

Practical Manual
on
Ornamental Horticulture
HFL 222 3(2+1)

(For Undergraduate Horticulture students)

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2019

**RANI LAKSHMI BAI CENTRAL AGRICULTURAL
UNIVERSITY, Jhansi-284003**

Syllabus:

Practical: Identification and description of annuals, biennials, herbaceous perennials, climbers, shrubs, trees, indoor plants, ferns and sellagenellas, Palms and cycads and Cacti and succulents. Planning and designing and establishment of garden features viz. lawn, hedge and edge, rockery, water garden, carpet bedding, shade garden, roof garden, Study and creation of terrariums, vertical garden, study and practice of different types of flower arrangements, preparation of floral bouquets, preparation of floral rangoli, veni etc., Study of Bonsai techniques, Bonsai practicing and training. Visit to nurseries and floriculture units.

Name of Student

Roll No.

Batch

Session

Semester

Course Name :

Course No. :

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Published: 2019

No. of copies:

Price: Rs.

CERTIFICATE

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the respective lab/field of College.

Date:

Course Teacher

INDEX

| S. No. | Practical Exercise | Page No. |
|--------|---|----------|
| 1. | To study classification of annuals and their identification | |
| 2. | To study about nursery raising of annuals | |
| 3. | Identification of pot plants | |
| 4. | To study about potting and repotting of ornamental pot plants. | |
| 5. | To study about classification of trees and their identification | |
| 6. | To identify ornamental and foliage shrubs used in landscaping | |
| 7. | To identify ornamental climbers available in the University | |
| 8. | To study propagation of ornamental plants through cuttings. | |
| 9. | To study flat grafting technique in cactus | |
| 10. | To study methods of lawn establishment | |
| 11. | To study different garden features | |
| 12. | To study about Bottle gardening and terrariums. | |
| 13. | To study about water gardens. | |
| 14. | To study about flower arrangement. | |
| 15. | To study the art of making bonsai | |
| 16. | To study vertical gardens. | |
| 17. | To study about rock garden or rockery. | |
| 18. | To study carpet bedding. | |
| | APPENDIX | |

**Exercise 2: Arrange the herbaceous borders of annuals according to height and colour scheme.
Write the names of annuals suitable for these purposes and draw layout.**

Practical No. 2

Objective: To study about nursery raising of Annuals

MATERIAL REQUIRED: Soil, sand, FYM, seeds of different species of annuals, tags, watering can.

Steps in preparation of nursery beds and sowing of seeds

- Land is prepared by ploughing or digging upto 30 cm depth and exposed to sun for at least 15 days.
- Well rotten FYM at the rate of 5 kg/ m² should be thoroughly incorporated in the upper 10-15 cm soil of the beds at least 7 days before transplanting.
- Soil is levelled properly and stones are removed. Raised nursery beds up to 15 cm height should be prepared during rainy season.
- Lines of uniform depth are prepared at a distance of 5- 10 cm and seeds are placed in these lines.
- Seeds are then covered with a mixture of soil+ sand+ FYM (1:1:1, v/v).
- Beds are immediately watered with help of watering can using a fine hose.
- Beds are kept moist by sprinkling water as and when required.
- Seedlings of most annual flowers become ready for transplanting between 30 to 40 days of sowing.

Exercise: Prepare a nursery bed of size 5m x 1m (in groups of 5 each) and write the procedure with diagrammatic representation of steps followed.

Exercise 2: Arrange pot plants according to colour and height for making trophy for a circle of diameter 3m and make a diagram using coloured pencils.

Practical No. 4

Objective: To study about potting and repotting of ornamental pot plants.

MATERIAL REQUIRED: Pot plants, new pots, stones/ broken pot pieces, sand, soil, FYM, watering can

Procedure of Potting:

- Before use, pots are cleaned and thoroughly rinsed in water or in a solution of one part bleach (Calcium hypochlorite) to nine parts water.
- Cover the drainage holes in the pot with pieces of broken clay pots or coarse gravel so as to allow drainage and hole is not blocked by the compost.
- Next add enough potting compost and place the plant in centre, fill in the space with more compost leaving about ½ inch below the rim of the pot.
- Pots are watered with help of watering can till compost gets fully saturated.
- Immediately after potting, the pots are placed in shade to enable the roots to get established.

Procedure of Re-potting

- When a pot plant is to be repotted with the ball of earth intact in a larger pot, this operation can be undertaken almost any time of the year as the roots do not get disturbed during the process.
- When the ball of earth is to be disturbed or broken because of poor growth and old compost getting exhausted, the transplanting should be undertaken in a season when the roots are in active growth.
- For repotting, hold the plant and soil ball with one hand, invert it and lightly tap the edge of the pot on a hard surface such as a table or countertop. If the soil mass is completely surrounded by a mass of roots, the plant needs to be repotted.
- Plant roots are trimmed with help of secateurs and repotted in similar way as followed in potting.

Exercise: Perform potting and repotting of pot plants and draw diagram of steps followed for potting and repotting of plants.

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Practical No. 11

Objective: To study different garden features

Exercise: Make a hedge and edge for 10 m length area, write the procedure and make design using coloured pencils (using scale 1m=1cm).

Materials Required:

Procedure:

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Practical No. 15

Objective: To study the art of making Bonsai

Exercise: Make a bonsai (in group of 5 students). Write the procedure along with diagram.

Materials required:

Procedure:

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Objective: To study vertical gardens

Exercise: Make a vertical garden and write the procedure with a neat diagram of vertical garden using coloured pencils.

Materials required:

Procedure:

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Objective: To study rock garden or rockery

Exercise: Make a rock garden in an area of 5 m x 5 m area (in group of 5 students each). Write the procedure and draw a diagram of rock garden.

Materials required:

Procedure:

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Objective: To study Carpet Bedding

Exercise: Make a carpet bedding design depicting University Name initial letters. Write the procedure and draw a diagram using coloured pencils.

Materials required:

Procedure:

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IDENTIFICATION OF ANNUALS

1. Winter season Annuals:

| Sr. No. | Botanical Name | Common Name | Family | Colour | Description |
|---------|-----------------------------------|------------------------------|-----------------|--------------------------------|---|
| 1. | <i>Acroclinium roseum</i> | Paper Flower | Asteraceae | Pink & White | Grown for bedding purpose and as dry flowers for decoration. |
| 2. | <i>Ageratum houstonianum</i> | Floss Flower | Asteraceae | Blue, white or pink | Grown for bedding purpose |
| 3. | <i>Alcea rosea</i> | Hollyhock | Malvaceae | Various colours | Can be used for screening purpose, background and borders |
| 4. | <i>Antirrhinum majus</i> | Snapdragon | Plantaginaceae | White, yellow pink, rose mauve | Bedding and pots, good cut flower |
| 5. | <i>Arctotis stoechadifolia</i> | African Daisy | Asteraceae | White | Bedding purpose and herbaceous borders |
| 6. | <i>Brachycome iberidifolia</i> | Swan River Daisy | Asteraceae | White, pink and blue | Bedding purpose and herbaceous borders. |
| 7. | <i>Bracteantha viscosa</i> | Sticky paper daisy | Asteraceae | Yellow | Bedding purpose and good dry flower |
| 8. | <i>Bellis perennis</i> | English daisy | Asteraceae | White, pink, red | Bedding purpose |
| 9. | <i>Bromus sp.</i> | - | Poaceae | Green to pale | Used as bedding plant and excellent dry flower |
| 10. | <i>Briza maxima</i> | Greater quacking grass | Poaceae | Green to pale | Used as bedding plant and excellent dry flower |
| 11. | <i>Calceolaria xherbeohybrida</i> | Lady's purse, slipper flower | Calceolariaceae | Orange, yellow and red | Easy to grow indoors or outdoors in pots or beds. Suitable as potted plant for temperate areas. |
| 12. | <i>Calendula officinalis</i> | Pot marigold | Asteraceae | Yellow, orange | Bedding and pots |
| 13. | <i>Callistephus chinensis</i> | China aster | Asteraceae | White, pink, blue | Bedding and pots, good cut flower |
| 14. | <i>Centaurea cyanus</i> | Corn flower | Asteraceae | -do- | Bedding purpose |
| 15. | <i>Centaurea moschata</i> | Sweet sultan | Asteraceae | Mauve, white, yellow | Bedding purpose and pots, having scented flowers |
| 16. | <i>Erysimum cheiri</i> | Wall flower | Brassicaceae | Yellow burnt orange | Bedding purpose and pots, having scented flowers |
| 17. | <i>Clarkia elegans</i> | Clarkia | Onagraceae | White, rose, pink, purple | Bedding purpose |
| 18. | <i>Coreopsis tinctoria</i> | Plains tickseed | Asteraceae | Yellow | -do- |
| 19. | <i>Coreopsis lanceolata</i> | Lance-leaved coreopsis | Asteraceae | Yellow | -do- |
| 20. | <i>Cosmos bipinnatus</i> | Garden Cosmos | Asteraceae | White, pink, mauve, magenta | Bedding purpose and can be grown throughout the year |
| 21. | <i>Cosmos sulphureus</i> | Sulfur Cosmos | Asteraceae | Yellow | -do- |
| 22. | <i>Consolida ajacis</i> | Larkspur | Ranunculaceae | Blue | Bedding purpose |
| 23. | <i>Dahlia variabilis</i> | Dahlia | Asteraceae | Various colours | Bedding purpose and pots |
| 24. | <i>Dianthus barbatus</i> | Sweet William | Caryophyllaceae | White, pink and red | Bedding purpose and as cut flower, have scented flowers |
| 25. | <i>Dianthus chinensis</i> | Chinese pink | Caryophyllaceae | -do- | Bedding purpose. |
| 26. | <i>Dimorphotheca Sinuate</i> | African daisy | Asteraceae | White | Bedding purpose and pots |
| 27. | <i>Eschscholtzia californica</i> | Californian poppy | Papaveraceae | Yellow and Orange | Medium growing , for bedding purpose |
| 28. | <i>Gazania splendens</i> | Treasure daisy | Asteraceae | Yellow and dark brown | Bedding purpose and pots |
| 29. | <i>Glebionis coronaria</i> | Annual chrysanthemum | Asteraceae | White, yellow | Bedding purpose and good loose flower. |
| 30. | <i>Gypsophila elegans</i> | Annual baby's breath | Caryophyllaceae | White, pink yellow | Bedding purpose, good cut flowers used as fillers. |
| 31. | <i>Helichrysum bracteatum</i> | Straw flower | Asteraceae | Yellow, white, pink | Bedding purpose and good dry flower |
| 32. | <i>Iberis amara</i> | Candytuft | Brassicaceae | White, pink | Can be grown in pots and for edging of herbaceous border |
| 33. | <i>Lagurus ovatus</i> | Hare's-tail or Bunnettail | Poaceae | Green | Bedding purpose, pots and excellent dry flower |
| 34. | <i>Lathyrus odoratus</i> | Sweet pea | Fabaceae | Various colours | Annual climber with fragrant flowers, suitable for screening and trellises. |
| 35. | <i>Limonium sinuatum</i> | Sea-lavender /Statice | Plumbaginaceae | White, pink, yellow purple | Fairly drought resistant, very good cut flower as filler and as dry flower |
| 36. | <i>Linaria bipartite</i> | Toadflax | Plumbaginaceae | Various colours | Can be grown in semi-shady places, good for bedding |

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| | | | | | and pots. |
| 37. | <i>Lobularia maritima</i> | Sweet Alyssum | Brassicaceae | White, lilac | Bedding purpose and pot plants |
| 38. | <i>Lupinus hartwegii</i> | Lupin | Fabaceae | Purplish blue | For bedding purpose and as cut flower |
| 39. | <i>Mathiola incana</i> | Stock | Brassicaceae | White, purple, yellow | For bedding purpose and good cut flower |
| 40. | <i>Dorotheanthus bellidiformis</i> | Ice plant | Aizoaceae | Pink, white, yellow | Leaves are fleshy and have small dew like natural eruptions. For edging, pots, hanging baskets, rockery. |
| 41. | <i>Euryops chrysanthemoides</i> | African bush daisy | Asteraceae | Bright yellow | Edging plant and pots |
| 42. | <i>Mimulus tigrinus</i> | Tiger Monkey flower | Phrymaceae | yellow with brown blotches | Partially shady places, suitable, good for pots |
| 43. | <i>Moluccella laevis</i> | Bells of Ireland | Lamiaceae | Green like bells | Used in flower arrangements and good dry flower |
| 44. | <i>Nemesia strumosa</i> | Nemesia | Scrophulariaceae | Yellow, red, orange | Bedding and pots |
| 45. | <i>Nigella damascena</i> | Love -in- a -mist | Ranunculaceae | Blue, white ,purple | Sunny areas and pods are used as dry flowers |
| 46. | <i>Petunia hybrida</i> | Petunia | Solanaceae | Various colours | Good for pots, hanging baskets and bedding purpose |
| 47. | <i>Phlox drummondii</i> | Drummond's Phlox | Polemoniaceae | Various colours | Dwarf plants are very showy when grown in borders, baskets and pots |
| 48. | <i>Papaver orientale</i> | Common poppy | Papaveraceae | Red | Good for bedding purpose and herbaceous borders |
| 49. | <i>Primula melacoides</i> | Fairy primrose | Primulaceae | Mauve, pink, white | Good for bedding purpose and pots. Suitable for temperate areas. |
| 50. | <i>Salvia splendens</i> | scarlet sage | Lamiaceae | Scarlet, red, white, purple | Easily grown in shady places and rockery, used as bedding plant and in pots |
| 51. | <i>Senecio cruentus</i> | Cineraria | Asteraceae | Various colours | Grown in shady places, good for bedding purpose and pots |
| 52. | <i>Tagetes erecta</i> | African Marigold | Asteraceae | Yellow, orange | Easily grown, good for bedding, pots and commercially grown for loose flowers |
| 53. | <i>Tagetes patula</i> | French Marigold | Asteraceae | Yellow, orange, red | Hardy annual used for bedding purpose, pots and as loose flower. |
| 54. | <i>Torenia fourmieri</i> | Wishbone flower | Linderniaceae | blue ,purple, pink, rose and white | blooms abundantly in shady conditions, good for edging and containers |
| 55. | <i>Tropaeolum majus</i> | Nasturtium | Tropaeolaceae | -do- | Mostly grown in rockeries. It has trailing habit, so used as climbers and in hanging baskets. |
| 56. | <i>Verbena hybrida</i> | Verbena | Verbenaceae | Purple, pink, blue, red, white | Good for bedding purpose, pots, hanging baskets, window boxes and rockery. |
| 57. | <i>Viola tricolor var hortensis/ Viola wittrockiana</i> | Pansy | Violaceae | Yellow, blue, red, purple, violet bicolor | Sunny location is preferred, good for bedding and hanging baskets. Flowers resembles with the butterflies |

2. Summer and rainy season annuals

| Sr. No. | Botanical Name | Common Name | Family | Colour | Remarks |
|---------|---|--------------------|---------------|------------------------------|---|
| 1 | <i>Celosia cristata</i> | Cock's comb | Amaranthaceae | Pink, yellow, orange | Very hardy and longer flowering period and makes good crest |
| 2 | <i>Celosia plumosa</i> | Plumed cockscomb | Amaranthaceae | -do- | Flowers like plume of ostrich. Good for bedding purpose. |
| 3 | <i>Amaranthus caudatus</i> | Love-lies-bleeding | Amaranthaceae | Pink & White | Due to variegated leaves, it is also grown in pots for indoor decoration |
| 4 | <i>Gaillardia pulchella</i> | Blanket flower | Asteraceae | Yellow, orange scarlet brown | It can resist dry conditions and can be grown as perennial also. Good cut flower |
| 5 | <i>Gomphrena globosa</i> | Bachelor's button | Amaranthaceae | Pink, Magenta | Good for dry conditions and used as dry flower. |
| 6 | <i>Helianthus annuus</i> | Sunflower | Asteraceae | Yellow orange | Can be grown throughout the year and sown directly from seeds into permanent places |
| 7 | <i>Portulaca grandiflora</i> | Moss Rose | Portulacaceae | Various colours | Easily propagated by cutting, can be grown in pots, hanging basket and small boxes. |
| 8 | <i>Bassia scoparia/ Kochia scoparia</i> | Summer Cypress | Amaranthaceae | --- | Mostly grown for foliage beauty due to uniform, well-shaped and bushy growth. |
| 9 | <i>Impatiens balsamina</i> | Balsam | Balsaminaceae | Various colours | Early flowering and for short duration, Very delicate and needs much care |
| 10 | <i>Impatiens walleriana</i> | Impatiens | Balsaminaceae | pink, red or white | Suitable for pots and bedding purpose. |
| 11 | <i>Tithonia speciose</i> | Mexican Sunflower | Asteraceae | Orange, scarlet | Sown directly from seeds |
| 12 | <i>Catharanthus roseus</i> | Periwinkle | Apocynaceae | Purple, Pink white | Can be grown throughout the year |
| 13 | <i>Zinnia elegans</i> | Zinnia | Asteraceae | Various colours | Very hardy and grown easily for longer duration |

IMPORTANT FLOWERING PLANTS FOR POT CULTURE

| S. No. | Botanical name | Common Name | Family | Identifying features / Landscape value |
|--------|---|-----------------------------------|------------------|--|
| 1 | <i>Adenium obesum</i> | Desert rose | Euphorbiaceae | Beautiful flowering succulent bears red, pink and white flowers. |
| 2 | <i>Azalea sp.</i> | Azalea | Ericaceae | Small shrubs with beautiful single or double flowers which come in white, pink, rose, red and purple colours. |
| 3 | <i>Begonia semperflorens</i> | Begonia | Begoniaceae | This specie bear beautiful small clusters of shell like flowers in shades of light to deep pink, red, salmon, white and orange. |
| 4 | <i>Calceolaria herbeohybrida</i> | Pouch flower/ Slipper flower | Scrophulariaceae | Tender herbaceous plant with bright coloured and peculiar shaped flowers as purses, pouch like or slipper like. They have wide range of colours like yellow, orange, red, etc. in various unique patterns. |
| 5 | <i>Cinereria cruentus</i> | Florist Cinereria | Asteraceae | It is a shade loving and low growing annual flower. Daisy like, brightly coloured flowers are borne in huge clusters. |
| 6 | <i>Camellia japonica</i> | Camellia | Theaceae | It is perfect flowering shrub for medium and high elevation areas. It bears red, pink, white double or semi-double flowers similar to rose flowers. |
| 7 | <i>Catharanthus roseus</i> Syn. <i>Vinca rosea</i> | Madagascar Periwinkle | Apocynaceae | Perennial plant with mostly rose purple or white flowers, however, many hybrids are available in various colours like magenta, red, bicoloured. |
| 8 | <i>Clivia miniata</i> | Natal lily/ Kaffir lily | Amaryllidaceae | An evergreen flowering bulbous plant suitable for hilly areas. The orange-yellow or scarlet coloured funnel-shaped flowers are borne in umbels. |
| 9 | <i>Cyclamen persicum</i> | Cyclamen | Primulaceae | Cyclamens are herbaceous low growing plants which thrive well in temperate regions. Flowers have reflexed petals and flower colours are red, pink, white, purple and bicoloured. |
| 10 | <i>Fuchsia × hybrida</i> | Ladies Eardrops/ Dancing Lady | Onagraceae | It is a flowering shrub with exceedingly beautiful pendulous 'eardrop' shape flowers. Flower colour can be almost any combination of white, pink, red, magenta and purple. |
| 11 | <i>Gloxinia speciosa</i> | Gloxinia | Gesneriaceae | Low growing herbaceous bulbous plant with velvety- green leaves. It produces large flowers with white, pink, blue, bright red colour or blue, scarlet red with white border. |
| 12 | <i>Hydrangea macrophylla</i> | Hydrangea | Hydrangeaceae | A good flowering shrub used as pot plants in medium to high altitude areas. Plants produce large round heads of white, pink or blue flowers. |
| 13 | <i>Kalanchoe blossfeldiana</i> | Florist kalanchoe | Crassulaceae | It is a flowering herbaceous perennial plant growing to 30 cm tall. The flowers are profusely borne and are available in numerous colours like red, pink, yellow, orange. |
| 14 | <i>Pelargonium zonale</i> | Geranium | Geraniaceae | Geraniums are herbaceous perennials with beautiful flowers borne in clusters. Flowers may be single or double in shades of white, pink, red, pale rose or sometimes bicoloured. |
| 15 | <i>Petunia hybrida</i> | Petunia | Solanaceae | Petunia is a beautiful attractive annual. Beautiful funnel shaped, small or large flowers which re available in wide variety of colours like white, pink |
| 16 | <i>Primula malacoides</i> | Baby Primrosor/ Fairy Primrose | Primulaceae | Herbaceous annual plant with rosette of leaves at the base. White, pink to mauve. Flowers, single or double, borne on long slender stalk in round umbels |
| 17 | <i>Primula hortensis</i> | Primrose | Primulaceae | It is a perennial or annual herbaceous plant. Leaves appear in clusters at the base. Multi-coloured flowers are solitary or in umbels on stalks longer than leaves. |
| 18 | <i>Ranunculus asiaticus</i> | Ranunculus/ Persian Buttercup | Ranunculaceae | Herbaceous plant with cud shaped flowers borne on a long stalk. Flowers have petals in many bright colours like white, yellow, cream, orange, red, pink |
| 19 | <i>Ruellia simplex</i> | Mexican petunia | Acanthaceae | Evergreen perennial plant bears pink, purple and white flowers |
| 20 | <i>Saintpaulia ionantha</i> | African Violet | Gesneriaceae | African violet are stemless, hairy perennials with ovate leaves having many small hair on both surface. |

2. List of important foliage plants for pot culture

| S. No. | Botanical Name | Common Name | Family | Identifying features / Landscape value |
|--------|--|-----------------------------------|--------------|---|
| 1 | <i>Aechmea fasciata</i> | Urn plant | Bromeliaceae | A good houseplant for tropical areas. The leaves are ornamental with cross band. The leaves grow together forming a rosette shape at the centre of plant |
| 2 | <i>Aglaonema sp.</i> | Aglaonema | Araceae | The plants are herbaceous, produce branches freely and have beautiful foliage. Leaves are generally green and in many species/ varieties they are beautifully and variously variegated, blotched or with spots. |
| 3 | <i>Alocasia sps.</i> | Elephant's Ear plant | Araceae | The plants of this genus have beautiful showy foliage. Leaves are dark green and heart-shaped. Leaves of <i>Alocasia amazonica</i> leaves with white margins and veins. |
| 4 | <i>Anthurium scherzerianum</i> and <i>A. andreanum</i> | Flamingo flower or Tail flower | Araceae | A beautiful group of tropical aroids. Leaves are dark green and glossy. is grown for its beautiful flowers. They produce large heart shaped coloured spathes and cylindrical spadices |
| 5 | <i>Aralia elegantissima</i> | Aralia | Araliaceae | An excellent plant with bright green leaves, which are palmate compound, leathery with 7- 10 leaflets. |

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| 6 | <i>Alpinia zerumbet</i> | Ginger lily | Zingiberaceae | Plants with beautiful variegated foliage. Leaves are clustered on short stalk, lanceolate, dark green with strips and bands of creamy yellow colour. |
| 7 | <i>Araucaria cookii</i> | Monkey Puzzle | Araucariaceae | Tall tree grows upto 70 m height but as pot plant it is preferred short. Plant is pyramidal in shape. Its growth is slow and symmetrical. Branches radiate from the stem horizontally. |
| 8 | <i>Asparagus deniflorus 'Sprenger'</i> | Emerald Fern | Liliaceae | It is evergreen plant with long trailing branches. Plants have tuberous roots and true leaves are reduced to thorns. |
| 9 | <i>Asparagus plumosus</i> | Asparagus fern | Liliaceae | It is a fine foliage climber. Twigs and cladodes are arranged in a horizontal and triangular in outline. |
| 10 | <i>Aspidistra elatior</i> | Cast Iron plant | Liliaceae | It is a perennial, stemless and slow growing plant. Leaves are large, leathery and shining blackish green. |
| 11 | <i>Begonia rex</i> | Rex Begonia | Begoniaceae | These begonias are valued mainly for their large, beautiful and ornamental leaves. Different varieties available with various patterns and colour of leaves |
| 12 | <i>Caladium sps</i> | Mother-in-Law Plant/ Elephant's Ear | Araceae | Rhizomatous plants having beautiful foliage colour which ranges from dark green to yellowish green, deep crimson and blotched and spotted with conspicuous colours. |
| 12 | <i>Calathea sp.</i> | Peacock Plant/ Zebra Plant | Marantaceae | Rhizomatous herbaceous plants with beautifully variegated leaves which are marked with shades of green, red, yellow and white. |
| 13 | <i>Chlorophytum comosum</i> | Spider plant/ Ribbon plant | Liliaceae | Perennial herbaceous plant with rosette of arching green leaves with white band in the centre and loosely arranged in tuft. After flowering, shoots develop plantlets at the tips, which develop aerial roots. |
| 14 | <i>Codiaeum variegatum</i> | Croton | Euphorbiaceae | These are shrubs with colourful and variegated leaves. Leaf variegations include yellow, green, copper, red, pink, orange, ivory colours and may spread over whole leaf or appear as veins, spots, blotches and other attractive patterns |
| 15 | <i>Coleus blumei</i> | Coleus | Lamiaceae | Herbaceous plants generally grown for brilliantly coloured foliage. Leaves are of various colour and pattern: like green, yellow, crimson, reddish and pink. |
| 16 | <i>Cordyline terminalis</i> | Good luck plant | Liliaceae | <i>Cordyline</i> is closely related to <i>Dracaena</i> and difference is only in the structure of ovary. Plants are slow growing evergreens, valued for their richly coloured foliage, including variegated forms. |
| 17 | <i>Dieffenbachia amoena</i> | Dumb cane | Araceae | Dieffenbachias are popular house plants and are grown for their pretty and elegant foliage exhibiting various patterns of variegations. |
| 18 | <i>Dracaena sp.</i> | Dracaena | Liliaceae | Dracaenas have striking attractive, green, variegated and colourful foliage. Leaves are thin, leathery and colour varies from dark green to variegated with white bands and stripes. |
| 19 | <i>Epipremnum aureum</i> | Pothos/ Money plant | Araceae | In temperate regions it is popular houseplant with beautiful variegated leaves. It is a climbing type of plant and are grown in pots along moss column. |
| 20 | <i>Euphorbia thithymaloides</i> | Devil's backbone/ Redbird flower | Euphorbiaceae | Grown as pot plant for outdoor as well as indoor conditions and also used for rock garden and a hedges. |
| 21 | <i>Excoecaria bicolor</i> | Excoecaria | Euphorbiaceae | A small shrub with beautiful foliage. The upper leaf surface is glabrous and olive-green and the lower red. |
| 22 | <i>Ficus elastica</i> | Rubber plant | Moraceae | Evergreen woody plant with leathery, extra smooth, large green leaves. In variety 'Variegata' leaves are variegated with creamy yellow margins. |
| 23 | <i>Hedera helix</i> | English Ivy | Araliaceae | It is a versatile hardy popular climber suitable for pots. The climbing vine has 5 lobed glossy dark green leaves with creamy veins. |
| 24 | <i>Monstera deliciosa</i> | Monstera/ Cut leaf Philodendron | Araceae | A very showy, stout, herbaceous climber. Leaves are very large upto 90 cm wide, thick leathery. Pinnately cut half-way to mid rib. |
| 25 | <i>Nephrolepis exaltata</i> | Boston fern | Lomariopsidaceae | Evergreen fern suitable for medium to low light areas. |
| 26 | <i>Ophiopogon intermedius</i> | Ophiopogon | Liliaceae | A beautiful herbaceous stemless plant with tufted, linear, grass like leathery, dark green leaves. |
| 27 | <i>Paperomia obtusifolia</i> | Paperomia | Paperomiaceae | Plants with succulent stems and spoon shaped leaves. Leaves are waxy green above and pale green beneath. Leaf stalk is red or striped maroon brown. |
| 28 | <i>Paperomia caperata</i> | Emerald Ripple | Paperomiaceae | The plant is beautiful with hardly 20 cm height. It has thick, wrinkled, and heart shaped; glossy, dark green leaves with reddish leaf stalk. |
| 29 | <i>Philodendron bipinnatifidum,</i> | Philodendron | Araceae | Plants are creeping, stemless herbs with beautiful foliage. Leaves are large heart shaped and wide, leathery and dark green. |
| 30 | <i>Pilea cadierei</i> | Aluminium | Urticaceae | Succulent herbaceous plant with thin, fleshy and green leaves with interrupted bands of silver colour in the centre and along the margins. |
| 31 | <i>Senecio macroglossus</i> | Natal Ivy | Asteraceae | Succulent climber with ivy like leaves having waxy and shiny texture. It can be twined over a support in pots or grown in hanging baskets. |
| 32 | <i>Schefflera arboricola</i> | Umbrella tree | Araliaceae | Popular dwarf plant of freely branching habit. Leaves are palmate, glossy green with 7-8 leaflets. |
| 33 | <i>Syngonium podophyllum</i> | African Evergreen | Araceae | Quick growing, ornamental foliage climber suitable for pots. Leaves are medium green in colour, sometimes beautifully variegated with silver cream/ white colour |

CLASSIFICATION OF TREES

Ornamental flowering trees: Grown for the beauty of their showy and ornamental flowers.

| Sr. No. | Botanical Name | Common Name | Family | Flower colour and time | Description |
|---------|--|----------------------------------|--------------|---------------------------------|--|
| 1. | <i>Acacia auriculiformis</i> | Earleaf Acacia/ Auri | Fabaceae | Yellow, August-September | An evergreen tree with pendulous branches and phyllodes leaves. The tree is medium sized |
| 2. | <i>Alstonia scholaris</i> | Devil's tree | Apocynaceae | Greenish white, March- April | It is tall, spreading and shady tree. Leaves are shiny and dark green. The tree bears small greenish white flowers during Nov –Dec. |
| 3. | <i>Azadirachta indica</i> | Neem | Meliaceae | White, April- May | 10-15 m high, good shady tree. It grows successfully on rocky and alkaline soils. Very good shade tree for tropical/sub-tropical areas |
| 4. | <i>Bauhinia purpurea</i> | Orchid tree/ Purple Bauhinia | Fabaceae | Rosy- purple, Nov – Feb. | A medium sized tree suitable for avenue planting, |
| 5. | <i>Bauhinia tomentosa</i> | Yellow Bauhinia/ Orchid tree | Fabaceae | Yellow , April- June | A small tree with drooping branches which bear showy yellow flowers and suitable for growing in gardens. |
| 6. | <i>Bauhinia variegata</i> | Orchid tree / Kachnar | Fabaceae | White-pink, Feb- April | A small sized tree, bear flowers when the tree is leafless. The flowers are edible and used for culinary purpose. |
| 7. | <i>Bombax ceiba</i> | Silk Cotton tree/ Simbal | Malvaceae | Red , orange, Jan- March | A large deciduous tree, stem is straight and undivided. The young stem is covered with sharp prickles. It bears flowers when tree is leafless. |
| 8. | <i>Butea monosperma</i> | Dhak/Palash/ flame of the forest | Fabaceae | Orange red, March- April | A small deciduous tree having irregular branches. It bears showy flowers when the tree is leafless. It is drought resistant tree and can be grown in alkaline soils |
| 9. | <i>Callistemon lanceolatus</i> | Bottle Brush | Myrtaceae | Red, Round the year | A beautiful small tree having weeping habit, the crowded scarlet flowers are borne in spikes almost throughout the year. |
| 10. | <i>Cassia fistula</i> | Indian Laburnum/ Amaltas | Fabaceae | Yellow, May- June | A medium sized shady tree, bears pendulous racemes of large bright yellow flowers, when tree is leafless. It is drought-resistant and can tolerate quite a high salt levels. |
| 11. | <i>Cassia javanica</i> | Java Cassia | Fabaceae | Pink, May- June | A medium sized tree with spreading crown, bears clusters of pink flowers with the foliage. |
| 12. | <i>Cassia renigera</i> | Burmese Pink Cassia | Fabaceae | Pink, May- July | It bears flowers in clusters giving appearance of bunches of roses on long branches. |
| 13. | <i>Cassia siamea</i> | Kasod tree | Fabaceae | Yellow, Nov- Feb | A medium sized shady tree. It is drought resistant and can tolerate lot of dust. It is suitable for planting along roadside. |
| 14. | <i>Ceiba speciosa</i> | Silk floss tree | Malvaceae | Pink, July- August | It is beautiful tree with a bottle shaped green thorny trunk |
| 15. | <i>Delonix regia</i> | Gulmohar/ Royal Poinciana | Fabaceae | Scarlet red, April- June | A large tree with umbrella like crown and feathery leaves. |
| 16. | <i>Erythrina indica/ E. variegata</i> | Indian Coral tree | Fabaceae | Scarlet, crimson, March- April | A quick growing tree. It bears flowers when the tree is leafless. |
| 17. | <i>Grevillea robusta</i> | Silver oak | Proteaceae | Yellow, April- June | An evergreen tree with a conical crown. The leaves are fern like and silvery from the lower side. It bears coppery yellow flowers in April. |
| 18. | <i>Jacaranda mimosaeifolia</i> | Neeli Gulmohar | Fabaceae | Purple-mauve, March- May | Medium to large sized tree, with feathery bipinnate leaves. Quick growing tree suitable for avenue planting |
| 19. | <i>Kigelia pinnata</i> | Sausage tree | Bignoniaceae | Dark red-maroon, April- May | A large tree with good spreading crown. Sausage like fruits borne on long pendulous stalks can be seen hanging on trees. |
| 20. | <i>Lagerstroemia speciosa/ L. flos-reginae</i> | Giant Crepe Myrtle | Lythraceae | Mauve/ pinkish, April to August | A medium sized deciduous tree. Suitable for avenue planting. |
| 21. | <i>Madhuca indica</i> | Mahua | Sapotaceae | Cream, Feb- March | Fast growing large deciduous tree. The leaves are borne in clusters near the end of the branches and are coppery coloured when young. The flowers are used for making vegetables and wine. |
| 22. | <i>Magnolia champaca</i> | Champak/ Champa | Magnoliaceae | Light yellow, May- September | A medium sized evergreen tree. Bears fragrant flowers |
| 23. | <i>Magnolia grandiflora</i> | Bara champa | Magnoliaceae | White, April- May | A medium sized, evergreen tree with beautiful foliage, large scented white flowers. |
| 24. | <i>Millingtonia hortensis</i> | Tree jasmine/ Indian cork tree | Bignoniaceae | White, April- June | A tall evergreen tree which bears sweet scented flowers. The tree is quick growing. |
| 25. | <i>Milletia ovalifolia</i> | Molmein rosewood | Fabaceae | Light pink, pink, Feb- March | A medium sized tree. Bears profuse flowers when the tree is leafless |
| 26. | <i>Peltophorum pterocarpum</i> | Yellow Flamboyant | Fabaceae | Yellow, Sept- November | Deciduous tree with bipinnate leaves, erect trunk and suitable for avenue planting |
| 26. | <i>Plumeria acutifolia</i> | Pagoda tree/ Temple tree | Apocynaceae | White, April- November | Dwarf evergreen tree with large green leaves with acute tips. |

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|-----|------------------------------|--------------------------------------|--------------|--------------------------------------|---|
| 27. | <i>Plumeria alba</i> | Pagoda tree/ Temple tree | Apocynaceae | White, April- November | Dwarf evergreen tree with large glabrous dark green leaves with round tip, bear fragrant flowers |
| 28. | <i>Plumeria rubra</i> | Red Frangipani | Apocynaceae | Pinkish red, red, April- November | Dwarf deciduous tree with large dark green conical leaves, bear red flowers |
| 29. | <i>Saraca indica</i> | Sita Ashoka | Fabaceae | Bright orange- Red, April – May | Evergreen tree with drooping branches, bear fragrant flowers. |
| 30. | <i>Spathodea campanulata</i> | Fountain tree/ African Tulip tree | Bignoniaceae | Red, Feb-May. | Monotypic genus in the family Bignoniaceae, A medium sized tree. Flower on pressing trickles out water like a fountain. |
| 31. | <i>Tabebuia rosea</i> | Rosy trumpet tree | Bignoniaceae | Deep rose pink, Feb- April | Large tree which bears flowers when leafless. |
| 32. | <i>Tabebuia argentea</i> | Silver trumpet tree | Bignoniaceae | Yellow, March- May | Quick growing tree, bears flowers when leafless. Suitable for avenue planting. |
| 33. | <i>Tecomella undulata</i> | Roheda | Bignoniaceae | Orange, March- April | It is dwarf tree, evergreen to semi-deciduous tree suitable for dry and desert areas. |

2. Foliage trees: Trees grown for their showy ornamental foliage or for providing shade in garden.

| S. No. | Botanical Name | Common Name | Family | Description |
|--------|---|-----------------------------|----------------|---|
| 1. | <i>Alstonia scholaris</i> | Sat Patia or Devil's tree | Apocynaceae | Bright green leaves borne in cluster of seven. It is good shady tree, used for avenue planting and near parking areas |
| 2. | <i>Araucaria cookii</i> | Monkey Puzzle Tree | Araucariaceae | It has symmetrical growth habit. Good for planting as specimen tree. Propagated from seed. |
| 3. | <i>Casuarina equisetifolia</i> | Australian pine tree | Casuarinaceae | Tall columnar tree with needle like leaves, suitable for wind breaks |
| 4. | <i>Cedrus deodara</i> | Cedar pine/ Deodar | Pinaceae | Evergreen pine tree of temperate areas, suitable for roadside planting and timber. |
| 5. | <i>Cupressus sempervirens</i> | Saru | Cupressaceae | Conical tree with thin foliage and suitable for planting in the graveyard. |
| 6. | <i>Dillenia indica</i> | Chalta | Dilleniaceae | Dwarf slow growing tree with shiny green serrated leaves. |
| 7. | <i>Eucalyptus spp.</i> | Blue gum tree/ Safeda | Myrtaceae | Slender trunk, smooth clean few branches lemon scented leaves. Grow rapidly and planted as avenues on marshy land. |
| 8. | <i>Eugenia jambolina</i> | Jamun/ Java plum | Myrtaceae | Tall and spreading with dark green foliage, suitable for providing shade. It bears fruits and attract birds. |
| 9. | <i>Ficus benghalensis</i> | Bohr or Banyan tree | Moraceae | Tall, round shaped foliage tree, usually grown for providing shade in gardens. |
| 10. | <i>Ficus religiosa</i> | Pipal | Moraceae | Tall, evergreen, round shaped tree usually grown for providing shade in gardens. |
| 11. | <i>Ficus elastica</i> | Rubber tree | Moraceae | Evergreen medium size tree, bright shining blackish green leaves, can be used as a specimen tree and as a pot plant. |
| 12. | <i>Juniperus chinensis</i> | Chinese Juniper | Cupressaceae | Conical growth habit and fine needle like thin green leaves, can be planted as pot plant or as specimen. |
| 13. | <i>Melia azedarch</i> | Chinaberry tree/ Drake | Meliaceae | Winter deciduous tree, light green shiny foliage, suitable for plantation as shady tree |
| 14. | <i>Melaleuca bracteata</i> | Golden Bottle brush | Myrtaceae | Tree with pendulous branches, leaves are golden-greenish in colour. |
| 15. | <i>Mimusops elengi</i> | Spanish cherry. Maulsari | Sapotaceae | Slow growing tree with round canopy and dark green foliage, bears scented flowers |
| 16. | <i>Polyalthia longifolia</i> | False Ashok | Annonaceae | Tall evergreen tree with a symmetrical columnar crown, good for screening and roadside planting. |
| 17. | <i>Pinus roxburghii</i> | Chirpine | Pinaceae | Evergreen pine tree grown in hills. It can be grown as specimen tree. |
| 18. | <i>Pongamia pinnata</i> | Pongam tree | Fabaceae | Medium size shady tree with dark green foliage, bears purplish white flowers. |
| 19. | <i>Pterospermum acerifolium</i> | Bayur tree/ Kanak Champa | Malvaceae | Medium sized evergreen tree with beautiful foliage and creamish yellow scented flower which appears from April to June. |
| 20. | <i>Pterygote alata/ Sterculia alata</i> | Buddha coconut | Malvaceae | Tall slow growing tree with broad leaves, less spreading, suitable for planting as avenue tree. |
| 21. | <i>Putranjiva roxburghii</i> | Putrajiva | Putranjivaceae | Large tree with a semi-globular crown dense glossy, foliage, good for avenues. |
| 22. | <i>Terminallia arjuna</i> | Arjun tree | Combretaceae | Large evergreen shady tree. Flowers are not showy. Suitable for planting along roads and in groups for shade. |

IDENTIFICATION OF SHRUBS

1. Flowering shrubs: Shrubs are grown for their beautiful flowers.

| S. No. | Botanical Name | Common Name | Family | Flowering time | Identifying characters |
|--------|---|----------------------------------|----------------|---|--|
| 1. | <i>Abelia grandiflora</i> | Abelia | Caprifoliaceae | May-June | It grows to a height of 1.5-2m, spreading habit and propagated through cuttings. |
| 2. | <i>Abutilon pictum</i> | Chinese lantern | Malvaceae | Orange-yellow | Short shrub, propagated from seeds and cuttings and prefer partial shade. |
| 3. | <i>Acalypha hispida</i> | Chenille plant/ Cat's tail | Euphorbiaceae | Throughout the year, red | Bushy shrub with dark green foliage and long red coloured fuzzy pendulous inflorescence which looks like cat's tail. |
| 4. | <i>Achania malvaviscus</i> | Sleeping Hibiscus | Malvaceae | Throughout the year, red | Popular shrub used as hedge, easily propagated from cuttings |
| 5. | <i>Asclepias currassavica</i> | Milk weed | Asclepiadaceae | Summer season Orange-yellow | As a specimen shrub, good for border, propagated from seed or cuttings |
| 6. | <i>Barleria cristata</i> | Philippine violet | Acanthaceae | Oct-Dec. Violet blue, pink, white | It is a small shrub, winter deciduous in nature propagated from seed. |
| 7. | <i>Bauhinia tomentosa</i> | Bell bauhinia | Leguminosae | August-October Sulphur yellow | 5-8 m high, winter deciduous shrub, quick growing. Grown for foliage and flower beauty. Propagated from seed. |
| 8. | <i>Bougainvillea</i> spp | Bougainvillea | Nyctaginaceae | Red, yellow, white, purple, pink | It is a multipurpose shrub, quick growing. Hardy and can be grown under neglected conditions for screening purpose. |
| 9. | <i>Brugmansia suaveolens</i> | Datura | Solanaceae | Pink flowers | Very good landscape plant, prefers partial shade. |
| 10. | <i>Caesalpinia pulcherrima</i> | Peacock flower | Leguminosae | May-Aug. Scarlet, yellow | It is medium sized shrub grown for foliage and flower beauty. It is a quick growing shrub suitable for dry areas. |
| 11. | <i>Calliandra brevipes</i> | Pink Powder puff | Leguminosae | Red, pink, white | It is medium to tall, evergreen shrub with beautiful foliage. |
| 12. | <i>Camellia japonica</i> | Camellia | Theaceae | April-June Red, Pink | Very good specimen shrub suitable for high elevations. |
| 13. | <i>Carissa carandus</i> | Karonda | Apocynaceae | March-April, white | A good hedge plant and can be planted in a large shrubbery. |
| 14. | <i>Cascabela thevetia/ Thevetia peruviana</i> | Pili Kaner | Apocynaceae | Year round, Yellow | Tall evergreen shrubs with shining leaves, for roadside plantation and screening, propagation is from seed. |
| 15. | <i>Cassia biflora</i> | Desert Cassia | Leguminosae | Feb-April Yellow | It is 6-8 ft. in height propagated from seed and air layering, used as specimen shrub. |
| 16. | <i>Cassia glauca</i> | Scrambled egg bush | Leguminosae | Mar-May, Sept. -Nov., Yellow | It is tall, evergreen, quick growing shrub suitable for arid areas. |
| 17. | <i>Cestrum diurnum</i> | Din ka Raja | Solanaceae | June-Aug White | It is medium sized quick growing, evergreen shrub with blue berries. |
| 18. | <i>Cestrum elegans</i> | Pink Cestrum | Solanaceae | Sept-Dec. Purple red | A plant suitable for temperate climate and high altitudes. |
| 19. | <i>Cestrum nocturnum</i> | Rat ki Rani | Solanaceae | Spring & Rainy season white | It is 5-6 ft high, evergreen, hardy quick growing shrub, propagated from cuttings, fragrant flowers open at night. |
| 20. | <i>Clerodendrum thomsonae</i> | Bleeding heart | Verbenaceae | Rainy season Scarlet with white calyx | Very attractive shrub/climber suitable for tropical areas. |
| 21. | <i>Cotoneaster microphyllus</i> | Rockspray Cotoneaster | Rosaceae | White flowers | Prostrate trailing shrubs, climbs over rocks and suitable for rock gardens. |
| 22. | <i>Cuphea hyssopifolia</i> | False Heather | Lythraceae | July-September blue flowers | Evergreen shrub suitable as good edging plant bearing pinkish purple flowers. |
| 23. | <i>Galphimia gracilis</i> | Golden shower | Malpighiaceae | Jul-Nov. Yellow | It is evergreen medium shrub, can be used as hedge. Propagated through seed. |
| 24. | <i>Gardenia jasminoides</i> | Gandhraj | Rubiaceae | March-Sept. White | Evergreen medium shrub. Grown as a specimen shrub, bears sweet scented flowers. |
| 25. | <i>Hamelia patens</i> | Firebush/ humming birdbush | Rubiaceae | Year round Red | Tall shrub. On rockery it can be trained as small bush, grown for the foliage and flower beauty and for screening. |
| 26. | <i>Hamiltonia suaveolens</i> | - | Rubiaceae | Feb-March Lavender | Medium to large shrub 6-8'. Propagated from cutting, used for group plantation. |
| 27. | <i>Hibiscus mutabilis</i> | Changeable Rose | Malvaceae | White to Pink to red | It is tall growing, deciduous shrub with large leaves.. |
| 28. | <i>Hibiscus rosa-sinensis</i> | China Rose | Malvaceae | Year round White, pink rose, yellow | Evergreen medium sized. Used for making flowering hedge. |
| 29. | <i>Hibiscus syriacus</i> | Rose of Sharon | Malvaceae | Summers, White & Mauve | Deciduous shrub 5-6'. Propagated from cuttings. Good for temperate climatic areas. |
| 30. | <i>Holmskioldia</i> | Cup-n-Saucer | Verbenaceae | Yellow, red | Medium sized shrub. Long branches used for dry decoration. |

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| | <i>Sanguinea</i> | | | | |
| 31. | <i>Ixora coccinea</i> | Jungle geranium | Rubiaceae | Deep scarlet July-Aug | Evergreen specimen shrub. Prefers partial shade for growth. |
| 32. | <i>Ixora parviflora</i> | -do- | Rubiaceae | White, Mar-Apr | Tall evergreen specimen shrub with sweet scented flowers. |
| 33. | <i>Ixora singaporiensis</i> | -do- | Rubiaceae | Pinkish red | Dwarf shrub, used as a specimen bush. Prefers partial shade for growth. |
| 34. | <i>Jacobinia carnea</i> | Jacobinia | Acanthaceae | Orange | 4-5' evergreen shrub, bears tubular orange flower, grown for making flowering hedge. |
| 35. | <i>Jasminum humile</i> | Peeli chameli | Oleaceae | Feb-Mar, Yellow | Evergreen shrub. Thrives well in poor soil, can be used as climber. |
| 36. | <i>Jasminum sambac</i> | Motia | -do- | March-Sept. White | Dwarf shrub, planted for sweet scented flowers. Propagated by suckers and cuttings. |
| 37. | <i>Lagerstroemia indica</i> | Sawani | Lythraceae | May-Aug Mauve, pink and white | Tall, winter deciduous shrub, Propagated from cuttings. |
| 38. | <i>Lantana sellowiana</i> | Trailing Lantana | Verbenaceae | Year round Pale mauve | Medium shrub, evergreen, good for planting on mounds and rockeries. |
| 39. | <i>Mussaenda frondosa</i> | Mussaenda | Rubiaceae | Summers White sepals | Evergreen shrub. Long white sepals form a part of flowers. |
| 40. | <i>Nerium oleander</i> | Kaner | Apocynaceae | May-Oct White, pink, Red | Evergreen shrub. Suitable for roadside plantation, screening. Variegated varieties are used as specimen plant. |
| 41. | <i>Nyctanthes arbor-tristis</i> | Parijaat/ Har-Shingar | Oleaceae | October- January White with orange peduncle | Tall evergreen shrub, with numerous sweet scented flowers, propagation is from seed. |
| 42. | <i>Plumbago capensis</i> | Chitra | Plumbaginaceae | Mar.-Oct., White turn light blue | Evergreen shrub, used as ground cover, pot plant or for foundation plantation. |
| 43. | <i>Poinsettia pulcherrima</i> | Christmas Flower | Euphorbiaceae | Dec.-Jan Yellow and Red | Deciduous shrub, 5-6 ft height, terminal leaves look like flowers. |
| 44. | <i>Ruellia simplex</i> | Mexican petunia | Acanthaceae | Spring to summers, Purple, pink, white | Thriving best under semi-shade, suitable for shrubbery and hanging baskets. |
| 45. | <i>Russelia juncea</i> | Fire cracker plant | Scrophulariaceae | June to Aug, Coral red | Dwarf, evergreen shrub, used as foundation plant, bears tube like flowers. Used in bouquet making. |
| 46. | <i>Tabernaemontana coronaria</i> | Pinwheel flower/ Chandni | Apocynaceae | Round the year, white | Tall evergreen shrub with glossy leaves used in shrubbery, specimen shrub, avenue and screening. |
| 47. | <i>Tecoma stans</i> | Yellow trumpet bush | Bignoniaceae | Year round, Golden yellow | Dwarf growing shrub grown in shrubbery or as hedge. |
| 48. | <i>Thunbergia erecta</i> | Purple king's mantle | Acanthaceae | Year round Dark blue | Medium sized evergreen shrub, used for making flowering hedge. |
| 49. | <i>Volkmeria inermis</i> /Clerodendrum inermi | Forest Jasmine | Verbenaceae | July-Nov. White | It is evergreen shrub, good for hedge making, can be trained for topiary making and good for dry areas. |

2. Foliage shrubs: These shrubs are grown for their foliage either green or variegated

| S. No. | Botanical Name | Common Name | Family | Flowering time | Identifying characters |
|--------|-------------------------------|----------------------------|----------------|-------------------------------|--|
| 1. | <i>Acalypha wilkensisiana</i> | Acalypha | Euphorbiaceae | - | It is 3-4 ft. in height. It is good for hedge, foundation plantation and pot plant. It prefers partial shade for healthy growth. |
| 2. | <i>Duranta repens</i> | Golden Dewrop | Verbenaceae | May-Jul, Blue | Medium sized, suitable for dry areas, propagated through cuttings. Used for edge & hedge making. |
| 3. | <i>Euonymus japonicus</i> | Privet or Japanese spindle | Celastraceae | - | Medium sized shrub, used for hedge making, as pot plant, foliage is used as cut stem. |
| 4. | <i>Euphorbia cotinifolia</i> | Caribbean copper leaf | Euphorbiaceae | - | Fast growing shrub with reddish foliage, suitable as pot plant, shrubbery and specimen |
| 5. | <i>Excoecaria bicolor</i> | Chinese croton | Euphorbiaceae | - | Attractive leaves, red and green on opposite sides of leaf blade, good shrub for pots. |
| 6. | <i>Ficus benjamina</i> | Weeping fig | Moraceae | - | Shrub with dark green leaves suitable for hedges, specimen and topiary. |
| 7. | <i>Justicia gendarussa</i> | Willow leaved Justicia | Acanthaceae | - | Medium shrub, good for making edges. Can also be grown under partial shade. |
| 8. | <i>Lawsonia inermis</i> | Mehndi | Lythraceae | Creamy white | Medium sized fragrant, quick growing shrub, powder of its leaves used for decorating hand and feet. |
| 9. | <i>Ligustrum ovalifolium</i> | Japanese Privet | Oleaceae | Dull white | It is popular as a hedge plant can be propagated through cuttings. |
| 10. | <i>Malpighia coccigera</i> | Miniature Holly | Malpighiaceae | Throughout the year, White | Evergreen shrub with small dark green spiny leaves. Good for making topiary, hedges, edges and bonsai. |
| 11. | <i>Melaleuca bracteata</i> | Golden bottle brush | Myrtaceae | April – Oct, White | Shrub of weeping habit, most suitable for topiary making, can be propagated from cuttings. |
| 12. | <i>Phyllanthus</i> | Mouse tail plant | Phyllanthaceae | May- | Evergreen shrub with small light green leaves borne on drooping |

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| | <i>myrtifolius</i> | | | Sept., red | branches, producing a dense crown. Suitable for hedges, edges and topiary. |
| 13. | <i>Pseuderanthemum carruthersii</i> | False Eranthemum | Acanthaceae | June-October, White, pink | Medium growing evergreen shrub, with green, dark purple and variegated leaves, suitable as pot plant |
| 14. | <i>Vitex negundo</i> | Nirgundi | Verbenaceae | May-June Lilac | Tall shrub, silvery leaves. Suitable for saline, alkaline soil, drought resistant. |
| 15. | <i>Volkemeria inermis</i> / <i>Clerodendrum inermi</i> | Forest Jasmine | Verbenaceae | July-Nov. White | It is evergreen shrub, good for hedge making, can be trained for topiary making. Propagated from cuttings and is drought resistant. |

IDENTIFICATION OF ORNAMENTAL CLIMBERS

| S. No. | Botanical Name | Common Name | Family | Flower colour and flowering time | Identifying characters |
|--------|--|-----------------------------------|------------------------|---|--|
| 1. | <i>Allamanda cathartica</i> | Allamanda | Apocynaceae | Yellow, May-September | Light green foliage with narrow pointed leaves arranged in whorl of four. It can be grown as garden shrub or as climber. |
| 2. | <i>Antigonon leptopus</i> | Coral Vine | Polygonaceae | Rose-pink, July-October | Deciduous quick growing climber, good for trellis and cascading |
| 3. | <i>Aristolochia elegans</i> | Duck flower | Aristolochiaceae | June-September | Deciduous quick growing climber, good for trellis and cascading |
| 4. | <i>Bauhinia vahlii</i> | Maljhan, Climbing bauhinia | Caesalpiniaceae | Creamy-white, May-June | Large, evergreen climber/ rambler, good for growing in foothills in drought prone areas. |
| 5. | <i>Beaumontia grandiflora</i> | Nepal trumpet creeper | Apocynaceae | White, January-April | Evergreen quick growing heavy climber with shining coarse textured foliage |
| 6. | <i>Bougainvillea</i> spp | Bougainvillea | Nyctaginaceae | Pink, magenta, white, orange, Throughout year | Evergreen to semi-deciduous climber usually pruned for restricting growth. It is valued for coloured bracts |
| 7. | <i>Clerodendrum splendens</i> | Flaming glory bower | Lamiaceae/ Verbenaceae | Red, January-April | Large evergreen climber with coarse textured dark green foliage. |
| 8. | <i>C. thomsonae</i> | Bleeding Heart | Lamiaceae | White bracts with red flowers, Jan-April | Evergreen climber dark green foliage and suitable for pots. |
| 9. | <i>Clitoria ternatea</i> | Asian pigeon wings/ Butterfly pea | Fabaceae | Blue, white November-March | It is an annual climber, slow growing, can be grown as a pot climber |
| 10. | <i>Combretum indicum/ Quisqualis indica</i> | Rangoon creeper/ Jhumka bel | Combretaceae | Reddish pink, Round the year | Beautiful creeper with moderately scented flowers. Used on long pillars, arches and trellis. |
| 11. | <i>Dolichandra unguicati/ Bignonia unguicati</i> | Cat's claw | Bignoniaceae | Yellow, March-July | Evergreen light climber and have ability to climb over bare walls and pillars, emerging leaves purple-red. Good for making topiary. |
| 12. | <i>Ficus repens</i> | Creeping fig/ Chipku bel | Moraceae | - | Evergreen climber and climbs with help of root exudates on walls, dead trees etc. and cover the wall. Best for growing in shady situations |
| 13. | <i>Hiptage benghalensis</i> | Madhavi lata | Malphiaceae | Creamy-white, February-June | Heavy woody semi-deciduous climber with shining foliage, emerging orange-red and red purple in autumn and have fragrant flowers. |
| 14. | <i>Ipomoea cairica</i> | Railway creeper | Convolvulaceae | Purple, Throughout year | Evergreen quick growing climber. |
| 15. | <i>Ipomoea learii</i> | Morning glory | -do- | Scarlet-pink, blue, June-September | Annual climber and usually grow in wild as weed. |
| 16. | <i>I. quamoclit</i> | Cypress vine | -do- | Red, Oct-March | Annual climber with fine textured dark green leaves like fern |
| 17. | <i>Jasminum auriculatum</i> | Juhi | Oleaceae | White, April-July | Evergreen climber with fragrant flowers. |
| 18. | <i>J. grandiflorum</i> | Chameli/ Spanish jasmine | -do- | White, March-October | Evergreen climber with dark green fine textured foliage and fragrant flowers. |
| 19. | <i>Lonicera japonica</i> | Honeysuckle | Caprifoliaceae | Creamy-white, Throughout year | Evergreen heavy quick growing creeping plant with fragrant flowers. |
| 20. | <i>Mansoa alliacea/ Adenocalymma alliacium</i> | Garlic Vine | Bignoniaceae | Mauve-purple, March-June | Hardy climber with shining leaves which produce garlic like smell on rubbing. Suitable for pergolas and arches. |
| 21. | <i>Pandorea jasminoides</i> | Australian bower plant | Bignoniaceae | Reddish pink, April-Nov. | Light climber with shining green foliage |
| 22. | <i>Pyrostegia venusta</i> | Golden shower | Bignoniaceae | Orange, February-April | Heavy climber with drooping branches. |

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| 23. | <i>Passiflora caerulea</i> | Blue Passion flower | Passifloraceae | White with blue filament, Sept-Nov | Flowers look like clock/ watch, planted on arches and entrances. |
| 24. | <i>Passiflora coccinea</i> | Red passion flower | Passifloraceae | Red, August- November | Tropical climber bears showy scarlet red flowers, suitable for sunny and high humidity. |
| 25. | <i>Petrea volublis</i> | Purple wreath | Verbenaceae | Spring, purple | Creepers with woody stem with drooping long racemes of star like flowers. |
| 26. | <i>Rosa</i> sp. | Climbing rose | Rosaceae | Many colours, Feb- July | Many varieties of climbing rose are suitable for growing in arches, pergolas and trellises. |
| 27. | <i>Rosa banksiana</i> | Banksian Rose | Rosaceae | Creamish white, white, March- April | Trailing type of species which produces small flowers in bunches. |
| 28. | <i>Solanum jasminoides</i> | Potato vine/ Jasmine nightshade | Solanaceae | White, bluish white Sep- Feb | A slender twining shrub suitable for medium to high elevations. |
| 29. | <i>Tecoma grandiflora/ Campsis grandiflora</i> | Trumpet flower | Bignoniaceae | Orange, March- October | Deciduous climber and have ability to climb over walls. Bear glossy dark green leaves. |
| 30. | <i>Tecomaria capensis</i> | Cape Honeysuckle | Bignoniaceae | Orange, throughout the year | Evergreen climber, it can be trimmed to give shapes. |
| 31. | <i>Thunbergia grandiflora</i> | Bengal Clockvine | Acanthaceae | Sky blue, Feb-Mar | Dense green foliage, heart shaped. It can cover walls, trees |
| 32. | <i>T. mysorensis</i> | Mysore trumpet vine | Acanthaceae | Orange, red, yellow, Jan- March | Flowers are borne in pendulous racemes, suitable for arches, pergolas and trellis. |
| 33. | <i>Trachelospermum jasminoides</i> | Star jasmine | Apocynaceae | April-June, white | Evergreen climber, suitable for growing in shady situation and bears fragrant flowers. |
| 34. | <i>Wisteria sinensis</i> | Chinese Wisteria | Fabaceae | Purple, white, February- March, | It is a winter deciduous creeper which can be trained over pergolas, fences and trellis. |
| 35. | <i>Tarlmounia elliptica</i> | Curtain creeper | Asteraceae | Foliage shrub with white flowers | It is evergreen climber with drooping branches. Good for covering boundary wall and verandas. |

PROPAGATION OF ORNAMENTAL PLANTS THROUGH CUTTINGS

Material required: Secateurs, mother plants, knife, rooting hormones, rooting medium, tags, watering can

Procedure:

a) **Herbaceous cuttings:**

- These are made from succulent, non-woody plants.
- Terminal cuttings or nodal cuttings of 7 to 12 cm long with leaves retained at the upper end are taken.
- Coleus, geranium, chrysanthemum, carnation, *Begonia semperflorens*, *Iresine*, *Alternanthera* etc.

b) **Soft-wood cuttings:**

- Cuttings prepared from soft, succulent, new spring growth of deciduous or evergreen species are softwood cuttings.
- The softwood condition for most woody plants ranges from two to eight weeks.
- The cuttings are usually 8 to 12 cm long with leaves retained at the upper end.
- Examples are *Duranta*, *Ficus benjamina*, *Pseuderanthemum* etc.

c) **Semi-hardwood cuttings:**

- Semi-hardwood cuttings are those made from woody or with partially matured wood.
- Cuttings of broad leaved evergreen species are generally taken during the summer through early fall from the new shoots just after a flush of growth has taken place and the wood is partially matured.
- Examples are *Bougainvillea*, *Clerodendrum*, *Duranta*, *Hibiscus*, *Hydrangea*, rose, evergreen azaleas are commonly propagated by this method.

d) **Hardwood cuttings:**

- Hardwood cuttings of narrow-leaved evergreens are also dormant and in deciduous plants, their foliage is retained when propagated.
- Examples are *Thuja*, *Juniperus*, *Taxus*, firs, pines, spruce are propagated through hardwood cuttings.

e) **Leaf cuttings:**

- In leaf cuttings, the leaf blade, or leaf blade and petiole, is utilized in starting new plants.
- Adventitious buds, shoots, and roots form at the base of the leaf and develop into a new plant; the original leaf does not become a part of the plant. Examples are *Bryophyllum*, *Portulaca argentea*, *Sedum morganianum*, *Senecio rowleyanus*, *Schlumbergera*, *Saintpaulia*, Gloxinia, Begonias, *Sansevieria* and *Peperomia* are routinely propagated through leaf cuttings.

FLAT GRAFTING TECHNIQUE IN CACTUS

Material required: Rootstocks of cactus, scion, sharp knife, alcohol, rubber bands, gloves

Procedure of flat grafting:

- Using a sharp knife sterilized with alcohol, a transverse or flat cut is made on the rootstock.
- Edges of rootstock along its perimeter slant cuts are made, however, the centre of the rootstock should be flat
- Use sharp knife sterilized with alcohol, make a transverse or flat cut at the base of the scion in the same manner as done on the root stock.
- It is important that the rootstock and scion cuts are of nearly the same diameter. Otherwise, the cambium vascular systems will not line up and graft union will not form.
- Quickly make slant cuts on the base of scion along its perimeter in the same manner as done on the rootstock. This cut facilitates proper cambium contact, and callus formation. Now that the initial incisions have been made.
- Make one final thin slice across the flat centre of both pieces to expose fresh flesh.
- Place the freshly cut scion on top of the fresh cut rootstock, and line up the pieces so that the centre diameters of both rootstock and scion match.
- Use a couple of rubber bands to hold the scion and the rootstock together tightly and securely.
- Transfer the grafted plants to bright, warm, dry location, free from direct sunlight. Do not water until the pieces grow together and a callus has formed.
- This should happen within a couple of weeks or in a month. After the union formation takes place, carefully remove the rubber bands.

Rootstock used for grafting: *Hylocereus undatus*, *Selenicereus*, *Cereus*, *Opuntia* sp.

Scion sp.: *Chamaecereus*, *Eriocactus*, *Echinocereus*, *Gymnocalycium mihanovichii*, *Mammillaria*, *Zygocactus*

etc.

METHODS OF LAWN ESTABLISHMENT

Material required: Spade, Lawn grass seeds or stolons, FYM, cow dung, soil, watering can

Methods of establishment of lawn:

- 1. Seeding:** The best time for sowing of seed is about end of August or it may be done in February- March. Seed rate is 250-300g/100 sq. m area. The seed should be mixed with small amounts of carrier, which may be top soil or sand, to obtain uniform distribution of the seed. After the sowing is complete, a light covering with dry, sieved, garden compost or weed-free straw helps to retain moisture for longer time and prevents washing of seed during watering or rainfall. The surface soil has to be kept moist until the seeds germinate and seedlings establish. Normally, the seeds germinate in 10-12 days.
- 2. Dibbling:** Dibbling is the most commonly used method for developing lawn. In the month of February- March or July- August runners are obtained by tearing apart or shredding pieces of established sod which are dibbled about 4-6 inches apart. Watering should be one immediately afterwards.
- 3. Turfing or Sodding:** It may be done where immediate effect is required or on steep slopes or terraces. This is the fastest method of establishing lawn. The mats about 1 inch in thickness are cut manually or mechanically and laid like bricks and fitted as tightly as possible. After laying it should be tamped lightly and top dressed with a small amount of top soil. The sod should be kept moist till the lawn is well established.
- 4. Turf Plastering:** A paste is prepared by mixing garden soil and fresh cow dung and water plus chopped pieces of lawn (*doob*) grass having nodal sections. The paste is spread and covered with 2cm dry soil and irrigated. The soil is kept moist until sprouting of grass. This method is not suitable especially in dry and variable climate.

DIFFERENT GARDEN FEATURES

Material required: Secateurs, Pruning shear, spade, *khurpi*, watering can, plants

Garden features

- 1. Hedge:** Shrubs or trees planted at regular intervals to form a continuous screen is called a hedge. Plants suitable for hedges are as following-
Shrubs: *Acalypha wilkesiana*, *Bougainvillea sp.*, *Carissa carandus*, *Duranta repens*, *Hamelia patens*, *Hibiscus rosa-sinensis*, *Justicia gendarussa*, *Malpighia coccigera*, *Murraya exotica*, *Plumbago capensis*, *Rosa sp.*, *Thuja, orientalis*, *Volkmeria inermis*.
Trees: *Pithecellobium dulce*, *Polyalthia longifolia*, *Casuarina equisetifolia*, *Putranjiva roxburghii*
Succulents: *Agave americana*, *Furcraea selloa*, *Euphorbia tithymaloides*
 - 2. Edges:** Lining of borders of flower beds, paths, lawn and shrubbery with brick, concrete, living plants is known as edging. Plants suitable for making the purpose of edging are called edge plants, and these should be grown very low as the purpose is not for screening but to provide lining only, for the purpose of decoration or demarcation. Plants suitable for edging are *Alternanthera amabilis*, *A. versicolor*, *Cineraria maritima*, *Cuphea hyssopifolia*, *Echeveria*, *Iresine lindenii*, *Ophiopogon japonicus*, *Tradescantia spathecea* etc.
 - 3. Arches:** Arches are the structures on which climbers or ramblers are trained in a garden. Arches are generally constructed near the gate or over the paths in the garden. The arch should be 2-2.5 m in height and breadth depends upon the path over which it is constructed but should not be less than 1 m. arches can be made with wooden poles, iron angles or galvanized pipes. Plants suitable for training over arches are *Bougainvillea spp.*, *Passiflora cearulea*, *Rosa banksiana*, climbing rose, *Thunbergia grandiflora*, *Trachelospermum jasminoides*,
 - 4. Pergolas:** a pergola may be defined as series of arches joined together. Pergolas are generally constructed over pathways, and climbers are trained over it. Like arches support can be made up of wooden, angle iron, galvanized pipes etc. the width of pergola is generally kept 2-2.5 m and the height is also same or higher than this. Plants suitable for training over pergolas are *Bougainvillea spp.*, *Pyrostegia venusta*, *Thunbergia grandiflora*, *T. mysorensis*, *Trachelospermum jasminoides*, *Wisteria sinensis*,
- Topiary:** It is an art of training trees or shrubs by clipping or trimming the foliage into different shapes like birds, animals etc. the plants used in topiary are evergreen, having small leaves with dense growth habit. Shaped

wire cages are sometimes used to make topiary. Examples of plants for making topiary are *Bougainvillea sp.*, *Buxus sempervirens*, *Duranta repens*, *Malpighia coccigera*, *Melaleuca bractata*, *Murraya exotica*, *Thuja, orientalis*, *Volkmeria inermis*.

BOTTLE GARDENING AND TERRARIUMS

Materials required: Glass bottles of 25-30 cm diameter, tong, long forceps, funnel, pebbles, charcoal pieces, compost, syringe, dropper and plants.

Procedure:

- Selected glass container is washed and spotlessly cleaned inside and outside and dried thoroughly so that soil does not stick while filling.
- A compost is made of equal parts of garden soil, leaf mould, peat moss and sand. The compost should be sterilized to prevent fungal growth.
- First 2.5 cm layer of charcoal and gravel is placed at the bottom for drainage.
- The compost is made slightly moist and poured inside with the help of long tube funnel. After the soil is poured it is moulded into the desired landscape with the help of fork.
- A 25 litre bottle needs 5-7 cm drainage material and 10-12 cm of compost.
- The rooted cuttings or plantlets of plants are planted and roots are covered with the trowel while the plant is held in position with the tong, then the soil around the roots is rammed firmly with the rammer.
- After planting is over every bit of soil that might be sticking to the sides of the bottles and on lids are removed.
- Since the planting is done on a moist compost, no watering is needed at the time of planting, but for proper establishment of plants, the leaves should be moistened with the mist of clean water.
- After this the mouth is closed tightly with a stopper or lid and bottle is not watered for 2 months.
- Watering is done drop by drop with the help of a dropper with long tube so that there is no over-watering and soil does not splash on the glass.
- Misting may be done at an interval of two months. Bottle garden plants need a reasonable amount of light, but direct sunlight will over heat the plants.

Plants suitable for bottle gardening or terrariums

Plants suitable for bright sunlight: In areas having bright sunlight, an open succulent bottle garden is suitable with plants like *Crassula argentea*, *Echeveria*, *Sempervivum*, *Haworthia*, *Kalanchoe tomentosa*, *Kalanchoe blossfeldiana*

Plants suitable for medium light: *Peperomia caperata*, *P. albovittata* (Radiator Plant), Ferns like *Adiantum sp.*, *Asplenium sp.*, *Athyrium sp.*, *Nephrolepis sp.*, *Polypodium sp.*, *Polystichum sp.*, *Pilea cadierei* (Aluminium plant), *P. peperomioides*, *P. involucrata*, *Hypoestes phyllostachya* (Polka Dot Plant), *Selaginella kraussiana*, *S. martensii*, *S. uncinata*, *S. pallescens*, *Fittonia sp.* (Nerve Plant), *Oxalis triangularis*, *Asparagus plumosus 'Nanus'* (Fern Asparagus)

WATER GARDENS

Materials required: Spade, tank for formal pool, sticky clay soil, FYM, plants.

Procedure:

- For planting fill the tank to a depth of 30-40 cm with heavy loam or clay mixed with sufficient FYM.
- The lilies and lotus are planted directly in the soil and then water is filled in just to cover the crown of the plants.
- More water is filled in stages as the plant makes new growth.
- In an already filled up pool, the planting procedure is first to plant the water plant in a pot filled with compost and then lowering it in water, keeping in the view that crown remains above the water.

Plants suitable for water garden

1. **Surface flowering plants:** *Euryale ferox*, *Nelumbo lutea*, *Nelumbo nucifera*, *Nymphaea alba*.
2. **Oxygenators/ submerged plants:** *Callitriche autumnalis*, *Elodea canadensis*, *Ranunculus aquatilis*, *Vallisneria spiralis*.

3. **Floating plants:** *Azolla Carolina*, *Eichhornia speciose*, *Lemna gibba*, *Trapa nutans*, *Pistia stratiote*, *Salvinia minima*.
4. **Marginal plants/ Bog plants:** *Acorus calamus*, *Calla palustris*, *Cyperus alternifolius*, *Iris laevigata*, *I. kaempferi*, *Typha angustifolia/ T. latifolia*, *Caltha palustris*.

FLOWER ARRANGEMENT

Materials required: Flower vases, cut stems of flowers like rose, gerbera, gladiolus, tuberose, pin holders, fillers like leaves of ferns, Asparagus

Procedure of making Ikebana flower arrangement:

- In any style of Ikebana flower arrangement there are 3 main lines i.e. *Shin* (Heaven), *Soe* (Man), *Hikae* (Earth) represented by cut flowers. In addition there are the Jushi stems or the fillers attached to the three main lines these associate.
- In any arrangement the shin should always be the tallest, followed in terms of height by Soe and Hikae.
- In a large vase the length of the Shin is equal to twice the combined measurement of the diameter and height of the vase i.e. $2 \times (\text{Diameter} + \text{Height})$ while Soe should be $\frac{3}{4}$ th of Shin and Hikae $\frac{1}{2}$ of Soe.
- In a standard sized or a small sized vase the length of Shin will be $1.5 \times (\text{Diameter} + \text{Height})$ of the vase and $(\text{Diameter} + \text{height})$ of the vase respectively.
- In both the above mentioned vase sizes the other main lines (Soe and Hikae) should be only $\frac{3}{4}$ th of its predecessors.
- The arrangement is made on the frontal left side of the container.
- Shin is fixed at the rear end at an angle of 10-15°. Soe is arranged on left side of Shin at 45° and Hikae right side at 75°.

Indian and other type of flower arrangements

1. **Garlands:** Made of different types of loose flowers such as marigold, rose, jasmine, tuberose, annual chrysanthemum, China aster, gaillardia etc.
2. **Gajra and Veni:** These are the floral arrangements used Indian Women to decorate hair. Flowers used are Crossandra, jasmine (Mogra, Juhi, Chameli), tuberose, barleria etc.
3. **Floral Rangoli:** It is the decoration of colourful flowers in different designs and patterns. Flowers and petals of marigold, rose, chrysanthemum, bougainvillea are generally used for making floral *rangolis*.
4. **Bouquet:** Generally conical, round and flat bouquets are made. In flat type of bouquets generally spikes of gladiolus, tuberose, cut stems of rose, orchids, gerbera, chrysanthemum are used. For filling the void space fillers like fern leaves, *Thuja* leaves, *Asparagus* and palm leaves are used. However, round and conical type of bouquets are mostly made from hybrid cut roses, gladiolus, carnation, liliium, orchids, gerbera, anthuriums, chrysanthemum in combination with foliage like palm leaves, *Nephrolepis* leaves, Solidago etc.

ART OF MAKING BONSAI

Material required: Shallow container or pot, plant in polybag or pot, spoil, sand, FYM, Spade, secateur, wire.

Procedure to start a bonsai

- Well established plants in polybags or pots can also be obtained from nurseries as these can be transferred to containers directly with little root pruning.
- Compost for bonsai be made by adding 2 parts good garden loam, 1.5 parts sand, 1 part leaf mould and 1 part FYM.
- The drainage holes are first covered with crocks and the compost if filled upto half level.
- Then plant selected is kept in the centre or on one side depending upon the type of bonsai and secured in position by adding more compost.
- After potting the plant is watered till saturation of compost and kept in shade for few days.

Procedure of repotting a bonsai

- The plant is taken out gently with the earth ball intact.
- Then $\frac{1}{3}$ rd of old soil and portion of surface soil is removed.
- The soil stuck up between roots of plants is also removed with help of a pointed stick of pencil thickness.
- Any root longer than what can be accommodated in the container is cut with help of sharp secateurs.
- The plant is then placed in position, new compost is filled in and watered immediately.

Procedure of Training of bonsai

- For wiring a branch, first wind the wire round the trunk several times and then around the branch to be trained.
- The wire coils should be spaced evenly by about (0.5-0.6 cm) apart.
- Specific shape may be given with wire in same position for several years, but rewinding is to be done every 6 months.

- In tender plants like succulents, first wind the branch with cotton tape and then wind over this to avoid injury.

VERTICAL GARDENS

Material required: Frame for hanging pots or containers, containers suitable for vertical gardens, compost, plants

Steps Involved in the Preparation of Vertical Garden

- The Vertical Garden is composed of three parts: a metal or a wooden frame, a PVC layer and a layer of felt. The metal or wooden frame is hung on a wall or can be self-standing.
- PVC sheet of 1.00 cm thickness is riveted to the frame. This layer brings rigidity to the whole structure and makes it waterproof.
- A felt layer, made of polyamide, is stapled on the PVC. This felt is rot proof and its high capillarity allow homogeneous water distribution and the plant roots grow well on felt.
- Slits are cut in the outer felt layer to create pockets into which either direct seeds are placed or cuttings or already grown plants are placed. The density is about thirty plants per square meter.
- The water is provided from the top supplemented with nutrients.
- A pump and drip irrigation system supply nutrient-laden water, which slowly cascades down the wall through the felt material layers until reaching the bottom where a collector recovers the excess for reuse.
- The whole weight of the vertical garden including plants and metal frame is lower than 25 kg per square meter.

Plants Suitable for Vertical Garden: *Asparagus sprengeri*, *Kalanchoe*, *Cordyline* spp., *Chlorophytum* spp., *Haworthia* spp., *Tradescantia pallida*, *Tradescantia zebrina*, *Fittonia* spp., *Maranta* spp., *Petunia*, *Nasturtiums*, *Daisies*, *Bromeliads* and *Philodendron*, *Epipremnum*, *Saintpaulia*, *Begonia* or different ferns like *Nephrolepis*, *Asplenium nidus*, *Pteris* and many species of *Peperomia*.

ROCK GARDEN OR ROCKERY

Material required: Natural looking rocks of different sizes, compost, sand, soil, plants, spade, watering can.

Procedure of making rock garden or rockery:

- Rocks should be of local origin, porous, and have a weathered look.
- Stones of uniform size having diameter around 60 cm should be selected or even larger which can be handled without much difficulty.
- A mound is created by putting a good garden loam or a mixture of soil, sand, FYM and leaf mould in equal proportion.
- This compost is spread only on top 15-45 cm of the top layers of rockery, the sub-soil should be well drained and have the property to absorb sufficient water.
- Before placing and setting the rocks, the mound should be allowed to settle for some time or firmed by beating, if needed.
- The stones are placed in slightly slanting position gently leaning backwards, not forwards, so that rain water flows towards plant roots.
- Pockets are created in between stones varying in size from 15-60 cm across. These pockets are created in such a manner that it look natural and compost inside is not washed away with rain water.
- The rockery is planted with grown up and well established plants. Dense planting should be avoided rather planting is done at wide distance as with time plants will fill up the space as they grow.

Examples of plants for rock garden:

Cacti and succulents: Cacti like *Opuntia*, *Cereus*, *Mammillaria* and succulents like *Agave*, *Aloe*, *Euphorbia splendens*, *Furcraea*, *Gasteria*, *Howarthia*, *Kalanchoe*, *Euphorbia tithymaloides*, *Portulaca*, *Sansevieria*, *Sedum*, *Tradescantia pallida*, *T. zebrina*, *T. spathecea*, *Yucca* etc.

Ferns: *Nephrolepis*, *Pteris*, *Polypodium* etc.

Shrubs: *Azalea*, *Calliandra*, *Callistemon*, *Cassia biflora*, *Crossandra*, *Duranta*, *Juniperus horizontalis*, *Lantana sellowiana*, *Ruellia simplex*, *Russelia juncea*, *Sanchezia*, *Thuja* etc.

Herbaceous plants: *Catharanthus roseus*, *Dracaena* sp., *Hymenocallis*, *Verbena erinoides*, *Wedelia trilobata*, *Zephyranthes*, etc.

Annuals: Brachyscome, Candytuft, *Dianthus chinensis*, Gaillardia, Ice plant, Sweet Alyssum, Phlox, Pansy, Portulaca, Verbena, Zinnia etc.

CARPET BEDDING

Material required: Sade, garden hoe, *khurpi*, watering can and plants

Procedure:

- The area chosen for making desired design is ploughed or dug up thoroughly.
- All pebbles and weeds are removed and well rotten FYM is added, mixed thoroughly and area is then levelled properly.
- In a carpet bed, the plants are planted closely according to a set design.
- To keep a carpet bedding in right shape needs constant attention. After first planting the plants are trimmed as soon as they are well established.
- Henceforward, the plants are trimmed depending upon growth to keep them within the limits of the design.
- Whenever there is any gap due to mortality, they are filled up by previously grown plants in pots.
- Once in every 3-4 months the beds should be top- dressed with well decomposed FYM.

Examples of plants suitable for carpet bedding: *Alternanthera versicolor*, *Cineraria maritima*, *Coleus blumei*, *Echeveria secunda*, *Irisine*, *Portulaca grandiflora*, *Sedum rupestre*, *Sempervivum tectorum*