seeds are well known for their distinctive pleasant flavour and are thus used for chewing alone after meals or in betel leaves; sugar-coated pelleted fennel seeds are also used as a breath freshener. In different parts of India and Pakistan, roasted fennel is consumed as an organoleptic flavour corrector, or as an after meal digestive (hence why some Indian restaurants serve a fennel seed mix after meals). People in farming communities often chew fresh sprigs of green fennel seeds. It is an essential ingredient in the Bengali spice mixture *panch phoron* and in the Chinese five-spice powder. In the west, fennel seed is a very common ingredient in Italian sausages and northern European rye breads. Many eggs, fish and other dishes employ fresh or dried fennel leaves.

Essential oil extracted from fennel fruits is a rich source of bioactive compounds, thus used as a flavouring agent in various food items, in pickles and liquorice candy. It has been identified as a natural food flavourer with potential for use either individually or in admixture in beverages, bakery and other food preparations for its antimicrobial and antioxidant properties. Fennel oleoresin prepared from seeds gives a warm, aromatic and pleasing flavour to food products. The oleoresins from fennel are used in processed foods, snacks, sauces and various vegetable preparations.

Various fennel-based commercial blends are available; these include Fennel tea, Cough syrups, Absinthe, Indian panch phoran (five spices), Chinese five spice blend

Chemical composition of fennel

The chemical composition of fennel varies with morphotype, source, climate and harvesting stage. Every 100 g edible portion of fennel seeds contain on average: 8.8 g water; 15.8 g protein; 14.9 g fat; 36.6 g carbohydrate; 15.7 g fibre; and 8.2 g ash (containing 1.2 g Ca, 19 mg Fe, 1.7 g K, 385 mg Mg, 88 mg Na, 487 mg P and 28 mg Zn). Every 100 g contains: vitamin A (135 IU); niacin (6 mg); thiamine (0.41 mg); and riboflavin (0.35 mg); with an energy value of about 1440 kJ. The seeds contain mucilage, sugars, starch, tannin, essential oil and fixed oil (viz. petroselenic, oleic, linoleic and palmitic acids). The variety and quantity of vitamins contained is variable: folates, 270 mg/ kg; vitamin B3, 6.4 mg/kg; vitamin C, 8.7–340 mg/kg. Fennel contains potassium (4.24–5.85 g/kg), the most abundant mineral by far, with low amounts of phosphorus (500 mg/kg), calcium (5.6–363 mg/kg), magnesium (8.2–389 mg/k) and sodium (7.7– 512 mg/kg)

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SAFFRON (*Crocus sativus* L.)

Saffron (*Crocus sativus* L.; Family – Iridaceae), a herbaceous plant propagated vegetatively with corms, widespread throughout the tropical and subtropical regions of the northern hemisphere. The common names used in general are - Zafran/Koung (Kashmir), Abir (Persian), Safran (Turkey), *Crocus* (Roman), Gewurzsafran (German), Hay Saffron, Karcom (Hebrew), Krokos (Greek), Saffron, Z'afaran (Arabic/Yemen).

The cultivation of saffron by humans is so old that wild forms are no longer found on mother earth. It was probably used as part of embalming rituals by the ancient Egyptians. Indeed, saffron has been a very important source of dye and perfume ingredient since ancient times because its first written discussion comes from the Illiad, where it is mentioned as a fabric dye. *C. sativus* is believed to have originated on the island of Crete, and was then propagated throughout Europe and Asia due to the value of the dye and spice obtained form the three female styles of each flower. It was the most widespread cultivar in the ancient world for at least 1000 years before the rise of Athens.

Saffron is a high value low volume spice that grows in the Mediterranean and West Asia between 10° west and 80° east longitudes and 30 to 50° north latitudes. This herb has unique characteristics, with flowers appearing before any vegetative development. The plant starts its growth in autumn and ends in spring, its seeds are sterile despite production of many flowers, and flowers are harvested early in the morning. The production technology of this plant is more complicated compared to other crops and is largely based on indigenous knowledge of the farmers involved. Propagation occurs through the separation of small tubers, although precise cultivation methods are kept secret for economic purposes

Saffron is the dried orange-red trifid stigma of a perennial bulbous plant *C. sativus*, a triploid male-sterile plant flowering in autumn, one of the costliest culinary spice of the world. It is the most expensive spice on earth. Therefore, its cultivation has great economic significance, because 1 kilogram of saffron requires some 60,000 flowers to produce, and sells for about $10,000 USD. This expensive culinary spice is used for flavouring and colouring of food stuff. Interest in this plant is due to the effects of its carotenoids on human health, which is attracting much attention because of their high antioxidant capacity. The spice is used as flavoring and coloring agent in food and is a vital part of the dye, perfumery, and flavoring industries. Saffron also shows medicinal healing features as anticancer, antimutagenic, and antioxidant. Saffron has a great export value.

Saffron is cultivated widely in Kashmir, Iran, Turkey and other Mediterranean countries. It is is known as one of the oldest cultivated plants. The world's total annual saffron production is estimated at 205 tons, and over 80 percent of this harvest originated from Iran. Iran produces more than 65 percent of the world saffron and ranks first in production. Spain is generally is accepted as a significant source of cultivated *C. sativus*, based on an annual export of approximately 60 tons. However, the bulk of saffron re-exported from Spain is in fact of Iranian and Moroccan origin. Currently the largest saffron producer in Europe is Greece, with 4.5 tons per year. Currently commercial saffron production is limited to Iran, Azerbaijan, Spain, Italy, Kashmir, Greece and Turkey. One of the key centers of production is the plateaus of Pampore in Kashmir, an area cultivated since 750 AD. Kashmir despite being one of the oldest historical saffron producing areas is now facing a rapid decline.

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CLOVE (*Syzygium aromaticum* (L) Merr.& Perry)

Clove (*Syzygium aromaticum* (L) Merr.& Perry; Myrtaceae) is a precious and valuable spice of the world. It is unopened flower buds growing on a tree are the aromatic dried flower buds, commonly used in biryanis, pickles, salads and garam masala.

The tree that creates the miracle of nature originated from the Moluccas Islands, actually known as Spice Island. It is the common product found in the spice rack around the world. Clove buds posses intense fragrance and burning taste. They have deep brown color, powerful fragrant odour which is warm, pungent, strongly sweet and slightly astringent. In India it is used in almost all spicy rich dishes. Indonesia uses half the world production of cloves to make kretek cigarettes in the proportion of one part of clove mixed with two parts of tobacco. In 2009 clove cigarettes were banned in the U.S. however they are still marketed with the new label as filtered clove cigars.

Cloves are the aromatic dried buds of a tree (*Eugenia caryophyllata* also sometimes *Syzgium aromaticum*) used as a spice in virtually all the world's cuisine. The term 'Clove' is derived from the French word 'Clou' and the English word 'Clout', both meaning 'nail'- from the likeliness of the flower bud of the Clove tree to a broad headed nail. The Clove tree is an evergreen tree, which grows to a height ranging from 8-12m, having large square leaves and sanguine flowers in numerous groups of terminal clusters. The flower buds are at first of a pale color and gradually become green, after which they develop into a bright red, when they are ready for collecting. Cloves are harvested when 1.5–2 cm long, and consist of a long calyx, terminating in four spreading sepals, and four unopened petals, which form a small ball in the centre.

NUTRIENT CONTENT OF CLOVE

The composition of the clove varies according to the agro climatic conditions under which it is grown, processed and stored. The dried clove bud contains carbohydrates, fixed oil, steam-volatile oil, resins, tannins, proteins, cellulose, pentosans and mineral elements. Carbohydrates comprise about two-thirds of the weight of the spice. The dried dark and flower buds also contain nutrients like proteins, minerals, vitamins, etc.

CHEMICAL CONSTITUENTS

Clove comprises of volatile as well as non-volatile constituents.

Volatile Constituents

Clove yields different types of volatile oil [oil extracted from i. leaves, ii. the stem, iii. the buds and iv. the fruit.] These oils differ considerably in yield and quality. The yield and composition of the oil obtained are influenced by its origin, season, variety and quality of raw material, maturity at harvest, pre- and post-distillation treatments and method of distillation. The chief component of all the types of oil is eugenol.

Non-volatile Constituents

A few non-volatiles have been isolated from clove, which include tannins, sterols, triterpenes and flavonoids.

USES

Medicinal uses

Clove is known to possess antibacterial properties and is used in various dental creams, tooth pastes, mouth washes, and throat sprays to cleanse bacteria. It is also used to relive pain from sore gums and improves overall dental health.

In dentistry, eugenol in combination with zinc oxide is used for temporary filling of cavities. Clove is an anodyne (an agent that soothes or relives pain) for dental emergencies. Cloves are aphrodisiac (an agent for arousing or increasing sexual desire or potency). Clove is used as an anti-inflammatory agent, due to its high content of flavonoids. Aroma therapists use pure clove oil to cure the symptoms of rheumatism and arthritis.

Clove is used as a carminative, to increase hydrochloric acid in the stomach and to improve peristalsis. Apply the paste of clove powder in honey to treat acne. Paste of clove powder in water promotes faster healing of cuts and bites. Cloves can effectively cure many digestive problems. It is having medicinal qualities to cure flatulence, loose motions, indigestion and nausea. Cloves are useful in relieving the symptoms of diarrhoea, gastric irritability and vomiting.

Clove and clove oil boost the immune system by purifying the blood and help to fight against various diseases. Clove oil is effective in curing Athlete's foot and nail fungus. Cloves are good expectorants that promote the discharge of mucous and secretions in the respiratory passage. The aromatic clove oil, when inhaled can help soothe certain respiratory conditions like cold, cough, asthma, bronchitis, and sinusitis. It also helps in clearing the nasal tract.

Cloves can effectively prevent the lung cancer as well as the skin cancer. Eugenol helps in minimizing the harmful effects of environmental wastes that can cause cancer of digestive system. Clove oil stimulates blood flow and circulation making it useful for the people having cold extremities. Cloves benefit the diabetic patients by controlling the blood glucose levels. Eugenol is powerful enough for preventing blood clots. Sucking of a clove bud reduces desire for alcohol. Muscular cramps are often relieved, when the oil of clove is applied as a poultice near the affected area.
Cloves also help prevent the breakdown in retina of the eye, which slows down macular degeneration and aids vision in the old age. Researchers found that sniffing the spicy aroma of cloves reduces drowsiness, irritability and headaches. Clove enhances memory retention. Clove oil is an effective mosquito repellent. Clove may be looked upon as the champion of all the anti-oxidants known till date.

Veterinary uses
The clove oil has been used to treat foreign matter in dog and cat ears and as a painkiller to treat tooth pain. Peppermint tea with a sprinkle of cloves and ginger has been used to treat vomiting in dogs; 1 tbsp or more, according to the size of the animal, being given 3 times daily.

Culinary uses
Dried cloves are the key ingredient in Indian masala tea. Clove is often used to flavor meat products, pastries, cookies, candies, chewing gum, spiced fruits, hot spiced drinks, chocolate drinks, wines and liqueurs, puddings, sandwiches, cakes, curries, and pickles. It is a common kitchen spice used for studding particularly tomatoes, onions, sausage, soups, salads and herbal teas. It is an important spice used in cuisines of Russia, Scandinavia, Greece, India, and China.

Miscellaneous uses
Clove is used to flavor Pharmaceuticals. Clove oil is used to flavor tooth pastes. The leaf oil is used to impart fragrance to perfumes and soaps. In Indonesia, cloves are mixed with tobacco in the proportion of 1: 2 to make a cigarette called Kretek. Clove is used to make pomanders (thin skinned oranges, lemon and apples are pierced with a large needle to make holes for studding clove inside the concentric holes).

Pharmacological activity
Anti-microbial activity
Cloves represent one of the Mother Nature's premier antiseptic. Clove oil was found to be very effective against *Staphylococcus species*. Amongst the fungi, *Aspergillus niger* was found to be highly sensitive to the clove oil.

Anti -viral activity
Clove is a potent antiviral agent. Eugenin isolated from clove buds showed antiviral activity against Herpes Simplex virus.
Other pharmacological activity of clove are - Chemo-preventive, Hepato-protective activity, Anti-oxidant activity, Anti-diabetic activity, Anti-inflammatory activity, Anti-stress activity, Anti-platelet activity, Anti-pyretic effect, Anaesthetic effect, Aphrodisiac, Mosquito repellent, Insecticidal activity.

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