Ornamental Horticulture

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Ornamental Horticulture Content

History, scope of gardening aesthetic values. Gardens in India, types of gardens. Landscaping, historical background, definition. Floriculture industry: importance, area and production, industrial importance in India. Landscaping, basic principles and basic components. Principles of gardening, garden components, adornments, lawn making, methods of designing rockery, water garden, etc. Special types of gardens, their walk-paths, bridges, constructed features. Greenhouse. Special types of gardens, trees, their design, values in landscaping, propagation, planting shrubs and herbaceous perennials. Importance, design values, propagation, plating, climbers and creepers, palms, ferns, grasses and cacti succulents. Flower arrangement: importance, production details and cultural operations, constraints, post-harvest practices. Bio-aesthetic planning, definition, need, round country planning, urban planning and planting avenues, schools, villages, beautifying railway stations, dam sites, hydroelectric stations, colonies, river banks, planting material for play grounds. Vertical gardens, roof gardens. Culture of bonsai, art of making bonsai. Parks and public gardens.

Practical: Identification and description of annuals, herbaceous, perennials, climbers, creepers, foliage flowering shrubs, trees, palms, ferns, ornamental grasses; cacti succulents. Planning and designing gardens, layout of location of components of garden study, functional uses of plants in the landscape. Planning design of house garden, roadside planting, avenues for new colonies, traffic islands, preparation of land for lawn and planting. Description and design of garden structures, layout of rockery, water garden, terrace garden, and Japanese gardens, recreational and children's corner. Layout of terrarium, traffic islands, bottle garden, dish garden. Flower arrangement, bonsai practicing and training. Visit to nearby gardens. Identification and description of species/varieties of jasmine, chrysanthemum, marigold, dahlia, gladiolus, carnation, aster and their important inter-culture practices. Practical: Practice in judging the maturity of various horticultural produce, determination of physiological loss in weight and quality. Grading of horticultural produce, post-harvest treatment of horticultural crops, physical and chemical methods. Packaging studies in fruits, vegetables, plantation crops and cut flowers by using different packaging materials, methods of storage, post-harvest disorders in horticultural produce. Identification of storage pests and diseases in spices. Visit to markets, packaging houses and cold storage units.

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Lecture No.1

HISTORY, IMPORTANCE AND SCOPE OF GARDENING

History of gardening in India

The history of systematic gardening in India is as old as civilization of Indus of Harappan which existed between 2500 B.C and 1750 B.C. During the period, people were living in well-planned dwellings. Harappan pots were generally decorated with the design of trees. In every village, trees including *Ficus religiosa* (pipal) and *F. bengalensis* (banyan) were planted for worship as well as for shade.

Aryans came to India in 1600 B.C. They were literary people and brought with them the four Vedas *viz*., Rig Veda, Artharva Veda, Yuzur Veda and Sam Veda and the Puranas. They appreciated the beauty of flowering plants, lakes, mountains, forests, *etc.,* and named their children after flowers like Kamal, Champa, Bela, Chameli, Rukmani, *etc*., Detailed account of the status of gardening at that time has been presented in Ramayana written by Valmiki. Ayodhya city was described as having wide streets, large houses, richly decorated temples and gardens. These gardens were planted with fruit trees and flowering plants and had lakes full of lotus (*Nelumbo* sp.) and different kinds of birds. During exile, lord Rama and Sita are believed to have observed a number of trees and were fascinated by beautiful flowers. One such tree was Ashoka (*Saraca indica*).

Another epic 'Mahabharat' written by saint Vyasa also mentions about gardens. During the Mahabharat era, pleasure gardens were planted with flowering plants. The famous tree of this era was Kadamba *(Anthocephalus cadamba*), which is associated with lord Krishna. The great poet *Kalidas* has described the numerous flowering plants of that era in a number of his books. In 'Kumar Sambhav' trees like Ashoka, Kalpvriksha, Shirish flower, *Butea monosperma,* parijatham (*Nyctanthes arbotristis*), *Mimusops elengi,* lotus and lilies have been mentioned.

The association of different trees with the life of Lord Buddha is well known. Buddha was born in 563 B.C. His birth is believed to have taken place under the Asoka tree (*Saraca indica*). Further, Buddha attained his enlightenment under a *Pipal* tree, spread his new teachings under shady banyan and mango trees and breathed his last in a Sal (*Shorea robusta*) grove.

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The great Emperor Asoka (264-227 B.C.) adopted arboriculture as one of his state policies. He encouraged the planting of avenue trees. His son Prince Mahendra took a sampling of the *Bodhi* tree (*Ficus religiosa*) from India and planted it at Anuradhapur in Sri Lanka (250 B.C.).

In the works of Kalidasa during the rule of Chandragupta II, we find the mention of several flowering trees including the *Asoka* tree *(Saraca asoka), Kadamba (Anthocephalus cadamba*), *Arjuna (Terminalia arjuna), Butea monosperma, Parijatha (Nyctanthes arbor-tristis), Bauhinia variegata, Mimusops elengi, Albizzia lebbek* and screwpine. The creeper '*Madhavi latha*' (*Hiptage madablata*) occupied a prominent place in his play 'Sakuntala'. In the same play we find the mention of pleasure gardens. In Meghduta he describes the women of Alakapuri to have used *Kadamba* flowers to decorate their hair in the monsoon and carried pink lotuses in their arms.

The famous poet Bhana Bhatta describes a number of flowering plants including the B*anyan, Sal, Champaka*, flame of the forest, *Mimusops elengi*, *Kadamba, Ashoka* and the Indian coral in his famous book '*Harsh Charita'*.

Vatsayana (300-400 A.D.) in his book 'Kamasutra' gives a glimpse of the joyful civic life of that period. He narrates four kinds of gardens:

1. *Pramododyan* meant for the enjoyment of the royal couples
2. *Udyan* where the kings played chess, enjoyed the dances of the maids and jokes of the court jesters
3. *Brikshavatika* the garden where high-placed persons in the king's court enjoyed life with courtesans
4. *Nandavana* which was dedicated to Lord Krishna.

Gardening during Mughal era

Among the Mughal emperors, Babar had high aesthetic sense and was fond of gardens and he made gardens at Panipat and Agra. Aram Bagh at Agra is still being well maintained by the Archeological Department. Mughal gardens are synonymous with formal style of gardening. The square or rectangular flower beds are special features of Mughal

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gardens. Another important contribution was the introduction of exotic plants like cypress, rose, carnation, narcissus, daffodils, lilies, tulips, *etc.,*

Some of the famous gardens established by the Mughal rulers are listed below.

Mughal Emperor	Gardens established
Akbar	Fatehpur garden, Sikri (Agra)
	Tomb garden, Sikandra (Agra)
Jahangir	Shalimar, Acbhalbal, Varinag (Kashmir)
	Itmad-ud-Daulah (Agra)
	Dilkusha garden, Lahore
Shan Jahan	Shalimar, Lahore
	Tai Mahal, Red Fort, Agra
	Red Fort, Delhi
Fadai Khan	Pinjore garden, Pinjore

Gardening during British era

During the British Era, there was a lot of activity in gardening by Britishers and Indian Kings. Making of herbaceous borders and lawns gained momentum during the British era. Concentrated efforts were initiated to improve the gardening in three ways, namely:

(i) Introduction of exotic plants from England and other countries

(ii) Establishment of Royal Agri-Horticulture societies and botanical gardens

(iii) Compilation of local flora of different regions

Flowering annuals such as phlox, verbena, larkspur, dahlia, pansy, aster, antirrhinum, *etc.,* were introduced. A number of botanical gardens were established in different parts of the country. The important ones are:

Royal Agri-Horticulture Society Garden, Calcutta

Royal Botanical Garden, Darjeeling

National Botanical Gardens, Lucknow

Lal Bagh Botanical Garden, Bangalore

Government Botanical Garden, Ooty

Bryant's Park, Kodaikanal

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Many valuable plant materials were planted in these botanical gardens and the plants were botanically labeled.



Glass house at Lal Bagh, Bengaluru

Courtesy: http://www.india-travelinfo.com/bangalore-travelinfo/Lalbagh-bangalore.html

Gardening during post-independence period



Rose garden, Chandigarh

http://www.paradise-holidays.net/pic_gallery/displayimage.php?pid=30

There have been significant changes in the field of ornamental gardening during the post-independence era. Achievements have been made in all the important fronts *viz*. conscious planning for improving total environment, commercial floriculture and teaching and research of ornamental horticulture.

Several gardens in different cities have been laid out to provide active and passive recreational facilities and to improve the environment. Important gardens are Budha Jayanti Park (New Delhi), Rose garden (Chandigarh and Ludhiana)

These gardens deviate from the traditional Mughal gardens in their layout. As a general rule, landscaping of public and private buildings has become an integral part of planning. State

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departments pertaining to urban, archeological and tourism development are actively involved in improving the total environment by conscious planning and planting.

Scope of ornamental gardening and landscaping

Gardening which was only an art and science in the earlier days has now emerged as a huge industry. With the importance and need of gardening in improving and conserving the environment being strongly felt now, the concept of landscaping and gardening is growing rapidly. Ornamental gardening and landscaping has expanded as a multi-faceted industry encompassing activities such as propagating and rearing ornamental plants, landscaping, production of growing media, pots and other accessories, *etc.,* generating huge employment opportunities and simultaneously promoting activities that would improve the environment.

Questions

1. Dahlia and aster were introduced to India during the English era. State True or False

   Answer: True

2. The Royal Botanical Garden is located at ----------

   Answer: Darjeeling

3. Mughal garden at Pinjore was established by

   a. King Akbar b. King Fadai Khan c. Shah Jahan d. King Aurangazeb

   Answer: b. King Fadai Khan

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Lecture No.2
Popular Gardens in India

Lal Bagh, Bengaluru (Karnataka)

The Lal Bagh situated at Bengaluru is the State Botanical Garden of Karnataka. Bengaluru with an altitude of about 900 m has a mild climate and is therefore suitable for growing a wide range of plants. The initial layout of the garden was started in 1760 by Hyder Ali. Presently, the garden is the seat of the Directorate of Horticulture of the State.



http://www.allaboutindia.org/top-ten-tourist-places-near-bangalore/

The most attractive feature of the garden is a large glasshouse where the annual flower show is held. The glasshouse is also used for holding important meetings, conferences and for receiving important dignitaries. Another attraction is the tall majestic-looking *Araucarias*, especially *Araucaria excelsa* (Syn. *A. cookii*) which steal the eyes of the visitors. The avenue of the large *Ficus benjamina* near the glasshouse is definitely a special feature of the garden. Three species of the flowering tree *Tabebuia* namely, *Tabebuia argentea, T. avalandii* and *T. spectabilis* are prized collections of the garden. The garden also has rich collections of cassia, bougainvillea and hibiscus. The other attractive features of the garden are collections of foliage plants, pergolas, arbours, statues, fountains, water garden, the aquarium, the rose garden and the natural rock formations. The garden with its well-laid-out features, paths, open spaces, shade and flowering trees attracts a large number of visitors regularly. The total area of the garden is about 50 hectares.

Brindavan Gardens, Mysore (Karnataka)

The Brindavan Gardens are located in the state of Karnataka in India. The garden lies adjoining the Krishnarajasagara dam which is built across the river Cauvery. The work on laying out this garden was started in the year 1927 and completed in 1932. It is

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spread across an area of 60 acres. The garden is famous mainly for its illuminated running waters and innumerable fountains decorated by coloured lights. In the evening when all the fountains and running water start working and are illuminated with changing colour of lights, the whole place looks like a paradise. The main attraction of the park is the musical fountain in which movement of water is synchronized to the music of songs. Other attractions of the garden are open spaces under lawn and illuminated flower beds. The garden is laid out in 3 terraces which contain water fountains, *Ficus* trees, foliage plants such as *Duranta* and *Euphorbia* and flowering plants like celosia, marigold and bougainvillea. The garden also has topiary works, pergolas, etc. The river Cauvery below the giant dam divides the garden into two parts and visitors enjoy a boat ride in the river. The garden is a public park and not meant for research.

Government Botanic Gardens, Udhagamandalam (Tamil Nadu)

This garden is situated at an altitude of 2,175 - 2,280 m above MSL in the Nilgiris Hills of Tamil Nadu. It actually started functioning in 1848. The garden covers an area of 20 hectares in ascending terraces.



The Garden has around 1000 species of plants which includes shrubs, trees, ferns and herbal plants. In the centre of the gardens lie a fossilized tree trunk estimated to be 20 million years old. The gardens consist of several lawns, ponds with lilies, beds of flowers and ferns laid out in an Italian style, several plots of flowering plants and variety of medicinal plants.

The garden is the pioneer in introducing potato, cabbage, cauliflower, carrot, beetroot, *etc.*, and many fruits in the Nilgiris. It is also a pioneer in introducing Cinchona and different species of *Eucalyptus* in this region. Many essential oil yielding plants were introduced by the garden, out of which scented geranium is the most important.

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The Bryant Park, Kodaikanal (Tamil Nadu)

The park has a total area of 10 hectares. The park was actually laid out in 1909, but it suffered due to the lack of trained personnel and funds until 1961 when it was taken over by the Horticultural Department of Tamil Nadu government and development work started in right earnest. The park has terrace gardens, lawns, children's parks, a sunken garden, besides a good collection of roses, chrysanthemums, trees and shrubs. The park is a centre for supplying ornamental plants.

Rashtrapati Bhavan Garden, New Delhi

The Rashtrapati Bhavan or the Official Residence of the President of India, located in New Delhi, is one of the largest buildings of its kind in the world. The architecture of the palace is a mixture of Indian and western style. It was formerly known as 'Viceroy's House' and was occupied by the Governor General of India, until independence. It was renamed as 'Rashtrapati Bhavan' in 1950. Designed by the British architect Sir Edwin Lutyens, this classical building uses colours and details peculiar to Indian architecture. It was completed in 1929 and was officially inaugurated in 1931. It has 340 decorated rooms and a floor area of two lakh square feet.

Rashtrapathi Bhavan, New Delhi



http://www.indiatravelbuddy.com/2011/02/mughal-garden-delhi-

The garden inside this palace was laid on the pattern of Mughal gardens with conventional arrangement of squares, terraces, water channels, *etc.* The main garden area is roughly 134 square metres and is bounded from all sides by a paved red stone path. Two canals each of 5.40 m width run from north to south and two similar canals intersect these to form a 60 square metre island in the centre. This island is the venue for the most of the receptions held at Rashtrapati Bhavan. There is a sunken or circular garden which is a beautiful spot especially during the winter when innumerable seasonal flowers bloom. The garden is famous for quantity and quality of seasonal flowers. There are good collections of bougainvilleas, bulbous plants as well as flowering trees which ensure adequate colour

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throughout the year. There is a large collection of roses also. Other important features are greenhouses with collections of orchids, cacti, succulents and ferns. The pergolas are laden with fine creepers. There are a large number of trees, especially cypress (*Cupressus*) which are clipped in the topiary style. The garden remains open for about a month for the general visitors during the winter months when the seasonal flowers are in full bloom. This garden is popularly referred to as Mughal Gardens.

Mughal Gardens of Kashmir

The credit of developing the Mughal gardens in Kashmir goes to three rulers *i.e.*, Akbar, Jehangir and Shah Jahan. All these gardens have a series of descending terraces, following the tradition of Mughal style, to facilitate the flow of water which is another main stay of the Mughal gardens.

The gardens on the bank of the Dal Lake, Shalimar, Nishat Bagh and Chasma-e-Shahi are well preserved and frequently visited by tourists. Some other popular gardens are at Achabal, Verinag and Bijbehara. The most spectacular feature of these gardens is '*Chenar'* trees in groups. A Persian poet Jami has mentioned about Mughal Gardens of Kashmir as "If there is a paradise on earth, it is this, it is this, it is this".

Shalimar Garden

This garden was initiated by Jehangir for his wife Nur Jehan in 1619 and was extended in 1630 by Zafar Khan, the then Governor of Kashmir, under the instructions of Emperor Shah Jahan. This garden is also known as the 'garden of love' and offers a picturesque view created by terraces and lakes. ('Shalimar' in Sanskrit means "abode of love")

The garden extends to an area of 12.4 hectares. It has three terraces fitted with fountains and tree-lined vistas. The Shah Nahar is the main feeder channel to all the terraces.

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Shalimar Garden



http://www.imagesofasia.com

The garden is connected with the Dal Lake by a 1.6 km canal which is about 10.8 m wide. On both sides of the canal there are broad green paths lined by majestic *chenar* trees. The garden consists of three terraces, the first having a *baradari*, the *Diwan-e-Am* and the second contains the *Diwan-e-Khas.* But, unfortunately, both these buildings do not exist today, but only their stone bases are left surrounded by fountains. Along the centre of the garden there are a series of water reservoirs inter-connected by a wide canal. The canals and the reservoirs are paved with polished limestone. The source of running water is a stream which flows through these reservoirs and canals and sometimes through beautiful chutes of various designs.

The third terrace containing a magnificent black stone pavilion was meant for ladies. The pavilion is surrounded by a reservoir containing 140 large fountains. Maharaja Hari Singh of Kashmir provided electricity to the garden.

The Mughal Garden, Pinjore (Haryana)

This garden situated 5 km below Kalka on the Ambala Simla road, was laid out by Fidai Khan, the foster-brother of Aurangazeb during his reign in the seventeenth century. The original name of the place Panchapura or Panjpur has association with the five *Pandavas* of our epic *Mahabharata*.

The Mughal Garden, Pinjore



http://www.indiatourismecatalog.com

It is one of the best preserved gardens of north India and is famous for its beauty. The garden is uniquely laid out in an area of 25

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hectares and is divided into six terraces. During its heyday a dignitary paying a visit to the garden saw about 40 *maunds* (each *maund* is equal of about 37 kg) of red roses being sent to the perfumery (*gula khana*) of Fidai Khan in a single day.

As customary with all Mughal gardens, this garden is also enriched by an embattled wall. The main gate is at the highest terrace while the remaining five appear in a descending way. Because of this, in spite of the formal layout the full garden is not visible to the visitor at one glance.

As in other Mughal gardens there is a central water channel. Water falls from one terrace to the other and into the tanks. The tanks and the water channels have numerous fountains. On other side of the central channel the paths are paved. Along these paths there are lawns, flower beds, trimmed hedges, rows of bottle palms and many other ornamental shrubs and trees. There is a good collection of fruit trees, especially of mango, litchi and sapota. There are three magnificent buildings - the *Shish Mahal,* the *Rang Mahal*, and the *Jal Mahal*. The credit for the fine collection of ornamental plants goes to the erstwhile rulers of Patiala, especially the former Maharaja Yadavindra Singh. The garden is situated at the foothills of the Himalayas at an altitude of about 600 m. A mini zoo, plants nursery, a Japanese garden, historic palaces and picnic lawns await tourists.

Chandigarh Rose Garden

Rose Garden in Chandigarh is Asia's largest rose garden. This garden was created in 1967, under the expert guidance of Dr M.S.Randhawa, Chandigarh's first Chief Commissioner, and is named after India's President, Zakir Hussain.

Rose Garden, Chandigarh



The garden is situated in the centre of the city on a 15-hectare plot. It is designed to contain about 60,000 roses when completed. It is also contemplated to collect about 5,000 outstanding cultivars of roses. The garden is situated in a valley and a natural stream runs through it. The land on the banks of the stream is undulating and has natural curves. To preserve this natural landscape, the garden has been laid in the most informal and natural manner. The area adjoining the stream has

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been planted with a large number of scented cultivars, which fill the whole area with exquisite fragrance. The garden was started in December 1966 and at present about 1,500 named roses are there in the museum. This garden is a wonderful place to visit.

Taj Mahal Gardens, Agra

The Taj Mahal in Agra is a mausoleum built by the Mughul Emperor Shah Jehan (1592-1666) in memory of Mum Taz, his beloved wife, who died in childbirth. Though this is located outside the geographical region under consideration in this book, it requires mention for its being the beginning of a style. The architectural splendour is complimented by a garden, 8 ha in extent. The garden is formal in style characterized by terraced square plots, interspersed by walks, attractive stonework and steps. Water from the Yamuna is channeled both along and across the garden. To create movements of water, chutes were fixed at regular intervals along the channels. The Taj gardens are a good example of Mughul gardening. The main aesthetic feature here is the placement of the tomb in vista when on approaches it from the entrance gate. The garden is planted to *Cupressus*, pomegranate and other fruit trees, formal hedges and the scented jasmine, are all planted in pictorial symmetry. The entire planting and the water serve to create a reflective mood, befitting a tomb of a loved one, irretrievably snatched away by the hands of cruel death. A golden moon further enhances the charm of the marble tomb and its landscape.

The Sim's Park, Coonoor

Coonoor is situated at an altitude of 1700 m above MSL. The park, which is actually a botanic garden, covers an area of 12 ha. It has seven sections or terraces treated to formal, informal and picturesque designs.

This is a garden laid out in the English landscape style. The beauty of the original undulating line was taken advantage of by the designers. It is in a saucer-shaped deep valley. A perennial stream bisects it and leads to a pond at the lowermost regions of the park. In the centre of the pond are two beautiful islands. The native trees in the *sholas* occurring in the higher slopes at the site were selectively retained and incorporated in the design.

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The Sim's Park, Coonoor



A large number of trees and shrubs from temperate countries and also from humid tropics have been successfully introduced here. The trees planted are scattered all over the parks, giving a woodland and glade effect. A mild mountain climate characterized by low seasonal spurt in temperature, well distributed rainfall and high relative humidity, cause some tree or other to flower throughout the year. Flowering and foliage shrubs are used in raising hedges along the boundaries of the park, along contours, footpaths and around the lake. Showy climbers on arches, arbours and trellises located at appropriate places adorn the garden. The green glass-covered valleys, colourful beds and borders, rock gardens, fountains and serpentine walks, all combine to form sensuous yet beautiful scenery.

The Indian Botanic Garden, Kolkata (West Bengal)

The Acharya Jagadish Chandra Bose Botanical Garden (previously known as Indian Botanical Gardens, Howrah) is situated in the twin city of Howrah, on the opposite side of the river Hoogly. The gardens exhibit a wide variety of rare plants and a total collection of over 12,000 specimens spread over 109 hectares. It is under Botanical Survey of India (BSI) of Ministry of Environment and Forests, Government of India. The garden was established in 1787. It ranks among the great botanical gardens of the world. The garden was established on the suggestion of Robert Kyd, an army man. The garden had a unique privilege of having famous scientists as its superintendents such as Dr. William Roxburg, Sir J. Hooker, Dr. N. Wallich, Dr. Hugh Falconer, Sir George King, Sir William Wright Smith, Sir David Prain and R. C.C. Calder. The first Indian to occupy this post was Dr. K. Biswas.

The feature which attract most visitors are the giant 200 year old banyan tree (*Ficus benghalensis)* and the large collection of palms with a pond in the foreground. The garden has 26 lakes. Another important feature is the giant lily, *Victoria regia* which has giant disc-like leaves raised at the margins. It is reported that the leaves floating on the

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surface of water can withstand the weight of a baby. The garden has 15,000 trees and shrubs in the open, representing 2,500 species. The palm houses, orchid houses, and ferneries house several thousand herbaceous plants. The Royal Palm Avenue near the river gate is another beautiful feature of the garden. The garden houses the best herbarium in the country and the library has more than 25,000 volumes.

Llyod Botanic Garden, Darjeeling (West Bengal)

Established in 1878 and situated at an altitude of about 2,100 m MSL in the midst of the Himalayas, is one of the most picturesque botanic gardens of India. The garden was laid by Sir George Kind, donated by William Lloyd. The garden has a total area of 40 acres laid out in beautiful terraces and provided with metallic approach roads. The garden has about 1,800 botanical species representing regions such as Burma, Malaysia, Central Asia, Japan, North and South America, Europe, and Africa.

National Botanical Research Institute, Lucknow (Uttar Pradesh)

The National Botanical Research Institute popularly known as Sikander Bagh, was laid out by Nawab Saadat Ali Khan (1789 – 1814) which was fu1rther improved upon by Nawab Wajid Ali Shah, the latter naming it after his wife Sikander Mahal Begum. The present area of the garden is 27 hectares. The Botanic Garden serves as a National Facility with three main functions *viz.* Conservation, education and bio-aesthetics. A repository of germplasm collection of various tropical and sub-tropical plant species, comprising 5,000 taxa, representing 212 families, the Botanic Garden has rich genetic treasure with the collection of trees, shrubs and herbs of ornamental, economic, medicinal, aromatic and rare importance, hailing from the indigenous and exotic sources.

Important features of the garden are a library, large herbarium fine lawns, rose gardens, conservatory, cactus house and the lily pool.

Rock Garden of Chandigarh

The Rock Garden or Rock Garden of Chandigarh is a Sculpture garden in Chandigarh, also known as *Nek Chand's Rock Garden* after its founder Nek Chand, a government official who started the garden secretly in his spare time in 1957. Today it is spread over an area of 40 acres. This rock garden is an epitome of creativity and

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innovation. It is a unique garden that consists of various art objects. But the best part about the rock garden is that each of its artwork has been made by using industrial & urban waste. It consists of man-made interlinked waterfalls and many other sculptures that have been made of scrap and other kinds of wastes (bottles, glasses, bangles, tiles, ceramic pots, sinks, electrical waste, etc) which are placed in walled paths.

The Ramoji Film City Gardens, Hyderabad

Ramoji Film City is the world's largest integrated film studio complex at over 2,000 acres of land. It is also a popular tourism and recreation centre, containing both natural and artificial attractions including an amusement park. Ramoji Film City situated 25 km away from Hyderabad City.

The first garden is a Greek Garden. Beautifully set in ancient Greece, beautiful Greek fountains and nice little gardens to suite the surroundings. Then the Roman garden, with hundreds of Roman Gods, Goddesses sculptured around, a fantastic fountain with the Roman Sun God riding a beautiful 7 horse chariot. The pathways in these gardens are also made in such a way that chariots can move around in them. There are around 60 such different theme gardens including, Brindavan Garden of Mysore to the Mughal gardens in Delhi with all the beautiful monuments providing the background. Some of the other places include a Japanese garden, a large pool, artificial waterfalls, intricately carved caves, a nursery that sells exotic plants etc.

Questions

1. Rashtrapathi garden was laid out in the pattern of_____

   Answer: Mughul garden

2. The Lal Bagh garden was initially laid out by _____

   Answer:Hyder Ali

3. Brindavan garden is located in Mysore. True/False

   Answer: True

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4. Match the following

a. Lal Bagh	- Haryana **(b)**
b. Pinjore garden	- Bengaluru **(a)**
c. Brindavan garden	- Kodaikanal **(d)**
d. Bryant park	- Mysore **(c)**

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Lecture No.3

Basic Principles of Gardening

Landscaping is an aesthetic branch of Horticulture, which deals with planting of ornamental plants in such a way that it creates a picturesque effect. Landscape gardening can also be defined as the beautification of a tract of land having a house or other object of interest on it. It is done with a view to create a natural scene by the planting of lawns, trees, shrubs flowering annuals, climbers, creepers, etc. Further, landscape gardening is both an art and science of the establishment of a ground in such a way that it gives an effect of a natural landscape. It can also be defined as "improving of total living environment for the people".

There are certain basic gardening principles that a gardener should follow to achieve a garden that is pleasing to the senses and provides a pleasant outdoor living space. These principles are discussed in this chapter.

Balance

The balance in landscape design is visual equilibrium of different garden elements. Balance can be created in a garden either formal or informal by grouping the components, structures and plants equally on both sides of the imaginary central axis. It is a striking feature in a formal garden. The exact duplication of what is on right on the left imposes a balance. The balance should be colourwise, texture wise and shape wise. Trees as an avenue on one side will not make a balance. Care should be bestowed to create balance in colour and texture.



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In an informal garden, the overall mass or dense of structure should be distributed on both sides of the axis which may be curved or informal. A large mass of yellow and white coloured flowers may be informally balanced on the other side with few flowers of red to create visual balance.

The human psyche is depressed when thoughts are not balanced. The balance created through plants imposes equilibrium in human psyche thus providing instant subconscious tranquility. Paired opposites such as pleasure and pain, bitter and sweet *etc*., will get naturalized when one is balanced in thought.

Proportion

Proportion refers to the share of the different parts or components to the whole. It is the relation of the component with other in magnitude. In a landscape garden, the space and area provided for a lawn, paths, borders, trees, buildings etc. should be in right proportion and not equal in proportion. Proportion helps in space organization. The disproportionate occupation of any one component may distract the eye and attention.



Proportion, suggested by plants in a garden indirectly pacifies the psyche as one's mind is conditioned to enjoy one component of a garden in proportion to the other without a discordant note. Such a conditioned mind will not succumb to streak thoughts which are disproportionate.



Unity

Though diverse structures, plants and features are used to create a landscape, there should be a unity



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among each component and all the components with main building. Instead of the individual beauty of a component, the overall beauty should be focused to achieve unity in diversity. Further, a designer should work towards integrating the aesthetic principles of balance, rhythm, proportion and harmony to give unity to the composition.

If one's mind is conditioned to freely unite or mingle with other persons, he will be accustomed to interact without reaction. Such interaction without reaction is the quality imposed by the 'unity' concept of a garden.

Perspective

Any object situated at a distance will look small compared to the one of the same size kept close to the vision. Eg. Rail road converges at distance.



This visual phenomenon of shrinkage in size and converging of lines is termed perspective. The garden objects can be positioned either at the foreground or background to create pleasing visual illusions.

Artist's perspective is two dimensional, sculpture's perspective is three dimensional while the landscape architects perspective is of four dimensional, the fourth dimension being the time because, as the time passes, the size of plants differ, colour differ and ultimate visual quality will differ.

Vista



It is the three dimensional confined view of a terminal object along eye line at focal point. E.g. Taj tomb as viewed from its opposite.

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Prospect



Prospect is the view of a scenery, natural or man made, through an opening such as window or a gap in the foliage of trees. It is the 'camera view' of any scenery. Such prospects can be created in landscape gardening by adopting suitable proportion and unity.

Restraint

Overuse of any component including grouping of plants in a particular location masks the scenic beauty. If all the features whether natural or artificial are kept within bounds or used with restraint, best results can be achieved.

Rhythm

Rhythm is measured as cyclic repetition of an object, effect and event. In a garden, rhythm can be infused through cleverly repeated colours and shape, topiaries and hedges etc. In Mughal gardens, the fountains and cascades have been repetitively provided to create rhythm. Sometimes rhythm is created through action of lights under water.

Boredom clutches the mind predisposing it to become devil's workshop. Rhythm in thought waves elevates the mind from the tentacles of boredom.





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Harmony

Harmony is the pleasing effect obtained due to appropriate arrangement and collation of the various garden features. It is the overall effect of various features styles, colours and structures in the total landscape. Every part of the landscape should synchronize into the other and all the components into the whole. No individual component should project itself beyond its expected limit.

The beauty of the landscape depends upon the degree of harmony of various elements. It is the evident relationship of all parts of a thing observed visually, audibly and psychically. When the components of landscape architecture posses harmony, the picturesque effect is produced and can aesthetically please the visitor. Further the garden should harmonize with the building and both should harmonize with the natural landscape beyond the boundaries of landscape area.

The synchronization of one within the other is the key factor to achieve harmony.

Movement or Mobility

The concept of mobility is vital to garden as breath to human. Mobility can be introduced in the garden by the magnificent sway of tall trees, birds in the sky, butterflies circling over flowers, dispersal of clouds in the sky, surging water in fountains, the gentle curvature of roads, trunks, branches of trees, etc.

If all the components are stiff, stony and static, it will harden the attitude of person and the aggressive tendency is triggered from within. Mobility in a garden will loosen the hardened attitude of humans and relax them from the tentacles of anger and revenge.

Surprise

All components of a garden should not be exposed to the vision at one stroke from one point. If exposed, there won't be any curiosity in a person to walk along and move within to explore further. One component should be gracefully hidden from the

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other either by gentle turn of road, paths or screening through shrubbery, hedges or pergolas.

The secret of life lies in the mystery over the future. The unexpected turn of events forces mankind to lead life with curiosity which adds spice. Surprise element kindle the person's heart to probe further and lead life in real sense.

Skyline

Garden meets the sky in its vertical dimension. Planning a garden should include planning for a skyline also. A peak of a mountain, gigantic trees, an old monumental building, temple towers *etc.*, if available, naturally can be woven into the background design to add beauty to the skyline of trees.



Scale

Scale is a relative dimension. The height and spread of trees and shrubs and the spread of the water garden are determined by adopting a scale. To make it clear, it may be noted that a small reflecting pool underneath a large tree will be dominated by the tree and render the pool ineffective, owing to the difference in their dimensions. To get the right picture of a tree beside a pool we should adopt a ratio between the size of the tree and pool as is obtained in nature. Appropriate adoption of scales and proportionate measurements are the success of imitative naturalistic garden art.

Space

The aim of every garden design should be such that the garden should appear large than its actual size. One way of achieving this is to keep vast open spaces, preferably under lawn and restrict the plantings in the periphery, normally avoiding any planting in the centre. But if any planting has to be done in the centre, the choice should be a tree which branches at a higher level on the trunk (or the lower branches are removed), and not a bushy shrub. Such planting will not obstruct the view or make the garden appear smaller than its size.

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Questions

1. Any object situated at a distance will look small compared to the one of the same size kept close to the vision. This principle is called ----------

Ans: Perspective

2. ---------- is the view of scenery, natural or man made, through an opening such as window or a gap in the foliage of trees.

Ans: Prospect

3. ----------is measured as cyclic repetition of an object, effect, event

Ans: Rhythm

4. Garden meets the sky in its vertical dimension. This principle is referred to as ----------

Ans: skyline

5. One component should be hidden from the other either by gentle turn of road, or screening through shrubbery or pergolas. This principle is referred to as ----------

Ans: surprise

6. ----------is the principle of relative dimension

Ans: Scale

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Lecture No.4
Types of Gardens: Formal and Informal Gardens

Formal style

The gardens of Greece and Rome assured an emotional security though their formal style. The Persian, Moorish gardens of Spain and Mughal gardens were also of the same kind and were strictly formal, symmetrical and geometrical resembling a carpet.

The Italian renaissance garden was having intricate geometric designs, sheared trees, trimmed hedges and edges to create formality. The impact of formalism influenced the French and British gardens also in the form of parterre, the much divided flower beds.



Taj Mahal



Shalimar Garden

The key features of formal design are

The design is stiff as everything is done in a straight and narrow way.

If there is a plant on the left hand side of a straight road, a similar plant must be planted at the opposite place on the right hand side *i.e.,* mirror image of each other.

The plan is symmetrical with square, rectangular and roads cut at right angles.

It has a sort of enclosure or boundary.

Flower beds are arranged in geometric designs.

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The arrangement of trees and shrubs is necessarily geometrical and kept in shape by trimming and training.

Other features like fountains, water pools, cascades etc. are used for further attraction.

Demerits

Formal gardens have no 'secrets' and the element of surprise is lost.

However, attractive focal points at terminal and intersecting points of paths and roads are provided to make the formal garden effective.

Present day home gardens are laid out in formal design only at the frontage.

Informal style

The idea behind this design is to imitate nature.

Hindu, Buddhist and Japanese gardens lay no emphasis on formality.

Woodlands (*vanams*) and running water (streams and rivers) was the main feature around which the garden was created in natural way.

Brindavan of Lord Krishna was woodland.

Every temple was provided with irregular shaped lotus tanks. (Latter on such tanks were given masonry boundary either rectangular or square).

Japanese developed a naturalistic style of gardening. It is in Japanese garden that the asymmetric balance has been perfected.

The impact of industrial climate drove the British to opt for natural gardens later.

The further man is isolated from nature (due to industrial revolution) the deep is the longing to go back to nature. The industrialized cities have become concrete jungles with no flavour and aroma of nature. To avert this, the concept of natural gardens was given impetus.

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Informal Gardens

Nature's projection of mountains, oceans, rivers and lakes on a larger canvas of earth's surface is informal with all its grandeur. Such grandeur is mimicked in informal gardens.

Key features of informal style / natural style

This style reflects naturalistic effect of total view and represents natural beauty.

It is contrast to formal style.

Plan is asymmetrical according to the land available for making the garden.

Smooth curvaceous outlines are more appropriate.

Water bodies are more irregular in shape.

Features such as hillocks, water falls, lakes, islands, cascades, rocks, *shola* and rustic hutments are provided to create rural effect.

Plants are appropriately grouped and they are not trimmed, so as to avoid geometrical arrangements.

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Questions

1. An example for symmetrical garden-
Ans: Taj Mahal

2. Japanese gardens are laid in a formal design. Say true or false. State True or False
Ans: false

3. ---------- style reflects naturalistic effect of total view and represents natural beauty.
Ans: Informal

4. ----------gardens have no 'secrets' and the element of surprise is lost.
Ans: Formal

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Lecture No.5

Garden Styles - i : Hindu Type Gardens (*vanams*), Natural Garden, Wild Garden

Hindu type of gardens

'*Vanams*' in ancient period served the purpose of a garden and was synonymous with garden. *Vanams* were the natural gardens furnished by the mother earth for the humans and animals to dwell on and inhabit in. Such *vanams* were put to various uses by the various sections of the society. *Vanavasam* was part of the life of Vikramaditya, Rama and Pandavas. Great sages resided in *vanams* to attain spiritual bliss.

Rajavanam

It referred to an area of natural forest exclusively meant for kings to hunt wild animals. More than hunting, it was the time spent in hunting that is relaxing in real sense. Later on four kinds of *Rajavanams* came into existence as detailed below.



i *Promododyan*: Private garden for king and queen exclusively. It was attached to the fort where the queen resided.

ii *Udayan*: A *vanam* where the kings passed their leisure time in playing chess, enjoying dance and listening to music.

iii *Vriksha vatica*: a *vanam* meant for ministers and courtiers where they made merry with courtesans.

iv Special gardens dedicated to god with water pools studded with lotuses and lilies.

Tabovanam

It was meant for sages and hermits to meditate to explore the self and the super natural power. *Tabovanams* had trees of spiritual significance as listed below.

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Guettarda speciosa

Couropita guinensis

Butea frondosa

Callophyllum inophyllum

Michelia champaca

Ficus bengalensis

Brindavanam



'*Brindavanam*' means a place of eternal bliss. It is supposed to be the advanced version of *tabovanam*. It is the natural abode where sages are believed to have relinquished their 'physical body' and attained 'radiant body' and 'eternal ecstasy'. The Arvind Ashram at Pondicherry is an example for such a garden. Trees with showy, colourful flowers which express absolute joy found a place in Brindavans.

Asokavanam





It was a garden where royal ladies like queens and princesses relaxed. Asoka trees (*Saraca indica*) were grown in woodlots. The down flowing coppery leaves of *Saraca* were believed to suggest to royal ladies that their kings would return with triumph and pacify their emotionally imbalanced hearts.

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Nandavanams

They are small gardens established around village temples with flowering shrubs the flowers of which are offered to various deities. The shrubs commonly grown in such gardens include *Tabernaemontana coronaria, Hibiscus, Tecoma, Nerium, Jasminum* spp., etc.

Natural gardening during Indus and Harappan civilizations

The history of systematic gardening in India is as old as civilization of Indus and Harappan which existed between 2500 BC and 1750 BC.

- Harappan pots were generally decorated with designs of trees of pipal, mango and neem.
- The culture of animal and tree worship was at its peak.
- The pipal tree (*Ficus religiosa*) and banyan tree (*Ficus bengalensis*) served mankind and fauna in many different ways and they were considered as the symbols of fertility.

Wild garden

This is comparatively a recent style of gardening. The revolutionary concept of 'wild garden' was expounded by William Robinson in the last decade of the nineteenth century. The concept of wild garden is not only against all formalism but it also breaks the rule of landscape styles. His main idea was to naturalize plants in shrubberies. He also preached that grass should remain unmowed, as in nature, and few bulbous plants should be grown scattered in the grass to imitate wild scenery. He also suggested that trees, shrubs, and bulbous plants should be planted among the forest flora to fulfill his idea of a wild garden and to allow creepers to grow over the trees naturally imitating those of the forests.

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Questions

1. Rocks, *shola* and a rustic hutment are provided to create rural effect in ---------- style of garden

Ans: natural / informal

2. An example for tree of spiritual significance found in *Tabovanams* is ----------

Ans: Couropita guinensis

3. ---------- means a place of eternal bliss

Ans: *Brindavanam*

4. ---------- was grown in woodlots of *Asokavanam*

Ans: Asoka tree (*Saraca indica*)

5. ---------- are small gardens established around village temples

Ans: *Nandavanams*

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Lecture No.6

Garden Styles - ii : Mughal Gardens, Persian Gardens, Italian Gardens, French Gardens, English Gardens, Japanese Gardens

The major garden styles are:

- Mughal gardens
- Persian gardens
- Italian gardens
- French gardens
- English gardens and
- Japanese gardens

Out of these, the Mughal, Persian, Italian and French types fall in the category of formal gardens, whereas the English and Japanese gardens are classified in the informal style of gardening.

Mughal gardens

The great Mughal Emperor Babur had high aesthetic sense and was fond of gardens. Garden of Panipet and Aram bagh garden at Agra are still maintained. Mughal gardens are synonymous of formal style of gardening.

Broadly Mughal gardens can be categorised into two: i) Pleasure gardens of kings and queens and ii) Tomb garden. The former gardens were made with the sole purpose of pleasure of king and Queen and family members whereas the latter gardens were attached to tombs of king or queen for giving peace to soul.

General features of Mughal gardens

Gardens are formal in style; symmetrically designed in rectangular or square plots. The garden area is divided into four plots by water channels. These four channels represent four rivers of life. The running water provides coolness and freshness to the garden. Reflection of sky and trees provide unique beauty to the eye.

The four plots are planted with trees, shrubs, *etc.,*

The axis is straight and central and sometimes represented by trees line.

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The water pool created in the centre with over flowing water serves as central specimen.

Fountains, cascades are linked to central pool to create scenic beauty.

Taj Gardens



http://taj-mahal.highpointdesigns.com



Key features

(i) Terraces: Terraces are components to maintain the proportion of land for extended view irrespective of topography of the area 7, 8 or 12 terraces symbolize 7 planets, 8 paradise and 12 zodiacal signs. The entrance is located at the lowest terrace. As the Mughal emperors came from a hilly country, the idea of building a garden in terraces came to them naturally.

(ii) Running water (***Nahars***): Water is the life and soul of Mughal garden. Love for running water made the Mughals to select sites close to hill sides and rivulets for their gardens.

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The idea of constructing canals and tanks to keep the water brimming to the level of paths on either side was borrowed from Persians.

Water channels were paved with tiles of brilliant blue color to reflect the sky and give impression of depth.

Various patterns were used for paving the marble stones and style so that running water is thrown up and broken into ripples. At dusk, tiny lighted lamps were placed behind the water falls so that diffusion of light through the water creates a very pleasant sight.

(iii) Site and design: A perennial river, the slope of a hill and river banks were the places selected for this purpose. A typical Mughal garden is square or rectangle in shape. It is not merely a garden but serves the purpose of fort, residence and a place for recreation.

(iv) High protecting wall: Mughal gardens are protected by a high strong wall. The top of the wall is adorned with serrated battlements. The presence of high wall was for protection against enemy and hot winds of summer.

(v) Entrance: Entrance is generally tall and gorgeous. Doors are huge and strong wooden structure studded with heavy iron nails and spikes. Heavy gates are provided to protect the kings and gardens from enemy attack.

(vi) *Baradari*: It is a canopied building with twelve open doors *i.e.*, three in each direction. From baradari, one can sit and enjoy the fresh breeze and watch dark clouds and birds in the sky. The masonry pillars of baradari were painted with designs of flowers in vases and the floor was furnished with thick carpets and cushions.

(vii) Scented flowers: The flowers in Mughal gardens are mostly scented in nature and highly colourful. The colourful effects are created by massing mixed coloured annuals. Mixed colours have been preferred rather than mono, complementary or contrast colours.

Symbolism in Mughal gardens

i Water: Source of life
ii Eight divisions: Eight divisions of Koran
iii Alternate planting of cypress and flowering trees: immortality and renewal of life.
iv White flowering *Bauhinia alba*: Youth and life.

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Italian gardens / Roman gardens

The second and first centuries B.C. saw a marked advance in the art of garden making among Romans.

Italian Garden / Roman Garden





http://www.christusrex.org

The key features

- There were terraces adorned with marble pillars
- There were rose gardens, fountains, pools, sculptures among plants

Persian garden

Water was central feature of the Persian garden design with religious symbolism. The main aspect of a Persian garden design was *nahars* (flowing canals) of water.

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Persian garden



http://www.patternlanguage.com

The traditional Persian garden was composed of four essentials as below:

i Water for irrigation, display and sound

ii Shade trees for shelter

iii Flowers for scent and colour

iv Music to delight the ears

A typical garden is a quadrant pattern with water channels dividing the garden into four sections and this design is called as *Char Bagh* Design. There was usually a pool or small hill with a pavilion at the intersection of the channels. Shade trees and fruit trees were grown in four square plots.

British garden

BRITISH GARDEN



http://www.britsattheirbest.com



http://www.guardian.co.uk

English gardens are the most beautiful gardens among all European gardens. The reasons are that the UK enjoys the typical grassland climate with well distributed rainfall

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which is favourable for the growth of herbaceous perennials. Since they were ruling many countries, valuable plant collection was possible from diverse areas.

The key features of British gardens in India are: i) lawn ii) rockery and iii) herbaceous border.

i) Lawn: Grass lawn is a principal feature of English garden. A lawn can be of any shape and it may be plain or undulating. It can be laid by seed, turfing or plastering.

ii) Rockery: It is the second important feature of an English garden. There are various types of rockeries.

a). Cold weather rockery of annuals like Alyssum, Calendula, Candytuft, Dianthus, Ageratum, Gaillardia, Verbena, Zinnia.

b). Rockery of succulents for dry areas.

c). Rockery of ferns in humid areas.

iii) Herbaceous border: Flower beds or borders are characteristic feature of a British garden. The height of the plant, time, duration and overall colour scheme are taken into consideration.

HERBACEOUS BORDER

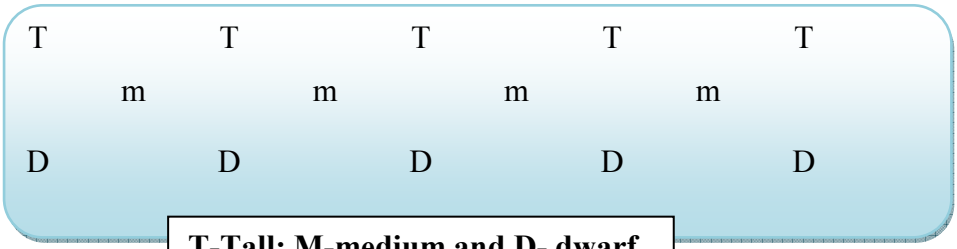


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✶ It is usually designed in three rows with tall and dwarf ones on the sides and the medium ones in the middle.



T-Tall; M-medium and D- dwarf

French garden

During the sixteenth-century, in France the court life was shrouded with stiff formality and exactness. To match with this formality, the French style of garden designs were also very intricate and artificial. Due to the efforts of Le Notre who served in the Royal Garden of Louis XIV from 1643 to 1700, the art of garden design was elevated to a higher. It was Le Notre who showed to the world the impact in impressiveness of scale on garden design. His main creations, the gardens at Versailles, have avenues which are memorable for their tremendous length and width. To design a garden at Vauxe-le-Vicomte, his first master piece, Le Notre had removed three villages to create his vista. The moral of French garden style of Le Notre seems to teach the lesson "how to think big". The style of Le Notre can be termed as an evolution and mastery of the art of formal garden in its perfection. His style dominated the gardens of civilized Europe, for a long time.

Japanese garden

Japanese Garden



http://fc.francisparker.org

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Japanese gardens style is 'nature in miniature' which enables them to meditate, be in harmony with nature even while they are busy with daily routine. Both the Persian and Japanese garden designs were based on their respective ideas of heaven. One most admirable feature of the Japanese garden is that while other major styles of gardening of the world changed radically or fallen into disfavour, the Japanese continued the same style for centuries but still remained popular. This can be attributed to the special relation of the Japanese gardens to nature.

A most important teaching of the Japanese garden is possibly that "unless a garden has an air of peace it's not worth a place visiting. It should be a place where the mind finds rest and relaxation."

Forms or types of Japanese gardens

A Japanese garden may either be in the form of a large public park or a small family garden. The Japanese gardens are further classified based on positions, shape, and purpose. The important types are:

1. Hill garden
2. Flat garden
3. Tea garden
4. Passage garden
5. Sand gardens

Hill garden: The main features of hill garden are hills, streams and ponds along with other features. This style is known in Japanese as *'Tsukiyama-niwa* or *Tsukiyama-sansui'*, meaning hills and water. The features of the hill garden are described below.

i. <u>Ornamental water</u>

Water is the life of the garden and necessary feature of hill gardens. It may be present in the form of big lakes with a calm tranquil surface or symbolically in the form of water basins of natural shape.

Waterfall is another means to bring the natural setting into a garden. A group of stones is raised and water is allowed to fall from it naturally. The trees are planted in

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front of the place where water falls. Wells serve a dual purpose for beauty as well as utility.

ii. Islands

Islands are important feature and are located in the middle of the pond. Rocks are used as foundation and soil is deposited on it. Then trees are planted and stones are erected in an irregular manner to give natural touch. Islands many be connected by a bridge or left isolated.

Different Islands are formed because hills, lakes and islands are complementary beauties. They are given personal touch by naming them as Master Island, Guest Island and Central Island.

iii. Hills and hillocks

A bigger sized broad viewed hill forms the main feature (Hill-1). Secondary to it, a lower hill is created adjacent to Hill-1 and is called companion hill (Hill-2). A lower hill-3 is projected front opposite to Hill-1. Hill-4 is elegantly introduced in the foreground close to hill-3 and below Hill-2. At the far end, Hill-5 is to be located which could be seen from all parts of the garden.

iv. Stones

Stone structures are used to depict different natural moods, ideas of spirituality and melody. There are 5 such types of stones as described below:

- Status stone: A tall vertical stone bulging out towards middle and finishing at the top suggesting a human at thinking or meditating.
- Low vertical stone: is rounded at the base and its top is bent resembling the bud of magnolia.
- Flat stone: is a low broad stone of irregular shape with a flat top suggesting submissiveness.
- Recumbent or ox stone: resembles trunk of an animal. Its long curved and bent boulder suggests an animal hiding in a bush.

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- Arching stone is arch like as its name indicates and suggests flexibility in thought.

5. Trees

Trees are planted with certain objectives and have been given specific names.

- **Principal tree**: Group of trees planted at the central part of background.
- **View perfecting tree**: A tree planted in the foreground of an island.
- **Tree of solitude**: Group of trees with thick foliage in the background on one side.
- **Cascade screening tree**: Group of bushy or leafy tree planted at the side of waterfall to hide the portion of it.
- **Tree of setting sun**: is planted in the west side to filter the glare of setting sun.
- **Distancing tree**: Pine plants planted to give a forest look.

6. Garden lanterns

Stone and bronze lanterns were used to decorate Buddhist temples. They became the thing of beauty in gardens also. Standard lanterns or legged lanterns or stone lanterns are used in an informal manner to decorate the garden.

7. Garden pagoda

It may be in the form of stone tower or pagoda. The roof may have three, five or seven a nine or eleven separate roots.

8. Garden bridges

They are made of natural wood of stone varying in size and width. They are used to connect islands. Either single stone or many pieces have been used to make the bridges sometime, semicircular arch. Form of bridges are constructed on the special ponds to permit the passage of boats under it. The bridges are named as wooden trestle bridge, 'peeping' bridge, 'Granite slat bridge' curved bracket bridge, Chinese full moon bridge *etc.,*

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Garden bridges



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Japanese Tea Gardens

In Japanese culture, the tea ceremony has gained the status of national ceremony and has been intricately woven with life style. Tea garden is nature recreated in miniature in front of the house.

The present day Japanese tea garden is sectioned into three areas *viz., sotoroji* (outer section) *machi* (middle section) and *uchiroji* (inner section)

Outer section: The guests are supposed to wait after removing shoes. Paths will be provided with stepping stones to lead to middle section. Stone benches of irregular size are provided and the area is not planted with many kinds of plants except grasses.

Middle section: Stone troughs with water are kept for the guests to clean themselves before making entry into the inner section. Here also the stepping stones and naturally looking objects are located in a improper manner.

Inner garden: It is extremely simple and natural stones, lanterns, rocks water basins which look as antiques are placed. The trees, shrubs, annual and grasses are put in an informal manner. A rustic well compete with lever, rope, bucket, pulley *etc.,* is an essential feature of inner garden. Hedge walls are provided to look natural. The selection of trees is such that when the outer garden is exposed to the light the inner must be darkened by shady evergreen trees.

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Flat gardens

Flat gardens lack ups and down and are devoid of hills, streams and ponds. They are created for confined places and are secondary in importance. Mostly '*Moore*' type gardens are developed to create scenic beauty, other adornments like stones, wells, water basins, trees, *etc.,* are used. Water current of an ocean effect is produced by covering the land surface with pure sand. The rocks or pebbles are so arranged that they give an effect of diversion or rush or water.

Some typical trees of Japanese gardens are:

(a) **Evergreen trees**: Pines, different species of *Abies, Cryptomeria japonica, Podocarpus macrophylla*, and *Juniperus chinensis*

(b) **Deciduous trees**: Maples (Acer species), Poplars (*Populus* sp.) Mulbery, (*Morus alba*), and *Salix babylonica* (willow)

(c) **Flowering trees:** The most commonly used plants are different *Prunus* species, besides *Magnolia grandiflora* and others.

(d) **Shrubs**: *Aucuba japonica*, Azaleas, *Gardenia florida*, *Nandina domestica*, Camellia, *Lagestroemia indica*, Rhododendrons.

Bamboos play a special role in the Japanese gardens. The striking patterns of shadow cast by the arching bamboos against paved path, fences, and patios look beautiful. A paved path in the entrance garden bordered by bamboos simulates a grove.

The Japanese use more flowers like chrysanthemums, asters (e.g., *Aster fastigiatus, A. glehnii, A. microcephalus*), carnation, different lilies, irises, lotuses, peonies, and orchids. Among the vines, (Clematis, *Lonicera japonica*, *Ipomoea hederacea* (Syn. *Pharbitis headeacea*), *Ipomoea purpurea* (Syn. *Pharbitis purpurea*), *Trachelosermum jasminoides*, and *Wisteria sinensis* are often used.

Questions

1. As per the Japanese legend, 'Sanshu no jinji' the sacred objects given to sun god are

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a. Sword b. Jwell c. Mirror d. all the above

Ans: d. all the above

2. -------- is the life of the garden and necessary feature of Japanese hill gardens

Ans: Water

3. --------are important features located in the middle of the pond in a Japanese garden.

Ans: Islands

4. ---------- garden is an example for an informal garden.

Ans: Japanese

5. A garden in a quadrant pattern with water channels dividing it into four sections is called as ----------

Ans: Char Bagh Design

6. Garden of Fatehpur Sikri was laid out by the king ----------

Ans: Akbar

7. ----------is a canopied building with twelve open doors, three in each direction where one can sit and enjoy the fresh breeze and watch dark clouds and birds in the sky.

Ans: Baradari

8. ---------- is a symbol for source of life in Mughal garden

Ans: Water

9. White *Bauhinia alba* symbolize ---------- in Mughal gardens.

Ans: youth and life

10. They key features of a British garden are:

i) Lawn ii) Rockery iii) herbaceous border iv) all the above

Ans: all the above

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Lecture No.7

Classification of Plants Based on Utilities

TREES

Trees are very fascinating because of their graceful appearance and the abundance of bloom. They are grown for their economic importance or aesthetic value or both. The cultivation of trees for their aesthetic or recreational value is known as arboriculture. Trees should be planted carefully and thoughtfully for the benefit of height, shade, colour and vertical emphasis.



Significance of trees in landscaping

- Trees form the main framework of the garden.
- Some trees produce attractive and beautiful flowers including fragrant flowers
- Some trees are noted for their attractive foliage
- Some trees are known for their peculiar shape or form which is used as specimen trees.
- Some trees are known for their peculiar shape or form which is used as specimen trees.

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1. Spreading tree
2. Upright tree
3. Columnar tree
4. Umbrella shape - palm
5. Conical tree
6. Round-headed tree
7. Picturesque tree



1. S-shaped tree
2. Twisted trunk
3. Buttressed tree
4. Slanting tree
5. Twin-branched tree
6. Three-trunk tree



1. Cascade
2. Exposed root
3. Coppiced tree
4. Lopped tree

Shady trees are planted in chosen spots of large public garden which provides place for picnic and relaxation. Such trees are also planted along the borders of roads as avenue for giving shade.

In selecting ornamental trees, the purpose should be decided first and then the place of its culture should be finalized.

SHRUBS

Shrubs are defined as woody or semi woody perennial plants, the branches of which arise from the base of the plant and grow up to a height ranging from 50 cm to 4 m.



Hibiscus *Ixora* *Tecoma stans*

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Uses

a) They are important garden plants not only because of the large number of cultivated species and varieties but also due to the wide range of variation in the shape and size of the plants
b) They fit very well to home gardens in cities and towns.
c) Shrubs act as a foundation plant in the buildings.
d) Flowering can be seen throughout the year from one or other plant.
e) They can be used as a hedge, fencing and also for topiary e.g. Hibiscus, Divi Divi, Thevitia, Casuarina *etc.,*
f) They can also be grown as potted plants.

Classification

I. Based on the use in the garden

a) Shrubs for showy or attractive flowers e.g. Hibiscus, Ixora, Mussanda, Night queen, Euphorbia etc.,
b) Shrubs for fragrance e.g. Jasmine, Rose, Nandiayavattai (Tabarraemontuna Coronaria), Pavalamalli (Nytanthes arhotristis) *etc.,*
c) Shrubs for foliage e.g. *Crotons, Polycias, Eranthemum, Graptophyllum etc.*

II. Based on sunlight requirement

a) Open sunlight e.g. *Hibiscus, Bougainvillea etc.,*
b) Partial sunlight e.g. Eranthemum, Polyscias, Pisonia, Graptophyllum *etc.,*
c) Full shade e.g. Polyscias

FLOWERING ANNUALS

Annuals are plants that complete their life cycle in one season or one year. They attain their full growth from seed, flower and die in one year or one season. They comprise of several of the most beautiful and easily grown plants widely varying in form, habit of growth and colour.

The selection of annuals for gardening can be made according to following purposes.

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i) **Bedding purpose:** Dahlia, Marigold, Phlox, Verbena, Pansy, Carnation, Petunia, Zinnia, Portulaca, Gomphrena, Gaillardia.

ii) **Fragrant flowers:** Carnations, Sweet pea

iii) **For cut flowers:** Carnation, Aster, Helichrysum, Antirrhirum

iv) **For loose flowers:** Marigold, Annual Chrysanthemum, Aster, Zinnia, Gaillardia

v) **For hanging basket:** Daisy, Nasturtium, Verbena, Phlox, Alyseum, Portulace

vi) **For rock garden:** Nasturtium, Verbana, Phlox and Gamolepis

vii) **For screening :** Hollihock and sweet pea

viii) **For pots:** Carnation, Antirrhinum, Aster, Petunia

ix) **For dry flowers:** Helichrysum, Gomphrena

BULBOUS ORNAMENTALS

The word "bulb" in gardening includes bulbs, corms, rhizomes, tubers, fascicled roots, etc. Some popular bulbous plants suitable for landscaping include *Canna*, crinum, dahlia, hippeastrum, lilium, tuberose, caladium, amaryllis, zephyranthes, iris lily, *Oxalis* species, tiger lily, gladiolus, anemone and ornithogalum.

CLIMBERS AND CREEPERS

Climbers are very important ornamental plants and are commonly used on walls, arches and pergolas but in cities their utility is increased for the purpose of screening the premises from adjacent houses and maintaining privacy. Bare walls can be most effectively decorated by growing colorful climbers on them. Botanically, plants, which have the special structure to climb on supports, are defined as climbers.

Selection of climbers

1. Annual climbers e.g. *Clitoria ternata,* sweet pea, morning glory, *(Ipomoea rubrocaerulea)*
2. Climbers for screening e.g. *Antigonon leptopus Passiflora, Porana Ipomoea, Clerodendron splendens Thunbergia etc.*

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3. Climbers for low walls or trellis for this purpose only light climbers are selected. e.g. *Lonicera japonica, Solanum seaforthianum, Tristellatia australis, Tecoma jasminoides, Jacquemontia violacea.*
4. Climbers for pergola usually heavy climbers are grown. e.g. *Quisqualis indica, Petrea volubilis, Adenocalymma allicea, Allamanda cathartica* etc.
5. Climbers for porches e.g. *Pyrostegia venusta, Petrea volubilis, Clerodendron splendens, Bougainvillea, Jasminum* sp. etc.
6. Flowering climbers in partial shade e.g. Passiflora, Aristolochia, *Quisqualis indica, Clerodendron splendens, Jacquemontia violaceae.*
7. Foliage climbers e.g. *Scindapsus aureus, Philodendron* sp., *Monstera deliciosa*
8. Climbers for pot culture e.g. *Tristellatia australis, Adenocalymma allicea, Clitoria ternata, Bignonia purpurea* etc.

Questions

1. The cultivation of trees for their aesthetic or recreational values is known as ----------.

   Ans: Arboriculture

2. Shrubs which can be used as a hedge, fencing and also for topiary ----------

   Ans: Hibiscus, Divi Divi, Thevitia, Casuarina.

3. An example for foliage shrub is ----------

   Ans: Acalypha, Eranthemum

4. A plant species suitable for hanging basket is ----------

   Ans: Portulaca

5. A suitable climber for pergola is ----------

   Ans: Quisqualis indica

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Lecture No.8
Components and Features of Landscaping - I: Plant Components

A judicious blend of plant and non-plant components in a garden makes it beautiful and useful. The common plant components of a garden are discussed here.

Lawn

A lawn can be defined as the green carpet for a landscape. It is a basic feature for for any type of garden. In a home garden, lawn improves the appearance of the house, enhances its beauty, increases conveniences and usefulness thus adding monetary value to the real estate. The lawn provides a perfect setting for a flower bed, a border, a shrubbery or a specimen tree or a shrub. Besides the material value, a lawn has its spiritual value, too. A lawn is the source of charm and pride and reduces tension of the mind after a day's hard work in the materialistic world.



Shrubbery



Growing of shrubs in a group is called shrubbery. It is of two types (i) Pure shrubbery (ii) Mixed shrubbery. Pure shrubbery refers to planting of entire selected area with a single species whereas a mixed shrubbery has many different species of shrubs.

Flower beds and borders

Annuals and herbaceous perennials are grown in flower beds to provide mass effect of different colors. Borders are continuous beds of more length than width containing plants of one kind only.

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Rockery

A rockery or a rock garden is the arrangement of rocks with plants growing in the crevices. Its bold ruggedness is a pleasant contrast to the softness of the flowers. The stones help the plants in retaining their moisture and keeping their roots cool. In plains, on the sunny side some of the cacti and succulents and plants like *Lantana*, *Setcreasea, Verbena*, *etc.,* can be grown successfully. Ferns and some indoor plants also look natural on the rockery slopes in shade.

Rocks are also valued in garden design for their interesting shapes. The range and variability of shapes and size give them a sculptural quality. Those with natural curves and smooth outlines are more valuable than others. Their surface texture is another attractive feature. Cobbles and pebbles found in water courses are generally smooth.

Carpet beds

The art of growing ground cover plants closely and trimming them to a design or alphabetical letters is called a carpet bed. Colourful foliage as edge plants is found to be more suitable for this purpose.

Plants for carpet beds should possess the following characteristics:

1. Perennial in nature
2. Should have quick recuperative quality
3. Should withstand frequent pruning
4. Should withstand summer sun and heavy rains
6. Should withstand drought e.g. *Alternenthera*

Topiary



It is the art of developing the plant or training the plant into different forms or shapes like animals, birds, arches, *etc*. The plant should be amenable for repeated pruning and also flexible with more vegetative growth. e.g. For hills - *Cupressus macrocarpa, Pinus patul;* for plains - *Casuarina* sp., *Caesalphinia coriari*, *Bougainvillea* sp., *Clerodendron* sp.

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Trophy

It is the arrangement of colorful potted plants in different tiers around a central object which may be a tree trunk, lamp post or a pillar.

Hedges



With the help of plants, live hedges can be formed and used as a fence or a green wall Acalypha, Casuarina, Divi divi (*Caesalpinia coriaria*), *etc.,* are plants suitable for hedging. Hedges help to screen a particular site or building or hiding of unwanted places. They help to partition the garden into several parts.

Edges

These are perennial herbs often used as a short border for lawn or ground cover or dividing beds from roads, walks or paths. These herbs often stand frequent trimming e.g. *Eupatorium, Alternanthera*, *Duranta*, Dwarf marigold, *etc*.



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Questions

1. ---------- can be defined as the green carpet for a landscape

Ans: Lawn

2. ---------- refers to planting of entire selected area with a single shrub species

Ans: Pure shrubbery

3. A plant species suitable for carpet bed is ----------

Ans: *Alternanthera*

4. The art of training plants into different forms or shapes like animals, birds etc is called ---------

Ans: Topiary

5. A plant species suitable for topiary in plains is

Ans: *Casuarina*

6. The arrangement of colourful potted plants in different tiers around a central pillar is called

---

Ans: trophy.

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Lecture No.9

Components and Features of Landscaping - II: Non-plant Components

The commonly used non-plant garden components are discussed here.

Arches



Arches are supports provided for climbers. It should be at least two meter height and one metre wide. The breadth depends upon the path over which it is constructed but should not be less than 1 metre. Arches may be made of wood, metal, stones or concrete structures.

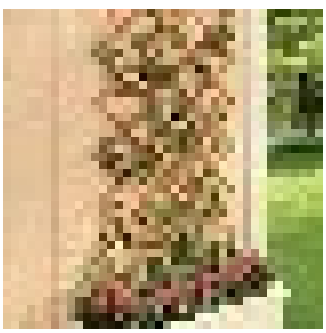
Pergolas



A pergola is formed by connecting a series of arches over a considerable length. Usually flowering creepers are trained over the arches. A pergola is a useful resting place during the summer months in tropical regions. The path below remains cool due to the creepers growing above. Below the pergola, concrete or wooden benches may be constructed for sitting.

Trellises

A garden trellis makes the most of limited space with a vertical display of lush greenery and colorful blooms



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Uses of a garden trellis include the following.

- Creates a privacy screen in a garden or on a patio or balcony
- Provides support for large vines and trailing plants
- Screens an unattractive area of the landscape
- Provides shelter from wind
- Provides shade for sitting area

Climbers such as climbing roses, Clematis, English ivy, passion flower, *etc.,* are suitable for trellises.

Islands

Various types of islands are made in garden lakes and ponds. Islands are decorated with trees, flowers, several other features and connected with bridges. Islands are a very important feature in Japanese gardens. It is no doubt a special representation of nature and a retreat for quiet meditation.

Garden walls

Garden walls serve many purposes in different situations. They provide privacy and security, screen out wind and noise. They can also be constructed to observe the ugly sights in the garden.

Garden fences

They have a specific function as well as beauty. Fencing provides privacy, separates different areas of gardens and ensures safety. They have almost infinite possibilities and variations in design, material and usefulness. Fences may be solid or open. Materials like wood, bamboo, wire, wire-netting and chain link fences may be used for fencing. Painted fences are an additional attraction in the garden.

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Foot paths




Foot paths facilitate movement within the garden area. Foot paths may be winding, circular or straight. Spinal or herring-borne designs can also be adopted. Winding foot path conceals the components beyond and creates curiosity. Straight foot paths make one walk fast. A vista at the end of a straight foot path adds beauty to the scenery

Roads

The different locations of landscape over an area require proper roads. In a small garden, foot path will serve the purpose. Roads are constructed in larger gardens like dam site gardens, public gardens and botanical gardens. Such roads should be straight in formal gardens and with curvatures in informal gardens. The road gradient should be 1 to 30 for effective traction. Width may be 3.3-5 m. Drainage gutters should be provided on both sides. The road may be made with single metal with black top.

Arbours

Garden arbours are an attractive and very functional addition to landscape that will allow exploring the vertical dimension of garden. Arbours come in a variety of shapes from rounded or gently curved tops, to linear, flat tops to suit any garden style and space. An arbour, or pergola, can also cover a larger area such as a patio or balcony.

The following are the uses of garden arbours.

- Add vertical interest to the garden
- Create a transition from house to garden or from one garden area to another
- Extend or integrate architectural details from house or garage to garden
- Provide a shaded area in the garden
- Provide shelter from wind
- Provide support for vines
- Screen an unattractive area of the landscape
- Create privacy

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Bridges



Bridges are essential constructed features in a garden to link ponds and rivers. The design and colour of the bridge should merge with the landscape design; always a rustic design is preferred. Bridges should be structurally sound to withstand traffic. The culverts along the main road and foot paths also should be rustic. Bridges made of single or double trees fallen across a stream or a single long stone, arched bamboo bridges will serve better in informal gardens.

Garden adornments

There are several garden adornments and accessories such as bird bath, sun clock, fountains, garden seats, ornamental posts, pillars, *etc.,* which make the garden more enjoyable.

1. **Garden-seats:** The garden-seats should not look out of place. They should be comfortable, durable and artistic looking. Seats made out of wooden or fabric material are comfortable to sit compared to those built in stone or iron. The wood used is to be treated with a preservative and painted with moisture proof chemicals. Iron or stone or concrete seats get easily heated in the summer months and become cool in the winter months, thus making them uncomfortable to sit. Concrete or stone seats are preferable in public parks as they are durable in nature.
2. **Ornamental tubs, urns and vases:** The tub or the vase can be made of timber or preferably of brick, concrete or carved out of stone, which can be kept permanently or temporarily. These can be positioned over ornamental pillars, at the end of paved paths, near the gate or near the staircase of the main entrance. Ornamental urns made of metal with carvings outside look beautiful in the terrace, near the staircase or even inside the house.
3. **Bird bath:** It is a large, bow-shaped container generally made of concrete, fixed over a pillar or column, which is about 1m tall. Water is stored in the bowl for the birds to come and drink or bath in it. Bird baths may be constructed at the quiet corner of the garden.
4. **Sun dials:** It can be used as a focal point in a garden, can form a centerpiece of a formal flower bed, and can be placed in the centre or at the end of the lawn or at the junction or termination of path. It is also a good feature in a sunken-garden. The sundial should be

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positioned in a place where the shadow from a tree or building does not fall for a long duration.

5. **Floral clocks:** These are huge clocks generally operated by electricity, having huge hands for showing the seconds, minutes and hours. The machinery of the clock is concealed in an underground chamber with only the hands showing above the ground against a dial of carpet bedding plants or flowerbeds. Instead of live plants, the dial can be decorated with various coloured pebbles.

Questions

1. Connecting a series of arches together is called ----------

Ans: Pergola

2. A plant suitable for trellis is ----------

Ans: Climbing rose

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Lecture No.10
Special Types of Gardens - I: Roof Garden, Sunken Garden, Vertical Garden, Terrace Garden

(A)ROOF GARDEN

Concept

A garden on the flat roof of a building, especially one found in an urban setting is called a roof garden. Often there is a misconception in India between roof gardening and terrace garden. In many publications, the gardening on the roof is often termed as terrace gardening which is not strictly correct according to the British concept.

In modern times, individual homes with a compound and a lawn are becoming rare in cities and towns and skyscrapers are replacing such homes. As a result, the private home gardens are vanishing and the only places left for gardening are the roofs of houses. A spacious well planned roof garden can be a place of joy and recreation. In bigger cities of India, many of the large hotels and public buildings are developing this type of gardens.

Types of roof garden

Based on the amount of maintenance required, the depth of soil and the types of plants the area will support, roof gardens are classified into three basic types namely, extensive living roofs, semi-extensive living roofs and Intensive living roofs.

Extensive living roofs range from as little as 2.5 to 12.5 cm in soil depth. Semi-extensive living roofs have deeper soils and can therefore support a greater number and wider variety of plants, making them more decorative. However, their depth makes them heavy so they require a strong structure to support them. They can combine the relatively low maintenance of extensive roofs with a more aesthetic appearance. Intensive living roofs require a minimum of one foot of soil depth to create a more traditional roof garden, with large trees, shrubs and other manicured landscapes. They require intensive maintenance.

Besides the above three types, other types of roof garden as detailed below are also being designed in recent days.

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Communal roof gardens: Green roofs can slope down to ground level, to make them accessible to pedestrians. This roof design is used for a spa hotel - an unusually protected environment. It could be used for campus-type environments (e.g. business parks and universities).

Public roof parks: A green bridge can be used to join green roofs on separate buildings, thus creating a continuous public or private green space at roof level. This green space planning idea is described elsewhere as a skyway **.**

Nature conservation roofs: It is often more appropriate to use vegetated roofs as wildlife habitats than as amenity green roofs for people.

Private roof gardens: Roofs designed as living space have been made since ancient times. Unlike the roof garden types described above, private roof gardens benefit from (1) a surrounding wall, at least to waist height, for safety (2) an overhead shelter, or pergola, to provide spatial security and shade when required.

Design and style

A roof garden needs careful planning and designing. The essential requirements of a roof garden are detailed below.

Waterproof layer - The base layer which is added to the existing surface.

Roof membrane - Waterproofing layers, such as asphalt and bitumen, are very susceptible to damage from plant roots and any root penetration may lead to leaks. A pond liner or butyl lining or 300 micron damp-proof polythene should be laid over the waterproof.

Filter sheet - This sheet allows moisture to drain off from the roof but retains fine materials.

Drainage layer - This helps to retain moisture while allowing excess water to drain away. Commercial systems store water and are made of plastic or geotextile materials.

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Soils and substrates - The top layer. The growing medium should be light weight and free draining yet of a material that retains moisture.

Planting and care

- Use light-weight soil-less mixes or patio mixes for containers.
- Choose drought tolerant plants that will tolerate rooftop or balcony conditions.
- Daily watering with an easy-maintenance drip irrigation system and mulching.
- Use water soluble and slow release fertilizers.

Plants for roof gardening

Climbers	:	*Ficus repens*, *Vernonia elaegnifolia*, *Thunbergia alata*
Flowering annuals	:	*Antirrhinum*, stocks, dwarf sweet peas, pansy, dahlia, chyrsanthemum, marigold, sweet alyssum, phlox, verbena
Herbaceous perennials	:	*Pelargonium, Canna, Portulaca*, golden rod, periwinkle
Trees	:	*Plumeria* sp., *Callistemon lanceolatus, Gliricidia maculata*, *Araucaria cookie*, *Mimusops elengi*, *Brassica actinophylla*

(B)SUNKEN GARDEN



It is formed taking advantage of a natural depression. The depression is made into different tiers over which ground covers, edges, flower beds and small herbs may be grown. At the center of the depression, a pond or pool is formed to grow water plants.

A sunken garden can be laid out in an already existing depression of land or a portion of the garden may be modified to lay out such a garden. Since a sunken ground is likely to collect water, adequate drainage arrangement should be made. The simplest method will

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be to have one or two drainage outlets and connect them to the sewage system. It is not advisable to have a sunken garden in a very heavy soil because of the drainage problem. If the garden is likely to be flooded rapidly, special arrangements may have to be made to drain out the excess of water accumulated. Some drainage materials such as stones, rubbles, *etc.,* may be placed below the surface of the sunken garden at a depth of about 1 metre from the surface. The thickness of these materials may be about 60 cm. Steps should be taken to prevent the surface run-off water falling into the sunken garden.

(C)VERTICAL GARDEN

Vertical gardening involves gardening with upright structures so as to utilize the vertical space. It is ideal for gardening in the urban city areas and apartments with balconies. Many structures including fences, arbours, trellises and walls can be used to create vertical gardens. Hanging plants and pulley systems can be used to make vertical gardening attractive.





(D)TERRACE GARDEN

It is a garden arranged in various levels or terraces. Terrace gardening involves land raising and construction of steps, ramps, walls and paved paths as well as planting of lawn grasses and other plants. It is desirable to have plants on the terrace but it should be restricted to the edges so that the middle is left open for circulation. Since

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such gardens are mainly for relaxation, they should provide both sunny and shady areas. Terrace gardens must offer a fine year-round view of the entire garden. Addition of sculptured rocks, a small lily pond with a fountain and water plants will lend visual enrichment.

Questions

1. A garden on the flat roof of a building found in an urban setting is called a----------

Ans: Roof garden.

2. ----------allows moisture to drain off from the roof in the roof garden.

Ans: Filter Sheet

3. State a climber suitable for roof gardening----------

Ans: *Ficus repens*

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Lecture No.11

Special Types of Gardens - II: Water Garden, Bog Garden, Shade Garden, Rock Garden

(A) WATER GARDEN

Importance



Civilization's first settlements sprang up around rivers due to irrigation and transportation needs. Later these people produced such technologies as canals and aqueducts to bring water to lands. Water lilies, lotus, iris, arrowheads as well as numerous grasses, trees, and other plants were found to grow well in and around water sources. In recent days, water gardens are becoming one of the most popular landscape projects. They can be designed to fit virtually any existing landscape. Water gardens are places for recreation. Many of the popular theme parks are based on the concept of water garden only.

Installing a water garden

Site selection: In selecting the site for the water garden, consider the plants that intend to grow in the pond, the soils on the site, how level the grade of the site is, surface drainage of the site, the view of the pond site from the house, the overall fit of the pond in the existing landscape and anticipated maintenance requirements.

Location: A water garden should be located in full sun, or as much as is available, within easy access to water and electricity, where it can be appropriately viewed from the house, where the water can reflect the beauty of the surrounding landscape.

Aquatic plants such as water lilies require full sun for optimum flowering. For the best growth and establishment of all of water garden plants, a minimum of 5 to 6 hours of

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direct sunlight each day is recommended. A water garden should not be located where leaves fall from trees or in a low spot in the yard where heavy rain could flood it.

- **Design consideration:** The design of the pond is of utmost importance. The design of the pond should take into account the following aspects.

- **Size of pond:** The size of the pond is very important. Minimum size for a healthy balanced pond is considered to be about 50 square feet of surface area. Depth of the pond should range from 18 to 24 inches.

- **Shape:** For a formal style landscape, a geometrically shaped pond would be ideal. If the landscape is informal, a less geometric or informal shaped pond would be more suitable.

- **Edging:** Edging materials help the water feature to merge with the overall scheme of the garden. Bricks, rocks, steel edging or wood around the pond can be used to accent the pond.

Construction: Choice of materials should take into account the cost, life expectancy of the material, installation requirements, availability and how these materials may blend with the existing materials in landscape.

- Liner: The liner is generally the most important and most expensive component of the water garden. Some examples of liners are listed below.

Type of liner	Life expectancy
PVC	7 to 15 years
Butyl or rubber	30 years
Fiberglass	50 years
Concrete	Lifetime

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- **Pumps:** The size of pump for the pond should be capable of circulating the entire volume of the pond's water through a filter in 1 to 2 hours. If water feature such as a waterfall is to be included in the water garden, the pump must be of a size capable of carrying the extra load and fast enough to handle the transit time of the water in the feature.

- **Pump filters:** These remove particulate matter such as algae, sediments and fish wastes from the pond's water. There are two main types of filters, mechanical and biological. The mechanical filters are less expensive but require more maintenance. Mechanical filters require the entire volume of water in the pond to circulate through them at least once every hour to be effective. Biological filters are more difficult to install but may need attention as seldom as once a month *e.g. Nitrosomonos* sp., *Nitrospira* sp., *etc.*, are effective as water filters.

Media for plants:

Potting media for all pond plants should be fertile heavy clay loam. This soil should be free from fertilizers, herbicides and other pesticides. These chemicals, if not directly toxic to the plants, can leach out and cause damage to fish and animals living in the pond. Soil should also be free of any fresh organic matter such as peat (fresh organic matter will tend to float out of the soil and cloud the water). All media must be covered with a 1 to 2 inch layer of coarse gravel or rocks (not sand) to prevent the clay from dispersing into the pond water.

Fertilizers:

Fertilizers used should be special aquatic pelletized slow release forms. Well balanced fertilizer can be mixed into the soil and then packed into the middle of the root ball at the bottom of the pot to prevent it from leaching.

Maintenance tools:

A long poled net is handy for the removal of leaves and other fallen materials. Garden shears facilitate pruning of water plants. A pH meter or testing kit is useful to test the water pH.

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Water

Correct depth of pond, a good filtration system and correctly chosen plants can ensure maintenance of water in a good condition. A water filtration system and oxygenators will help in keeping the water clear of algae and other debris. The water filter should be cleaned at least once a week, or as needed.

Pumps:

Pumps should be pulled from the pond and cleaned regularly. The pump filters may need weekly cleaning.

Plants:

As the leaves and flowers of the aquatic plants die they should be removed. Watch the root balls and leaves for damage by fish and insects. Once or twice in a year lotus will need repotting.

Plants for water gardening

Aquatic plants basically fall into four categories as listed below.

1. Deep water plants
2. Bog plants (marginals)
3. Oxygenators
4. Floating plants

Of these, the following plants are suitable for water gardens.

Deep water plants:

Water lilies - *Nymphaea* spp.
Lotus - *Nelumbo* spp.
Spatterdock - *Nuphar luteum*

Floating plants:

Azolla - *Azolla* sp
Duckweed - *Lemna* sp

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Water meal - *Wolffia* sp
Water fern - *Salvinia minima*
Water hyacinth - *Eichhornia crassipes*
Water Lettuce - *Pistia stratiotes*

Submerged plants or oxygenators:

Vallisneria - *Vallisneria americana*
Dwarf sagittaria - *Sagittaria natans*
Anacharis - *Elodea canadensis*
Cabomba - *Cabomba caroliniana*
Water milfoil - *Myriophyllus* spp.

Fish: Fish should be watched for infections of fungi and other parasites. If any die, remove them as soon as they are found. Goldfish are very hardy and are suitable for ponds. Shubunkin, Calicoes, Orandas, Fantails such as Chinese Moor and Comets are popular types of goldfish.

(B) BOG GARDEN

The actual bog garden is an area where there is stagnant acid water and only plants such as sundew, butterwort, *etc.,* grow. But the bog garden in landscape gardening refers to a marsh where the soil is not sour or acid and a shallow stream or trickle runs through it. The main criterion of a marsh garden is to keep it moist and in a swampy state all throughout. The site should be low-lying where the surface drainage water will collect naturally. A site having a sub-soil of sticky clay is ideally suitable for marsh garden as only a trickle of water will keep this wet, but if the soil is light in nature, certain amount of digging will be needed before establishing a marsh garden.

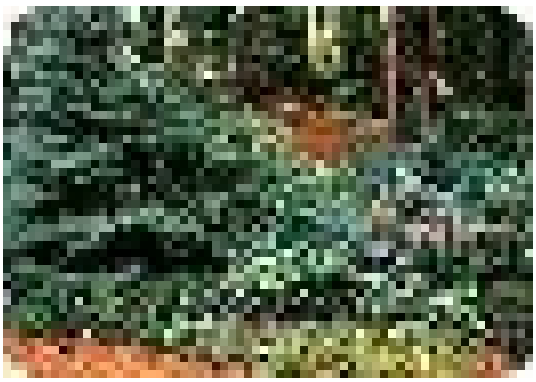
Plants for bog gardens

Arrowhead - *Sagittaria sagittifolia*
Bog Lily - *Crinum americanum*
Bull Rush - *Scirpus* spp.
Cat tails - *Typha* spp.

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(C) SHADE GARDEN



Shade gardening refers to growing of shade loving plants under shady conditions. The shady conditions may be natural tree shades or artificial shade created using protected structures such as conservatories, shade net houses, *etc.,* The plants suitable for shade gardens are listed below.

-

Ferns	: *Nephrolepis, Asplenium, Pteris*
Foliage plants	: *Caladium, Alocasia*
Bulbs	: Daffodil, crocus, hyacinth
Cut flowers	: Fox glove (*Digitalis*)
Perennials	: Hydrangea

(D) ROCK GARDEN



A rock garden is the arrangement of rocks with plants growing in the crevices. Its bold ruggedness is a pleasant contrast to the softness of the flowers. The stones help the plants in retaining their moisture and keeping their roots cool. In plains, on the sunny side some of the cacti and succulents, Lantana, Setcreasea, Verbena *etc.,* can be grown successfully. Ferns and some indoor plants also look natural on the rockery slopes in shade.

Site selection

A rock garden should be situated in an open part of the garden. It is often advised that a shaded corner of the garden should be devoted for making the rock garden. The rock garden should get all the sun possible or at least for half the day, preferably in the forenoon.

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Construction of the rockery

The placement and selection of rocks is an important factor. Rocks should be of local origin, porous, and have a weathered look. Granite is unsuitable, whereas a weathered limestone is ideal. Lime stones from the quarry can be used as they weather quickly. Stones of uniform size having a diameter around 60 cm should be selected and a few stones should be as large as can be handled without much difficulty.

Rock plants do not grow exclusively on rocks, and, hence, a good soil is needed for every rock garden. In the hills, there is no problem in selecting the soil as the natural soil is the best soil there. The soils obtained from where the paths are laid will make the mounds and ranges. In the plains, a soil full of coarse sand, plenty of leaf-mould and well-rotten farm yard manure is quite suitable for most of the plants. In addition to leaf-mould, fine compost suitable for rock garden can be prepared from the cutting of the turf by the usual method of composting. Only the few centimeters (15-45 cm) of the top layers of the rockery will have this compost. The sub-soil should be well drained and have the property to absorb sufficient moisture. If it is not naturally so, this can be created by adding sand or gravel.

Management of the rockery

In places having a severe winter, delicate plants will need protection. When plants are small a glass sheet resting on the rocks may be placed over the plants. For larger plants four strong galvanized wires may be inserted in the ground and the glass placed over this. If the weather is very cold the sides should also be covered with glass or polythene sheets.

The rock garden should be weeded periodically and all dying or dead leaves and branches are removed. Rock plants are replanted every 4 to 5 years or they may be top dressed every year with a mixture of compost, garden soil, fine sand, and leaf-mould in equal proportions. Periodically the rock plants may be fed with liquid.

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Questions

1. Mention a suitable plant for water garden -

Ans: Water lily (*Nymphaea* sp.)

2. Lantana is a plant suitable for rock gardens - State True or False

Ans: True

3. Match the following

(a). Floating plants - *Vallisneria americana* (b)

(b). Oxygenators - *Nelumbo* spp (c)

(c). Deep Water Plants - *Eichhornia crassipes* (a)

4. A plant suitable for bog garden- ----------

Ans: Arrowhead (*Sagittaria sagittifolia)*

5. A plant suitable for shade garden ----------

Ans: Nephrolepis

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Lecture No.12

Special Types of Gardens - III: Terrarium, Bottle and Dish Gardens, Window Garden

(A)TERRARIUM

Concept

A terrarium is a transparent glass or plastic container with plants grown in it to make a miniature landscape. It has an open or closed top. Many kinds of containers can be used for terrariums. These clear-sided containers have no drain holes and usually have a clear top. When a terrarium is properly planted and located, it can be a source of enjoyment for years, providing an interesting way to grow and display many plants with relatively little care. The introduction of the art of the terrarium is generally credited with Nathaniel Bagshaw Ward as early as 1842.

Terrarium planting is a specialized part of home gardening. Terrariums provide a humid atmosphere that allows growing of forest plants at home. The theory behind the terrarium is that in a closed container the moisture which the plants take up through their roots and transpire through their leaves is condensed and eventually returns to the soil again, keeping the plants watered and at the same time keeping the air within the container at a point below saturation.

Containers

The originality of a terrarium depends on the type of containers and plants used and the way of arrangement. Any glass container can serve as a terrarium, provided that it is transparent. A large glass jar, a fish bowl or an old aquarium can also be used. Alternatively, there are some very attractive containers made of wood and glass or plastic available in the market. Terrariums do not require drain holes at the bottom of the container.



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Soil mixes and additives

Clean, sterilized peat moss based soilless mix with vermiculite or perlite will enable the soil to hold moisture and oxygen. There should be an initial layer of gravel for drainage (one part gravel to two parts soilless mix). Charcoal can be added to absorb odour. Sand is used in a desert terrarium. Sand should be washed and made free of salts.

Watering

When your plants are all in position, the soil should be well watered. The frequency with which terrariums must be watered after they have been started depends on how much ventilation they are given. Generally, a terrarium garden will need watering only once every few months.

Lighting

Terrarium plants need sunlight, but in limited amounts. It is important that the plants receive bright, indirect light. Natural sunlight can be filtered through a sheer fabric or white plastic. The lighting is adjusted based on the performance of the plants. Artificial illumination may be provided if required.

Location

Location of the terrarium is an important aspect. Succulents like sedum do well in a sunny location whereas plants such as ferns and mosses are suitable for a moist and shady location.

Terrarium-tools

Certain special tools are required especially if the terrarium has a narrow mouth.

- Tweezers and long sticks can be used to dig holes, move items and support plants while they are being planted.
- A long, thin spoon will be helpful in placing soil and drainage material in the container.
- A funnel made from paper or aluminum foil can be used for placing soil into the container.
- Household scissors are handy for pruning plants before they are planted.
- An atomizer or bulb-type sprayer will be useful for spraying and watering plants in the terrarium.

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- A stick with a wire loop on the end is handy for lowering plants into large terrariums with small tops.

Plants for terrarium

Many of the indoor plants are suitable for the terrarium.

- Swedish ivy (*Plectranthes australis)*
- Sansevieria (*Sansevieria trifasciata)*
- Bird's nest fern (*Asplenium trichomanes)*
- Maidenhair fern (*Adiantum cuneatum*
- Philodendron (*Philodendron scandens)*
- Irish moss (*Selaginella* sp.*)*
- Artillery plant (*Pilea microphylla*)
- Parlor palm (*Chamaedorea elegans)*
- Nerve plant (*Fittonia sp.)*
- Podocarpus (*Podocarpus macrophylla)*
- Prayer plant (*Maranta sp.)*
- Spider plant (*Chlorophytum comosum*)
- African violet (*Saintpaulia* sp.*)*
- Peperomia (*Peperomia* spp.*)*
- Club moss (*Lycopodium* spp.*)*
- English ivy (*Hedera helix)*
- Flame violet (*Episcia dianthiflora)*
- Miniature Begonia rex (*Begonia rex-cultorum)*
- Golden pothos (*Scindapsis aureus*)
- Hen and chicks (*Echeveria* spp.)
- Jade plant (*Crassula argentea)*
- Kalanchoe *(Kalanchoe tomentosa*)
- Oxalis (*Oxalis spp.)*
- Asparagus (*Asparagus plumosus)*
- Iresine (*Iresine sp.)*

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(B)BOTTLE AND DISH GARDENS



Bottle gardens may be called as miniature greenhouse in which liliputian landscapes are planned. Any size of bottle, a jar, or a jug is suitable for gardening provided these are made of clear glass. Bottle gardening is a novel way of growing certain moisture-loving indoor plants, which may be otherwise impossible to grow in a dry house.

Dish gardening refers to making gardens in dish like containers. Plants suitable for dish gardens are:

- Club moss (*Lycopodium clavatum)*
- Heart leaf philodendron (*Philodendron scandens)*
- Snake plant (*Sansiviera trifasciata*)
- Artillery plant (*Pilea macrophylla*)
- Asparagus fern *(Asparagus plumosus)*
- *Begonia rex (Begonia rex-cultorum)*
- Bird's nest fern (*Asplenium nidus)*
- Peperomia (*Peperomia caperata*)

(c) WINDOW GARDENING

'Window gardening' or 'window-box gardening' is making of garden in the window sill or any other attachment to it.



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Merits

- Novel method of gardening
- An ideal place for growing a wide range of house plants
- Ideally suitable for congested cities and flat dwellers

Containers for window gardening

- Containers made of following materials are suitable
- Wood, fibre glass, iron, plastic, *etc.,*
- Painted with water proof paint to protect from rotting
- A box of 75cm length, 30cm width and 20cm depth is ideal.
- Provision for drainage holes is essential.

Media for window garden

- Three parts of garden soil, 1 part of cow dung manure, 1/4 part of sand (or) soil mixture containing 3 parts of loam soil,1 part leaf mould, 1 part river sand and 1 part compost mixture.
- Soil mixture can be changed when it becomes exhaustive.

Planting in a window box

- Put some broken bricks or earthen pot pieces and fibrous materials on the bottom of the box at the depth of 1.3 cm to prevent soil being washed out of the drainage hole.
- Fill the box with soil mixture keeping 1.5 cm space up to the rim.
- Plants should be spaced about 10 cm apart
- Moss can be added to the top for moisture retention.

Suitable plants

Plants for window garden should be selected depending on:

- Weather conditions
- Growth habit (spread and height of the plants)
- Availability of sunlight.

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- Colour of flowers and foliage
- The situation and time of flowering

Sun-loving plants: *Alyssum, Geranium, Petunia*, dusty miller, *Cosmos*, snapdragon, *Dahlia, Nasturtium*, succulents

Shade-loving plants: Ferns, begonias, *Impatiens*, ivy, *Caladium*, violas, mint, *Philodendron*, *Spathiphyllum*

Creepers: *Tradescantia*, *Hedera helix, Juniperus prostate,* morning glory

Perennials: *Lantana sellowiana, Verbena*, *Russelia juncea*

Plants for 'window herb garden

Lemon grass	Marjoram
Ginger	Mint
Basil	Oregano
Dill	Parsley
Thyme	Rosemary
Parsley	Sage

Questions

1. The art of the terrarium was introduced by Nathaniel Bagshaw Ward. State True or false

   Ans: True

2. A plant suitable for Terrarium ----------

   Ans: Swedish ivy (*Plectranthes australis)*

3. Plants suitable for Dish gardens are

   Ans: Club moss (*Lycopodium clavatum)*, Heart leaf philodendron (*Philodendron scandens)*

4. A creeper suitable for window gardening is

   Ans: Hedera helix

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Lecture No.13

Significance of Trees in Landscaping

A tree is a perennial plant having a distinct trunk with a crown at the top. Trees have immense beauty from aesthetic view point. They bring the change in sky line on account of variation in their height, shapes, foliage texture and flower colour. They are used in landscape plan for aesthetic and functional purposes. Trees are used in gardens as specimens, for avenue plantation and as wind breaks and screening.

Trees are very fascinating because of their graceful appearance and the abundance of bloom. They are grown for their economic importance or aesthetic value or both. The cultivation of trees for their aesthetic or recreational value is known as arboriculture. Trees should be planted carefully and thoughtfully for the benefit of height, shade, colour and vertical emphasis.

Significance of trees in landscaping

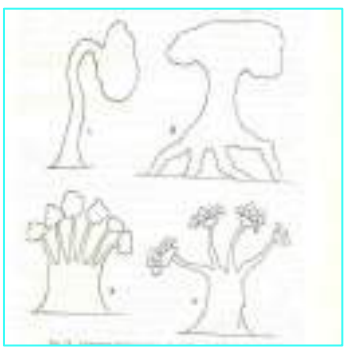
- Trees form the main framework of the garden.
- Some trees produce attractive and beautiful flowers including fragrant flowers
- Some trees are noted for their attractive foliage
- Some trees are known for their peculiar shape or form which is used as specimen trees



1. Spreading tree
2. Upright tree
3. Columnar tree
4. Umbrella shape - palm
5. Conical tree
6. Round-headed tree
7. Picturesque tree



1. S-shaped tree
2. Twisted trunk
3. Buttressed tree
4. Slanting tree
5. Twin-branched tree
6. Three-trunk tree



1. Cascade
2. Exposed root
3. Coppiced tree
4. Lopped tree

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- Shady trees are planted in chosen spots of large public garden which provides place for picnic and relaxation. Such trees are also planted along the borders of roads as avenue for giving shade.

In selecting ornamental trees, the purpose should be decided first and then the place of its culture should be finalized.

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Selected list of ornamental trees

(A) Flowering trees

Botanical name	Common name	Family	Flowering season	Flower colour	Remarks
Albizzia lebbek	Albizzia	Leguminosae	April-May	Greenish white, heavy fragrance	Attractive foliage 16-20 cm long pods
Bauhinia purpurea	Mountain ebony	Leguminosae	October-March	Large flowers, rose and purple tones	10-12 m height, hardy tree
Bauhinia variegata	Bauhinia	Leguminosae	February - March	Large, fragrant coloured with various shades of pink and purple	6-8 m height, flowers appear when the tree is leafless
Bixa orellana	Annatto	Bixaceae	September	Petals white and pale pink	Dye is prepared from orange red pulp that covers the seeds
Bombax malabaricum	Red slik cotton	Bombacaecae	January - February	Bright red	Tall, quick growing, flowers fleshy and edible
Butea monosperma	Flame of the Forest	Leguminosae	February - March	Orange red	Flowers used as dyes, gum is used for tanning

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Caesalpinia coriaria	Divi-Divi	Leguminosae	April-July	Greenish yellow flowers, scented	Slow growing
Callistemon lanceolatus	Bottle brush	Myrtaceae	Throughout the year, peak in February - November	Scarlet red	Drooping / pendulous growth habit, flower bearing branches resemble bottle brush in shape
Calophyllum inophyllum	Alexandrian laurel	Guttiferae	June - November	Fragrant white	Medium sized tree, 15 m height
Cassia fistula	Golden shower	Leguminosae	February - May	Yellow	Medium sized tree
Cassia javanica subsp. *renigera*	Burmese pink cassia	Leguminosae	April-July	Bright pink, fading to white	Deciduous tree, 12-16 m height
Cassia siamea	Kassod tree	Leguminosae	June-January; peak in October	Bright yellow	Rounded crown, suitable for road sides, avenues and parks
Cordia sebestina	Scarlet cordia	Boraginaceae	Year round flowering; peak -	Scarlet red	Dwarf evergreen, 6-8 m height

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			January - May		
Couropita guianensis	Cannon ball tree	Lecythidaceae	-	Fragrant showy flowers	Tall soft wooded deciduous tree, 15-20 m, large spreading crown
Crescentia cujete	Beggar's bowl	Bignoniaceae	April-June	Pale greenish yellow	Handsome tree, flowers appear on main trunk and old branches
Delonix regia	Gulmohar / mayflower	Leguminosae	March-July	Scarlet, mild scent	Large deciduous tree, umbrella shaped crown, 12-20 m height
Grevilleae robusta	Silver oak	Proteaceae	March-April	Small reddish orange	Medium sized tree (25 m), attractive foliage
Jacaranda mimosifolia	Jacaranda	Bignoniaceae	March-April	Purplish blue	Medium sized (10-12 m), subtropical
Kigelia pinnata	Sausage tree	Bignoniaceae	-	Striped on the outside	Large spreading crown well shaped tree, fast growing, hardy, flowers hang on a rope like stalk arising from the branch which mav attain a length of 1.5-2m.
Lagerstroemia speciosa	Pride of India	Lythraceae	February-April	Purplish-pink flowers, terminal	6-8 m, uniformly spreading,

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				panicles	
Michelia champaca	Champaka	Magnoliaceae	Throughout summer and rains	Yellow scented	Medium sized (20 m), cylindrical crown
Millingtonia hortensis	Tree jasmine / Indian oak tree	Bignoniaceae	-	White and fragrant flowers open in the evening	Tall evergreen, 15-20 m height, drooping branchlets, bark irregularly ridged and fissured, very rough and corky, avenue planting
Peltophorum pterocarpum Syn : P. ferrugineum)	Rusty shield bearer / Copper pod bearer / yellow gulmohar	Leguminosae	March-April, minor flushes in rainy season	Yellow	Large tree (30 m), spreading crown, road side planting
Plumeria spp. (*P. alba - white; P. rubra - r*ose, pink, red)	Pagoda tree / Temple tree	Apocynaceae	Summer; *P. alba* - throughout year	Large flowers, white or various shades of pink, yellow and red	Medium sized deciduous tree
Pongamia glabra	Pongamia	Leguminosae	May-June	Lilac coloured or pale pink	Moderate sized tree, 10-15 m, shining dark green leaves
Samania saman	Rain tree	Leguminosae	March-	Rosy pink with	Large tree, 20 m height

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			October, peak - March-April, Sept. - October	attractive rosy stamens projecting far beyond the rest of the flower	
Saraca india	Asoka tree	Leguminosae	February	Yellow or orange	Medium sized (8-10 m), shade tree, associated with Lord Buddha
Spathodea campanulata	Tulip tree	Bignoniaceae	February	Large, scarlet red flowers	20 m height, drier soil and climate
Tabebuia rosea	Rosy trumpet tree	Bignoniaceae	February	Rose purple flowers on leaf less clusters	20-25 m, quick growing, but not wind tolerant

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(B) Trees with attractive foliage / canopy

Botanical name	Common name	Family	Remarks
Albizzia lebbek	Albizzia	Leguminosae	Attractive foliage 16-20 cm long pods
Aleurites fordii	Indian walnut / Tung oil tree	Euphorbiaceae	Evergreen, medium height 15m; hairy, triangular leaves, edible oil from seeds, oil has medicinal uses
Azadirachta indica	Neem	Meliaceae	10-15m height
Bombax malabaricum	Red slik cotton	Bombacaecae	Tall, quick growing, flowers fleshy and edible
Caesalpinia coriaria	Divi-Divi	Leguminosae	Slow growing
Calophyllum inophyllum	Alexandrian laurel	Guttiferae	Medium sized tree, 15 m height
Eucalyptus citriodora	Eucalyptus	Myrtaceae	Tree of elegant appearance, 40-50 m height
Ficus bengalensis	Ficus	Moraceae	Large, 30 m tall, horizontal spreading
Ficus elastica	Rubber tree	Moraceae	Large tree, small plants are used as houseplants
Filicium decipiens	Fern leaf tree	Sapinadaceae	Medium sized tree, attractive foliage, best in humid and semi shaded conditions.

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Grevilleae robusta	Silver oak	Proteaceae	Medium sized tree (25 m), attractive foliage
Polyalthia longifolia	Mast tree	Annonaceae	Tall, upright (20-25 m), conical shape, branches and leaves droop steeply downward
Pongamia glabra	Pongamia	Leguminosae	Moderate sized tree, 10-15 m, shining dark green leaves
Pterospermum acerifolium	Pterospermum	Sterculiaceae	Large handsome tree
Samania saman	Rain tree	Leguminosae	Large tree, 20 m height
Saraca india	Asoka tree	Leguminosae	Medium sized (8-10 m), shade tree, associated with Lord Buddha
Simarouba glauca	Paradise tree	Simaroubaceae	Medium tree, 15m height, glossy attractive foliage, fast growing
Terminalia arjuna	Terminalia	Combretaceae	Horizontal spreading tree, Commonly planted along road sides
Terminalia. catappa	Indian almond / Country almond / Tropical almond	Combretaceae	Tall deciduous, 25 m height, branches horizontally spreading in whorls from main stem, leaves large, clustered, showy green; one of the few tropical species changing leaf colour to red purple before fall

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Guidelines for tree planting and maintenance

- Plant only one sapling per pit
- Plant with ball of earth intact
- Plant saplings during monsoon
- Give spacing based on canopy spread
- Protect saplings against scorching sun with organic covers (paddy or wheat straw, banana leaves, etc.)
- Protect from grazing animals using tree guards
- Prune the tree to create the required framework
- Feed the trees regularly with organic manures

Trees are not just a wise investment but are also 'living memorials'. Let us dedicate ourselves to the care and preservation of trees because *"the very air we breathe is improved by the presence of trees."*

Questions

1. Match the following

a. Flame of the forest	-	*Cassia fistula* (b)
b. Golden shower	-	Avenue planting (d)
c. Paradise tree	-	*Butea monosperma* (a)
d. *Polyalthia longifolia*	-	*Simarouba glauca* (c)

2. State two red flowering trees

Ans: *Cordia sebestina*, *Delonix regia*

3. State two trees with attractive foliage

Ans: *Grevillea robusta, Filicium decipiens*

4. State two avenue trees

Ans: *Casuarina equisetifolia*, *Polyalthia longifolia*

5. Give an example for white fragrant flowering tree

Ans: *Millingtonia hortensis*

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Lecture No.14

Significance of Shrubs in Landscaping



Shrubs are defined as woody or semi woody perennial plants, the branches of which arise from the base of the plant and grow up to a height ranging from 50 cm to 4 m. Shrubs are very important garden components not only because of the large number of cultivated species and varieties but also due to the wide range of variation in the shape and size of the plants, handsome foliage, richly coloured flowers, ease in propagation and suitability to grow in varied climatic conditions. They become an integral part of the garden, being permanent characters.

Utility of shrubs in gardening

a) They form part of the framework of the garden and create very pleasing picturesque effect if selected and planted carefully.
b) Shrubs act as foundation plants for buildings.
c) Variegated shrubs especially with silver or dark grey foliage can also produce pleasing effects if planted in appropriate schemes as they provide most suitable contrasts in the garden.
d) Flowering can be seen throughout the year from one or other plant.
e) They can be used for hedging, fencing and also for topiary e.g. *Hibiscus*, Divi Divi, *Thevetia, Casuarina, etc.,*
f) They can also be grown as potted plants.

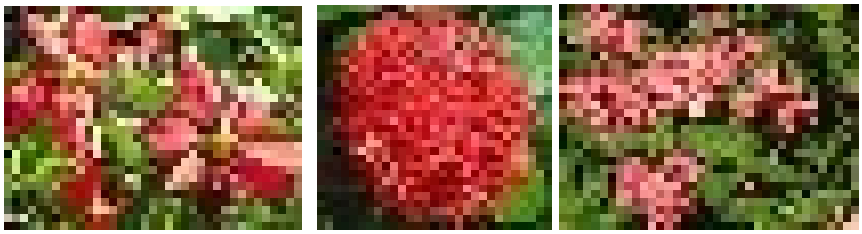
Classification

I. Based on use in the garden

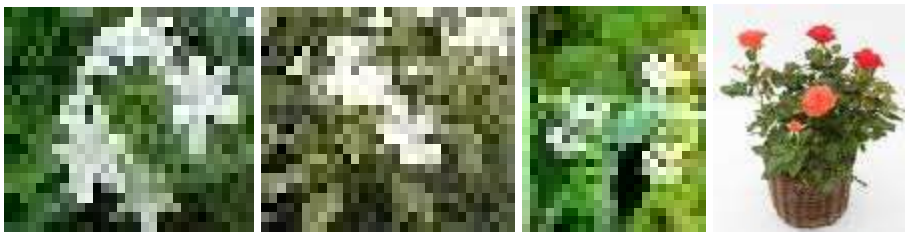
a) Shrubs for showy or attractive flowers e.g. *Hibiscus, Ixora*, *Mussaenda, Cestrum, Euphorbia*

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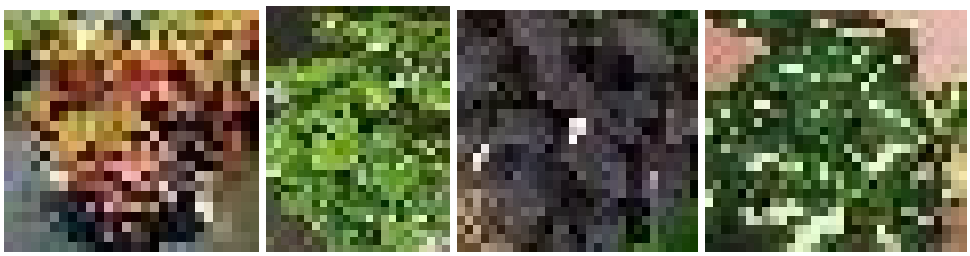
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b) Shrubs for fragrance e.g. jasmine, rose, *Tabernaemontana, Nyctanthes*

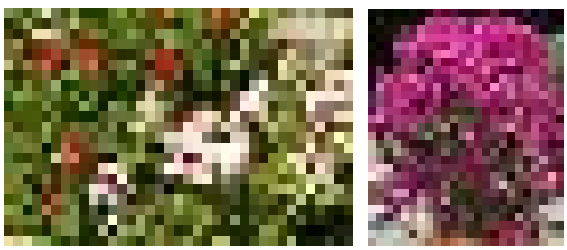


c) Shrubs for foliage e.g. Crotons, *Polyscias, Eranthemum, Graptophyllum*



II. Based on sunlight requirement

a) Open sunlight e.g. *Hibiscus, Bougainvillea* etc.



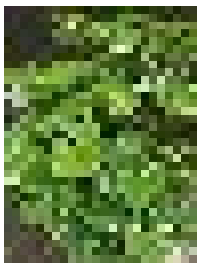
b) Partial sunlight e.g. *Eranthemum, Polyscias, Pisonia, Graptophyllum*



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c) Full shade: e.g. *Polyscias, Hemigraphis*



Description of important shrubs

***Acalypha* sp.** Euphorbiaceae

These are colourful foliage shrubs used for various purposes of garden decoration. *A. hispida.* Flowers appear in erect or drooping, terminal or auxiliary spikes, called 'cat's tail'. Mostly used as hedge plant. It is propagated from stem cuttings.

Adenium obesum Apocjanaceae

Tall erect shrub, growing up to 2.5 meters. Stem swollen at base and succulent. Leaves clustered near the tip of branches; simple, sessile oblong. Flowers are many on terminal corymbs, funnel shaped, pinkish crimson. The long conical fruits contain winged seeds. Flowering season: June-September; propagated by seeds or air-layers.

Barleria cristata (December crossandra) Acanthaceae

A dwarf bushy much branched shrub; flower is funnel shaped. Flowering season is November to January. It is propagated from stem cuttings.

Bauhinia tomentosa Fabaceae

An erect, bushy deciduous shrub grows up to 2.5 meters. The plants bear numerous sulphur yellow flowers in summer and rains. It is propagated from seeds.

Bougainvillea spectabilis Nyctaginaceae

It is a popular shrub or a climber with stiff thorns arises from axils of leaves; Bracts are many colored, elliptic in shape, perianth is tubular ending in five star shaped

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lobes; once established in the ground, it seldom needs watering even during the hot months.

Caesalpinia pulcherrima Fabaceae

It is a beautiful bushy shrub with few prickles. Flowers are orange scarlet in terminal raceme; sepals are red, tinged green. It is propagated by seeds.

Calliandra brevipes (Powder puff) Fabaceae

This is a bushy shrub with branches drooping and spreading. Flowers arise in clusters with numerous fine pink stamens. The plants are multiplied from seeds or layers. Flowering seen almost throughout the year.

Cestrum diurnum (Day jasmine or Day queen) Solanaceae

A bushy shrub with spreading branches: The flowers are sessile & white coloured. The fruit is showy, globular, blue, and grows in a cluster. Flowers in summer and rainy season. It is propagated by seeds and cuttings.

Cestrum nocturnum (Night queen) Solanaceae

A large bush with weak branches; leaves are oblong and alternate. Flowers grow in axillary or terminal panicle, creamy white and night scented; Propagated by cutting and layering.

Codiaeum variegatum (Crotons) Euphorbiaceae

Medium growing foliage shrubs with attractive foliage in multiple colors and spots; suitable for semi shaded and open areas. It is propagated by air-layers and cuttings.

Crossandra infundibuliformis Acanthaceae

It is a perpetual flowering shrub; quick growing and flowers are commercially valued. Flowers are orange and a borne on spikes. Propagation is by seeds.

Cassia biflora Leguminosae

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A tall bushy evergreen plant, 3 m tall. Leaves are compound with 10-12 pairs of leaflets. Flowers are golden yellow in colour, develop in clusters of auxiliary or terminal raceme. Pods are flat. Flowering is almost throughout the year. Propagation is by seeds.

Cassia alata Leguminosae

A tall erect shrub, not much branched as other cassias. Flower is golden yellow, pod is long and winged. Propagated by seeds.

Dombeya natalensis Sterculiaceae

A tall shrub with numerous spreading branches; Flowers grow on terminal umbels of 4-8, rosy white, slightly scented with 5 petals. Produce numerous tufts of white flowers during the winter. Propagation is by air layering and cutting.

Duranta plumeri Verbenaceae

A tall much branched shrub with axillary spines. Branches are 4 angled. Flowers are blue in loose terminal panicles. Fruits are yellow in colour propagation is by cuttings.

Eranthemum bicolor Acanthaceae

The plants are bushy useful for shady and semi-shady places with colorful foliage and flowers. Plants grow well in rich porous soil. Flowers are tubular, white with 4 lobes, grow on terminal or auxiliary raceme. Propagation is by terminal cuttings.

Euphorbia pulcherrima (Syn: ***Poinsettia pulcherrima***) Christmas flower
Euphorbiaceae

A shrub with cylindrical branches. Leaves are with pink petioles. Flowers appear as clusters on top of the branches. Bracts are crimson red and are showy during winter; propagated from cuttings.

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Euphorbia leucocephala Euphorbiaceae

A medium shrub with cylindrical branches. Leaves turn to white during winter giving beautiful appearance. Flowers are small, white, and arise in leaf axils and terminals. Propagation is by air layering and cuttings.

Graptophyllum hortensis Acanthaceae

A beautiful foliage shrub, stem is yellowish green; flowers are deep red in terminal or axillary raceme. Grows well in a semi-shade and porous soil.

Hamelia patens Rubiaceae

A handsome perpetual flowering shrub, stem is reddish green, pubescent leaves. It produces numerous tubular flowers all the year round. Propagation is by cutting or air layering.

Hibiscus mutabilis Malvaceae

A deciduous shrub, growing up to 2.5 m height. Flowers are solitary & large. Petals white at first, fading to pink later. Propagation is by air layering, cutting or seed.

Hibiscus rosasinensis China rose *Malvaceae*

A tall or medium sized evergreen shrub; leaves are ovate, coarsely toothed. Flowers are large, solitary, axillary, single or double, having shades of one or two or more colors. The colors range from white, yellow, orange, salmon, pink, mauve red etc.

Ixora singaporensis **(red)** Rubiaceae

Ixora coccinea These are popular and useful flowering shrubs in the garden and almost all the species and varieties flower very freely in the summer and rains. Many types of Ixora produce seeds, but cuttings and layering are the common methods or propagation.

Jasminum spp. ***Oleaceae***

Jasminum auriculatum **-** Mullai

J. sambac - Gundumalli

J. grandiflorum - Jathimalli

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Jasminum species are group of shrubs of commercial importance. Leaves are opposite or alternate; flowers are in terminal or auxiliary corymbs and flowering seen for 5-6 months in summer and rains. Large-scale propagation is done by cuttings.

Jatropha multifida (Coral bush) Euphorbiaceae

A perpetual flowering shrub; flowers are red with yellow stamens. Propagation is by stem cuttings.

Lantana camara Verbenaceae

Prickly stemmed bushy plants of half to two meters height. Leaves are opposite, ovate or oblong, toothed, coarse. Flower colours range from yellow, bright red, white etc.

Lawsonia inerme **(Syn*: L. alba*)** Lythraceae

Var. alba-petals light yellow; var rubra petals rose. It is tall growing shrub and flowers are small in terminal cymes. Petals are ovate, wrinkled on the top of the calyx tube. Propagation is by stem cuttings.

Mussaenda erythrophylla Rubiaceae

A semi-erect shrub. The expanded sepals are sessile, bright scarlet above and whitish with red veins below. These velvety sepals are produced during summer and rains. Propagation is by air layering and cuttings. Thrive well in acidic soils.

Nerium oleander Apocynaceae

A evergreen erect shrub, leaves mostly in whorls of three, lanceolate, flowers may be single or double in terminal panicles, slightly fragrant. Pink, white, rosy red colour flowers are available. Propagated by stem cuttings.

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Nyctanthes arbortristis (Night jasmine) Oleaceae

A tall bushy shrub with drooping branches. Flowers are white with an orange tube in terminal panicles. Flowers open during night and drop off in the morning. Propagation is by stem cuttings.

Pentas lanceolata Rubiaceae

It is herbaceous or semi woody perpetual flowering shrub. Numerous flowers appear in terminal corymbs. The corolla is tubular with 5-6 lobes. Flowers are white, pink, mauve and red. Propagated by cuttings.

Phyllanthus nivosus (Snow bush) Euphorbiaceae

A bushy shrub with compound leaflets. Leaves have variegation with whitish and greenish patches. Flowers are small, greenish, hanging on a long pedicel from the leaf axils. Propagated by cuttings.

Plumbago capensis Plumbaginaceae

A dwarf shrub with green weak stem; Flowers grow in a short terminal raceme, which are azure blue colored. Propagated by layers and cuttings.

Polyscia filicifolia (Syn: ***Aralia filicifolia)*** Araliaceae

An erect glabrous shrub. The stem and leaf stalks are with various colours. There are usually 3 leaflets, which are roundish or reniform shaped.

Pisonia alba (Tree lettuce) **Nyctaginaceae**

A tall growing foliage shrub; can be grown in shade and semi-shade conditions. The leaves are also used as greens.

Tabernaemontana coronaria (Cape Jasmine) **Apocynaceae**

A very popular shrub. The leaves are simple oblong flowers are white. Single, semi double and double forms are available in terminal or axillary cymes.

Tecoma stans (yellow) Bignoniaceae

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An erect or rambling shrub growing up to 1.5 to 3.0 m height. Flowers borne in terminal panicles or racemes during summer and rains.

T. capensis (orange-red)

T. smithii (Yellowish orange)

Cuttings root very easily, and the plants thrive in all types of soils.

Thunbergia erecta Acanthaceae

A hardy bushy shrub. The flowers are in solitary or paired, axillary violet coloured with yellow or orange throat, tubular in shape. Propagated by cuttings.

Thevetia nerifolia **Apocynaceae**

A tall growing shrub normally used for fencing. The flowers are golden yellow, fruits and flowers have poisonous substances.

Vinca rosea; Syn: ***Catharanthus roseus*** (Periwinkle) **Apocynaceae**

A much branched dwarf bushy shrub, up to 60-90 cm high. Flowers are rose or white, solitary, axillary, flowers seen throughout the year. Vinca is grown mostly in rock gardens in full sunlight.

Questions

1. Give examples for fragrant shrubs

Ans: *Jasminum* spp., *Nyctanthes arbortristia*

2. Give examples for foliage shrubs

Ans: *Crotons, Polycias*

3. Match the following

(a). Cat's tail – *Cestrum diurnum (d)*

(b). Succulent – Rose (c)

(c). Pot shrub – *Cestrum nocturnum (e)*

(d). Day queen - *Acalypha hispida (a)*

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(e). Night queen – *Adenium (b)*

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Lecture No.15

Significance of Flowering Annuals in Landscaping

Annuals

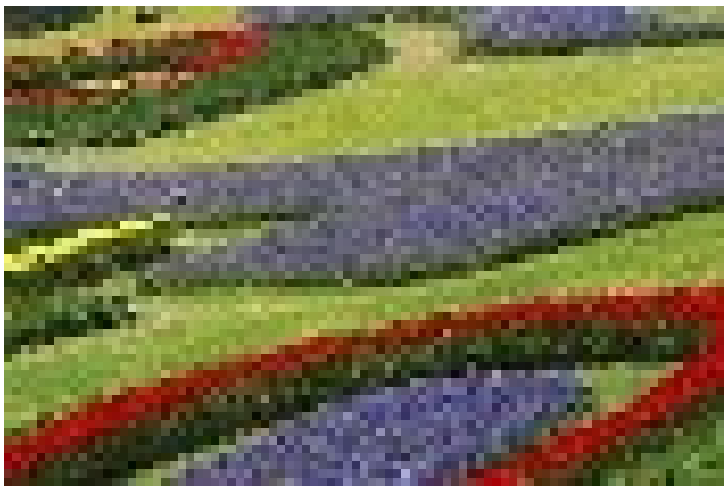
Annuals are the group of plants which complete their life cycle in one season or one year. They are easily grown plants. They vary widely in form, habit, colour and size of flowers.

They beautify the surroundings and exhibit a good show of blooms at low cost and labour. They bring a change in the look of the garden with change in the season and keep gardeners busy in raising them throughout the year.

Annuals are classified as detailed below.

(a) Classification based on usage

i) Bedding purpose : Dahlia, Marigold, Phlox, Verbena, Pansy, Carnation, Petunia, Zinnia, Portulaca, Gomphrena, Gaillardia.





Flower beds

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ii) Fragrant flowers : Carnation, sweet pea
iii) For cut flowers : Carnation, aster, Helichrysum, Antirrhinum
iv) For loose flowers : Marigold, Annual Chrysanthemum, Aster, Zinnia, Gaillardia
v) For hanging baskets : Daisy, Nasturtium, Verbena, Phlox, Alyssum, Portulaca
vi) For shady situations : Salvia, cineraria
vii) For rock garden : Nasturtium, Verbena, phlox
viii) For screening : Holly hock and sweet pea
ix) For pots: : Carnation, Antirrhinum, aster, Petunia
x) For dry flowers : Helichrysum, gomphrena

(b) Classification based on climatic requirements

Based on climatic requirements, annuals are classified into the following three groups:

i) Rainy season annuals
ii) Cold season or winter annuals
iii) Hot weather / summer annuals

Rainy season annuals

These annuals are grown in rainy season and can withstand heavy rains, and high humidity in atmosphere than other annuals. Seeds are sown in June and seedlings are transplanted in July.

e.g. Balsam, Cock's comb, Amaranthus, Gaillardia

Winter annuals

These annuals are able to tolerate comparatively low temperature and, hence, are comfortably grown in winter season and bloom best during this season. These winter annuals are sown in September and transplanted in October in plains whereas in hills, these are planted in February-March and July-August.

e.g. Antirhinum, petunia, nasturtium

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Hot weather annuals

These plants grow luxuriantly and produce flowers under high temperature and have the ability to survive extremely high temperature. The seeds are sown in end of February or beginning of March and seedlings are transplanted in end of March-April.

e.g. *Zinnia, Kochia, Portulaca, Tithonia, Gaillardia, Gomphrena*, Sunflower, *Cosmos*. **Popular**

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Flowering annuals for landscaping

S. No.	Name of plant & family	Height	Colour of flowers	Time of flowering	Method of propagation	Blooming period	Remarks
1.	*Ageratum* sp. (Floss flower) Compositae	6" – 24"	White, blue	August - September	Seeds	2 ½ - 3 months	Full blooming useful for edging, massing in beds and for mixed borders
2.	*Althaea rosea* (Hollyhock) Malvaceae	4 – 6 ft.	Various colours	August - September	Seeds	9 months after sowing	Large single or double flowers; useful for screens, borders and for background, suited to hills
3.	*Amaranthus* sp. Amaranthaceae	2 – 3 ft.	Various colours	August - September	Seeds	1 ½ - 2 months	Foliage or blooms are different coloured Foliage types: A. tricolor, *A. salicifoliu*, *A. melancholius ruber*
4.	*Antirrhinum majus* Snap-dragon Scrophulariaceae	6" – 18"	Various colours	December - February	Seeds	2 months	For bedding, borders, pots Flower colour - pink, rose, apricot, orange, crimson, white, yellow flowers.
5.	*Callistephes chinensis* (China aster) Compositae	9" – 36"	Various colours	Aug - Sep. and Jan-Feb.	Seeds	2 months	Suited for borders, can be grown throughout the year .
6.	*Coreopsis* spp. (Tick seed)	12" – 18"	Yellow brown or Crimson	Aug - Sep Dec - Jan	Seeds	2 months	For borders and flower beds, flowers single or

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	Compositae		brown				double; yellow, orange and crimson
7.	*Celosia* spp. Cock's comb Amaranthaceae	9" – 24"	Fasciated flowers of varying colours	Throughout the year	Seeds	2 ½ - 4 months	Suited for , flower colour – red, pink, yellow, white, etc.
8.	*Cosmos bipinnatus* Compositae	2" – 5"	White, crimson, rose & purple	Aug - Sep Dec - Feb	Seeds	2 – 2 ½ months	Popular rainy season annual with graceful foliage, can be grown throughout the year.
9.	*Dendranthema grandiflora (Chrysanthemum)* Compositae	18"	Yellow, white, pink, red, etc.	Sep - Oct	Seeds and suckers	2 ½ - 4 months	Hardy annual or perennial single or double flowers, useful for mixed border, bedding and pot culture.
10.	*Dianthus barbatus* *(*Sweet William) Caryophyllaceae	10" – 12"	Various colours	Aug - Sep Dec - Feb	Seeds	2 – 2 ½ months	Popular rainy season annual with graceful foliage, can be grown throughout the year, useful for pots and borders
11.	*Gaillardia pulchella* (Blanket flower) Compositae	1" – 1 ½"	Red yellow	Aug - Sep Dec - Feb	Seeds	2 – 2 ½ months	Suitable for beds, borders and as cut flowers; single or double flowered heads
12.	*Gomphrena globosa* (Globe amaranthus or Bachelor's button)	4" – 6"	Pink, Purple & Orange	Throughout the year	Seeds	1 month	Suitable for beds, borders and as cut flowers; thrives well in any garden soil.

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	Amaranthaceae						
13.	*Gerbera jamesonii* (Gerbera) Compositae	6" – 12"	Various colours	Aug - Sep Dec - Feb Apr - May	By divisions or suckers	Throughout the year	Suited for beds and borders, wide range of flower colour.
14.	*Helianthus* sp. Sunflower Compositae	2" – 8"	Yellow with brown (dark) colour	Aug- Sep Dec - Feb Apr - May	Seeds & Cuttings	2 – 2 ½ months	Staking the plants is essential in the case of tall and unbranched varieties.
15.	*Helichrysum* sp. Compositae	10" – 20"	Various colours	Aug - Sep Dec - Feb	Seeds	2 – 3 months	Suited for pots and borders – Everlasting flower.
16.	*Impatiens balsamina* (Balsam) Balsaminaceae	9" – 12"	Rose like and variegated	Aug - Sep	Seeds	2 months	Suited for borders, can be grown throughout the year
17.	*Kochia* Chenopodiaceae	12" – 24"	Minute Brownish Pink	Aug - Sep Dec - Feb Apr - May	Seeds	3 months	Suited for pots and as ornamental leaves for flower arrangements. Green in open sunny situations.
18.	*Lathyrus odoratus* (Sweet pea) Leguminaceae	16" – 18"	Sweet fine colour	Aug - Sep Dec - Feb Apr - May	Seeds	3 months	Grown in open sunny situations. Suited for hills
19.	*Petunia* sp. Solanaceae	18" – 24"	Various colours	Sep - Oct Dec - Jan	Seeds	3 – 4 months	Suited to flower beds, mixed borders, pot plants, window borders and hanging baskets.

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20.	*Phlox* Polemoniaceae	12”	Various colours	Sep - Oct Dec - Jan	Seeds	1 month	Suited for beds, pots
21.	*Pimpinella monoica* Lady’s Lace	24” – 48”	Small lacy white flowers	Dec – Feb	Seeds	2 months	Coriander like smell of leaves – Small lacy white flowers – Suited for medium high elevations.
22.	*Poppy* *Papaver* sp. Papaveraceae	24” – 48”	Various colours	Dec - Feb	Seeds	2 months	There are four species useful for cut flowers – Suitable for high attitudes.
23.	*Portulaca grandifiora* Portulacaceae	3” – 4”	Various colours	Dec - Feb	Seeds	3 ½ - 4 months	Trailing stem with short thick leaves – Resembles roses – Suited as an edge plant.
24.	*Salvia splendens* Lanbiatae	24” – 30”	Scarlet blue Purple pink	Aug-Sep. Dec-Feb.	Seeds	2 ½ months	Can be grown throughout the year – Suited for beds and borders – Pinching back the shoots in early stages builds up better plants
25.	*Schizanthus* sp. Solanaceae	12” – 18”	Various colours	Aug - Sep Dec - Feb	Seeds	2 ½ months	Cold season annual, pretty foliage of green colour, orchid like flowers of various colours.

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26.	*Tagetes erecta* African marigold Compositae	24" – 36"	Yellow orange variegated	Apr - May Sep - Oct	Seeds	3 months	Tall and erect growing annuals, single or double flowers, effective in beds and mixed borders. Flowers are grown on commercial scale also.
27.	*Tagetes patula* (Pot marigold Compositae	24" – 36"	Bright yellow, lemon yellow, orange	Aug - Nov	Seeds	2 – 3 months	Suited for beds and borders
28.	*Tithonia speciosa* (Mexican sunflower) Compositae	48" – 72"	Reddish orange flowers	May - Sep Oct & Dec - Jan	Seeds	3 months	Reddish orange flowers on long stalks, can be grown throughout the year, suitable borders and beds
29.	*Verbena hybrida* Verbenaceae)	6" – 12"	White, purple and pink	Throughout the year	Suckers, cuttings layers	2 ½ months	Trailing plants, annuals and perennials useful in shrubberies, hanging baskets, rockeries, flower beds and in pot culture.
30.	*Vinca rosea* *(Syn: Catharanthus roseus)* (Periwinkle) Apocynaceae	24"	Pure white red	Throughout the year	Suckers, cuttings layers	2 ½ months	Attractive foliage, smooth green leaves, useful for flower beds, plants, borders, rockeries, etc.
31.	*Viola tricolor*	6" – 9"	Violet, blue,	Dec - Feb	Seeds	2 – 3 months	Suited for borders and pots

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	(Pansy) Violaceae		yellow, white				– Pretty brilliant coloured flowers.
32.	*Zinnia elegans*	12" – 30"	Various colours	Dec - Jan Apr - May	Seeds	2 months	Hardy plant, flowers in profusion for a long period, single or double flowers borne on long stalks. Attractive in borders and beds.
33.	*Zinnia linearis*	6" – 9"	Golden orange	Dec - Jan Apr - May	Seeds	1 ½ months	Hardy flowering perennial, linear leaves, beautiful small golden orange flowers, useful for low bed, edging, hanging baskets and rockeries.

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Questions

1. Flowering annuals suitable for hanging baskets

Ans: Verbena, Portulaca

2. Annuals suitable for pots

Ans: Aster, Marigold

3. Give an example for yellow coloured flowering annual

Ans: Cosmos

4. The art of growing ground cover plants closely and trimming them to a design or alphabetical letters is called

Ans: Carpet bed

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Lecture No.16
Significance of Climbers and Creepers in Landscaping

Definitions

Climbers

Botanically, plants which have special structures to climb on supports are defined as climbers. Eg. *Antigonon, Thunbergia*

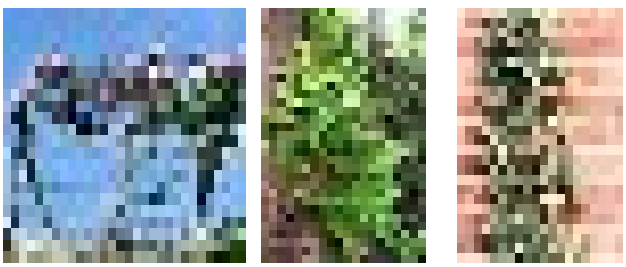
Twiners: The climbing plants which do not have any such structure but climb over a support or a plant by twining themselves spirally around such supports are called twiners Eg. *Ipomoea, Lonicera*.

Ramblers and stragglers

There are still other plants which fail in their attempt to climb but somehow manage to support themselves over the trunks, stems, or branches of other plants; these are termed ramblers and stragglers. Eg. *Quisqualis indica*.

Creepers

Plants which creep or climb on a surface with their rootlets are called creepers. Such plants are generally trained over stone or brick walls. Eg. *Ficus repens, Tecoma radicans*



Climbers

(Courtesy : http://www.sybout.com/vines_creepers)

Utility in gardening

- Climbers are very important ornamental plants in landscaping which add beauty, colour and fragrance to gardens
- They are commonly used on artificial structures like walls, arches, pergolas, pillars, cascades, topiary, etc.

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- Bare walls can be most effectively decorated by growing colourful climbers on them.
- Trees are also used to train the climbers and this enhances the beauty of garden many folds.
- Utility of climbers in cities is increasing for the purpose of screening the premises from adjacent houses and maintaining privacy.

Selection of climbers

S.No.	Usage	Examples
1	Annual flowering climbers	Sweet pea (*Clitoria ternatea*), morning glory (*Ipomoea rubrocaerulea*)
2	Climbers for screening	*Antigonon leptopus*, *Passiflora, Porana, Ipomoea, Clerodendron splendens, Thunbergia*
3	Climbers for low walls or trellis	Usually light climbers are grown. *Lonicera japonica, Solanum seaforthianum, Tristellatia australis, Tecoma jasminoides, Jacquemontia violacea*
4	Climbers for pergola	Usually heavy climbers are grown. *Quisqualis indica, Petrea volubilis, Adenocalymma allicea, Allamanda cathartica*
5	Climbers for porches	*Pyrostegia venusta, Petrea volubilis, Clerodendron splendens, Bougainvillea, Jasminum sp.*
6	Flowering climbers for partial shade	*Passiflora, Aristolochia, Quisqualis indica, Clerodendron splendens, Jacquemontia violaceae*
7	Foliage climbers	*Scindapsus aureus, Philodendron sp., Monstera deliciosa*
8	Climbers for pot culture	*Tristellatia asutralis, Adenocalymma allicea, Clitoria ternatea, Bignonia purpurea*

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Description of popular climbers and creepers

Adenocalymma allicea (Garlic vine) **Family: Bignoniaceae**

An evergreen plant with dense foliage. Flowers appear on large axillary panicles. Leaves are leathery producing an odor of garlic. Flowers are funnel shaped and mauve in color with 5 petals. Flowers during October to February and also in summer. Propagation is by simple layering.

Antigonan leptopus (Coral vine) **Family: Polygonaceae**

A tuberous rooted very quick growing climber. Stems are slender, green. Grown for the purpose of screening. Honey bees are attracted, propagation is by simple layering.

Allamanda violacea *(*Allamanda) **Family: Apocyanaceae**

A slender growing climber with 3-4 leaves / node. Flowers are produced in terminal cymes, large showy and purple in color. Propagation is by cutting and layers. In *Allamanda cathartica* flowers are large, yellow and appear during summer and rains. Corolla tube is long and the throat is striped brown.

Aristolochia elegans (Swan flower / Duck flower) **Family: Aristolochiaceae**

It is a tender climber. Flowers are solitary, long stalked; the tube is yellow green, purple and with blotched white on the outer with an yellow eye. Curious pouch shaped flowers are produced during hot months. Propagation is by seeds and cuttings.

Asparagus plumosus (Asparagus) **Family: Liliaceae**

It is a fine foliage climber. Its roots are not tuberous but long and fleshy cladodes are arranged in a horizontal plane. They are numerous, 8-16 in a fascicle. Flowers are small, white and with red berries; propagated by seeds.

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Bignonia venusta (Flame vine) **Family: Bignoniaceae**

Syn: ***Pyrostegia venusta***

It is a deciduous climber growing by means of its tendrils. Leaflets are ovate oblong. Flowers are golden colored, many drooping on corymbose cymes. It is a slow growing creeper propagated by layers.

Bignonia tweediana (Cat's claw) **Family: Bignoniaceae**

A slender evergreen climber with the leaves opposite and compound. They have terminal three partite claws like tendrils. Flowers are trumpet shaped borne in pairs and yellow in color. Flowering during March-May. Propagation is by seeds and layering.

Combretum comosum (Combretum) **Family:Combretaceae**

A large extensive shrubby climber. Leaves are simple, opposite elliptic, flowers are orange red in compact terminal spikes. Propagation is by layering.

Clerodendron splendens **Family: Verbanaceae**

A vigorous evergreen climber. Stem is slender and woody, leaves are simple and opposite; flowers are scarlet, terminal or axillary in corymbose clusters, producing flowers during winter. Thrives well in semi shade. Propagation is by root suckers and layers.

Clitoria ternata **Family: Leguminosae**

It is an annual twining climber, leaves pinnately compound flowers are solitary, blue or white, and pods are long. Propagated by seeds. Ideal climbers for low trellis.

Gloriosa superba **(Glory lily)** **Family: Liliaceae**

It is a rhizomatous weak stemmed climber. Supports by means of its tendrils like prolongation. Flowers are large, showy and solitary on a long stalk. Dormant in winter and starts growing in next season. Flowering during June to August. Propagation is by rhizomes and seeds.

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Holmskioldia sanguinea (Cup and saucer plant) **Family: Verbanaceae**

A straggling shrub, flowers in terminal or axillary raceme. Flowers are produced in winter. Propagation is by cuttings and layering.

Ipomoea palmate (Railway creeper) **Family: Convolvulaceae**

A perennial vigorous climber. Flowers are purple, the corolla is campanula ate, the color is deeper in the throat, used for screening purposes. Propagation is by cuttings in sand media.

Ipomoea tuberose (Wood rose) **Family: Convolvulaceae**

Dried fruit with persistent calyx is called wood rose. Used for dry flower arrangement. Propagation is by seeds or cuttings or layers. It is very strong climber. Stem is woody and twining. Flowers are axillary small, yellow and funnel shaped.

Jacquemontia violacea (Blue bell) **Family: Convolvulaceae**

A handsome light climber, stem is light green, leaves are alternate cordate, flowers are violet blue on loose cymes. Corolla is 5 angled in short funnel form, suitable for screening in semi shade areas. Propagated by cuttings.

Monstera deliciosa (Australian pineapple) **Family: Araceae**

A large foliage climber, stem is strong and fibrous, clasping the support by means of long and thick aerial shoots arising from the node. The leaves are large, 1-2.5 feet long, oblong and broad, thick and lathery, strongly scented when the fruits mature. Thrives in shade and semi shade. Propagated by cuttings.

Porana paniculata (Porana or bridal climber) **Family: Convolvulaceae**

A strong shrubby climber. Flowers are white, small and numerous on panicles. Pruning is done in rainy season. Propagation is by layering.

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Petrea volublis (Purple wreath) **Family: Verbanaceae**

A woody climber with grayish bark. Many flowers on a long dropping axillary raceme; bluish in color. Flowers are star shaped and appear during summer. Propagated by layers and cuttings.

Passiflora edulis (Passion fruit) **Family: Passifloraceae**

It is a strong woody climber. The flowers are solitary, terminal or auxiliary. 5 petals, the petals are often tinted with purple.

Quisqualis indica (Rangoon creeper) **Family: Combretaceae**

A large and vigorous climber. The flowers are initially white, turn pink and finally it becomes red. Numerous bunches of drooping white, pink or red with slightly fragrant are produced during summer and rains. Propagated by cuttings.

Solanum seaforthianum (Potato creeper) **Family: Solanaceae**

A slender and slightly woody climber. Flowers are many in long long drooping axillary panicles. They are violet-blue and star shaped with 5 petals. Suitable for semi shade conditions. Flowers during July to September. Propagated by cuttings.

Scindapsus aureus (Money plant) **Family: Araceae**

A tall and much branched climber. Arial roots arise from the nodes. Foliage is bright green with numerous irregular golden lines or paths.

Thunbergia australis **Family: Malpigiaceae**

A beautiful climber with prominent lenticels; flowers are produced in a terminal raceme. Petals are yellow with a red filament. Flowers are star shaped.

Tecoma jasminoides **Family: Bignoniaceae**

It is a handsome flowering climber. Corolla is tubular and companulate; white or rosy pink flowers and the color is deeper at the throat. Propagated by cuttings.

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Vernonia elaegnifolia (Vernonia) **Family: Asteraceae**

It is a quick growing evergreen climber. The stem is slender. Flowers are white, in a small auxiliary head. It is useful for screening purposes. It is usually propagated by cuttings.

Vallaris heynii **Family: Apocyanaceae**

A climber with a dark gray barks, leaves are opposite. Flowers are white fragrant in an auxiliary cymes with 3-6 flowers. Flowers are scented. Propagated by layers and cuttings.

Questions

1. Give a suitable climber for screening -

Ans: *Antigonon leptopus*

2. Give a suitable climber for pergola -

Ans: *Quisqualis indica*

3. Give a suitable climber for pot culture -

Ans: *Clitoria ternatea*

4. Give an example for foliage climber -

Ans: *Asparagus plumosus*

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Lecture No.18
Significance of Palms, Ferns and Cycads in Landscaping

PALMS

Palms are mainly tropical plants known for their tall, unbranched trunks topped by a crown of fan-shaped or feathery fronds which are sculpturistic in nature.



Areca lutescens



Oreodoxa regia



Pritchardia grandis

The Palmae family has more than 200 genera and 3000 species. They are suitable for outdoor planting as well for indoors.

Details of some of the popularly grown palms are furnished below.

S. No.	Common Name	Remarks
1.	Royal palm *Oreodoxa regia*	Large, solitary palm, about 20m tall, with a grey trunk, and graceful. leaves; very good for avenue planting.
2.	Areca palm *Areca lutescens*	A very attractive clustering palm to about 3 m high, with light green stems, and dark green fronds. It has fragrant, lemon scented, pale yellow flowers, which form into orange fruit about 25 mm (1 inch) long.
3.	Silver date palm *Phoenix sylvestris*	A very tall, slender palm with recurving, plumose, glaucouse fronds, faster growing. Typically has a swollen base, and retains the leaf bases on the trunk. It is ornamental when young

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4.	Miniature date palm *Phoenix roebelenii*	Quite a popular plant due to its hardiness, attractiveness and small size (good for small areas). Interestingly enough, all the cultivated plants are single trunked, yet in the wild, they are all clumping, and single trunked specimens haven't been found
5.	Fish-tail palm *Caryota urens*	Popular due to its unique leaf type

FERNS

Ferns are foliage plants distinguished from almost all other plants in that they do not produce flowers and seeds but reproduce by means of spores. These flowerless plants belong to several different families and yet they have many common characteristics. Some popular ferns are listed below.

Adiantum capillus : Venus hair fern
A. hispidulum : Australian maiden hair
A. bulbiferum : Hen and chiken fern
Asplenium sp. : Bird's nest fern
Pteris cretica : Table fern
Alsophila crinita : Tree fern
Lycopodium cernuum : Tree ferm

Details of some of the popular ferns are furnished below.

S. No.	Common Name	Remarks
1.	Venus hair fern *Adiantum capillus*	With pale green new growth this fern is excellent for glasshouse or indoor use. It requires humid conditions, and air movement, but will not tolerate hot, dry winds. It grows to about 40 cm.
2.	Australian maiden hair *A. hispidulum*	This hardy fern will grow strongly even if it is neglected. Its young pink or red fronds grow into striking green ones. Grows to about 55 cm. Sub tropical temperatures are best

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3.	Bird's nest fern *A. nidus*	A native of the tropics of the old world, it is a graceful species with long (up to 1 m) undivided fronds, each about 7-20 cm broad. The fronds in a large specimen plant form a cup-like cluster, in the shape of a bird's nest.
4.	Adiantum macrophyllum	This fern is an upright form with bright pink new fronds. This fern is tropical-subtropical. Prefers indirect or filtered light. Suitable for indoors, bush-house or shaded garden position. Grows to 0.6m high x 0.6m wide .12^{o}C to 40^{o}C
5	Tree fern *Alsophila crinita*	The plants like shade and plenty of moisture. The plants of tree fern groups have a straight, tall stem or trunk similar to that of a palm. The large leaves are borne at the apex of the trunk giving the plants a palm-like appearance. The ferns are suitable for cultivation at medium-to-high altitudes. At a lower altitude, one may attempt to grow these plants by providing them with shade and plenty of moisture.
6.	*Nephrolepis exaltata* (Vernoa Lace)	Small delicate fine lace fronds, with a drooping habit. It is excellent for indoor use, especially in hangers. This fern is not cold hardy

CYCADS

Cycads look like palms but have no botanical relationship with them. Very often they are referred to as palms but these plants have nothing in common with palms except the general habit of growth. Cycads belong to the family Cycadaceae and hence are commonly referred to as cycads.

The commonly grown cycads include plants belonging to the genera *Cycas, Dioon, Zamia* and *Macrozamia*.

The general cultivation of cycads is similar to that palms and similar types of soil and climate will suit them. Most of the plants in this group are slow in growth and prefer partial

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shade when grown in the tropics while in the hills these may have to be grown under glass. They are suitable for planting in ground or as pot plants.

Details of some of the popular cycads are furnished below.

S. No.	Common Name	Remarks
1.	*Cycus cercinalis* (*C. thouarsii*)	• The stem is erect, cylindrical, market with leaf scars, and usually grows to a height of 4.5 m but may attain a height upto 12m. • The stem is usually unbranched. • The appearance of the tree is palm-like, with the crown having a graceful rosette of fern-like, stiff, glossy, gracefully curved pinnate leaves, the leaflets being flat on the margins. The young leaves are covered with reddish-brown hair
2.	*C. revoluta* (Syn. *C.inermis*)	• It is commonly called the 'Sago Palm'. It is about 3 m tall, sometimes branched above. • The leaves are 60 cm to 3 m long, recurved, and the leaflets are many, stiff in nature, and rolled downwards.
3.	*Dioon edule*	• An ornamental palm-like foliage plant which is very ornamental and more or less similar in appearance to cycas. • The stem is about 90 cm tall and similar dimension. • The pinnate leaves have spiny tips. The petioles are covered with white wools at young stage. • The cones are 30 cm long.
4.	*D. spinulosum*	• The plants grow up to 15 m and have a slender trunk, crowned by a noble rosette of spreading pinnate leaves up to 1.8 m long. But the margins have 5-8 spines.
5.	*Encephalarios caffer* (*E.caffra*)	• The plants are handsome, palm-like with a stout stem which may grow up to 5.5 m. A crown may consist of 14 leaves, each about 60 to 120 cm long.

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6.	*E. hildebrandtii*	• A beautiful plant growing up to 6m. The leaves are up to 2.7 m long, and the main stalk is woolly when young.
7.	*Macrozamia spiralis (Syn. M. tridentate)*	• The trunk is short and usually underground. The leaves are 80 to 100, up to 1.8 m long, and the flat leaflets are spiny-tipped.
8.	*Zamia*	• This genus differs very little from cycas but the leaves are more leathery and fern-like. • The plants are tropical and subtropical and resemble palms and to some extent ferns.

Questions

1. ---------- are foliage plants which reproduce by means of spores

Ans: Ferns

2. Which of the following is cycad?

a. *Zamia* b. *Adiantum* *c. Pritchardia* *d. Caryota urens*

Ans: *Zamia*

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Lecture No.19

Significance of Cacti and Succulents in Landscaping

Cacti and succulents are a group of plants which have special structures to store water in thick fleshy leaves or stems. They thrive best in sunny situations and are light loving. They need little care except when actively growing. There is a clear distinction between both. Cactus is characterized by the presence of areoles, which often look like woolly cushions carrying spines, hairs or glochids and the flowers arise from or near the areoles. The spines in a cactus are modified leaves which provide shade against scorching sun and help in conservation of moisture besides protecting against birds and animals.





All the cacti are succulents on account of storing water but all the succulents are not cacti. Cacti and succulents are very popular amongst gardeners and they are used to adorn sunny situations of gardens, houses, window sides and rock gardens.

Some of the common cacti and succulents are described below.

Sl. No.	Common Name	Remarks
1.	*Agave*	Evergreen massive growing plant with short stem and leaves in a close rosette. Leaves are stiff, leathery and fibrous.
2.	*Aloe*	Plants are evergreen with soft, succulent thick leaves, often prickly or spiny resembling the Agaves. Some species have variegated foliage and are suited for pot culture.
3.	*Bryophyllum*	It is an erect growing succulent herb with thick fleshy simple leaves. It is good pot plant and could be easily propagated by leaves or leaf cuttings.

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4.	*Cereus*	They are long stemmed, vigorous growing, thorny, hardy plants. They are leafless climbers can reach the top of tall trees. They bloom during night and flowers are large, white and scented. They can be used as rootstock for Epiphyllum and phyllocactus.
5.	*Echeveria*	Cotyledon or Oyster plant. They are small succulent herbaceous perennials with dense rosettes of small leaves. Useful for growing in higher elevation. Useful for edging flower beds or in carpet beds in the hills. Propagated from suckers and also by leaves.
6.	*Echinocactus*	Hedge Hog Cactus. Small unbranching. Ovoid or globes succulent, prickly plant. They resemble a ribbed melon of the size of a cricket ball with star-like arrangement of thorns along the ribs. Golden Barrel is another variety with large ribbed green ball armed with straight golden yellow spines.
7.	*Echinocereus*	Low growing plants forming groups of clusters. They can be grown in small pots and they produce large flowers.
8.	*Echinopsis*	Hedge– Hog Cactus. Small spiny succulent. They produce detachable offsets. Suitable for growing in small pots for their increasing flowers. Propagated by offsets.
9.	*Epiphyllum*	Christmas Cactus or Crab Cactus. Plants with flattened succulent stems. The plants are spineless and bear usually large attractive flowers. Propagated by cuttings and can be used as rootstock.
10.	*Euphorbia*	Stems are thorny, leaves small. Stem and leaves discharge poisonous milky juice when punctured. Propagated by cutting.
11.	*Furcraea*	Ornamental foliage plants resembling agaves the variegated spines are very attractive. The flower, stem resembles that of Agaves and bears innumerable bulbils from which this species is propagated.

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12.	*Gasteria*	Aloe-like small evergreen succulent plants with fleshy, thick tongue shaped leaves which are green, spotted with or purple. Propagated by offsets and leaf cuttings.
13.	*Haworthia*	Small plants with or without a short stem, leaves in rosettes or closely overlapping or arranged in several rows. Easily propagated by offsets.
14.	*Kalanchoe*	Dwarf succulent plant resembling. Bryophyllum with thick fleshy leaves from which they are propagated.
15.	*Mammillaria*	Nipple cactus or Elephant's Tooth cactus. Dwarf plants with leafless cylindrical or globular stems bearing over their surface, small tubercles and each tubercle being covered by a rosette of hairy spines. Propagated by offsets.

Questions

1. ---------- are group of plants which have special structures to store water in thick fleshy leaves or stems.

Ans: Cacti and succulents

2. All the succulents are not cacti - True or false

Ans: True

3. A succulent which is propagated by leaves or leaf cuttings is ----------

Ans: Bryophyllum

4. The spines in a cactus are modifications of ----------

a. Stem b. Leaves c. Root d. Flowers

Ans: Leaves

5. A succulent suited for pot culture is ----------

Ans: Aloe

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Lecture No.20

Significance of Indoor Plants and Water Plants in Landscaping

(A) INDOOR PLANTS AND FOLIAGE PLANTS

Plants suitable for indoors

A wide range of plants can be grown indoors ranging from money plants that can grow in complete shade to a rose plant that loves bright sunlight; a tiny African violet or sapling of a rubber tree which can grow in to a giant tree can all be used for indoor gardening. But then one will have to see that the proper place for each plant is provided. The rose plant will have to be placed in a sunny balcony, money plant and African violet on a shady windowsill and the rubber tree sapling as long as it can be accommodated in the pot and indoors. Sun-loving plants too can be kept indoors temporarily, say for a function, such as a birthday party. A list of some plants suitable for keeping indoors is given below.

Decorative foliage plants

- Dieffenbachia
- Aglaonema
- Dracaena
- Maranta
- Ficus varieties
- Palms
- Schefflera
- Brassaia
- Alocassia
- Ferns
- Alpinia
- Oxalis
- Anthurium

For hanging baskets

- Fittonia
- Ferns
- Chlorophytum
- Begonia
- Peperomia
- Pilea
- Plectranthus
- Tradescantia
- Selaginella
- Episcia
- Money plants
- Hoya
- Orchids

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Flowering plants

- African violets
- Episcia
- Impatiens
- Spathiphyllum
- Orchids
- Flowering begonia
- Calla

Creepers

- Money plant
- Philodendron
- Syngonium
- Cissus
- Hoya
- *Passiflora tricolour*
- *Piper crocatum*
- Vanilla
- *Hedera helix*

(B) WATER PLANTS

Water gardens are becoming one of the most popular landscape projects. They can be designed to fit virtually any existing landscape. A water garden is a place for recreation. All theme parks are based on water garden only.

Plants for water gardening

Aquatic plants are basically of four types as detailed below.

1. Deep water plants
2. Bog plants (marginals)
3. Oxygenators
4. Floating plants

Deep water plants

Water lilies	-	*Nymphaea* spp.
Lotus	-	*Nelumbo* spp.
Spatterdock	-	*Nuphar luteum*

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Floating plants

Azolla - *Azolla* spp.
Duckweed - *Lemna* spp.
Water-meal - *Wolffia* spp.
Water Ferns - *Salvinia minima*
Water Hyacinth - *Eichhornia crassipes*
Water Lettuce - *Pistia stratiotes*

Submerged plants or oxygenators

Anacharis - *Elodea canadensis*
Cabomba - *Cabomba caroliniana*
Dwarf sagittaria - *Sagittaria natans*
Vallisneria - *Vallisneria americana*
Water milfoil - *Myriophyllus* spp.

Questions

1. Mention two foliage plants suitable for indoor gardening

Ans: Dieffenbachia, Dracaena

2. Mention two indoor plants suitable for hanging baskets

Ans: Fittonia, Money plants

3. Mention flowering plants suitable for indoor gardening

Ans: Orchids, Anthurium

4. Mention a creeper suitable for indoor gardening

Ans: *Scindapsus / Pothos*

5. Match the following

(a). Floating plants - *Vallisneria americana* (b)
(b). Oxygenators - *Nelumbo* spp (c)
(c). Deep Water Plants - *Eichhornia crassipes* (a)

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