

**Let's recall**

- What is meant by Horticulture?
- Which crops are covered under the Horticulture?
- Importance and scope for horticultural crops in India.
- Recent developments in Horticulture industry.
- Nutritional importance of fruits and vegetables.
- Which horticultural crops have export potential?

**Remember this**

Certain horticultural crops have special economic importance and these crops are grown by farmers with commercial approach. Such crops are useful for changing farmers economic condition. The special horticultural crops are the alternative for traditional agriculture, however they can be grown along traditional crops. These crops can be grown on commercial scale as well as on amature scale. These crops can be cultivated in various combinations and with different objectives

15.1 Different horticultural crops having special economic importance

The special horticultural crops are categorized in following way

- | | |
|----------------------|-----------------------|
| (1) Plantation crops | (2) Spice crops |
| (3) Aromatic crops | (4) Medicinal plants |
| (5) Vegetable crops | (6) Exotic crops |
| (7) Flower crops | (8) Ornamental Plants |

One or few crops from the each group are known be special as they have distinctive characters and uses

**Remind**

- Have you seen sugarcane plantation and sugar factory?
- Have you visited jaggery production unit?

15.1.1 Plantation Crops

Plantation crops are those which are cultivated on extensive scale.

Plantation is a large scale unit usually of a single crop.

Plantation is a large scale estate meant for farming that specializes in cash crop.

These crops are grown in huge plantations and need to undergo certain processing. Such processing units are established in plantation areas, there by having great impact on socio economic development of that region.

Different plantation crops are as follows

a. Tea - *Camellia sinensis*

Family - Theaceae

Tea plant is an evergreen shrub grown for its leaves. Top shoots along with two youngest leaves are removed and cured to impart taste and flavor. Leaf, broken and dust are the three grades of tea.

Tea is important crop of Assam, Nilgiri, Dargiling and hilly areas of India.



Fig. 15.1 Tea

b. Coffee - *Coffea robusta* *Coffea arabica*
Family - Rubiaceae

All coffee plant species are woody evergreens, but the plants range in size from small shrubs to trees more than 10 meters tall. Leaves vary in colour from yellowish to dark green, with touches of bronze or purple. The plant produces white flowers and red berries or “cherries” that contain seeds. Most coffee berries contain two seeds, which are known as “beans”. Beans are harvested from matured fruit, dried and powdered and used to make coffee beverage. Coffee is one of the important crops of Karnataka.



Fig. 15.2 Coffee



Use your brain power

You may have drunk coffee which is made by conventional filtering method or an instant coffee. Can you find how both the type of coffee powders are made?

c. Cocoa - *Theobroma cocoa*
Family - Malvaceae

Cocoa fruit contain seeds with pulp. The matured seeds are fermented, washed and powdered and then used for chocolate making.

Forestero and Criollo are the two famous varieties of cocoa.



Fig. 15.3 Cocoa



Do you know ?

Cocoa beans were used as currency during ancient period

d. Rubber- *Hevea brasiliensis*
Family- Euphorbiaceae

Natural rubber, also called Indian rubber, as initially produced, consists of polymers of the organic compound isoprene, with minor impurities of other organic compounds, plus water. Currently, rubber is harvested mainly in the form of the white latex from rubber plant trunk. The latex is a sticky, milky colloid drawn off by making incisions in the bark and collecting the fluid in vessels in a process called "tapping". The latex then is refined into rubber ready for commercial processing. Latex is allowed to coagulate in the collection cup and lumps are collected and processed into dry forms for marketing. Natural rubber is used extensively in many applications.



Fig. 15.4 Rubber

e. Coconut- *Cocos nucifera*
Family - Arecaceae

The coconut tree is a member of the palm tree family. The term "coconut" can refer to the whole coconut palm, the seed, or the fruit, which botanically is a drupe and not a nut. Coconuts are known for their versatility of uses, ranging from food to cosmetics. The inner flesh of the mature seed forms a regular part of the diets of many people known as *khobara*.

Coconuts are distinct from other fruits

because their endosperm contains a large quantity of clear liquid and when immature, may be harvested for their coconut water known as *shahale*. Mature, ripe coconuts can be used as *prasad* or nariyal (edible seeds), or processed for oil and coconut milk from the flesh, charcoal (active carbon) from the hard shell, cocopeat and coir from the fibrous husk. Dried coconut flesh is called *copra*, and the oil derived from it is commonly used in cooking as well as in making soaps and cosmetics. The hard shells, fibrous husks and long pinnate leaves can be used as raw material to make a variety of products for furnishing and decorating, brooms, *chatai*, etc. The coconut fruit also has cultural and religious significance in certain societies.



Fig. 15.5 Coconut

f. Arecanut - *Areca catchue* (Supari)
Family- Arecaceae

It is a species of palm which grows in much of the tropical Pacific, Asia, and parts of East Africa. The palm is believed to have originated in the Philippines, but is widespread in cultivation and is considered naturalized in India, widely grown in Karnatka state. The species has many common names including the areca palm, areca nut palm, betel palm, Indian nut, etc. This palm is called the betel tree because its fruit, the areca nut, is often chewed along with the betel leaf. Further is has medicinal and industrial uses.



Fig. 15.6 Arecanut

g. Cashew nut - *Anacardium occidentale*
(Kaju)

Family - Anacardeaceae

The cashew nut, often simply called a cashew, is widely consumed. It is eaten on its own, used in recipes, or processed into cashew cheese or cashew butter. The shell of the cashew seed yields derivatives that can be used in many applications including lubricants, waterproofing, paints, and arms production. The cashew apple has a light reddish to yellow colour. Its pulp can be processed into a light sweet, astringent fruit drink or distilled into liquor (called fenny in Goa). Cashew nut is known as dollar earning crop. India is the world's leading producer and exporter of cashew kernels.



Fig. 15.7 Cashew nut

15.1.2 Spice Crops

Spice is a substance that is used in cooking to add flavour to food which comes from dried plant part, powder or seed.

Spice is a seed, fruit, root or other plant part primarily used for flavouring, colouring or preserving food.



Remember this

India produces 75 varieties of spices of the 109 listed by International Spice Organisation and is also the largest producer of spices

Spices are classified according to their share in spice trade industry of the world.

(i) Major spices

Contribute about 75-90% of total spice trade. These are pepper, cumin, cardamom, ginger, turmeric and chilli.

(ii) Minor spices

These have less contribution in trade and are further classified as follows

- (a) Seed spices - Coriander, mustard, poppy, caraway, celery, fenugreek, etc.
- (b) Bulbous spices - Garlic, onion, leek, shallot, etc.
- (c) Aromatic spices - clove, cinnamon, all spices, ani seed, nutmeg, etc.
- (d) Leafy spices - Curry leaf, mint, rosemary, parsley, bay leaf, etc.
- (e) Acidulant tree spices - Tamrind, kokum, anardana, etc.

a. Cardamom (Veldoda) - *Elettaria cardamomum* Family-Zingiberaceae

Cardamom is grown for small black seeded pods. Spindle shaped pods contain black seeds. These are used for flavoring as well as cooking spice. Cardamom is known as Queen of spices.



Fig. 15.8 Cardamom

b. Black Pepper (Kali Miri) – *Piper nigrum* Family - Piperaceae

A vine crop cultivated for its small fruits which are usually dried and used as spice. Universally known as King of spices. Black pepper and white pepper are the types and have used for different purposes.



Fig. 15.9 Black pepper

c. Ginger (Ale) - *Zingiber officinale* Family Zingiberaceae

Ginger is a flowering plant whose rhizome, is widely used as a spice and for medicinal purposes. It is a herbaceous perennial, which grows annual pseudostem about a meter tall bearing narrow leaf blades. The inflorescences bear pale yellow with purple flowers and arise directly from the rhizome on separate shoots.

Ginger originated in Island Southeast Asia. Ginger produces a hot, pungent fragrant taste. Young ginger rhizomes are juicy and fleshy with a mild pungent taste due to gingersol. They are often pickled in vinegar. They can be steeped in boiling water to make ginger herb tea. Ginger can be made into candy or ginger wine. Ginger sets are dried into 'sunth', powder, ginger oil and oleo-resin. Ginger essence is used in pharmaceutical produces.



Fig. 15.9 Ginger



Remind

Medicinal property of ginger is because of ginglyol.

Have you eaten *alepak* or *sunth vadi*? And When?

d. Turmeric (Halad) - *Curcuma longa*

Family - Zingiberaceae

The plant is native to the Indian subcontinent. After harvesting the rhizomes are boiled in water for about 30–45 minutes and then dried in hot dryer, after which they are ground into a deep orange-yellow powder. It is commonly used as a coloring and flavoring agent in ayurvedic medicines.



Fig. 15.11 Turmeric

e. Cinnamon (Dalchini) - *Cinnamomum zealanicum*

Family - Lauraceae

Cinnamon is a spice obtained from the inner bark of a perennial shrub. Cinnamon is used mainly as an aromatic condiment and flavouring spice additive. The aroma and flavour of cinnamon is derived from its essential oil and principal component, cinnamaldehyde, as well as numerous other chemical constituents, including eugenol.



Fig. 15.12 Cinnamon

f. Clove (Lavang) - *Eugenia caryophyllata*

Family - Myrtaceae

Clove is native to India grown in South India. Clove flower buds are used as a spice in India. It is an evergreen tree of humid tropical climate and hilly tract of the Western Ghats and the red soils are best suitable for clove cultivation. A major component of clove taste is imparted by the chemical compound eugenol and it is used in traditional medicines. The clove oil is effective for toothache pains or other types of pains related health problems. It is widely used in all types of masala preparations.



Fig. 15.13 Clove

g. Chilli – *Capsicum annum*

Family Solanaceae

Chilli fruit is used in green and red form. (The dried ripe fruit) The chilli is an annual shrub. The flowers converted in red peppers after maturity, *Capsicum frutescence* is a perennial chilly with small sized pods which are highly pungent. It is commonly known as 'bird chilly'. Green chilli pods and dried chilli powder are commonly used in food preparation to get desired pungent taste and red colour. The pungency in chilli is due to capsaicin compound.



Fig. 15.14 Chilli

Find information on

Allspice-Plants Allspice, also called pimenta, *Jamaica pimenta*, or myrtle pepper, is the dried unripe fruit of *Pimenta dioica*, a mid canopy tree, native to the Greater Antilles, southern Mexico, and Central America, now cultivated in many warm parts of the world.

15.1.3 Aromatic crops

These are plants that produce and exude aromatic substances which are used in making perfumes, in cooking and in the food, pharmaceuticals and liquor industries.

Odoriferous and volatile substances occur as essential oils, gum extract, balsam and oleoresin in one or more parts viz. root, wood, bark, foliage, flower and fruit of the aromatic plant. The aromatic substances are obtained by the methods like distillation, maceration, expression and solvent extraction.

**a. Sandalwood- *Santalum album* (Chandan)
Family - Santalaceae**

Sandalwood is a class of woods from trees in the genus *Santalum*. The wood is heavy, yellow, and fine-grained, and unlike many other aromatic woods, they retain their fragrance for decades. Sandalwood is the second-most expensive wood in the world. Both the wood and the oil produce a distinctive fragrance that has been highly valued. Sandalwood trees are medium sized hemiparasitic. It is a threatened species indigenous to South India. Oil has a distinctive soft worm, smooth, creamy and

milky precious wood scent. Used in perfume, acts as finative, cosmetic and soap industry Sandalwood oil prices have risen to Rs 1.4 lakh per kg.



Fig. 15.15 Sandalwood

**b. Senna (Sonamukhi) - *Senna alexandrina*
Family - Fabaceae**

Senna is a large genus of flowering plants in the legume family .This diverse genus is native throughout the tropics, with a small number of species in temperate regions. The leaves of senna plant are used in tea hot drink and may help to relieve constipation. Some senna species are used as ornamental plants in landscaping. The plant is adapted to many climate types. Cassia gum, an extract of the seeds of Chinese senna is used as a thickening agent.



Fig. 15.16 Senna

**c. Geranium - *Pelargonium graveolens*
Family - Geraniaceae**

The family includes both the genus *Geranium* (the cranesbills, or true

geraniums) and the garden plants are called geraniums, which modern botany classifies as genus *pelargonium*, along with other related genera. The oil of geranium has a refreshingly delicate rose like aroma. As such itself is a perfume.



Fig. 15.17 Geranium

**e. Khus (Wala) - *Vetiveria incognita*
Family - Poaceae**

Khus is a perennial bunch grass native to India. The plant helps to stabilize soil and protects from erosion, but it can also protect fields against pests and weeds. It is also used as animal feed. Its spongy branched fine rootlets contain fragrant oil. Oil is extracted and used for cosmetics, aromatherapy, herbal skin care and ayurvedic soap. Due to its fibrous properties, the plant can also be used for handicrafts, ropes, food and flavourings, perfumery, etc.



Fig. 15.18 Khus

15.1.4 Medicinal plants

The plants having medicinal property in their any of the plant parts are known as medicinal plants. They provide basic raw

material for the indigenous pharmaceuticals, perfumery, flavour and cosmetic industry.

The curative property of drugs are due to the presence of complex chemical substance of varied composition in one or more parts of the plant.

India is known as rich wealth of medicinal plants. One of the oldest book 'Charak samhita' records the use of over 340 drugs of vegetable origin.

During last few decades the pharmaceutical industry has made massive investment on pharmacological, clinical and chemical researches all over the world.

**a. Opium (Aphu)– *Papaver somniferum*
Family Papaveraceae**

Latex of unripe fruit contains codeine, morphine used for pain relief. Approximately 12 % of opium latex is made up of analgesic alkaloid morphine which is processed chemically to produce heroin and other synthetic opioids for medical use and for illegal drug trade.



Fig. 15.19 Opium

**b. Psyllium (Isabgol) *Plantago ovata*
Family – Plantaginaceae**

Psyllium is mainly used as a dietary fibre to relieve symptoms of both constipation and mild diarrhea and occasionally as a food thickener. Research has shown that lowering of blood cholesterol levels in people with high cholesterol, and lowering of blood glucose levels in people with type 2 diabetes. The plants from which the seeds are extracted tolerate dry

and cool climates and are mainly cultivated in northern India. Fruit, husk and seed coat are used against chronic constipation.



Fig. 15.20 Isabgol

**c. Mints (Pudina) *Mentha piperata*
Family – Lamiaceae**

Mint is aromatic perennial herb. It has wide spreading underground and over ground stolons and erect branched stems. Volatile oil of plant is used as antiseptic, carminative and stimulant.



Fig. 15.21 Mint

**d. Rouwolfia (sarpagandha) -
Rouwolfia serpentina
Family - Apocynaceae**

Roots contain alkaloids like reserpine, serpentinine. Antidote for snake bite and medicine for blood pressure. Reserpine is an alkaloid first isolated from *R. serpentina* and was widely used as an antihypertensive drug. It had drastic psychological side effects and has been replaced as a first-line antihypertensive drug by other compounds that lack such adverse effects, although combination drugs that include it are still available in some countries as second-line antihypertensive drugs.



Fig. 15.22 Sarpagandha

**e. Lemon grass (Gavati chaha) –
Cymbopogon schoenanthus
Family - Poaceae**

Lemon grass is widely used as a culinary herb in Asian cuisines and also as a medicinal herb in India. It has a subtle citrus flavour and can be dried and powdered, or used fresh. It is commonly used in teas, soups, and curries. Lemon grass oil is used as a pesticide and a preservative. Research shows that lemon grass oil has antifungal properties. Despite its ability to repel some insects, such as mosquitoes, its oil is commonly used as a "lure" to attract honey bees.

Used in tea, soups and curries



Fig. 15.23 Lemon grass

**f. Vasaka (Adulsa) – *Adhatoda vasaca*
Family Acanthaceae**

Adhatoda, commonly known adulsa, vasa or *vasaka* is a medicinal plant native to Asia. The plant is native of Indian subcontinent.. This shrub has a number of traditional medicinal uses in Ayurvedic and Unani systems. Drug vasaka is obtained from dried leaves of the plant. Vasaka is mainly used in treatment of

chronic bronchitis and asthma. Leaf juice is given in the treatment of dysentery and diarrhea. Leaves contain vaccine which is expectorant and antiplasmodic.



Fig. 15.24 Adulsa

g. Amla – *Emblica officinale*
Family - Euphorbiaceae

The tree is small to medium in size, usually deciduous. The fruit is nearly spherical, light greenish-yellow, quite smooth and hard on appearance, with six vertical stripes or furrows.

After ripening the berries are harvested by hand. The taste is sour, bitter and astringent and it is quite fibrous in nature. Indian gooseberry is a common constituent, and most notably is the primary ingredient in an ancient herbal Chyawanprash. The fruit is commonly pickled with salt, oil, and spices. Murambah, a sweet dish is made by soaking the berries in sugar syrup until they are candied. It is traditionally consumed after meals. Popularly used in inks, shampoos and hair oils. Fruit contains large quantity of Vitamin C (600 mg/ 100 g) and is used against cough, cold and as a laxative in hyperacidity. Amla fruit is commonly used squash, juice, syrup, and crush.



Fig. 15.25 Amla

15.1.5 Vegetable Crops

Vegetables are parts of plants that are consumed by humans as food or as a part of a meal.

Vegetables collectively refer to all edible plant matter including the flowers, fruits, stems, leaves, roots and seeds.

Vegetables supply vital vitamins and minerals and known as protective food. They enhance palatability and intake of food.

According to plant part consumed vegetables are classified as under,

- (1) Leafy vegetables – Spinach, Amaranthus, Cabbage, Fenugreek
- (2) Fruit vegetables – Bottle gourd, Bitter gourd, Brinjal, Tomato, Capsicum, Pumpkin, Cucumber, Okra, etc.
- (3) Immature seeds and pods – Pea, Cowpea, French bean, Cluster bean, Indian bean, etc.
- (4) Root vegetables - Radish, Turnip, Carrot, Beet root
- (5) Tuber and bulb vegetables – Onion, Garlic, Potato, Sweet potato
- (6) Other vegetables – Cauliflower, knolkhol, Yam, Colocasia, etc.

a. Tomato – *Lycopersicon esculentum*
Family – Solanaceae

It is grown for its mature or ripe fruit, which has various culinary uses and used in preparation of many preserved products. It is very much popular all over the world. The tomato red color is due to antioxidant lycopene.

Important varieties – Arka sourabh, Arka vikas, Sl -120, Pusa early dwarf, Pusa rubi, etc.



Fig. 15.26 Tomato

b. Brinjal – *Solanum melongena*

Family – Solanaceae

It is one of the most common tropical vegetables grown in India. Many delicious dishes are prepared from fruits. Important varieties – Pusa kranti, manjarigota, Pusa purple long, etc.



Fig. 15.27 Brinjal

c. Cauliflower – *Brassica oleracea* var. *botrytis*

Family – Cruciferae

Edible part of cauliflower is known as curd which consists of a shoot system with short internodes, branches apices and bracts.

Important varieties – Early kunwari, Pusa synthetic, Pusa sharad, Pant shubhra, Pusa shubhra, etc.



Fig. 15.27 Cauliflower

d. Okra (Bhendi) - *Abelmoschus esculentus*

Family - Malvaceae

The crop is cultivated for its young tender fruits. It is major vegetable crop, available round the year having high export potential. Important varieties Arka anamika, Pusa makhamali, Parbhani kranti, Pusa sawani, etc.



Fig. 15.29 Okra

e. Potato - *Solanum tuberosum*

Family-Solanaceae

It is the top ranked vegetable grown in the world. It has high food value. It is grown for its stem tubers. It is a cool season crop. The aerial part of the stem is hollow, except its nodes. The tuber is shortened, thickened stem bearing buds. Potato tubers are used as a fresh vegetables and can be processed into many products.

Important varieties-Kufri Badashaha, Kufri Sindhuri, Kufri chandramukhi, Kufri Chamatkar, Kufri Jyoti, etc.



Fig. 15.30 Potato

f. Cucumber - *Cucumis sativus*

Family - Cucurbitaceae

Vine crop grown for its tender fruits which are usually used as salad. The stems are long and trailing. The fruits are elongated and



Fig. 15.31 Cucumber

cylindrical, vary in size and sometimes can be oval or short.

Important varieties - Japanese long green, Poona Khira, Sheetal, Pusa Sanyog, etc.

g. Carrot - *Daucus carota*

Family - Umbeliferae

Grown for its delicious tap roots. Roots are highly nutritive and useful as a salad

Important varieties - Nantes, Pusa yamdagni, Pusa kesar, Chantaney, etc.



Fig. 15.32 Carrot

h. Amaranthus - *Amaranthus species*

Family - Amaranthaceae

Entire young plant is used as a leafy vegetable

Important varieties - Chhoti Chaulai, Badi chaulai.



Fig. 15.33 Amaranthus

i. Onion - *Allium cepa*

Family - Amarylidaceae/ liliaceous

It is biennial herb with a characteristics smell. Bulb is formed by the attachment of swollen leaf bases the is formed by the

attachment of to underground part of stem which is small and rudimentary.

Varieties – Arka kalyan, Arka Pragati, Baswant-780, N-53, Agrifound dark red, Agrifound light red.



Fig. 15.34 Onion

15.1.6 Exotic Crops

The crops which are not indigenous to country are known as exotic crops.

Certain exotic crops are becoming popular in India. Indian farmers have started growing exotic crops as they are in great demand in Indian market and have scope for export. Exotic fruit like dragon fruit is becoming popular and fetches higher price in domestic market.

a. Broccoli - *Brassica oleracea var.italica*

Family - cruciferae

Braccoli is a cruciferous vegetable. It contains high amount of many nutrients, fibre, Vitamin C, Vitamin K, etc. Braccoli also contains more protein than other vegetables. Varieties-Calabrease, Brouzino, etc.



Fig. 15.35 Broccoli

b. Zucchini - *cucurbita pepo*

Family - cucurbitaceae

It is known as type of summer squash which can reach nearly 1 m in length. It is usually harvested when still immature. Some cultivars have dark green or deep yellow colour. Varieties - Raven, Bush baby, Black beauty, faudbook, etc.



Fig. 15.36 Zucchini

c. Dragon fruit (Pitaya) - *Hylocereus species*

Family - Cactaceae

Dragon fruit is very strange looking fruit. The dragon fruit is also known as a pitahaya or pitaya. Dragon fruit plant sowing is excellent in the less rainfall areas. Varieties - Pitaya rosa, pitaya blanca, etc.



Fig. 15.37 Dragon fruit



Remember this

Dragon Fruit is used in jams, ice creams, jelly production, fruit juice, wine face packs.

d. Celery - *Apium graveolens L.*

Family - Apiaceae

It is marshland plant has been cultivated

as vegetable since antiquity. Celery has long fibrous stalk tapering into leaves. Its stalk, leaves or hypocotyle are eaten and used in cooking.

Varieties - standard bearer, weigh grove giant, etc.



Fig. 15.38 Celery

f. Lettuce - *Lactula sativa L.*

Family - Asteraceae

It is an annual plant. It is often grown as a leafy vegetable but some times for stem and seeds. Lettuce is mostly used for salads. It can also used in soups, sandwiches and wraps.

Varieties - Great lakes, Chinese yellow, slobalt, etc.



Fig. 15.39 Lettuce

15.1.7 Flower crops

Flowers symbolize beauty, love and tranquility. Besides there aesthetic value, they are important for their economic uses such as cut blooms and for extracting essential oils. In India flowers are sanctified and use for worshipping

The important flower crops.

a. Rose - *Rosa spp.*

Family - Rosaceae

It is a beautiful flower and accepted all over the world. It is grown on commercial scale and on amateur basis.

Rose is propagated by shield budding method.

Varieties-Gladiator, Superstar, Double delight, Devine, Dekore, etc.



Fig. 15.40 Rose

b. Jasmine - *Jasminum species*

Family - Oleaceae

About 200 species of jasminum have climbing or shrub type growth habit.

Mogra, Jai, Jui, Chameli are the Important types they are particularly grown for their scented loose flowers
Parimullai and Co-2 (Jui)
CO-1 (Chameli)
Gundumalli, Ramban, Madanban (Mogra)



Fig. 15.41 Jasmine

c. Chrysanthemum - *Chrysanthemum species*

Family - Asteraceae

Annual and perennial types are found. It is grown for flowers, in pots and garden for decorative purposes. It is propagated by suckers.

Snowball, Potomal, M-24, Agnishikha, Navneet yellow, Gauri, Pournima, etc.



Fig. 15.42 Chrysanthemum

d. Marigold (Zendu) : *Tagetes erecta* (African marigold) *Tagetes patula* (French marigold)

Family - Asteraceae

Grown for composite flowers which are in great demand during festive season.

Varieties - Giant double, Cracker jack, Charm, Butter scotch, etc.



Fig. 15.43 Marigold

e. Tuberose (Gulchadi / Nishigandha) - *Polyanthes tuberosa*

Family - Amaryllidaceae

White scented flowers are used for garlands

Essential oil is extracted from flowers is used in perfumery and cosmetic. Tuberose is propagated by bulbs.

Varieties - Arka Nirantara, Shringar, Prajwal, Kalyani double, Vaibhav, Pearl, Svasini, etc.



Fig. 15.44 Tube Rose

f. Gerbera - *Gerbera jamesonii*

Family - Asteraceae

Gerbera is also known as Transval daisy. Long stalked flowers also stay long in Vases .It is grown in open fields and under cover also .Flower have export potential. It is propagated by suckers and tissue cultured seedlings.

Varieties -Ruby red, Dusty, Shania, Superniva, Maria, Black jack, etc.



Fig. 15.45 Gerbera

15.1.8 Ornamental plants

Ornamental plants are those plants which are used for beautification of surrounding by virtue of the attractive form, flower, foliage, growth habit of the plant.

Botanically ornamentals are widely spread over entire plant kingdom. They are used in garden, houses, pots, roads, etc.

There are different categories of ornamental plants. They are classified according to their growth habit and use

- (1) Herbaceous perennials-coleus, aglonema, diffenbachia, etc.
- (2) Flowering annual-Aster, marigold, hollyhock, spider flower, etc.
- (3) Shrubs-Croton, duranta, hamelia, tecoma, hibiscus, musanda, etc.
- (4) Trees- Gulmohar, Pilmohar, Bahavra, Kanchan, etc.
- (5) Climbers and creepers- sankrant vel, Argannillea, etc.
- (6) Grasses and bamboos- Ribbon grass, etc.
- (7) Bulbous plants- lilies, gladiolus, dahlia, Tulip, etc.
- (8) Cacti and succulents –Sanpendro cactus, oldman, old lady, etc.
- (9) Palms –Areca palm, fishtail palm, bottle palm, etc.
- (10) Hydroplants-Lotus, Nehmbo, hyacinth, etc.

Exercise

Q 1 A. Fill in the blanks.

1. Plantation is the term used for large scale unit usually of a ----- crop.
2. Cardamom is universally known as ----- of spices.
3. Amla contain Vitamin ----- in large scale.
4. Potato is an example of ----- tuber.
5. Lettuce leaves are used as ----- vegetable.

B. Make the pairs.

A

1. Tea
2. Coconut
3. Sandalwood
4. Brinjal
5. Dragon fruit

B

- a. Exotic crop
- b. Kerala
- c. Assam
- d. Savoy
- e. Edible oil
- f. Valuable oil
- g. Manjarigota

B. Find the odd out.

1. Tea, Coffee, Cocoa, Coconut, Clove.
2. Black pepper, Cinnamon, Cardamom, Chilli, Cabbage
3. Rose, Chrysanthemum, Gerbera, Marigold, Coriander
4. Aster, Marigold, Hollyhock, Croton, Gaillardia
5. Sandalwood, Geranium, Khus, Senna, Cucumber

C. State true or False.

1. Tea and coffee are prepared from same plant part.
2. Coir is an important product made from coconut husk.
3. Edible part of cauliflower is known as curd.
4. Tamrind is used as seed spice.

5. Fruit of *Curcuma longa* plant has commercial use.

Q 2 Answer in brief.

1. Write short notes on
 - (i) Write short note on importance spice crops.
 - (ii) Ornamental plants
 - (iii) Indian medicinal plants
2. Give difference between.
 - (i) Plantation crops and field crops.
 - (ii) Vegetable crops and flower crops
 - (iii) Medicinal and aromatic plants
3. Give reasons for.
 - (i) Vegetables are called as protective food.
 - (ii) Exotic crops are getting popularity in India.
 - (iii) Sandalwood is a valuable commercial tree.
4. Give examples of
 - (i) Commercial beverage crops
 - (ii) Aromatic plants
 - (iii) Medicinal plants
 - (iv) Vegetable crops
 - (v) Ornamental plants
5. Answer in brief.
 - (i) Write in brief about commercial importance of rubber.
 - (ii) Write in brief – Importance of coconut

Q 3 Answer the following questions.

1. Explain with the help of examples.
 - (i) Medicinal properties of vasaka
 - (ii) Uses of lemon grass.

2. Complete the table.

Crop	Botanical name	Useful plant part	Commercial uses
Cocoa			
Coconut			

Q 4 Answer following questions in detail.

1. Explain in detail importance and classification of spices.
2. Complete the following table

Sr. No.	Crop	Growth Habit	Useful plant part	Productive areas
1	Coconut	Tall monocot tree		
2	Cardamom		Black seeds	
3	Rose		Flower	
4			Stem tuber	Kufri
5		Evergreen shrub		Assam

3. Read the given following paragraph and answer the questions .

The tree of amla is small to medium in size, usually deciduous; the leaves are simple, subsessile and closely set along branchlets, light green, resembling pinnate leaves.. The fruit is nearly spherical, light greenish-yellow, quite smooth and hard on appearance, with six vertical stripes or furrows. Ripening in autumn, the berries are harvested by hand after climbing to upper branches bearing the fruits. The taste is sour, bitter and astringent and it is quite fibrous. Indian gooseberry is a common constituent, and most notably is the primary ingredient in an ancient herbal Chyawanprash. The fruit is commonly pickled with salt, oil, and spices, murabbah, a sweet dish made by soaking the berries in sugar syrup until they are candied. It is traditionally consumed after meals. Popularly used in inks, shampoos and hair oils. Fruit contains vitamin C and is used against cough, cold and as a laxative in hyperacidity.

Questions

- a. Which is an ancient herbal product made from amla?
- b. Which Vitamin is obtained from Amla fruits on large scale?
- c. How amla fruit looks in appearance?
- d. Mention uses of amla fruit.
- e. How amla fruit is in taste?

Activity :

Visit any farm growing horticultural crop and collect information on package of practices of that crop.

Agriculture Science and Technology

Practical syllabus std - XI

Practicals

1. Identification of rocks and minerals.
2. Study of soil profile. Collection and preparation of soil sample for analysis.
3. Study of meteorological equipments.
4. Study of important measurement units used in agriculture and their conversion.
5. Identification of seed and plant parts.
6. Calculation of seed rate, plant population,
7. Study of seed treatments and practicing different methods of sowing
8. Calculation of pure living seed percentage and physical purity percentage of seed.
9. Identification of manures and fertilizers and calculation of their quantity as per the recommendations.
10. Calculation of duty and delta of irrigation.
11. Erection and maintenance of drip and sprinkler irrigation systems.
12. Estimation of cost of fitting drip irrigation system for unit area.
13. Identifying and handling of different tillage implements and garden tools.
14. Practice of seed bed preparation.
15. Identification of different types of weeds and study of their control methods.
16. Study of major pest and diseases and their control measures.
17. Layout preparation for fruit orchard and preparation of pits for plantation.
18. Practicing training, pruning and other horticultural operations.
19. Study of design and construction of farm pond.

Visits

At least four visits from the following list should be conducted.

Separate section of visit report should be kept in the journal.

1. Visit to soil testing laboratory.
2. Visit to meteorological observatory.
3. Visit to seed farm / seed plot.
4. Visit to fertilizer factory.
5. Visit to bio-gas plant/vermicompost unit.
6. Visit to farmers producer company/multi purpose co-operative society.
7. Visit to farm for observing drip and sprinkler irrigation unit.
8. Visit to fruit orchard to observe different horticultural operations.

Project work

Complete any one of the following projects.

1. Collection of weeds and preparation of weed album.
2. Collection of insects and preparation of insect box.
3. Collection of organic and inorganic fertilizers.
4. Collection of seed samples and preparation of herbarium.

Agriculture Science and Technology
Specimen question paper (Practical) std - XI

Marks

Q. 1) Identification

6

- A) Identify
- B) Subquestion

Note : In all 6 Specimens should be kept, each carrying 1 mark ($\frac{1}{2}$ mark for identification and $\frac{1}{2}$ mark for correct answer of subquestion)

Q. 2) Solve any two of the following.

6

- A) Mathematical problem from practical syllabus (viz. seedrate / plant population / physical purity / pure living seed).
- B) Mathematical problem from practical syllabus (viz. quantity of fertilizers / duty and delta of irrigation / conversion of measurement unit from one system to another system).
- C) Theoretical question from practical syllabus.

Q. 3) Practical exercise (any one)

6

- A) Seed treatment
- B) Seed bed preparation
- C) Method of sowing
- D) Practice of training or pruning or any other horticultural operations.
- E) Collection and preparation of soil sample for analysis
- F) Tying and handling of tillage implements

Q. 4) A) Viva-voce - 02

6

B) Journal - 04

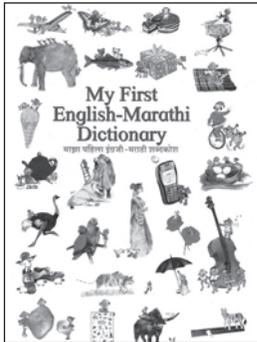
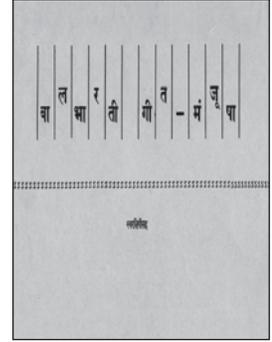
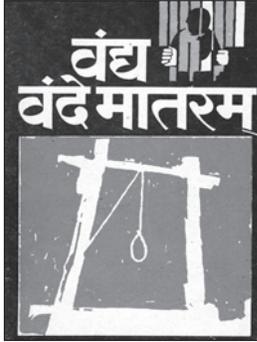
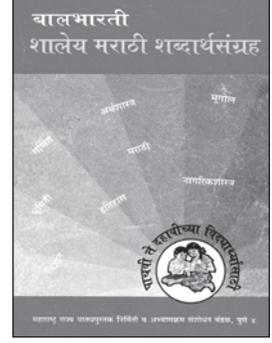
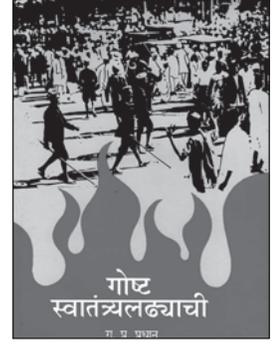
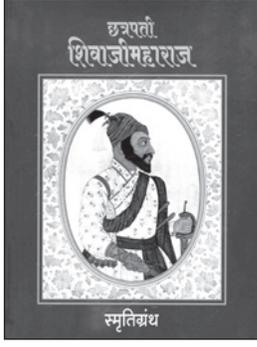
Q. 5) Project or visit report

6

Any one report on project or the visit actually given by the student during the academic year.

List of Reference Books

1. Introduction to Agronomy and Soil and Water Management- Dr. V. G. Vidya, K. R. Shasrabuddhe, Continental Prakashan, Pune - 411 030.
2. Crop Production and Field Experimentation - Dr. V. G. Vaidya, K. R. Sahasrabuddhe, Dr. V. S. Khuspe. Continental Prakashan, Pune - 411 030.
3. Agronomy - S. C. Panda - 2008, Agrobios (India) Jodhpur - 342 002.
4. Principles of Agronomy - J. Yellamanda Reddy, G. H. Sankara Reddy - Kalyani Publishers, Revised Edition 2002.
5. Principles of Crop Production - 2000 S. R. Reddy, Kalyani Publishers, Ludhiyana.
6. Hand Book of Agriculture - Fifth edition (2006) I. C. A. R., New Delhi.
7. Principles of Agriculture - 2009, Ashok S. Jadhav, Sandip K. Raskar, Raj laxmi Prakashan.
8. Plant Breeding - Principles and Methods - 2005, B. D. Singh, Kalyani Publishers.
9. Agronomy of Field Crops - 2006. S. R. Reddy, Kalyani Publishers, Ludhiyana.
10. Seed Technology, 2002, Ratan Lal Agrawal, Oxford and IBH Publishing Co-op. Pvt. Ltd., Kolkata.
11. Seed Technology - Dr. Harpal Singh, Tomar, Aman Publishing House, Meerut.
12. Plant Tissue Culture - M. K. Rajdan.
13. Plant Tissue Culture - M. K. Singh, Oxford and IBH Publishing Co. Pvt. Ltd. 2004.
14. Seed Science and Technology - A. K. Joshi, B. D. Singh, Kalyani Publishers.
15. Principles of Agronomy, 2011, - S. R. Reddy, Kalyani Publishers.
16. Fundamentals of of Agronomy, 2008, - Dr. Gopal Chandra De, Oxford and IBH Publishing Company Pvt. Ltd.
17. Seed Science and Technology, 2001 - Subir Sen, Nabinananda Ghosh, Kalyani Publishers.
18. Text Book of Soil Science - A Textbook - V. D. Patil, C. V. Mali, Phoneix Publications Parbhani.
19. Fundamentals of Soil Science, 1996 - Dr. J. A. Daji, Revised by Dr. J. R. Kadam, N. D. Patil, Media Promoters and Publisher Pvt. Ltd., Mumbai.
20. Handbook of Horticulture -, 2002, I. C. A. R., New Delhi.
21. Munures and Fertilizers - K. S. Yawalar, J. P. Agarwal, S. Bokde, Agri-Horticultural Publishing House, Nagpur.
22. Commercial Production of Horticultural Crops - H. N. Samaddar, Naya Udyog, Kokata.
23. Basic Horticulture - Jitendra Singh, Kalyani Publishers, Ludhiyana.
24. Vegetable Crops - T. K. Bose, K. Kabir et. al., Naya Prokash, Kolkata.
25. Introductory Ornamental Horticulture - J. S. Arora, Kalyani Publishers.
26. A Class Book of Botany - A. C. Datta, Oxford Publication.
27. Waste Management and Environment V. PDPO, H. Ltob, U. Mander.
28. Environment Waste Management, Ramchandra, Oxford Publication
29. Advances in Waste Management, - Ajay S. Kalasdhad, Jawan Singh, KondusamyDhamodharan, Springer, WIF Press.
30. Handbook on Waste Management, Thomas C., Kinnaman and Kenji Takeychi.
31. Agriculture Science and Technology, Std XI and Std XII, 2018, Maharashtra State Board Secondary and Higher Secondary Education, Pune.
32. Textbook of Crop Production Std-XI and Std-XII - Maharashtra State Board of Secondary and Higher Secondary Education, Pune.



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