

Unit X: Economic Botany

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Economically Useful Plants and Entrepreneurial Botany





Learning Objectives

The learner will be able to

- Acquire knowledge about origin, area of cultivation and uses of various food yielding plants.
- Describe the different spices and condiments and their uses.
- Elicit the uses of fibre, timbers, paper and dye yielding plants.
- Acquire knowledge about the active principles, chemical composition and medicinal uses of plants.
- Gains knowledge of organic farming- bio fertilisers and bio pest repellants.



Chapter outline

- 10.1 Food Plants
- 10.2 Spices and Condiments
- 10.3 Fibres
- 10.4 Timber
- 10.5 Latex
- 10.6 Pulp wood
- 10.7 Dyes
- 10.8 Cosmetics
- 10.9 Traditional systems of Medicines
- 10.10 Medicinal plants
- 10.11 Entrepreneurial Botany

The land and water of the earth sustain a vast assemblage of plants upon which all other living forms are directly or indirectly dependent. Pre-historic humans lived on berries, tubers, herbage, and the wild game which they collected and hunted that occupied whole of their time. Domestication of plants and animals has led to the production of surplus food which formed the basis for civilizations. Early civilization in different parts of the world has domesticated different species of plants for various purposes. Based on their utility, the economically useful plants are classified into food plants, fodder plants, fibre plants, timber plants, medicinal plants, and plants used in paper industries, dyes and cosmetics. Selected examples of economically important plants for each category are discussed in this chapter.

10.1 Food plants

Currently about 10,000 food plants are being used of which only around 1,500 species were brought under cultivation. However, food base of majority of the population depends only on three grass species namely rice, wheat and maize.

10.1.1 Cereals

The word cereal is derived from Ceres, which according to the Roman mythology denotes "Goddess of agriculture". All cereals are members of grass family (Poaceae) that are grown for their edible starchy seeds. The prominence of cereals as food plants is due to the following attributes:

- i. Greater adaptability and successful colonisation on every type of habitat.
- ii. The relative ease of cultivation
- iii. Tillering property that produce more branches which results in higher yield per unit area.
- iv. Compact and dry grains that they can be easily handled, transported and stored without undergoing spoilage.
- v. High caloric value that provides energy.

The nutrients provided by cereals include carbohydrates, proteins, fibres and a wide range of vitamins and minerals. Cereals can be classified into two different types based on their size namely Major Cereals and Minor Cereals.

Major Cereals

Rice / Paddy

Botanical name : Oryza sativa

Paddy is a semi-aquatic crop and is grown in standing water. It is an important food crop of the world, occupying the second position in terms of area under cultivation and production, next to wheat. Rice is the chief source of carbohydrate.

Origin and Area of cultivation

South East Asia is considered as the center of origin of rice. Earliest evidences of rice cultivation have been found in China, India and Thailand. It is mainly cultivated in Delta and irrigated regions of Tamil Nadu.

Uses

Rice is the easily digestible calorie rich cereal food which is used as a staple food in Southern and North East India. Various rice products such as **Flaked rice** (Aval), **Puffed rice / parched rice** (Pori) are used as breakfast cereal or as snack food in different parts of India.

Rice bran oil obtained from the rice bran is used in culinary and industrial purposes.

Husks are used as fuel, and in the manufacture of packing material and fertilizer.



Figure 10.1: Major Cereals

Wheat

Botanical name : Triticum aestivum

Origin and Area of cultivation

Earliest evidence for wheat cultivation comes from Fertile Crescent region. The common cultivated wheat, *Triticum aestivum* is cultivated for about 7,500 years. Wheat is mostly cultivated in the North Indian states such as Uttar Pradesh, Punjab, Haryana, Rajasthan, Madhya Pradesh and Bihar.

Uses

Wheat is the staple food in Northern India. Wheat flour is suitable to make bread and other bakery products. Processed wheat flour, that has little fibre, is called Maida which is used extensively in making parota, naan and bakery products. Malted wheat is a major raw material for producing alcoholic beverages and nutritive drinks.



PSEUDO-CEREAL

The term pseudo-cereal is used to describe foods that are prepared and eaten as a whole grain, but are botanical outliers from grasses. Example: quinoa. It is actually a seed from the Chenopodium quinoa plant

Pseudo cereal -Chenopodium quinoa

belongs to the family Amaranthaceae. It is a gluten-free, whole-grain carbohydrate, as well as a whole protein (meaning it contains all nine essential amino acids) and have been eaten for 6,000 years in Andes hill region.

Uses

Most of the corn produced is used as fodder than food. Corn syrup is used in the manufacture of infant foods. Corn is a raw material in the industrial production of alcohol and alcoholic beverages.

10.1.2 Millets (Siru Thaniyangal)

The term millet is applied to a variety of very small seeds originally cultivated by ancient people in Africa and Asia. They are gluten free and have less glycemic index.





Figure 10.2: Millets

Finger Millet - Ragi

Botanical name : Eleusine coracana

Finger millet is the crop of early introduction from East Africa into India. Ragi is rich in calcium.

Uses

It is used as a staple food in many southern hilly regions of India. Ragi grains are made into porridge and gruel. Ragi malt is the popular nutrient drink. It is used as a source of fermented beverages.

Sorghum

Botanical name : Sorghum vulgare

Sorghum is native to Africa. It is one of the major millets in the world and is rich in calcium and iron.

Uses

It is fed to poultry, birds, pigs and cattle and a source of fermented alcoholic beverage.



Figure 10.3: Minor Millets

Kodo Millet

10.1.3 Minor Millets

Foxtail Millet

Botanical name : Setaria italica

This is one of the oldest millet used traditionally in India. Which is domesticated first in China about 6000 years. Rich in protein, carbohydrate, vitamin B and C, Potassium and Calcium.

Uses

It supports in strengthening of heart and improves eye sight. Thinai porridge is given to lactating mother.

Kodo Millet

Botanical name : *Paspalum scrobiculatum*

Kodo millet is originated from West Africa, which is rich in fibre, protein and minerals.

Uses

Kodo millet is ground into flour and used to make pudding. Good diuretic and cures constipation. Helps to reduce obesity, blood sugar and blood pressure.

10.1.4 Pulses

The word Pulse is derived from the Latin words 'puls' or 'pultis' meaning "thick soup". Pulses are the edible seeds that are harvested from the fruits of Fabaceae. They provide vital source of plant-based protein, vitamins and minerals for people around the globe.

Black gram

Botanical name : Vigna mungo

Origin and Area of cultivation

Black gram is native to India. Earliest archeobotanical evidences record the presence

of black gram about 3,500 years ago. It is cultivated as a rain fed crop in drier parts of India. India contributes to 80% of the global production of black gram. Important states growing black gram in India are Uttar Pradesh, Chattisgarh and Karnataka.



Figure 10.4: Pulses

Uses

Black gram is eaten whole or split, boiled or roasted or ground into flour. Black gram batter is a major ingredients for the preparation of popular Southern Indian breakfast dishes. Split pulse is used in seasoning Indian curries.

Red gram / Pigeon pea

Botanical name : Cajanus cajan

Origin and Area of cultivation: It is the only pulse native to Southern India. It is mainly grown in the states of Maharashtra, Andhra Pradesh, Madhya Pradesh, Karnataka and Gujarat.

Uses

Red gram is a major ingredient of sambar, a characteristic dish of Southern India. Roasted seeds are consumed either salted or unsalted as a popular snack. Young pods are cooked and consumed.

Green gram

Botanical name : Vigna radiata

Origin and Area of cultivation

Green gram is a native of India and the earliest archaeological evidences are found in the state of Maharashtra. It is cultivated in the states of Madhya Pradesh, Karnataka and Tamil Nadu.

Uses

It can be used as roasted cooked and sprouted pulse. Green gram is one of the ingredients of pongal, a popular breakfast dish in Tamil Nadu. Fried dehulled and broken or whole green gram is used as popular snack. The flour is traditionally used as a cosmetic, especially for the skin.

10.1.5 Vegetables

While walking through a market filled with fresh vegetables like stacks of lady's finger, mountains of potatoes, pyramids of brinjal, tomatoes, cucurbits, we learn to choose the vegetables that is fresh, tender, ripe and those suit the family taste through experience and cultural practices. Why do we need to eat vegetables and what do they provide us?

Vegetables are the important part of healthy eating and provide many nutrients, including potassium, fiber, folic acid and vitamins A, E and C. The nutrients in vegetables are vital for maintenance of our health.

Lady's finger / Okra

Botanical name : *Abelmoschus esculentus* Family: Malvaceae

Origin and Area of cultivation

Lady's finger is a native of the Tropical Africa. Assam, Maharashtra and Gujarat are the important states where Lady's finger is grown in abundance. Coimbatore, Dharmapuri and Vellore are the major cultivating regions of Tamil Nadu.

Uses

The fresh and green tender fruits are used as a vegetable. Often they are sliced and dehydrated to conserve them for later use. It has most important nutrients.

10.1.6 Fruits

Edible fruits are fleshy structures with a pleasant aroma and flavours. Fruits are sources of many nutrients including potassium, dietary fiber, folic acid and vitamins.Depending on the climatic region in which fruit crops grow, they

can be classified into temperate(apple, pear, plum) and tropical fruits (mango, jack, banana). In this chapter we will study an example of tropical fruit.

Mango (National fruit of India) Botanical name : *Mangifera indica* Family: Anacardiaceae

Origin and Area of cultivation

The mango is the native to Southern Asia, especially Burma and Eastern India. It is the National fruit of India. Major mango producing



Figure 10.5: Mango

States are Andhra Pradesh, Bihar, Gujarat and Karnataka. Salem, Krishnagiri, Dharmapuri are the major mango producing districts of Tamil Nadu. Some of the major cultivars of mango in India are Alphonsa, Banganapalli, neelam and malgova.

Uses

Mango is the major table fruit of India, which is rich in beta carotenes. It is utilized in many ways, as dessert, canned, dried and preserves in Indian cuisine. Sour, unripe mangoes are used in chutneys, pickles, side dishes, or may be eaten raw with salt and chili. Mango pulp is made into jelly. Aerated and non-aerated fruit juice is a popular soft drink.

10.1.7 Nuts

Nuts are simple dry fruits composed of a hard shell and an edible kernel. They are packed with a good source of healthy fats, fibre, protein, vitamins, minerals and antioxidants.

Cashew nut

Botanical name : *Anacardium occidentale* Family: Anacardiaceae

Origin and Area of cultivation

Cashew has originated in Brazil and made its way to India in the 16th century through Portuguese sailors. Cashew is grown in Kerala, Karnataka, Goa, Maharashtra, Tamil Nadu, and Orissa.

Uses

Cashews are commonly used for garnishing sweets or curries, or ground into a paste that forms a base of



Figure 10.6: Nuts

sauces for curries or some sweets. Roasted and raw kernels are used as snacks.

10.1.8 Sugars

We experienced sweetness while eating the stems of sugarcane, roots of sugar beet, fruits of apple and while drinking palmyra sap. This is due to the different proportions of sugars found in it. Sugar is the generic name for sweet tasting soluble carbohydrate, which are used in foods and beverages. Sugars found in sugarcane and palmyra make them ideal for efficient extraction to make commercial sugar.

Sugarcane

Botanical name : *Saccharum officinarum* Family : Poaceae

Origin and Area of cultivation

The cultivated *Saccharum officinarum* has evolved by repeated back crossing of *S.officinarum* of New Guinea with wild *S.spontaneum* of India to improve the quality. All districts except Kanyakumari and Nilgiris of Tamil Nadu cultivate Sugarcane.

Uses

Sugar cane is the raw material for extracting white sugar. Sugarcane supports large number of industries like sugar mills producing refined sugars, distilleries producing liquor grade



Figure 10.7: Sugars

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ethanol and millions of jaggery manufacturing units. Fresh sugarcane juice is a refreshing drink. Molasses is the raw material for the production of ethyl alcohol.

Palmyra (State tree of Tamil Nadu) Botanical name : *Borassus flabellifer* Family: Arecaceae

Origin and Area of cultivation

Palmyra is native to tropical regions of Africa, Asia and New Guinea. Palmyra grows all over Tamil Nadu, especially in coastal districts.

Uses

Exudate from inflorescence axis is collected for preparing palm sugar. Inflorescence is tapped for its sap which is used as health drink. Sap is processed to get palm jaggery or fermented to give **toddy**.

Endosperm is used as a refreshing summer food. Germinated seeds have an elongated embryo surrounded by fleshy scale leaf which is edible.

10.1.9 Oil Seeds

Why fried foods are tastier than boiled foods? There are two kinds of oils namely, essential oils and vegetable oils or fatty oils. The essential oils or volatile oils which possess aroma evaporate or volatilize in contact with air. Any organ of a plant may be the source of essential oil. For example, flowers of Jasmine, fruits of orange and roots of ginger. The vegetable oils or non-volatile oils or fixed oils that do not evaporate. Whole seeds or endosperm form the sources of vegetable oils.

Let us know about few oil seeds

Groundnut / Peanut

Botanical name : *Arachis hypogaea* Family : Fabaceae

Origin and Area of Cultivation: Groundnut is native of Brazil. Portuguese introduced groundnut into Africa. The Spanish took it to the South East Asia



and India via Philippines. In India Gujarat, Andhra Pradesh and Rajasthan are top producers.

Uses

Nuts contain about 45% oil. The kernels are also rich sources of phosphorous and vitamins, particularly thiamine, riboflavin and niacin. It is premium cooking oil because it does not smoke. Lower grade oil is used in manufacture of soaps and lubricants.

Sesame / Gingelly

Botanical name : Sesamum indicum

Family : Pedaliaceae

Origin and Area of cultivation: Sesamum indicum has originated from Africa.. Sesame is cultivated as a dry land crop. West Bengal and Madhya Pradesh are the top producers in India during 2017-18. It is considered as a healthy oil in Southern Indian culture.

Uses

Sesame oil is used for mostly culinary purposes in India. Lower grades are used in manufacture of soaps, in paint industries, as a lubricant and as an illuminant. In India, the oil is the basis of most of the scented oils used in perfumes. Sesame seed snacks are popular throughout India.





Figure 10.8: Oil Seeds

10.1.10 Beverages

How about a cup of coffee or tea? We always entertain our guests with this offer.

All non-alcoholic beverages contain alkaloids that stimulate central nervous system and also possess mild diuretic properties.

Coffee

Botanical name : *Coffea arabica* Family : Rubiaceae



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Why does a student or a driver prefer tea or coffee during night work?

Origin and Area of cultivation: *Coffea arabica* is the prime source



Figure 10.9: Beverages

of commercial coffee which is native to the tropical Ethiopia An Indian Muslim saint, Baba Budan introduced coffee from Yemen to Mysore.Karnataka is the largest coffee producing state in India followed by Tamil Nadu and Kerala. Tamil Nadu is the largest consumer of coffee in India.

Uses

Drinking coffee in moderation provides the following health benefits:

Caffeine enhances release of acetylcholine in brain, which in turn enhances efficiency. It can lower the incidence of fatty liver diseases, cirrhosis and cancer. It may reduce the risk of type 2 diabetes.

10.2 Spices and Condiments

"Aroma attracts everyone"

History:

Spices were used extensively throughout the world for several thousands of years. Records of use of garlic and onion dates back 2500 years.

Majority of the spices are native to Mediterranean region, India and South East Asian countries. Spices, especially pepper triggered the search for sea route to India and paved way for the exploratory voyages by Spanish and Portuguese. Spices are accessory foods mainly used for flavouring during food preparation to improve their palatability. Spices are aromatic plant products and are characterized by sweet or bitter taste. Spices are added in minimal quantities during the cooking process. For example black pepper.

Condiments, on the other hand, are flavouring substances having a sharp taste and are usually added to food after cooking. For example, curry leaves.

The following spices and condiment are discussed in detail.

Spices

Cardamom

Botanical name : *Elettaria cardamomum* Family : Zingiberaceae

Origin and Area of cultivation: It is indigenous to Southern India and Sri Lanka. Cardamom is called as "Queen of Spices". In India it is one of the main cash crops cultivated in the Western Ghats, and North Eastern India

Uses

The seeds have a pleasing aroma and a characteristic warm, slightly pungent taste. It is used for flavouring confectionaries, bakery products and beverages. The seeds are used in the preparation of curry powder, pickles and cakes. Medicinally, it is employed as a stimulant and carminative. It is also chewed as a mouth freshener.

Black Pepper

Botanical name : *Piper nigrum* Family : Piperaceae



Figure 10.10: Spices





Origin and Area of cultivation: It is indigenous to Western Ghats of India. Pepper is one of the most important Indian spices referred to as the "King of Spices" and also termed as "Black Gold of India". Kerala, Karnataka and Tamil Nadu are the top producers in India.

The characteristic pungency of the pepper is due to the presence of alkaloid Piperine. There are two types of pepper available in the market namely black and white pepper.

Uses

It is used for flavouring in the preparation of sauces, soups, curry powder and pickles. It is used in medicine as an aromatic stimulant for enhancing salivary and gastric secretions and also as a stomachic. Pepper also enhances the bio-absorption of medicines.

Turmeric

Botanical name : Curcuma longa

Family : Zingiberaceae

Origin and Area of cultivation: It is indigenous to Southern Asia India is the largest producer, consumer and exporter of turmeric. Erode in Tamil Nadu is the World's largest wholesale turmeric market.

Uses

Turmeric is one of the most important and ancient Indian spices and used traditionally over thousands of years for culinary, cosmetic, dyeing and for medicinal purposes. It is an important constituent of curry powders. Turmeric is used as a colouring agent in pharmacy, confectionery and food industry. Rice coloured with turmeric (yellow) is considered sacred and auspicious which is used in ceremonies. It is also used for dyeing leather, fibre, paper and toys.

Curcumin extracted from turmeric is responsible for the yellow colour. Curcumin is a very good anti-oxidant which may help fight various kinds of cancer. It has anti-inflammatory, anti-diabetic, anti-bacterial, anti-fungal and antiviral activities. It stops platelets from clotting in arteries, which leads to heart attack.

Chillies / Red Pepper

Botanical name : *Capsicum annuum*, *C. frutescens*.

Family : Solanaceae

Origin and Area of cultivation: Capsicum is native to South America and is popularly known as chillies or red pepper in English. India is leading producer and exporter. *C. annuum* and *C. frutescens* are important cultivated species of chillies.

Uses

The fruits of *C.annuum* are less pungent than the fruits of *C.frutescens*. *C.annum* includes large, sweet bell peppers. Long fruit cultivars of this species are commercially known as 'Cayenne pepper' which are crushed, powdered and used as condiment. Chillies are used in manufacture of sauces, curry powders and preparation of pickles. Capsaicin is an active component of chillies. It has pain relieving properties and used in pain relieving balms. Chillies are a good source of Vitamin C, A and E.



Capsaicin is responsible for the pungency or spicy taste of chillies. Pungency of Chillies is measured in Scoville Heat Units

(SHU). World's hottest chilli, Carolina reaper pepper measures 2,200,000 SHU. Naga viper chilli is the hottest in India that measures 1,349,000 SHU. Commonly used cayenne pepper measures 30,000 to 50,000 SHU.

Condiment

Tamarind

Botanical name: *Tamarindus indica* Family : Fabaceae-Caesalpinioideae



Origin and Area of cultivation: Tamarind

is native of tropical African region and was

192

introduced into India several thousand years before. It is cultivated in India, Myanmar, south asian countries and several African and Central American countries. Tamarind has long been used in Africa and in Southern Asia. The name tamarindus is of Arabian origin, which means "dates of India". (tamar – dates; Indus – India).

Uses

It is used in flavouring sauces in the United States and Mexico. In India, the fruit pulp is major ingredients for many culinary preparations. Sweet tamarinds are sold as table fruits in India imported from Thailand and Malaysia.

10.3 Fibres

Botanically a fiber is a long narrow and thick-walled cell.

Cotton

Botanical name : Gossypium spp.

Family : Malvaceae

Cotton is the world's most important nonfood commercial crop.

Origin and Area of cultivation: It is one of the oldest cultivated crops of the world. It has been cultivated for about 8000 years both in new world and in old world. Commercial cotton comes from four cotton species: two from the new world and two from the old world. (1) *G. hirsutum* (2) *G.barbadense* are the New world species and (3) *G. arboretum* (4) *G. herbaceum* are the old world species. In India cotton is cultivated in Gujarat, Maharashtra, Andhra Pradesh and Tamil Nadu.

Uses

It is mainly used in the manufacturing of various textile, hosiery products, toys and is also used in hospitals.

Jute

Botanical name : *Corchorus* spp. Family : Malvaceae **Origin and Area of cultivation:** Jute is derived from the two cultivated species (1) *Corchorus capsularis* and (2) *C.olitorius* is of African origin whereas *C. capsularis*, is believed to be Indo-Burmese origin. It is an important cultivated commercial crop in Gangetic plains of India and Bangladesh.

Uses

It is one of the largest exported fibre material of India. The jute industry occupies an important place in the national economy of India. Jute is used for 'safe' packaging in view of being natural, renewable, bio-degradable and eco-friendly product. It is used in bagging and wrapping textile. About 75% of the jute produced is used for manufacturing sacks and bags. It is also used in manufacture of blankets, rags, curtains etc. It is also being used as a textile fibre in recent years.





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Figure 10.12: Fibres

10.4 Timber

The basic need of shelter is obtained from the timber trees.

Teak

Botanical name : Tectona grandis

Family: Lamiaceae

Origin and Area of cultivation: This is native to South east Asia. It is observed wild in Assam. But cultivated in Bengal, Assam, Kerala, Tamil Nadu and North-West India.



Figure 10.13: Timber

Uses

It is one of best timbers of the world.

Economically useful plants and Entrepreneurial Botany

The heartwood is golden yellow to golden brown when freshly sawn, turning darker when exposed to light. Known for its durability as it is immune to the attack of termites and fungi.

The wood does not split or crack and is a carpenter friendly wood. It was the chief railway carriage and wagon wood in India. Ship building and bridge-building depends on teakwood. It is also used in making boats, toys, plywood, door frames and doors.

10.5 Latex

Rubber

Botanical name : Hevea brasiliensis

Family Euphorbiaceae

Origin and Area of cultivation: It is a native of Brazil and was introduced



of Brazil and was introduced Fig outside its

Figure 10.14: Rubber Tree

native range during the colonial period and has become an important cash crop. Asia contributed 90% of the world production. Kerala is the largest producer in India followed by Tamil Nadu.

Uses

Tyre and other automobile parts manufacturing industries consume 70% of the rubber production. Rubber is used in manufacturing footwear, wire and cable insulations, raincoats, household and hospital goods, shock absorbers, belts, sports goods, erasers, adhesives, and rubber-bands Hard rubber is used in the electrical and radio engineering industries Concentrated latex is used for making gloves, balloons and

condoms. Foamed latex is used in the manufacture of cushions, pillows and lifebelts.





Rubber – Vulcanization

Charles Goodyear invented vulcanization in 1839. He found that the

defects in rubber articles could be overcome by heating rubber with sulphur under pressure at 150° C. The process was called vulcanization. The name was given from the Roman God of Fire, Vulcan. Because of this, solid rubber tyres were used for first time in 1867. That is why we smoothly travel on road.

10.6 Pulp Wood

The term paper is derived from the word 'papyrus' a plant (*Cyperus papyrus*) that was used by Egyptians



Figure 10.15 : Wood pulp

to make paper-like materials. Paper production is a Chinese invention. The Chinese discovered the paper that was prepared from the inner bark of paper mulberry in 105 A.D. For a long time, the art of paper making remained a monopoly of the Chinese until Arabs learned the technique and improved it around 750 A.D. Invention of printing increased the demand for paper.

Manufacture of Wood pulp: Wood is converted into pulp by mechanical, and chemical processes. Wood of Melia azadirachta, *Neolamarkia chinensis*, *Casuarina* spp, *Eucalyptus* spp are used for making paper pulp.

Purified dissolving pulp is used as a basic material in the manufacture of rayon or artificial silk, fabrics, transparent films (cellophane, cellulose acetate films), plastics. The viscose process of making rayon is the most common process.



10.7 Dyes

The ability to perceive colour is a wonderful aspect of human eyes and dyes add colour to the goods we use. They have been in use since the ancient times.

The earliest authentic records of dyeing were found in the tomb painting of ancient Egypt. Colourings on mummy cements (wrapping) included saffron and indigo. They can also be seen in rock paintings in India.

Henna

Botanical name : Lawsonia inermis

Family : Lythraceae

Origin and Area of cultivation: It is indigenous to North Africa and South-west Asia. It is grown mostly throughout India, especially in Gujarat, Madya Pradesh and Rajasthan.

Uses

An orange dye 'Henna' is obtained from the leaves and young shoots of *Lawsonia inermis*. The principal colouring matter of leaves 'lacosone" is harmless and causes no irritation to the skin. This dye has long been used to dye skin, hair and finger nails. It is used for colouring leather, for the tails of horses and in hair-dyes.



Figure 10.16: Naturals Dyes

10.8 Cosmetics

Traditionally in Southern India, people have been using turmeric, green gram powder, henna, sigaikai and usilai for their skin and hair care. These were mostly home prepared products that are used for grooming. Today, cosmetics have a high commercial value and have become chemical based industrial products. Providing personal care services has become a major industry. In recent years, people have realized the hazards of chemicalbased cosmetics and are turning back to natural products. In this chapter one of the major plants namely Aloe which is used in the cosmetic industries is discussed.

Aloe

Uses

'Aloin'

Botanical name : Aloe vera

Family: Asphodelaceae (formerly Liliaceae)

Origin and Area of cultivation: It is a native of Sudan. It is cultivated on a large scale in

Rajasthan, Gujarat, Maharashtra, Andhra Pradesh and Tamil Nadu.

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mixture

Figure 10.17: Aloe vera

of glucosides) and its gel are used as skin tonic. It has a cooling effect and moisturizing characteristics and hence used in preparation of creams, lotions, shampoos, shaving creams, after shave lotions and allied products. It is used in gerontological applications for rejuvenation of aging skin. Products prepared from aloe leaves have multiple properties such as emollient, antibacterial, antioxidant, antifungal and antiseptic. Aloe vera gel is used in skin care cosmetics.

10.8.1 Perfumes

The word **perfume** is derived from the Latin word **Per** (through) and **fumus** (to smoke), meaning **through smoke**. It refers to the age-old tradition of burning scented woods at religious ceremonies.In early days, when people were less conscious of personal hygiene, essential oils not only masked offensive odours, but also may have acted as antiseptics. Perfumes are added to baths and used for anointing the body.

Perfumes are manufactured from essential oil which are **volatile** and **aromatic**. Essential oils are found at different parts of the plant such as leaves, (curry leaf, mint), flowers (rose, jasmine), fruits (citrus, straw berry) and wood (sandal, eucalyptus).



Madurai Malli

'Madurai Malli' is the pride of Madurai has a distinct reputation universally

because of its uniqueness and has been given the Geographical Indications (GI) mark by the Geographical indication Registry of India. Madurai malli has thick petals with long stalk equal to that of petals and the distinct fragrance is due to the presence of chemicals such as jasmine and alpha terpineol. This makes it easy to distinguish Madurai Malli from other places. This is the second GI tag for Jasmine after 'Mysore Malli'.

Jasmine

Botanical name : *Jasminum grandiflorum* Family: Oleaceae

Jasmine, as a floral perfume, ranks next to the rose oil. Major species cultivated on the commercial scale is Jasminum



Figure 10.18: Jasmine

grandiflorum, a native of the north-western Himalayas. In Tamil Nadu, the major jasmine cultivation centres are Madurai and Thovalai of Kanyakumari District. The essential oil is present in the epidermal cells of the inner and outer surfaces of both the sepals and petals. One ton of Jasmine blossom yields about 2.5 to 3 kg of essential oil, comprising 0.25 to 3% of the weight of the fresh flower.

Uses

Jasmine flowers have been used since ancient times in India for worship, ceremonial purposes, incense and fumigants, as well as for making perfumed hair oils, cosmetics and soaps. Jasmine oil is an essential oil that is valued for its soothing, relaxing, antidepressant qualities. Jasmine blends well with other perfumes. It is much used in modern perfumery and cosmetics and has become popular in air freshners, anti-perspirants, talcum powders, shampoos and deodorants.

10.9 Traditional Systems of Medicines

India has a rich medicinal heritage. A number of Traditional Systems of Medicine (TSM) are practiced in India some of which come from outside India. TSM in India can be broadly classified into institutionalized or documented and non-institutionalized or oral traditions. Institutionalized Indian systems include Siddha and Ayurveda which are practiced for about two thousand years. These systems have prescribed texts in which the symptoms, disease diagnosis, drugs to cure, preparation of drugs, dosage and diet regimes, daily and seasonal regimens. Non-institutional systems, whereas, do not have such records and or practiced by rural and tribal peoples across India. The knowledge is mostly held in oral form. The TSM focus on healthy lifestyle and healthy diet for maintaining good health and disease reversal.

Siddha system of medicine

Siddha is the most popular, widely practiced and culturally accepted system in Tamil Nadu. It is based on the texts written by 18 Siddhars. There are different opinions on the constitution of 18 Siddhars. The Siddhars are not only from Tamil Nadu, but have also come from other countries. The entire knowledge is documented in the form of poems in Tamil. Siddha is principally based on the Pancabūta philosophy. According to this system three humors namely Vātam, Pittam and Kapam that are responsible for the health of human beings and any disturbance in the equilibrium of these humors result in ill health. The drug sources of Siddha include plants, animal parts, marine products and minerals. This system specializes in using minerals for preparing drugs with the long shelf-life. This system uses about 800 herbs as source of drugs. Great stress is laid on disease prevention, health promotion, rejuvenation and cure.

Ayurveda system of medicine

Ayurveda supposed to have originated from Brahma. The core knowledge is documented by **Charaka, Sushruta** and **Vagbhata** in compendiums written by them. This system is also based on three humor principles namely, Vatha, Pitha and Kapha which would exist in equilibrium for a healthy living. This system Uses more of herbs and few animal parts as drug sources. Plant sources include a good proportion of Himalayan plants. The **Ayurvedic Pharmacopoeia** of India lists about 500 plants used as source of drugs.

Folk system of medicine

Folk systems survive as an oral tradition among innumerable rural and tribal communities of India. A consolidated study to document the plants used by ethnic communities was launched by the Ministry of Environment and Forests, Government of India in the form of All India Coordinated Research Project on Ethnobiology. As a result about 8000 plant species have been documented which are used for medicinal purposes. The efforts to document in several under-explored and unexplored pockets of India still continue. Major tribal communities in Tamil Nadu who are known for their medicinal knowledge include Irulas, Malayalis, Kurumbas, Paliyans and Kaanis. Some of the important medicinal plants are discussed below.

10.10 Medicinal Plants

India is a treasure house of medicinal plants. They are linked to local heritage as well as to global-trade. All institutional systems in India primarily use medicinal plants as drug sources. At present, 90% collection of medicinal plants is from the non-cultivated sources. Growing demand for herbal products has led to quantum jump in volume of plant materials traded within and across the countries. Increasing demand exerts a heavy strain on the existing resources. Now efforts are being made to introduce cultivation techniques of medicinal plants to the farmers.

Medicinal plants play a significant role in providing primary health care services to rural and tribal people. They serve as therapeutic agents as well as important raw materials for the manufacture of traditional and modern medicines. Medicinally useful molecules obtained from plants that are marketed as drugs are called Biomedicines. Medicinal plants which are marketed as powders or in other modified forms are known as Botanical medicines.

Keezhanelli

Botanical name : *Phyllanthus amarus*

Family : Euphorbiaceae (Now in Phyllanthaceae)

Origin and Area of cultivation: The plant is a native of Tropical American region and is naturalised in India and other tropical countries. It is not cultivated and is collected from moist places in plains. *Phyllanthus maderspatensis* is also commonly sold in the medicinal plant markets collected from non-forest are as keezhanelli.

Active principle: Phyllanthin is the major chemical component.

Medicinal importance

Phyllanthus is a well-known hepato-protective plant generally used in Tamil Nadu for the treatment of Jaundice. Research carried out by Dr. S P Thyagarajan and his team from University of Madras has scientifically proved that the extract of *P. amarus* is effective against hepatitis B virus.

Nilavembu

Botanical name : Andrographis paniculata

Family : Acanthaceae

Andrographis paniculata, known as the **King of Bitters** is traditionally used in Indian systems of medicines.

Active principle: Andrographolides.

Medicinal importance:

Andrographis is a **potent hepatoprotective** and is widely used to treat liver disorders. Concoction of *Andrographis paniculata* and eight other herbs (Nilavembu Kudineer) is



Figure 10.19: Medicinal Plants

effectively used to treat malaria and dengue.

Psychoactive Drugs

In the above chapter you have learnt about plants that are used medicinally to treat various diseases. Phytochemicals / drugs from some of the plants alter an individual's perceptions of mind by producing hallucination are known as psychoactive drugs. These drugs are used in all ancient culture especially by Shamans and by traditional healers. Here we focus on two such plants namely Poppy and Marijuana.

Opium poppy

Botanical name : Papaver somniferum

Family: Papaveraceae

Origin and Area of cultivation: *Opium poppy* is native to South Eastern Europe and Western Asia. Madhya Pradesh, Rajasthan and Uttar Pradesh are the licenced states to cultivate opium poppy. Opium is derived from the exudates of fruits of poppy plants. It was traditionally used to induce sleep and for relieving pain. Opium yields **Morphine**, a strong analgesic which is used in surgery. However, opium is an addiction forming drug.

Cannabis / Marijuana

Botanical name : *Cannabis sativa* Family: Cannabiaceae

Origin and Area of Cultivation: Marijuana is native to China. States such as Gujarat, Himachal Pradesh, Uttarkand, Uttarpradesh and Madhaya Pradesh have legally permitted to cultivate industrial hemp/Marijuana

The active principle in Marijuana is trans-tetrahydrocanabinal (THC). It possess a number of medicinal properties. It is an effective pain reliever and reduces hypertension. THC is used in treating Glaucoma a condition in which pressure develops in the eyes. THC is also used in reducing nausea of cancer patients undergoing radiation and chemotherapy. THC provides relief to bronchial disorders, especially asthma as it dilates bronchial vessels. Because of these medicinal properties, cultivation of cannabis is legalized in some countries. However, prolonged use causes addiction and has an effect on individual's health and society.

Table 1: Other common Medicinal plants						
S. No	Common Name	Tamil Name	Botanical Name	Family	Plant part used	Medicinal Uses
1	Holy basil	துளசி	Ocimum sanctum	Lamiaceae	Leaves and Roots	The leaves are stimulant, antiseptic, anti- hypertensive and anti-bacterial and expectorant used in bronchitis. Decoction of roots is given as a diaphoretic in malarial fevel.
2	Indian gooseberry	நெல்லி	Phyllanthus emblica	Phyllanthaceae	Fruit	It is a potent rejuvenator and immune modulator. It has a anti-ageing properties. It helps to promote longevity, enhance digestion, treat constipation and reduce fever and cough.
3	Indian Acalypha	குப்பைமேனி	Acalypha indica	Euphorbiaceae	Leaves	Used to cure skin diseases caused by ringworms. Powdered leaves are used to cure bedsores and infected wounds.
4	Vilvam	ഖിல்ഖம்	Aegle marmelos	Rutaceae	Fruit	The unripe fruit is used to treat problems of stomach indigestion. It kills intestinal parasites.
5	Veldt grape	பிரண்டை	Cissus quadrangularis	Vitaceae	Stem and root	Paste obtained from the powdered stem and root of this plant is used in bone fractures. Whole plant is useful to treat asthma and stomach troubles.

198

Hence most of the countries have banned its cultivation and use.



Narcotics Control Bureau (NCB)

Drugs come in various forms and can be taken in numerous ways. Some are legal and others are not. Drug abuse and misuse can cause numerous health problems and in serious cases death can occur.

The Narcotics Control Bureau (NCB) is the nodal drug law enforcement and intelligence agency of India and is responsible for fighting drug trafficking and the abuse of illegal substances.



10.11 Entrepreneurial Botany

Entrepreneurial Botany is the study of how new businesses are created using plant resources as well as the actual process of starting a new business. An **entrepreneur** is someone who has an idea and who works to create a product or service that people will buy, by building an organization to support the sales. **Entrepreneurship** is now a popular topic for higher secondary students, with a focus on developing ideas to create new ventures among the young people.

Vast opportunities are there for the students of Botany. In the present scenario students should acquire ability to merge skills and knowledge in a meaningful way. Converting botanical knowledge into a business idea that can be put into practice for earning a livelihood is the much-needed training for the students.

Few examples for activities of entrepreneurship are Mushroom cultivation, Single cell protein (SCP) production, Seaweed liquid fertilizer, Organic farming, Terrarium, Bonsai and Cultivation of medicinal and aromatic plants

This part of the chapter is dealt about organic farming in brief.

10.11.1 Organic farming

Organic farming is an alternative agricultural system in which plants/crops are cultivated in natural ways by using biological inputs to maintain soil fertility and ecological balance thereby minimizing pollution and wastage. Indians were organic farmers by default until the green revolution came into practice.

Use of biofertilizers is one of the important components of integrated organic farm management, as they are cost effective and renewable source of plant nutrients to supplement the chemical fertilizers for sustainable agriculture. Several microorganisms and their association with crop plants are being exploited in the production of biofertilizers. Organic farming is thus considered as the movement directed towards the philosophy of **Back to Nature.**

I. Organic Pesticide

Pest like aphids, spider and mites can cause serious damage to flowers, fruits, and vegetables. These creatures attack the garden in swarms, and drain the life of the crop and often invite disease in the process. Many chemical pesticides prove unsafe for human and the environment. It turns fruits and vegetables unsafe for consumption. Thankfully, there are many homemade, organic options to turn to war against pests.

II. Bio-pest repellent

Botanical pest repellent and insecticide made with the dried leaves of *Azadirachta indica*

Preparation of Bio-pest repellent

- Pluck leaves from the neem tree and chop the leaves finely.
- The chopped up leaves were put in a 50-liter container and fill to half with water; put the lid on and leave it for 3 days to brew.
- Using another container, strain the mixture which has brewed for 3 days to remove the leaves, through fine mesh sieve. The filtrate can be sprayed on the plants to repel pests.

Preparation of Organic Pesticide

Add the vegetable

paste to 500 ml of

warm water. Give the

ingredients a stir to

thoroughly mix them

3



Mix 120g of hot chillies with 110 g of garlic or onion. Chop them thoroughly.



 $(\mathbf{1})$

Strain the mixture. Pour the solution through a strainer, remove the vegetables and collect the vegetable-infused water and pour into another container. This filtrate is the pesticide. Either discard the vegetables or use it as a compost.



Blend the vegetables together manually or using an electric grinder until it forms a thick paste.



together.

Pour the pesticide into a squirt bottle. Make sure that the spray bottle has first been cleaned with warm water and soap to get rid it of any potential contaminants. Use a funnel to transfer the liquid into the squirt bottle and replace the nozzle.



Pour the solution into a glass container and leave it undisturbed for 24 hours. If possible, keep the container in a sunny location. If not, at least keep the mixture in a warm place.



Spray your plants with the pesticide. Treat the infected plants every 4 to 5 days with the solution. After 3 or 4 treatments, the pest will be eliminated. If the area is thoroughly covered with the solution, this pesticide should keep bugs away for the rest of the season.

Avoid spraying the plants during the sunny times of the day since it could burn plants. Many other plants possess insect repellent or insecticidal properties. Combinations of these plants can be fermented and used as biopesticide.

Figure 10.20: Preparation of organic pesticide

To make sure that the pest repellent sticks to the plants, add 100 ml of cooking oil and the same amount of soap water. (The role of the soap water is to break down the oil,



and the role of the oil is to make it stick to the leaves).

• The stewed leaves from the mixture can be used in the compost heap or around the base of the plants.

Summary

Early civilization in different parts of the world has domesticated different species of plants

for various purposes. Based on their utility, the economically useful plants are classified into food plants, fibre plants, timber plants, medicinal plants, and plants used in paper industries, dyes and cosmetics.

However, food base of majority of the population depends on very few Cereals, Millets, Pulses, Vegetables, Fruits, Nuts, Sugars, Oil seeds, Beverages, Spices and Condiments.

Oils can be classified into two types namely, essential oils and vegetable oils. Fatty acids in oil may be saturated or unsaturated. The oil yielding plants are groundnut and sesame. The oils are used in cooking, making soaps and other purposes. Beverages contain



alkaloids that stimulate central nervous system. Spices were used throughout the world for several years. Cardamom is 'Queen of Spices' used for flavouring confectionaries and beverages. Black pepper is King of Spices.

Botanically a fibre is a long, narrow, thick walled cell. Cotton and Jute are fibre yielding plants. Teak is wood used for making furniture. Rubber is produced from the latex of Hevea brasiliensis. Paper production is a Chinese invention. Dyes have been used since ancient times. The orange dye henna is from the leaves of Lawsonia. Perfumes are volatile and aromatic in nature, manufactured from essential oils which are found at different parts of the plant. Medicinal plants serve as therapeutic agents. Medicinally useful molecules obtained from these plants are marketed as drugs are called Biomedicines. Whereas phytochemicals from some of the plants which alter an individual's perceptions of mind by producing hallucination are known as psychoactive drugs.

Entrepreneurial Botany is the study of how new businesses are created using plant resources as well as the actual process of starting a new business.

Evaluation

- 1. Consider the following statements and choose the right option.
 - i) Cereals are members of grass family.
 - ii) Most of the food grains come from monocotyledon.
 - a) (i) is correct and (ii) is wrong
 - b) Both (i) and (ii) are correct
 - c) (i) is wrong and (ii) is correct
 - d) Both (i) and (ii) are

wrong

2. Assertion: Vegetables are important part of healthy eating.



Reason: Vegetables are succulent structures of

plants with pleasant aroma and flavours. a) Assertion is correct, Reason is wrong

201

Economically useful plants and Entrepreneurial Botany

- b) Assertion is wrong, Reason is correct
- c) Both are correct and reason is the correct explanation for assertion.
- d) Both are correct and reason is not the correct explanation for assertion.
- 3. Groundnut is native of ____
 - a) Philippines b) India
 - c) North America d) Brazil
- Statement A: Coffee contains caffeine Statement B: Drinking coffee enhances cancer
 - a) A is correct, B is wrong
 - b) A and B Both are correct
 - c) A is wrong, B is correct
 - d) A and B Both are wrong
- 5. *Tectona grandis* is coming under family
 a) Lamiaceae
 b) Fabaceae
 c) Dipterocaipaceae
 e) Ebenaceae
- 6. Tamarindus indica is indigenous to
 - a) Tropical African regionb) South India, Sri Lankac) South America, Greece
 - d) India alone
- 7. New world species of cottona) Gossipium arboretumb) G.herbaceum
 - c) Both a and b
 - d) G.barbadense
- 8. Assertion: Turmeric fights various kinds of cancer Reason: Curcumin is an anti-oxidant
 - present in turmeric
 - a) Assertion is correct, Reason is wrong
 - b) Assertion is wrong, Reason is correct
 - c) Both are correct
 - d) Both are wrong
- 9. Find out the correctly matched pair.
 - a) Rubber Shorea robusta
 - b) Dye Lawsonia inermis
 - c) Timber *Cyperus papyrus*
 - d) Pulp Hevea brasiliensis
- Observe the following statements and pick out the right option from the following: Statement I – Perfumes are manufactured from essential oils. Statement II – Essential oils are formed at

- different parts of the plants.
- a) Statement I is correct
- b) Statement II is correct
- c) Both statements are correct
- d) Both statements are wrong
- 11. Observe the following statements and pick out the right option from the following: Statement I: The drug sources of Siddha include plants, animal parts, ores and minerals.

Statement II: Minerals are used for preparing drugs with long shelf-life.

- a) Statement I is correct
- b) Statement II is correct
- c) Both statements are correct
- d) Both statements are wrong
- 12. The active principle trans-tetra hydro canabial is present in
 - a) Opium b) Curcuma
 - c) Marijuana d) Andrographis
- 13. Which one of the following matches is correct?
 - a) Palmyra Native of Brazil
 - b) Saccharun Abundant in Kanyakumari
 - c) Steveocide Natural sweetener
 - d) Palmyra sap Fermented to give ethanol
- 14. The only cereal that has originated and domesticated from the New world.
 - a) *Oryza sativa* b)*Triticum asetumn*
 - c) *Triticum duram* d) *Zea mays*
- 15. Write the cosmetic uses of *Aloe*.
- 16. What is pseudo cereal? Give an example.
- 17. Discuss which wood is better for making furniture.
- 18. A person got irritation while applying chemical dye. What would be your suggestion for alternative?
- 19. Name the humors that are responsible for the health of human beings.
- 20. Give definitions for organic farming?
- 21. Which is called as the "King of Bitters"? Mention their medicinal importance.
- 22. Differentiate bio-medicines and botanical medicines.
- 23. Write the origin and area of cultivation of green gram and red gram.

- 24. What are millets? What are its types? Give example for each type.
- 25. If a person drinks a cup of coffee daily it will help him for his health. Is this correct? If it is correct, list out the benefits.
- 26. Enumerate the uses of turmeric.
- 27. What is TSM? How does it classified and what does it focuses on?
- 28. Write the uses of nuts you have studied.
- 29. Give an account on the role of *Jasminum* in perfuming.
- 30. Give an account of active principle and medicinal values of any two plants you have studied.
- 31. Write the economic importance of rice.
- 32. Which TSM is widely practiced and culturally accepted in Tamil Nadu? explain.
- 33. What are psychoactive drugs? Add a note *Marijuana* and *Opium*
- 34. What are the King and Queen of spices? Explain about them and their uses.
- 35. How will you prepare an organic pesticide for your home garden with the vegetables available from your kitchen?

Glossary

Alzheimer's disease: A type of dementia that causes problems with memory, thinking and behavior

Antiperspirant: Products whose primary function is to inhibit perspiration / sweat

Anti-inflammatory: the property of a substance or treatment that reduces swelling.

Antioxidant: A substance that scavenges free radicals.

Carminative: A drug causing expulsion of gas from the stomach or bowel.

Cirrhosis: A chronic liver disease typically caused by alcoholism or hepatitis.

Confectionary: a place where confections/ sweets are kept or made

Cosmetics: substances or products used foe personal grooming.

Diuretic: Substance that promote urine

202

Economically useful plants and Entrepreneurial Botany

Economically useful plants and Entrepreneurial Botany

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production

Ethnobiology: Ethnobiology is the study of relationships between peoples and plants.

Fixative: A substance used to reduce the evaporation rate and improve stability when added to more volatile components.

Lubricant: Oily substance reduces friction.

Malnutrition: Deficiencies, excesses or imbalances in a person's intake of energy and /

or nutrients

Odour: Smell (pleasant or unpleasant).

Perfumery: The art or process of making perfume

Pharmacopoeia: Is a book containing directions for the identification of compound medicines, and published by the authority of a government or a medical or pharmaceutical society.

Seasoning: The processing of food with spices and condiments to enhance the flavour.



203

Economically useful plants and Entrepreneurial Botany

Economically useful plants and Entrepreneurial Botany

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203

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