THE NEOTIA UNIVERSITY
ज्ञानम् आत्म प्रदीपाय

Agriculture Landscaping
Practical Manual
Course code: AGP-404 Credits: 3 (2+1)


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List of Experiments

Experiment No.1: IDENTIFICATION OF TREES, SHRUBS, ANNUALS, POT PLANTS

Aim of the Experiment- To study about different types of Ornamental Plants (Trees, Shrubs, Climbers, House Plants, Palms, Seasonal plants etc.) around your locality.

Table 1.1: Identification of different Ornamental Trees.

Common name	Scientific Name	Family	Flower colour	Flowering time
Tree of Heaven	*Ailanthus excelsa*	Simaroubaceae	-	April-June
Siris	*Albizzia lebbek*	Laguminaceae	Foliage	-
Devil's tree	*Alstonia scholaris*	Apocyanaceae	White	-
Monkey puzzle	*Araucaria excelsa*	Coniferae	Floiage	-
Monkey Puzzle	*Auraucaria cookie*	Coniferae	Foliage	-
Mahua	*Bassia latifolia*	Sapotaceae	Red	April-May
Flame of Forest	*Butea monosperma*	Leguminaceae	Scarlet	March
Bottle Brush	*Callistemon lanceolatus*	Myrtaceae	Red	March-April
Candle Bush/ Popcorn Senna	*Cassia alata*	Caesalpiniaceae	Yellow	March-April
Amaltas/ Golden Shower/ Indian laburnuma	*Cassia fistula*	Caesalpiniaceae	Deep Yellow	March-July
Pink Shower	*Cassia grandis*	Caesalpiniaceae	Rose Pink	-
Indian Mohagani	*Cederella tona*	Meliaceae	White	April
Gulmohar/ May flower	*Delonix regia*	Caesalpiniaceae	Orange-Red	May-June
Elephant Tree/ Chalta tree	*Dillenia indica*	Dilleniaceae	White	May-August
Indian Coral	*Erythrina variegata*	Caesalpiniaceae	Scarlet	April
Bodhi tree/ Pipal	*Ficus religiosa*	Moraceae	-	-
Silver Oak	*Grevillea robusta*	Proteaceae	Golden Yellow	April

Tree of Life	*Guaicum officinalis*	Zygophyllaceae	Blue	April
Jungal Jalebi	*Inga dulcis*	Leguminaceae	-	-
Nili Gulmohar	*Jacaranda acutifolia*	Bigoniaceae	Blue	April
Queen of flower/ Pride of India	*Lagerstroemia speciosa*	Lythraceae	Mauve	April-August
Swarn Champa	*Michelia champaca*	Magnoliaceae	White	April-May
Jerusalem Thron	*Parkinsonia aculeata*	Caesalpiniaceae	White	-
Coppper Pod tree/ Yellow gulmohar	*Peltophorum ferrugineum*	Caesalpiniaceae	Pale Yellow	-
Pagoda Tree/Temple tree	*Plumeria alba*	: Apocynaceae	-	-
Scholar's tree/ Ashok	*Polyalthia longifolia*	Anonaceae	Pale Green	April
Weeping Willow	*Salix babylonica*	Saliacaceae	-	-
Sita Ashok	*Saraca indica*	Leguminaceae	Scarlet Red	-

Ailanthus excelsa

Albizzia lebbek

Alstonia scholaris

Araucaria excelsa

Auraucaria

Bassia latifolia

Butea monosperma

Callistemon lanceolatus

Cassia alata

Cassia fistula

Cassia grandis

Cederella tona

Delonix regia

Dillenia indica

Erythrina variegata

Ficus religiosa

Grevillea robusta

Guaicum officinalis

Inga dulcis

Jacaranda acutifolia

Lagerstroemia speciosa

Michelia champaca

Parkinsonia aculeata

Peltophorum ferrugineum

Plumeria alba

Polyalthia longifolia

Salix babylonica

Saraca indica

Table 1.2: Identification of different Ornamental Shrubs.

Common name	Scientific Name	Family	Flower colour
Acalypha	*Acalypha Hispida*	Euphorbiaceae	-
Azalea	*Azalea sp.*	Ericaceae	-
Barleria	*Barleria cristata*	Acanthaceae	Violet Blue
Yesterday-Today-Tomorrow	*Brunfelsia calycina*	Solanaceae	Blue
Butterfly Bush	*Buddleja asiatica*	Loganiaceae	White
Peocock Flower	*Caesalpinia pulcherrima*	Leguminaceae	Red Yellow
King of Day	*Cestrum diurnum*	Solanaceae	White
Queen of Night	*Cestrum nocturnum*	Solanaceae	White
China Shoe Flower	*Hibiscus rosa sinensis*	Malvaceae	Scarlet
Cup and Saucer	*Holmskioldia sanguinea*	Verbanaceae	Red
Ixora	*Ixora coccinea*	Rubiaceae	Pink
Kund	*Jasminum multiflorum*	Oleaceae	White
Mogra	*Jasminum sambac*	Oleaceae	White
Kamini	*Murraya exotica*	Rutaceae	White
Mussaendra	*Mussaenda sp.*	Rubiaceae	Yellow
Tree of Sadness/ Parijatak	*Nyctanthes arbor tristis*	Oleaceae	White orange
Lolypop Plant	*Pachystachys spp.*	Acanthaceae	Golden Yellow
Poinsettia	*Poinsettia pulcherrima*	Euphorbiaceae	White
Snow Bush	*Phyllanthus nervosus*	Euphorbiaceae	-
Weeping Merry	Russelia juncea	Scrophulariaceae	Red

Acalypha Hispida

Azalea sp.

Barleria cristata

Brunfelsia calycina

Buddleja asiatica

Caesalpinia pulcherrima

Cestrum diurnum

Cestrum nocturnum

Hibiscus rosa sinensis

Holmskioldia sanguinea

Ixora coccinea

Jasminum multiflorum

Jasminum

Murraya exotica

Mussaenda sp.

Nyctanthes arbor tristis

Pachystachys spp

Poinsettia pulcherrima

Phyllanthus nervosus

Russelia juncea

Table 1.3: Identification of different Ornamental Annuals.

Common name	Other Name	Scientific Name	Family
Acroclinum	Paper/Everlasting flower	*Acroclinium roseum*	Asteraceae
Ageratum	Floss Flower	*Ageratum houstonianum*	Asteraceae
Amaranthus	Love Lies Bleeding	*Amaranthus caudatus*	Amaranthaceae
Antirrhunum	Snapdragon/Dog of flower	*Antirrhinum majus*	Scrophulariaceae
Calendula	Pot Marigold	*Calendula officinalis*	Asteraceae
Cock's Comb	-	*Celosia spp.*	Amaranthaceae
Corn Flower	Blue Bottle	*Centauera cyanus*	Asteraceae
Annual Chrysanthemum	Garland Chrysanthemum	*Chrysanthemum coronarium*	Asteraceae
Clarkia	-	*Clarkia elegans*	Onagraceae
Clianthus	Parrot's Bill	*Clianthus dampieri*	Leguminoceae
Coreopsis	Tick Seed	*Coreopsis tinctoria*	Asteraceae
Cosmos	-	*Cosmos bipinnatus*	Asteraceae
Larkspur	-	*Delphinium hybridum*	Ranunculaceae
Dimorphotheca	Cape Marigold	*Dimorphotheca aurantiaca*	Asteraceae
Gaillardia	Blanket Flower	*Gaillardia pulchella*	Asteraceae
Gomphrena	Globe Amaranth	*Gomphrena globosa*	Amaeanthaceae
Gypsophila	Baby's Breath	*Gypsophila elegans*	Caryophyllaceae
Sunflower	-	*Helianthus annuus*	Asteraceae
Helichrysum	Everlasting Flower	*Helichrysum bracteatum*	Asteraceae
Candytuft	Hyacinth flower	*Iberis spp.*	Crudiferae
Balsam	-	*Impatiens balsamina*	Balsaminaceae
Kochia	Summer Cypress	*Kochia scoparia*	Chenopodiaceae
Lupin	-	*Lupinus hartwegii*	Leguminaceae
Mimulus	Monkey flower	*Mimulus tigrinus*	Scrophulariaceae
Petunia	-	*Petunia hybrid*	Solanaceae
Phlox	Star Flower	*Phlox drummondii*	Polemoniaceae
Lady's Lace	-	*Pimpinella monoica*	Umbelliferae
Portulaca	Sun plant	*Portulaca grandiflora*	Portulaceae
Salvia	Sage Flower	*Salvia splendens*	Labiatae
Tithonia	Maxican Sunflower	*Tithonia speciosa*	Asteraceae
Pansy	Viola/ Heart's Ease	*Viola x Wittrockiana*	Violaceae
Zinnia	-	*Zinnia elegans*	Asteraceae

Acroclinium roseum

Ageratum houstonianum

Amaranthus caudatus

Antirrhinum majus

Calendula officinalis

Celosia spp.

Centauera cyanus

Chrysanthemum coronarium

Clarkia elegans

Clianthus dampieri

Coreopsis tinctoria

Cosmos bipinnatus

Delphinium hybridum

Dimorphotheca aurantiaca

Gaillardia pulchella

Gomphrena globosa

Gypsophila elegans

Helianthus annuus

Helichrysum bracteatum

Iberis spp.

Impatiens balsamina

Kochia scoparia

Lupinus hartwegii

Mimulus tigrinus

Petunia hybrid

Phlox drummondii

Pimpinella monoica

Portulaca grandiflora

Salvia splendens

Tithonia speciosa

Viola x Wittrockiana

Zinnia elegans

Table 1.4: Identification of different Ornamental Pot Plant.

Common name	Scientific Name	Family
Chinese Evergreen	*Aglaonema spp.*	Araceae
Foxtail Fern	*Asparagus densiflorus*	Liliaceae
Peacock Plant	*Calathea spp.*	Marantaceae
Ribbon Plant	*Chlorophytum comosum*	Liliaceae
Croton	*Cordiaeum variegatum*	Euphorbiaceae
Red Dracaena	*Cordyline spp.*	Liliaceae
Dumb Cane	*Dieffenbachia spp.*	Araceae
Algerian Ivy	*Hedera canariensis*	Araliaceae
Bryophyllum	*Kalanchoe spp.*	Crassulaceae
Song of India	*Pleomele reflexa variegata*	Liliaceae
Butcher's Broom	*Ruscus aculeatus*	Liliaceae
Money Plant	*Scindapsus aureus*	Araceae
Syngonium	*Syngonium podophyllum*	Araceae
Wondering Jew	*Zebrina pendula*	Commelinaceae

Aglaonema spp.

Asparagus densiflorus

Calathea spp.

Chlorophytum comosum

Cordiaeum variegatum

Cordyline spp.

Dieffenbachia spp.

Hedera canariensis

Kalanchoe spp.

Pleomele reflexa variegata

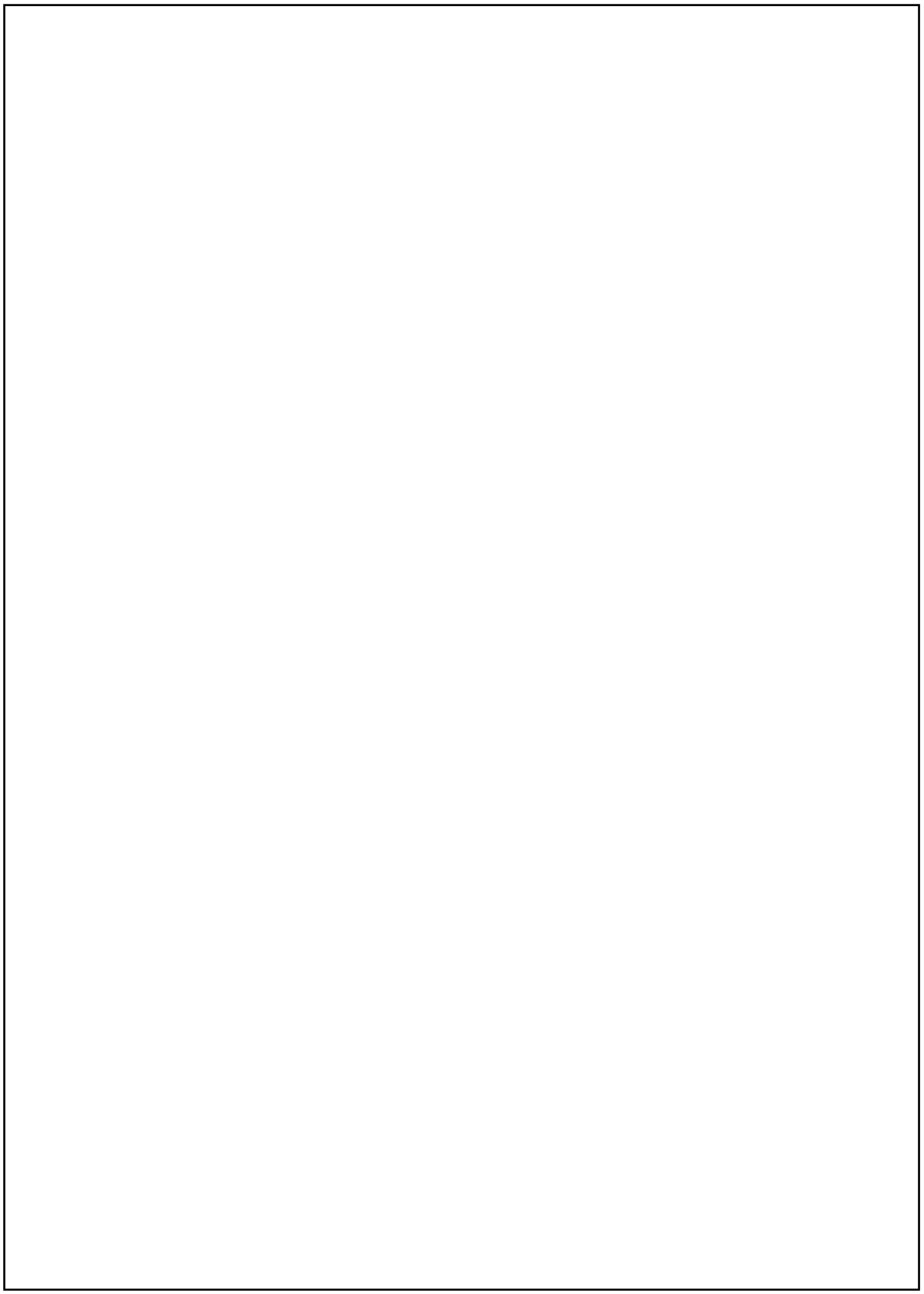
Ruscus aculeatus

Scindapsus aureus

Syngonium podophyllum

Zebrina pendula

Observation Recorded



Conclusion

Remarks

Signature of Student **Signature of Faculty-In-Charge**

Experiment No.2: PROPAGATION OF TREE, SHRUBS AND ANNUALS

Aim of the Experiment- To study about different types of Ornamental Plants (Trees, Shrubs, Climbers, House Plants, Palms, Seasonal plants etc.) around your locality.

A. Sexual propagation

Advantages of sextual propagation

- Propagation by seed is simples and easy.
- Seed propagation is the only means of creating diversity. Diversity sometimes yields better plant types known as chance seedling. Diversity in plants population is also essential for genetic improvement of plant.
- Seed produce plants are long lived, productive and show greater tolerance to adverse soil, climate and disease endemics.
- Polyembryonic seeds produce seedling from integument tissues and nuclear cells of embryo. Such seedling being free from effect of fertilization are identical to mother plant. Thus, there is no need of practicing asexual propagation in polyembriyonic seeds.
- Apomictic seeds produce true to type plants, in such cases also, there is no needs of asexual propagation.
- For asexual propagation rootstocks are raised by seeds.

Disadvantages of sextual propagation

- Seed propagated plants are not true to types to the mother plants.
- Seed propagated plants possess long juvenile phase and hence flowering commence very late.
- The seedling plants are long and gigantic in stature. Harvesting and other interculture operation becomes difficult.
- Seedling plants produce yield of inferior quality.
- Some viruses are transmitted through seed.
- Seed propagation excludes the benefits of rootstock.

1. **Little moisture for germination** : Portulaca, Eschscholtzia, etc.
2. **Required Light for germination** : Nicotiana, Lobelia, Veronica, etc.
3. **Required Dark for germination** : Nigella, Phlox, Amaranthus, etc.

B. Asexual propagation

Advantages of asexual propagation

- Asexually propagated plants are true to types to their mother plants**.**
- Asexually propagated plants possess short juvenile phase and flowers commence early in age.

- The propagated plants are smaller in stature and hence harvesting and other cultural operation become easy.
- Plants in which seed setting dose not take place, asexually propagation serves a substitute for sextual propagation. Using asexual methods, noble plants can be created. Sometimes on single plants of rose, Tow-three types of bloom flourishes. It become possible only through asexual propagation.
- The benefit of rootstock and scion are exploited through asexual propagation.
- Repairing of damaged portion of plant is possible in asexual propagation. Bridge grafting is suitable methods for such purpose.
- Using asexual methods, it is possible to convert a non-productive local variety into productive improved type variety.

Disadvantages of sextual propagation

- Asexual propagated plants have short life.
- Asexual propagation restricts diversity. Thus, it lessens vegetational diversity.
- Some viruses are transmitted through bud wood; Thus, sometimes asexual propagation disseminates disease.

1. **Softwood Cutting** : Chrysanthemum, Hibiscus, Jasmine, etc.
2. **Terminal Cutting/ Tip Cutting** : Carnation, etc.
3. **Cane cutting / Node cutting** : Dieffenbachia, Dracaena, Aglaonema, etc.
4. **Leaf cutting** : Sansevieria, etc.
5. **Leaf Bud Cutting** : Poinsettia, Hydrangea, Bryophyllum, etc.
6. **Leaf Vein Cutting** : *Begonia rex*, etc.
7. **Leaf Stalk Cutting** : Peperomia, etc.
8. **Simple Layering** : Jasmine, Oleander, etc.
9. **Mound or Stool Layering** : Cestrum, Deuzias, etc.
10. **Trench/ continuous Layering** : Hydrangea, Carnation, etc.
11. **Inarch Grafting** : Rose, *Petrea volubilis*, *Allamanda violacea*, etc.
12. **Side Grafting** : Camellias, etc.
13. **Saddle Grafting** : Rhododendron, Lilac, etc.
14. **Cleft Grafting** : Prolonged in finger/ Zygocactus.
15. **Rhizome** : Canna, etc.
16. **Stolon** : Chlorophytum, etc.,
17. **Tuber** : Tuberose, Begonia, Dahlia, etc.
18. **Tunicate bulb** : Daffodil: Tulip, etc.
19. **Non-tunicate bulb** : Lily, etc.,
20. **Corm** : Gladiolus, Iris, Freesia, etc.
21. **Bulbil** : Tiger lily, Narcissus, etc.
22. **Pseudobulb** : Few orchids.

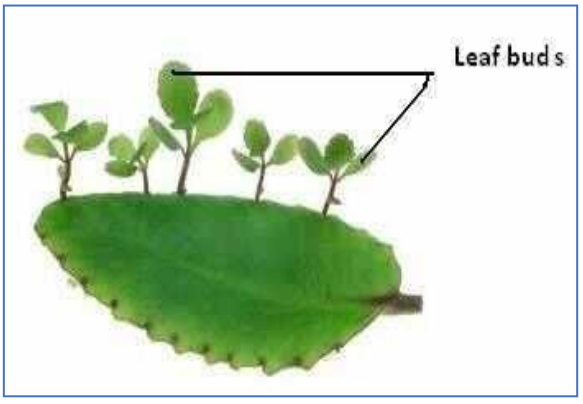
Seeds of Portulaca

Softwood Cutting

Terminal Cutting/Tip Cutting

Cane cutting / Node cutting

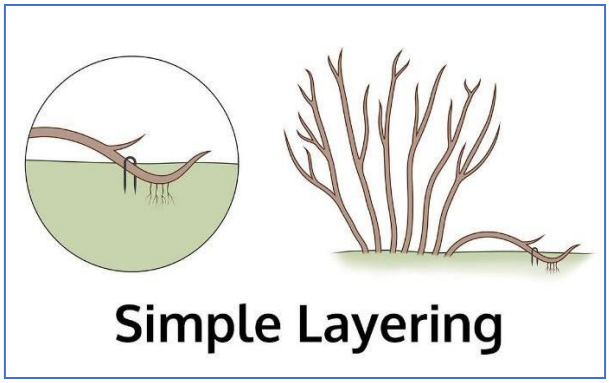
Leaf Cutting

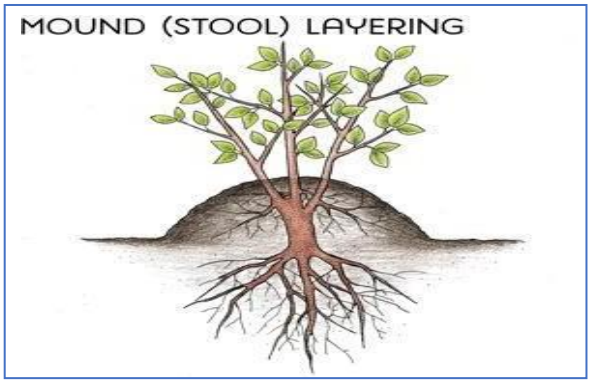


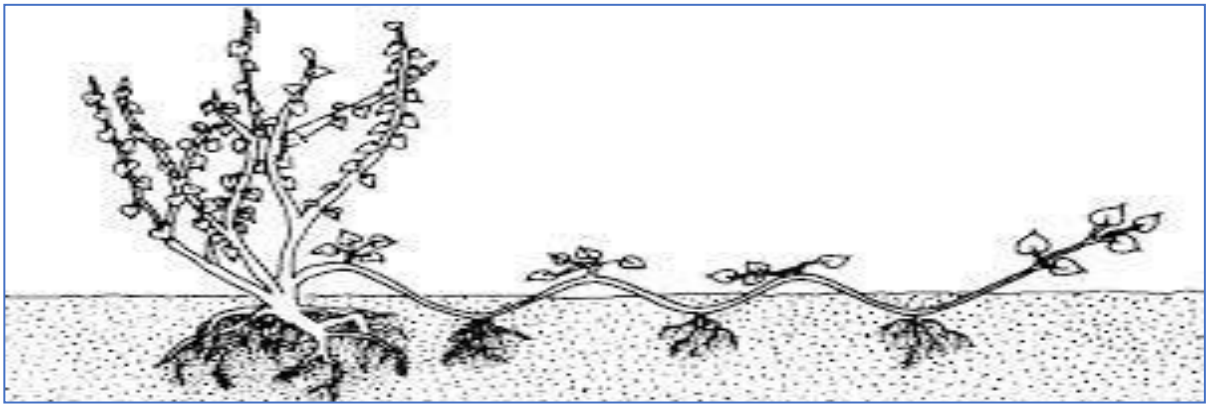
Leaf Bud Cutting

Leaf Vein Cutting

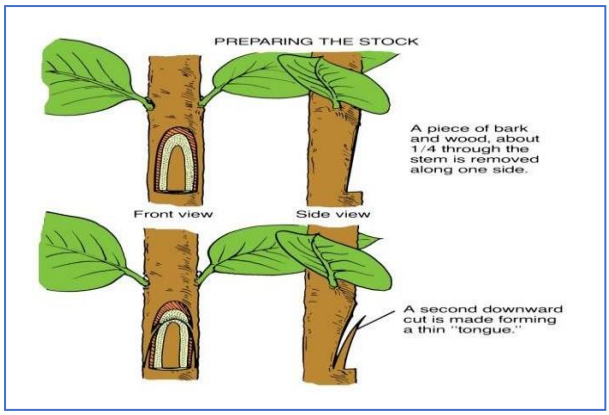
Leaf Stalk Cutting



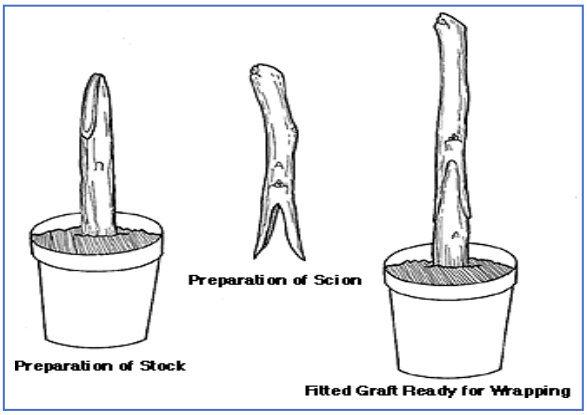




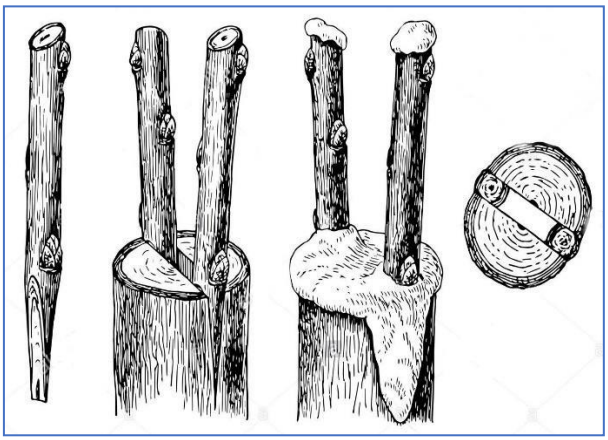
Trench/ continuous Layering



Side Grafting



Saddle Grafting



Cleft Grafting

Inarch Grafting

Rhizome

Stolon

Tuber

Tunicate Bulb

Non-Tunicate Bulb

Corm

Bulbil

Pseudobulb

Observation Recorded

Conclusion

Remarks

Signature of Student **Signature of Faculty-In-Charge**

Experiment No.3: CARE AND MAINTENANCE OF PLANTS, POTTING AND REPOTTING

Aim of the Experiment- To study about different intercultural operations, potting and re-potting in Ornamental crops for their care and maintenance to obtain high yield and good quality flower within a short period.

Different interculture operations in Ornamental crops

1. **Watering or Irrigation**

   Role of water in plants

   - Water is way of transportation of nutrients from roots to shoots and *vice-versa.*
   - Water is a means of thermal regulation of temperature inside the plants.
   - Many organic constituents of plants such as carbohydrates, proteins, nucleic acid and enzymes are denatured in absence of water.
   - Water forms the source of hydrogen for the reactions of carbon dioxide in the process of photosynthesis.
   - Water is essential for maintaining turgidity and it is essential for survival of plants.

   Methods of Irrigation

   i. Check-Basin method
   ii. Furrow Methods
   iii. Ring Basin System
   iv. Basin System
   v. Flood System
   vi. Pitcher System
   vii. Funnel System
   viii. Drip Irrigation system

   Advantages of drip irrigation

   - ✓ Water Saving (30-70%).
   - ✓ Labour Saving (60-90%).
   - ✓ Use of hilly terrain.
   - ✓ Suppressed weed growth.
   - ✓ Increased growth, vigour and yield.
   - ✓ Ease in orchard operation.
   - ✓ Use of low-quality water.
   - ✓ Ease in operation.
   - ✓ Suitability for light soil.
   - ✓ Ease in fertilizer application.
   - ✓ Less incidence of disease.

2. **Weeding and Mowing**
    - Weeding is important operations to raise a crop successfully. Manual labour is used to carry out this operation in India, so far. Therefore, the cost of cultivation enhances considerably. Weeds should be removed whenever they appear. Otherwise, weeds will complete with the main crop for nutrition and moisture.
    - Mowing is practiced to keep the growth off weed under check especially in lawn. The process of mowing is achieved by mower machine and hand blade having long cutting edge of about 1 meter. This method is successful only in case of short weeds growing close to the ground.
3. **Earthing up and Soil loosing on beds**
    - A technique where soil is drawn up around the base of a plant to keep it stable in windy weather.
    - A technique of drawing soil up around stems to encourage blanching.
    - A technique where soil is drawn up around the stems to encourage stem rooting.
    - Loosing of soil is an important operation for enhancing soil aeration.
4. **Mulching**

    Covering top of the soil with loose extraneous matter is known as mulching. It is of two types; organic and inorganic. The grass clippings, crop stump, straw, bark chips, compost, manure, saw dust, cotton buns, wooden pieces, rice husk, onion and garlic scales, leaf litter, cinders, paper, latex, asphalt, etc. are some important organic mulching, whereas, plastic film, metal foil, sand, gravel, stone, etc. constitute inorganic mulches.

    Purpose of mulching
    - Conservation of soil moisture.
    - Regulation of soil temperature.
    - Suppression of weed growth.
    - Prevention of soil erosion.
    - Control of pest and disease.
5. **Fertilizer and Others chemical application.**
    - Balance and regular supply of nutrient to plants helps in better growth and flower production.
    - Plant growth regular can also be applied for proper growth and development.
    - Pesticide and fungicide should be applied when plants are attracted by Pest and Disease.
6. **Special Cultural Operations**

A. De-Shooting

Sprouting of buds just below flower, from the point between shoot and leaf lead to smaller bud size. So, these shoots should be removed regularly.

B. Dead Shoot removal

In the old plants the dead shoot or dried shoots on plants are observed which will be the host for fungi. So, these have to be removed regularly.

C. Bending

Leaf is a source of food for every plant. There should be balance between source (assimilation) and sink (Dissimilation).

D. Mother shoots bending (Rose)

After planting 2 to 3 eye buds will sprout on main branch, these sprouts will grow as branches and these branches in turn form buds. This is don't to initiate bottom breaks or ground shoots which will form main framework of plant structure. The mother shoot is bended on 2nd leaf or nearer to the crown region. The first bottom break or ground shoot will start coming from the base. These ground shoots form the basic framework for production and thereon the ground shoots should be cut at 5th five pair of leaves and medium ground shoots should be cut at 2nd or 3rd five pair of leaves.

E. Defoliation

The removal of leaves is known as defoliation. It is done mainly to induce certain plant species to flower or to reduce transpiration loss during periods of stress. Defoliation may be done by removal of leaves manually or by withholding water. The shoots are defoliated after pruning.

F. Staking/netting (Carnation)

Good support material is metal wire mesh width of 7.5 x 7.5 cm to 15 x 15 cm. The cheapest support material is net with nylon. Minimum at every 3 meters, the wires should be supported with poles. The poles at the beginning and the end of each bed should be strong enough and be in cast concrete. For an optimal support of the crop, an increasing width of meshes may be used. E.g., the bottom net of 7.5 x 7.5 cm, then 12.5 x 12.5 cm and the upper nets 15 x 15 cm.

G. Pinching (Carnation)

Pinching refers to breaking out the tip of shoot with few leaves and encouraging growth of side shoots. There are three types of pinching

a) Single b) One and half and c) Double Pinches

Pinching is done at a stage when the plants are young and between of 7-15cm height. Since very tender shoots are usually pinched, no special tool is required. It is done by snapping the shoot tip manually. A sharp knife or blade may be used for pinching. When the plant attains 6 nodes, the first pinch is given. This is referred as 'single pinch'. This would give rise to six lateral shoots. With a 'one and half pinch', 2-3 of these lateral shoots are pinched again. For the 'double pinch' all the lateral shoots are pinched off. Other than carnation, pinching is also practiced in marigold, Gomphrena (single pinch), and spray types of chrysanthemum (double pinch).

H. Disbudding (Carnation)

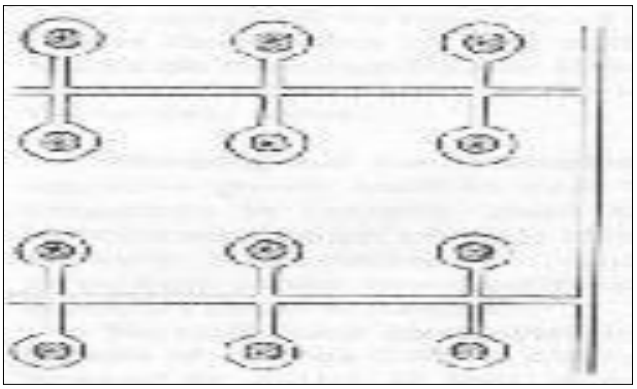
Disbudding refers to removal of side shoots so that the central/terminal bud receives maximum food for the full development. In standard carnations, side buds should be removed where as in spray carnations; the terminal bud has to be removed.

I. Training & Pruning

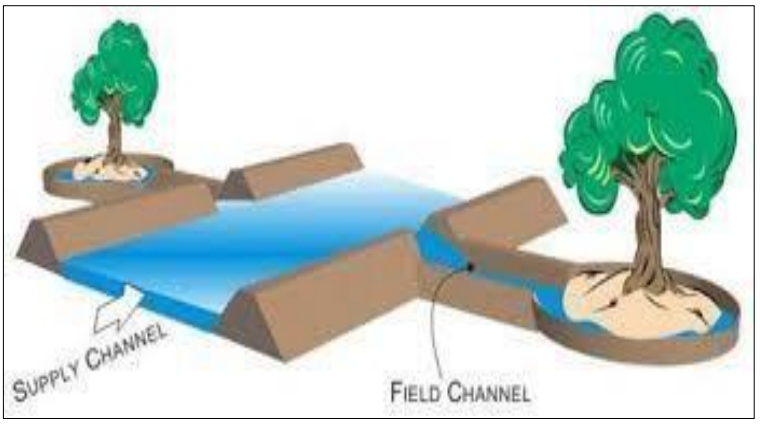
Training refers to judicious removal of part to develop a proper shape of plant capable of heavy crop load. Pruning is defined as the judicious removal of part like root, leaf, flower, fruit, etc. to obtained good qualitative yield.


Bed / Boarder / Check Basin Method


Furrow Irrigation

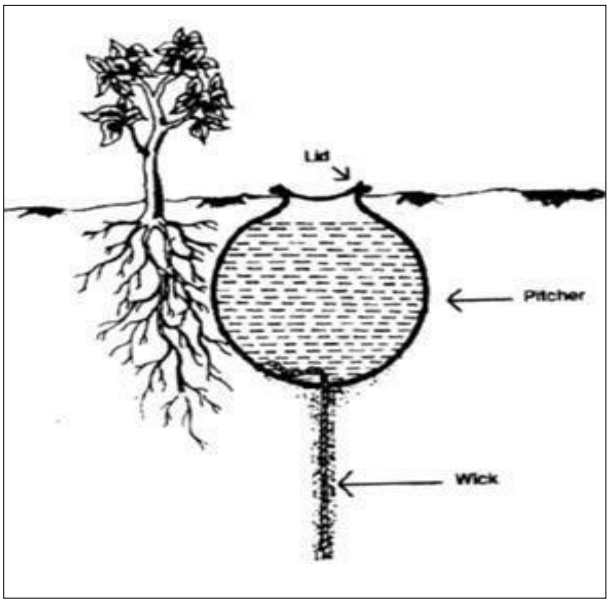



Ring Basin Irrigation

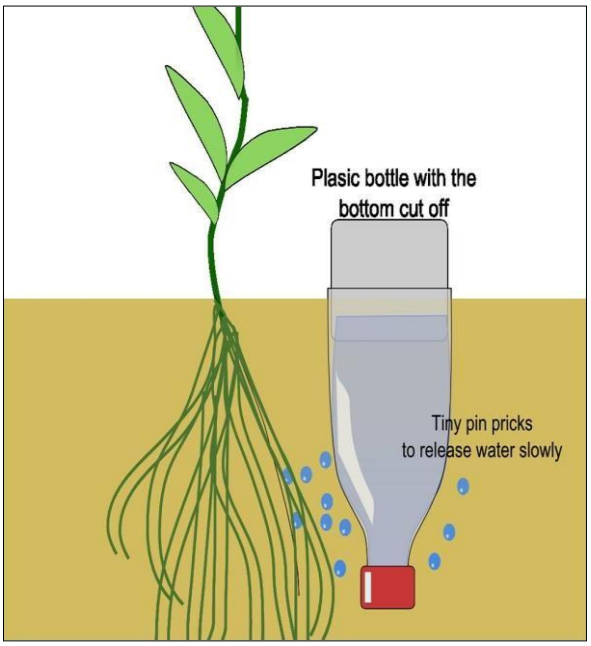



Basin Irrigation

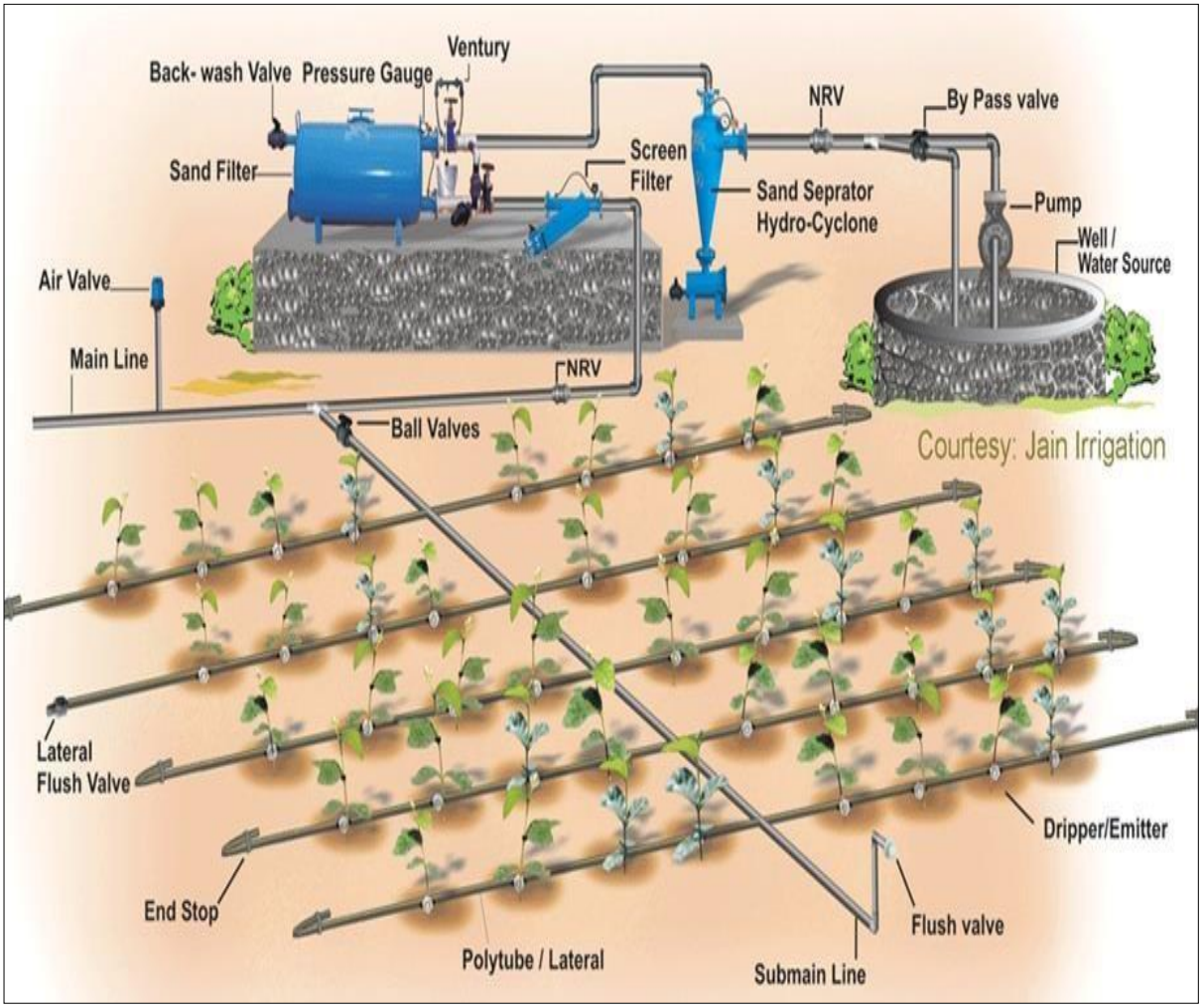

Flood Irrigation



Pitcher Method

Funnel Method



Drip Irrigation

Weeding

Earthing up

Mulching

Staking/netting

Pinching

Disbudding

Observation Recorded

Conclusion

Remarks

Signature of Student **Signature of Faculty-In-Charge**

Experiment No.4: IDENTIFICATION OF TOOLS AND IMPLEMENTS USED IN LANDSCAPE DESIGN

Aim of the Experiment- To study the identification of tools, implements and equipment used in Landscape Design.

Tools: -These are mechanical device which makes work easier.

Ex: -Spade, Knife, Hoe, Grafting and Budding Knife, etc.

Implements: -These mechanical devices are used for specific purpose or work and attached to another machine for operation.

Ex: - Cultivator, Disc Harrow, etc.

Equipment: -These are special mechanical devices which is used for specific purpose and without the devices, work cannot be completed.

Ex: -Measuring Tape, Tenderometer, Penetrometer, etc.

Table 4.1: Lists of Tools, Implements and Equipment

Sl. No	Name of The Tools, Implements and Equipment	Uses or Working
1.	Phawrah	It is used for primary ploughing, levelling the land, scraping of the land etc. Handle is perpendicular to the blade.
2.	Spade	It is used for digging of pits, lifting and turning of the soil. Handle is inclined to the blade.
3.	Garden Rake	It is used for levelling of land, collecting of weeds, soil clods and other plant debris.
4.	Shovel	It is used for loosening of soil around standing plants, weeding, digging of small pits and uprooting of seedling from nursery.
5.	Khurpi	It is used for loosening of soil around standing plants, weeding and digging of small pits. It is having flat blade
6.	Bill Hook	It is having curvy sharp blade used for cutting large branches

7.	Dab	It is used for cutting small branches, large and hardy weeds and other thorny plants. It consists long straight sharp blade
8.	Secature	It is used to cut tender branches, flowers, scions and rootstocks etc.
9.	Hedge shear	It is used in training of different hedges and topiary.
10.	Grafting and Budding knife	It is used for grafting and budding of different fruit crop, flowers and some vegetables.
11.	Measuring Tape	It is used for making layout.
12.	Rope	It is used for making layout and used to maintain spacing, drawing a long distance straight.
13.	Sickle	It is used for cutting large weeds, grasses and thorny plants.
14.	Cultivator	It is used for primary ploughing and breaking of crust having 9 to 11 tins. It is attached to tractor or power tiller.
15.	Disc Harrow	It is used for secondary ploughing, churning of soil to make soil fine tilth. It is attached to tractor or power tiller.
16.	Knap-snack Sprayers	It is used for spraying herbicides, growth regulator, insecticides, pesticides, vermi-wash and other plant products.
17.	Duster	It is used for dusting of different powdery pesticides and insecticides.
18.	Mower	It is used for mowing of lawn grasses. Make lawn uniform
19.	Rose cane	It is used for sprinkler irrigation to young.
20.	Dibler	It is used for digging pits.
21.	Refractor	It is used to measure the TSS (%of sugar) in different fruits and vegetables.
22.	Tenderometer	It is used for measuring the maturity indices of garden pea.

23.	Penetrometer	It is used for measuring the pulp thickness of different pulpy vegetables.
24.	Jellimeter	It is used to measure the pectin contain of fruits and vegetables.
25.	Mechanical dryer	It is used for drying of cut piece of fruits, vegetables, flowers, etc.
26.	Hydrometer (saccharometer, salinometer, acidometer)	Measuring the density of sugar, brine solution and specific gravity in an acid.
27.	Ladder	Used for harvesting, training and pruning of horticultural crops.
28.	Wheel barrow	Used for carrying nursery plants, compost, fertilizer, etc. to nursery and main field.
29.	Hedge Cutter	Used for cutting hedge to give its desirable shape
30.	Leafy vegetable harvester	It is the modification of hedge shear. Wire net is welded over the shear to form leafy vegetable harvester. The cut vegetables are collected in the net of the shear.
31.	Rubber tapping tool	It is provided with V shape notch at the terminal end. Blade is inserted in the rubber stem to collect the latex.
32.	Mango harvester	It consists of 2 blades, net basket and long handle. Blade is spring operated. The harvested mango is collected in the net basket. Due to long handle the fruits can be harvested in tall plant.
33	Hand sprayer	It is used for spraying pesticides in small area of vegetables, flower nursery.
34	Foot sprayer	It is suitable for spraying in the field as well as in the tall trees. It is having 2 main components i.e., foot pump and nozzle connected through pipes from the pump. So, it requires 2 persons to operate. One operates the pump another shows the direction of nozzle. The spray liquids are filled in another tank connected through pump.
35	Rocker sprayer	It requires 2 persons to operate. One person operate compressor and other operates the nozzle. Its spray the chemicals at high pressure and suitable for tall plants.

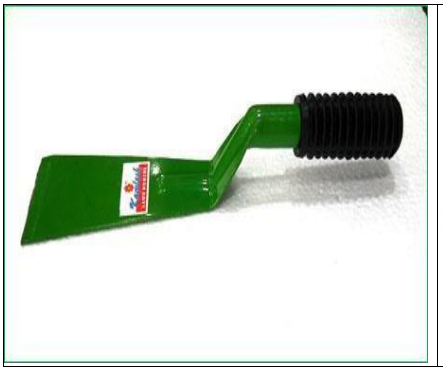
36	Flower scissor	It is used for cutting flowers and removing flower parts.
37	Tree pruner	It is used for pruning trees having branches at more height from the ground level.
38	Pruning shear	It is used for pruning tree branches near to ground. Due to long handle, a person can prune the branches from the ground level which is not possible with hedge shear.
39	Pruning saw	It is used for cutting stem and branches of thicker diameter. Mostly used for rejuvenation of fruit trees.
40	Axe	It is used for falling trees and cutting branches.
42	Pick axe	It is made up of carbon steel having two edges. One edge is pointed another is broader. It is used for digging hard compact and stone soils.
43	Trench hoe	It is having long handle with flat blades like spade and pointed rod at the opposite side of the blade. It is used for hoeing, digging of small pits, making furrows, etc.
44	Hand hoe	It is small in size like trench hoe.
45	Trowel	It is used for uprooting nursery plants and transplanting of seedlings.
46	Hand rake	Used for weeding purpose.
47	Peeling knife	Used for removing of skin of fruits and vegetables.
48	Coring knife	Some fruits having hard core inside e.g., apple, pear, pineapple. In this the core is removed b coring knife.
49	Pitting knife	Removal of stone from fruit is termed as pitting and it is practiced by pitting knife. E.g., Coconut.
50	Grater	It is cutting of fruits and vegetables in definite shape and size. E.g., apple grater.
51	Cooking thermometer	It is used to measuring temperature of cooking product.
52	Pressing machine	It is used for extraction of juice from fruit pulp.

Plate 4.1: Identification of Tools, Implements and Equipment


PHAWRA vs SPADE

GARDEN RAKE

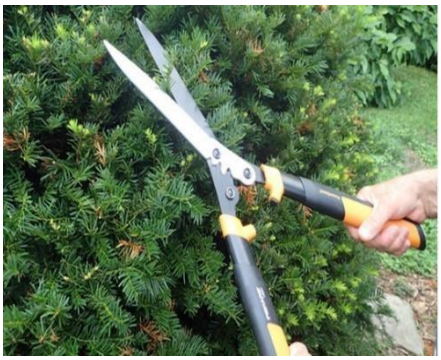
SHOVEL



KHURPI

BILLLWORK

SECATURE



HEDGE SHEAR

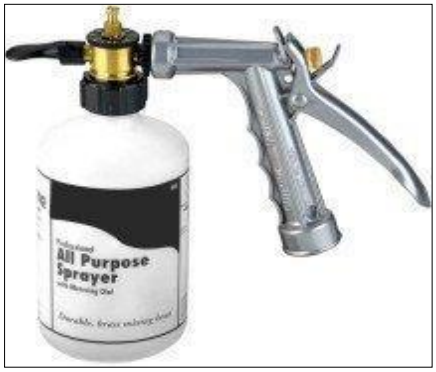
GRAFTING & BUDDING KNIFE

SICKLE

CULTIVATOR

DISC HARROW

KNAP SCAK SPRAYER

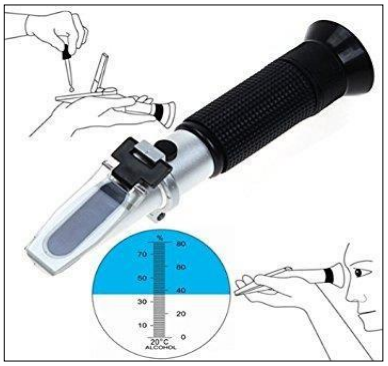


DUSTER

MOWER

ROSECAN

DIBLER



HAND REFRACTOMETER

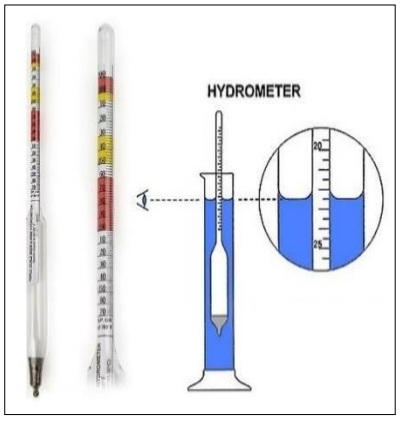
TENDEROMETER

PENETROMETER

JELLIMETER

POCKET REFRACTOMETER

MECHANICAL DRYER



HYDROMETER

LADDER

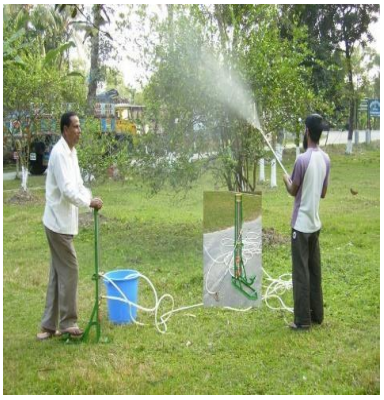
WHEEL BARROW

HEDGE CUTTER

LEAF VEGETABLE HARVESTER

RUBBER TAPPING KNIFE

HAND SPRAYER



FOOT SPRAYER

ROCKER SPRAYER

PRUNNING SHEAR vs FLOWER SHEAR

TREE PRUNER

PRUNING SAW

AXE

DAB

PICK AXE

TRENCH HOE

HAND HOE

TROWEL

HAND RAKE

PEELING KNIFE

CORING KNIFE

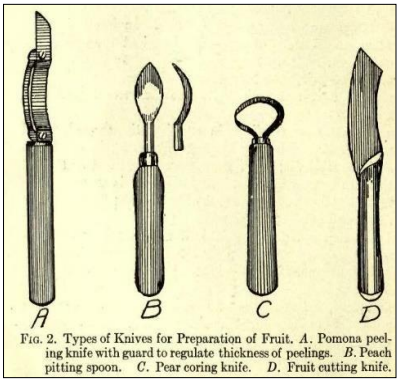


FIG. 2. Types of Knives for Preparation of Fruit. *A*. Pomona peeling knife with guard to regulate thickness of peelings. *B*. Peach pitting spoon. *C*. Pear coring knife. *D*. Fruit cutting knife.

B. PITTING KNIFE

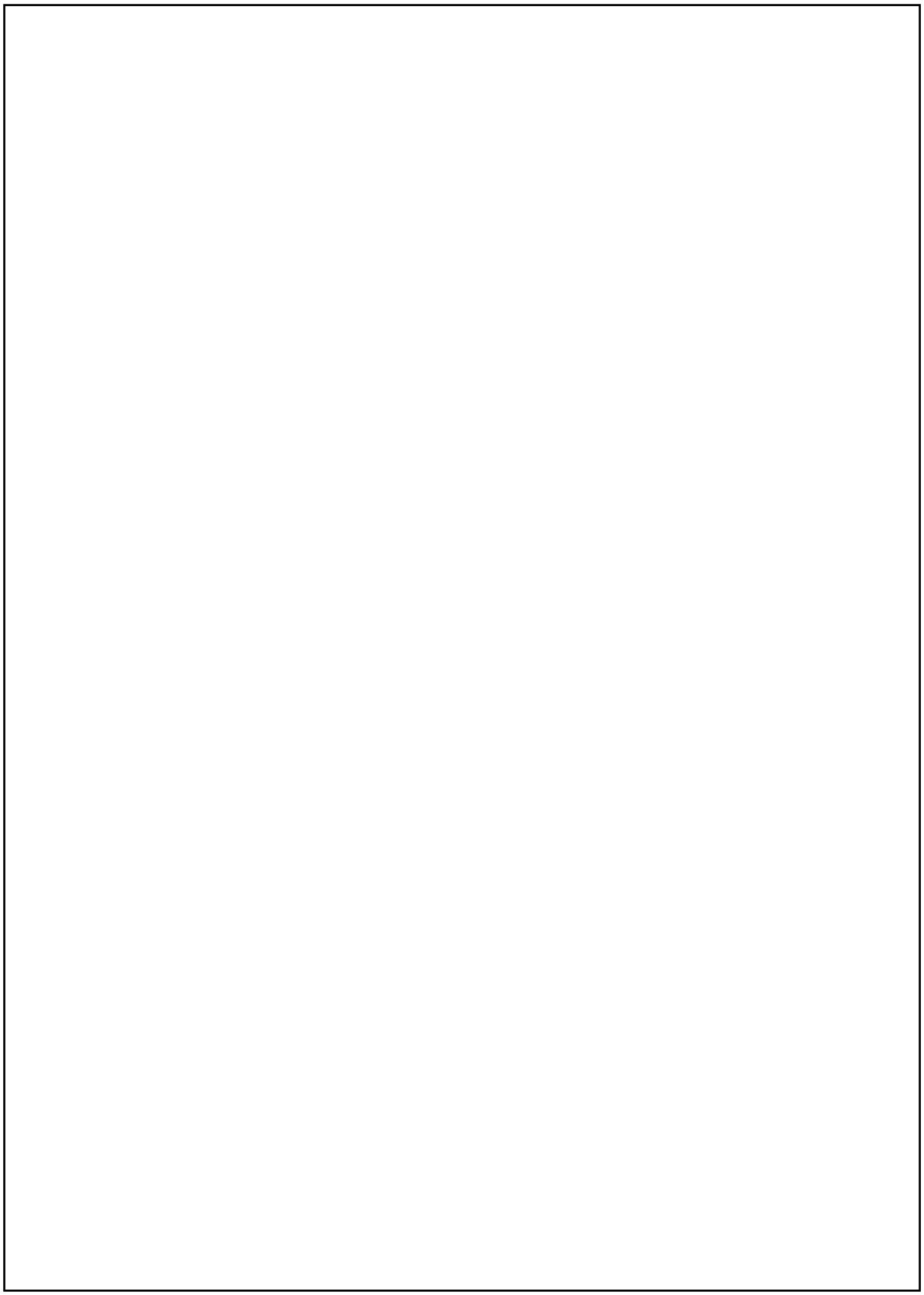
APPLE GRATTER

COOKING THERMOMETRE

PRESSING MACHINE

MANGO HARVESTER

Observation Recorded



Conclusion

Remarks

Signature of Student **Signature of Faculty-In-Charge**

Experiment No.5: TRAINING AND PRUNING OF PLANTS FOR SPECIAL EFFECTS

Aim of the Experiment- The cultivated plants may grow wild and attain a shape of their own depending upon the species and variety. They may not bear regularly and abundantly unless trained.

Training is defined as an operation done to a plant by which it is made to develop an orderly frame work or structure and this is achieve by staking, typing supporting, propping, trellising or spreading on pergola with or without pruning of plant parts and training is usually done when the plants/shrubs/vines are young. The training is normally achieved by pruning.

It is necessary to pay sufficient attention for training of plants during the first few years of planting. During this period, the preplanned frame work as decided by the grower should be allowed to develop.

The main points to be kept in view while training horticultural crops are;

1. To admit adequate sunlight and to train the centre of the tree to expose more leaf area to the sun.
2. To limit the growth and spread of the tree so that various cultural operations such as spraying and harvesting are performed at minimum cost.
3. To build the frame work and arrangement of scaffold branches.
4. To build the trees and maintain the height so as to reduce the exposure for sunscald and wind damage.

Branch orientation and leader training: The branches may be oriented around the stem to produce a nature shaped tree or they may be oriented in a single plane to provide a flat shape known as an Espalier (from the French word for Schedule).

Before attempting to train any tree, we should decide the height of the head or crown depending upon the height of the crown from ground level, the plants can be grouped into two:

A. High head: In this case, the main branches are encouraged at about one meter or higher height from ground level. In the case of high head plants, intercultural operations with animal or mechanically drawn implements can be carried out easily. In the tropical climate high headed trees are unsuitable as they are prone to sunscald and wind damage. The bearing area also develops late and so they come to bearing late.

B. Low head: Main branches forming the foundation frame work of the tree are encouraged on the trunk within a height of 1 meter from the ground level. The low headed trees are now becoming common all over the world as they come to bearing comparatively earlier, are able to resist strong winds more effectively and spraying and harvesting expenses are reduced.

C. How to train a plant: The formation of the main frame work of the tree is most important part of the training. Usually, two to four main branches are encouraged at almost the same height. These

should be allowed to rise from different directions, at some distance from one another so as to form a balanced frame work. These branches are called scaffold branches. The frame work. These branches

are called scaffold branches. The frame work is greatly strengthened if the branches are spaced at 5cm apart vertically on the main trunk. If two are more branches of equal size are allowed to arise from one place, they form a bad crotch which is often prone to split their common joint. Most deciduous and ever green trees are trained to a single stem except a few trees like pomegranate, custard apple, fig, etc. which are better trained to two or three stems.

Systems of Training

1. Central leader: In the central leader system of training the trunk is encouraged to form a central axis with branches distributed laterally up and down and around the stem. The central axis, or leader, is the dominant feature of the tree's frame work and the main direction of growth is upward. This system of training is adopted in such types of trees which have a pronounced special dominance. Here the main trunk grows undisturbed. On account of vigorous (rapid) growth of the main trunk the tree develops a close centre and grows to great heights. The side branches remain more or less shaded and consequently they would be lower in vigour and productivity. Since the plants would be very tall the spraying and harvesting operations become difficult and costly e.g. pear and some varieties of apple. This is not encouraged now.

2. Open centre: In this system, the main stem is allowed to grow only up to certain height by heading it within a year of its planting or terminating its growth at a particular height and all the subsequent vegetative growth is promoted by lateral branches. Originating rather close to the upper end of trunk. However, special pruning is required to prevent a lateral from becoming dominant i.e. from forming a new central leader. The tree thus trained results in a low head and as such, the crop is borne closer to the ground in contrast to the central leader system. Open centre system allows the sunshine to be equally distributed to all the branches. The open centre trained trees are more fruitful besides greatly facilitating the operations like spraying, thinning and harvesting. However, the branches form narrow/weak crotches since they arise very close to one another almost from the same spot. So, there is certain amount of risk of splitting of the branches when there is a heavier load of crop on the trees. In areas of high light intensity, such trees suffer from sever sunscald and sun burn injuries. Example, peaches, Apricots, etc.

3. Modified leader system: This system stands intermediate between the central leader and the open centre, combined with the advantages of both the systems. It is developed first by training the tree to the leader type allowing the central stem to grow unhampered for first four to five years. The main branches are allowed to rise on the main stem at reasonable intervals. After the required number of them has developed the main stem is cut of. The top laterals will take the place of the main stem. This results in a fairly strong and moderately spreading type of trees, e.g., apple, walnut etc.

Other Methods of Training:

1. Caldwell system of Training: The branches of the plant are bent and pegged to the ground. This makes the plant to come to bearing early and yield better. No pruning i8s involved in this method of training, e.g., erect growing varieties of guava.

2. Fan System: This method of training is suitable for wall side planting in home gardens. A fan shaped frame is developed by allowing the branches to grow in only one plane parallel to the wall, e.g., ornamental plants.

3. Cordon System: A single arm is allowed to develop from the trunk which will be trained along a stretched wire at a suitable height e.g., grape. A espalier restricted to one shoot or two shoots growing in opposite or parallel directions is called a garden.

4. Kniffin system:

(a) Two arm kniffin system: Two arms are allowed on the main stem at height of 5-6 ft and they trained on to wire on either side e.g., grape.

(b) Four arm kniffin system: Here there will be four arms two each on either side of the trunk. The first pair of arms arise at a height of 3-4‟ and the second at 5-6‟ e.g., grape.

5. Overhead trellis or telephone system: The wires will be fixed horizontally on some post just as telephone wires. The plant will be trained on to the wires with a suitable frame work, e.g., grape and ornamental creepers.

6. Pendal or Bower or Arbour system: A pendal will be erected with the help of pillars and wires and the plant will be trained on to the pendal with suitable frame work, e.g., grape ornamental creepers etc.

7. Single stake or umbrella systems: The main trunk will be supported by a stake. The trunk is beheaded at height of 5-6‟. The branches which arise on the trunk will be hanging freely. E.g., grape, Var. Arkavathi.

Pruning of Orchard Trees

Pruning is one of the major horticultural practices, which defined as “an art or a science of cutting away a portion of a plant”. The parts more commonly removed are branches, leaves or both. Obviously, pruning is a subtraction process.

The extent and intensity of pruning on the same tree varies from year to year, depending on the growth of the tree, its bearing habit and season. The great majority of ornamental plants, if allowed to grow under normal conditions, become full sized trees growing in a haphazard way occupying a lot of space in the garden. When raised in pots to get the bushy growth at manageable sized and in planting proportion, one should prune them periodically, very few species seldom grow and remain dwarf and compact.

Main objectives of Pruning

1. To maintain the growth and vigour of the trees and to have a balance between the vegetative vigour and fruitfulness, so as to be conductive for production of optimum crop of best quality.

2. To shape the tree to make the best use of the space between trees while allowing the necessary access.

3. To regulate the size and quality of the fruits by way of proper distribution of the fruiting area.

4. To regulate the succession of crop and to have the crop where it can be managed easily and cheaply.

5. To spread the trees for economic orchard management.

6. To remove the dead, diseased and over aged wood.

7. For effective spraying of pesticides to the crop.

8. To minimize biannual bearing and consequent risk of die back.

9. To get maximum plageiotrophic shoots/stems.

Principles of Pruning

1. Excessive pruning should be avoided as it affects the growth of the plant by dwarfing and may induce more of water suckers, fasciations (union of a number of parts sides by side in a flat plane) and thus affect the bearing potential.

2. In pruning, only that wood which is not necessary for the tree should be removed.

3. Pruning of larger limbs should be avoided as far as possible.

4. Pruning of young trees should be done more carefully than the yielding trees, since severe pruning of young trees delays the cropping and much more of yield area will be removed than what is desired.

Methods of Pruning

1. Thinning out: This refers to the removal of the branches entirely from its base leaving no stubs.

2. Heading back: This refers to pruning or cutting of main stem or all of few of the branches leaving a basal portion. This method is often followed for hedges, ornamental shrub and fore pruning in grapes.

3. Disbudding or rubbing off: Here the young buds are nipped without giving them the chance to sprout. The buds may be either vegetative or reproductive. This is practiced regularly in flowering plants to make the terminal bud to give a bigger flower. Thinning of the flower buds from the crowded one is essential to get large size quality blooms, as the lesser the number healthier and bigger the flowers. Generally, disbudding is done mainly for annuals, herbaceous perennials and roses. This is followed in large flowered cultivars such as carnation, chrysanthemum, dahlia, marigold and zinnia. Generally, one bud per shoot is retained.

4. Pinching and Topping: This refers to the removal of the tip of the shoot alone with a view

to stimulate mainly the lateral growth. This is practiced regularly in „coffee“ to remove the apical dominance and to allow the side branches to grow vigorously.

Time and extent of Pruning

The time of the year at which the different plants are pruned depends chiefly upon their dormant and flowering seasons. The best time for pruning most of the deciduous trees is at the end of the dormant season, i.e., about a month before the commencement of flowering, but time of pruning of evergreen tree is during December- January when growth is at minimum compare to dry and flowering seasons.

The extent of pruning to be adopted for a particular crop depends on its growing and fruiting habit as it directly affects the nutritive condition within the tree and consequently affects the fruit formation. It also much depends on variety and age of the plants. Pruning of bearing and non- bearing trees differs. The non-bearing trees need much lesser pruning as compared to the bearing trees.

Figure- 5.1: Systems of Training

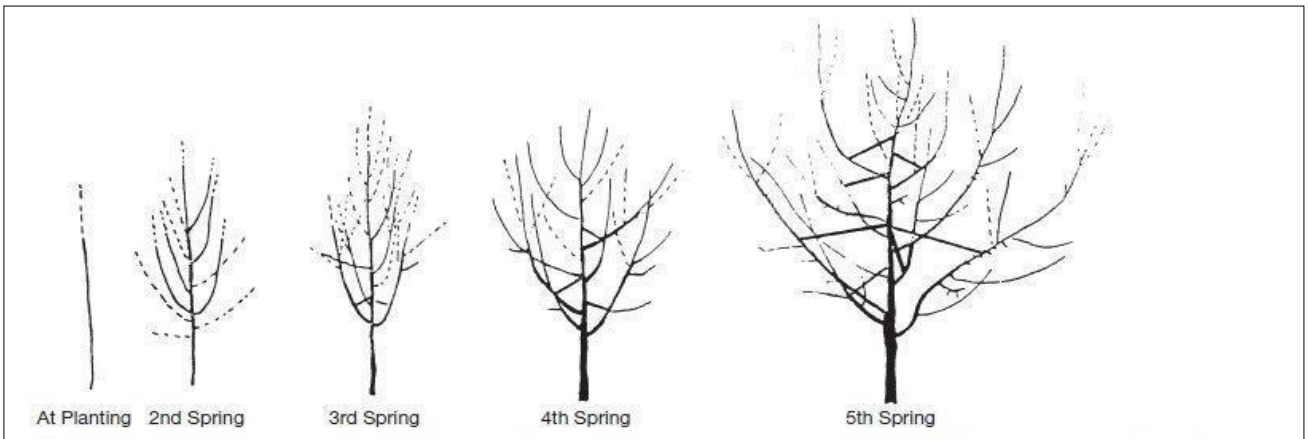
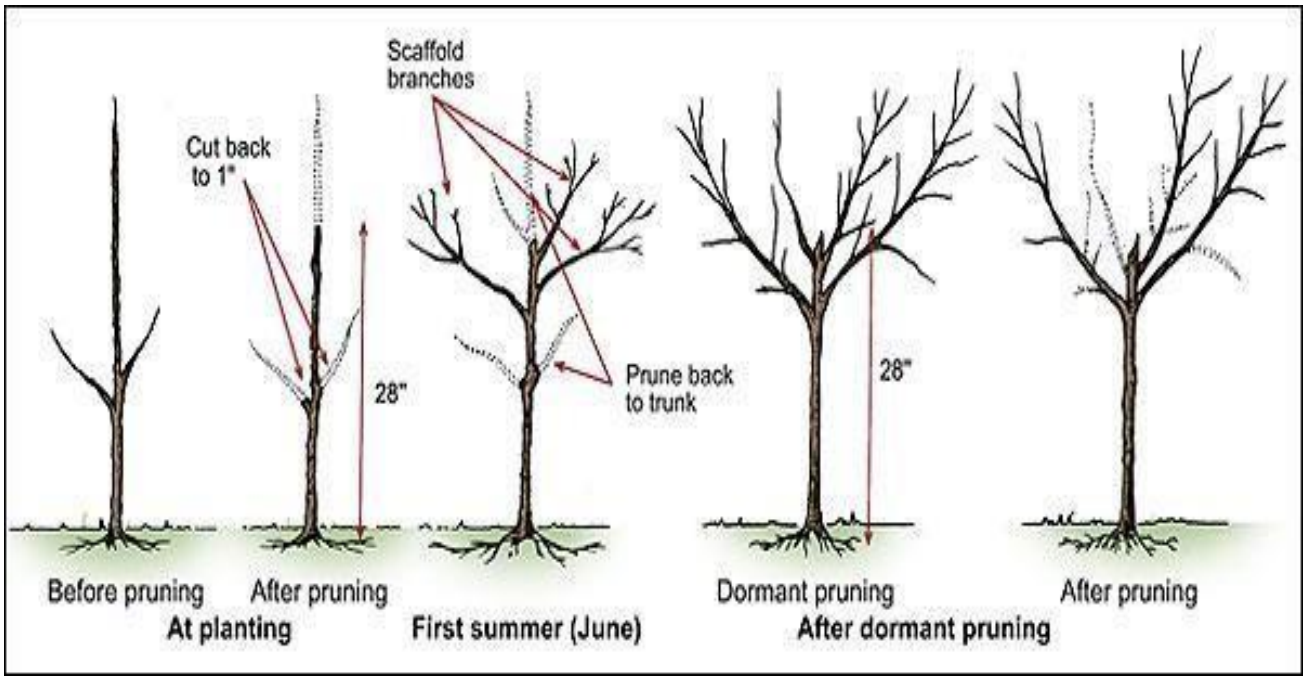
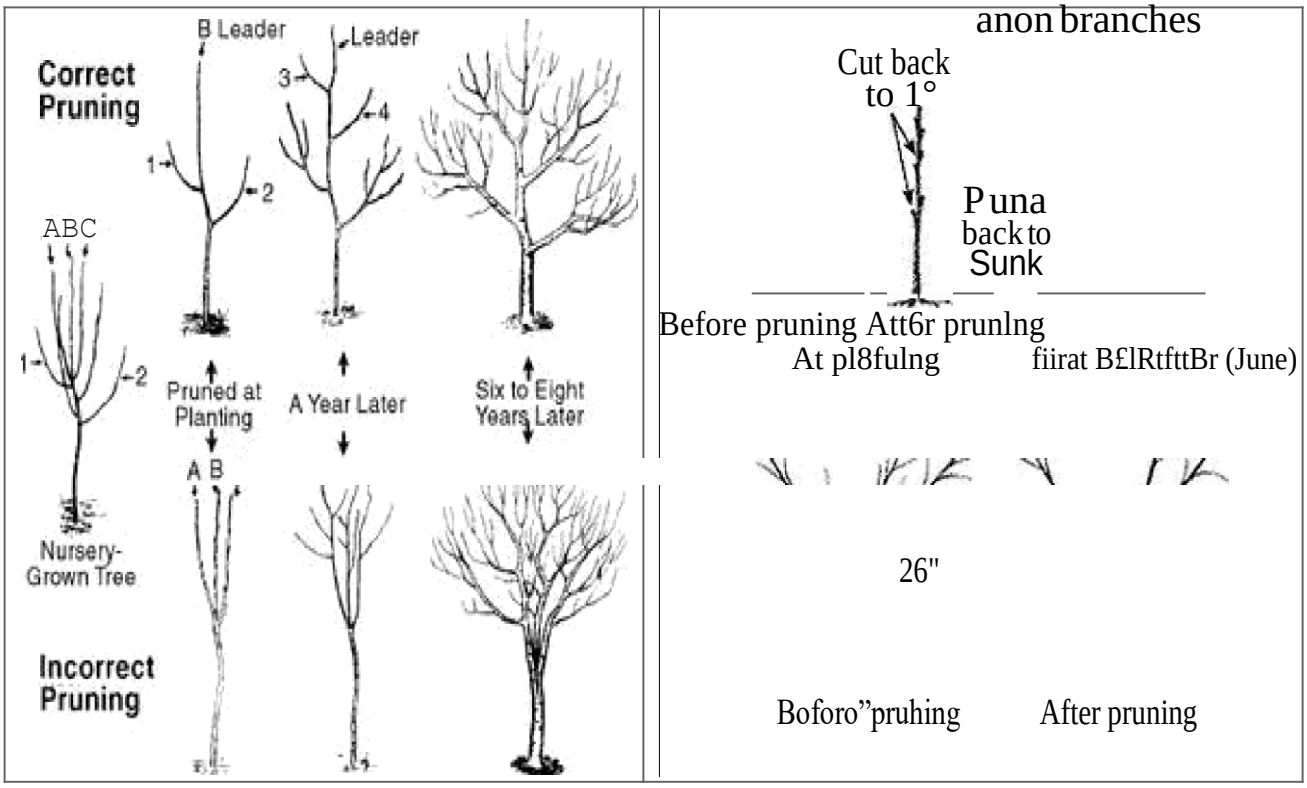


Figure 1. Central leader training system for apples and pears. Dotted lines represent branches that are removed. Source: Stebbins, R.L. 1980. Training and Pruning Apple and Pear Trees. PNW Cooperative Extension Service Bulletin 156




Correct Pruning
B Leader
Leader
ABC
1
2
3
4
Pruned at Planting
A Year Later
Six to Eight Years Later
A B
Nursery-Grown Tree
Incorrect Pruning
anon branches
Cut back to 1°
Puna back to Sunk
Before pruning Att6r prunlng
At pl8fulng
fiirat B£lRtfttBr (June)
26"
Boforo"pruhing
After pruning

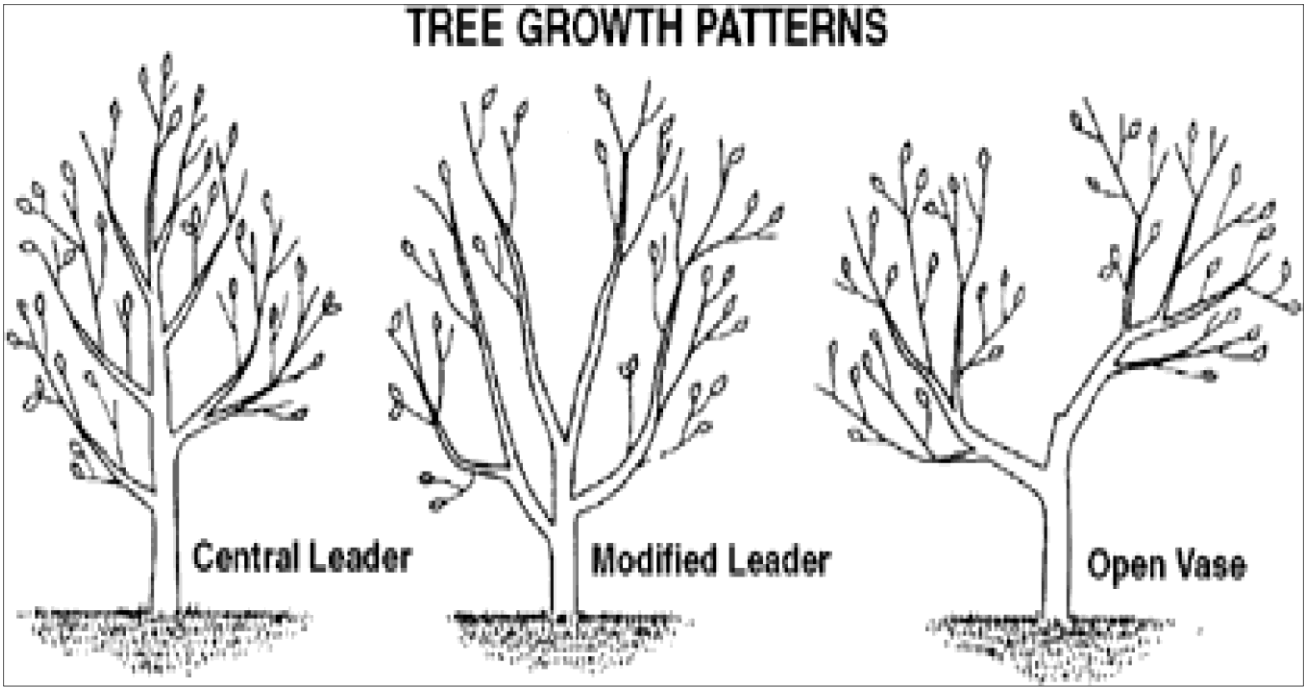
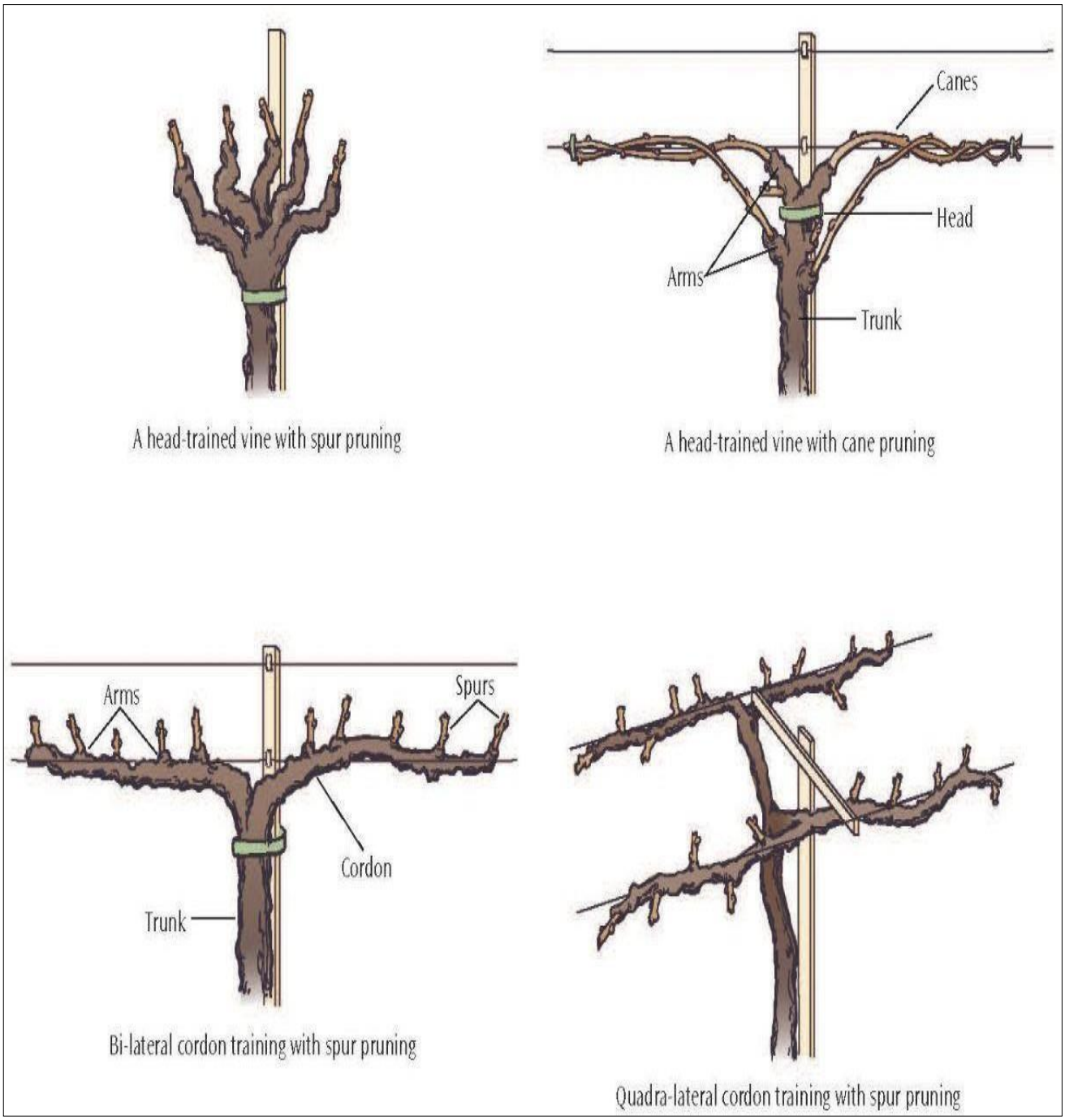
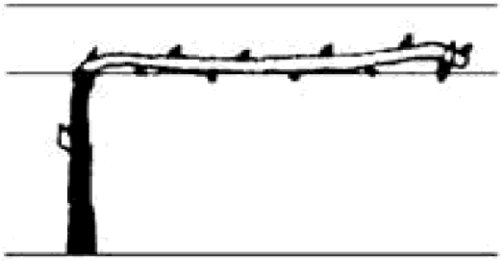

TREE GROWTH PATTERNS
Central Leader
Modified Leader
Open Vase

Figure- 5.2: Other Methods of Training

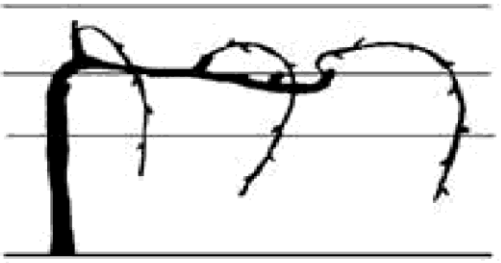


Hsad/eane



Guyot

Cordon/cane

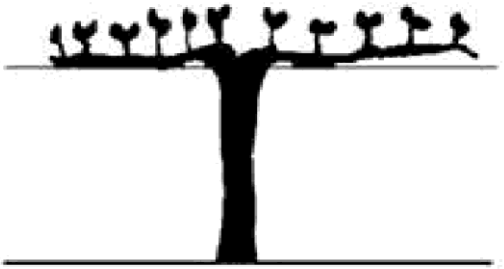


Sylvoz

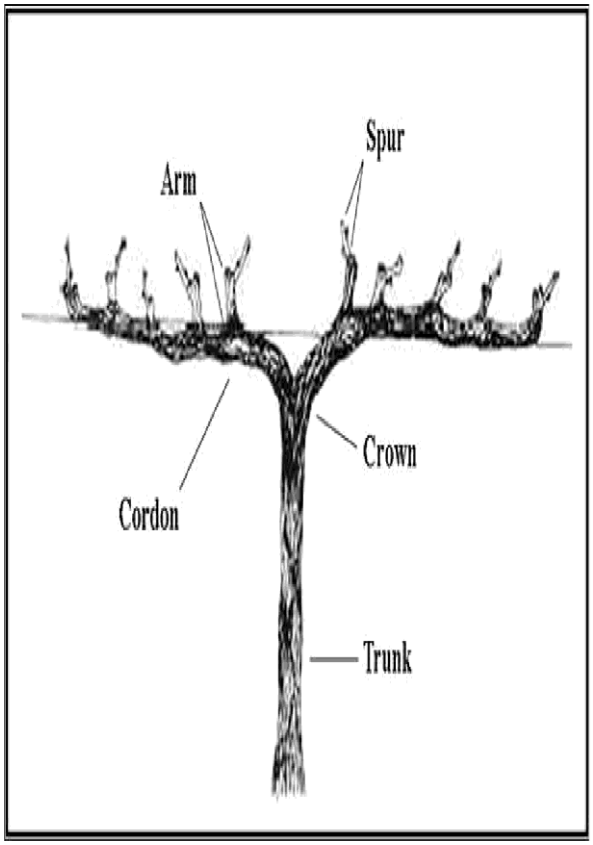
Head/spur

Bush

Cordon/spur



Midwire cordon



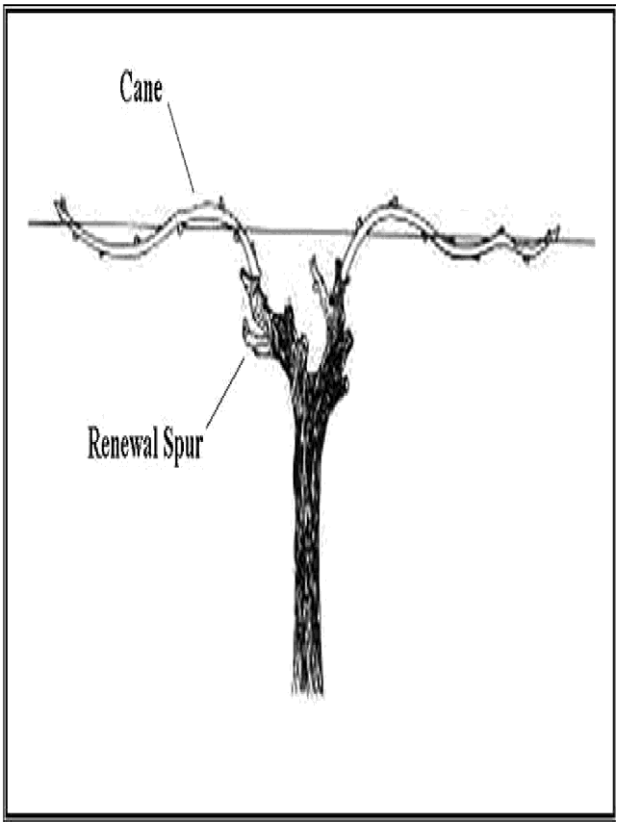


Figure- 5.3: The dimensions of the Y-shaped open-gable trellis system

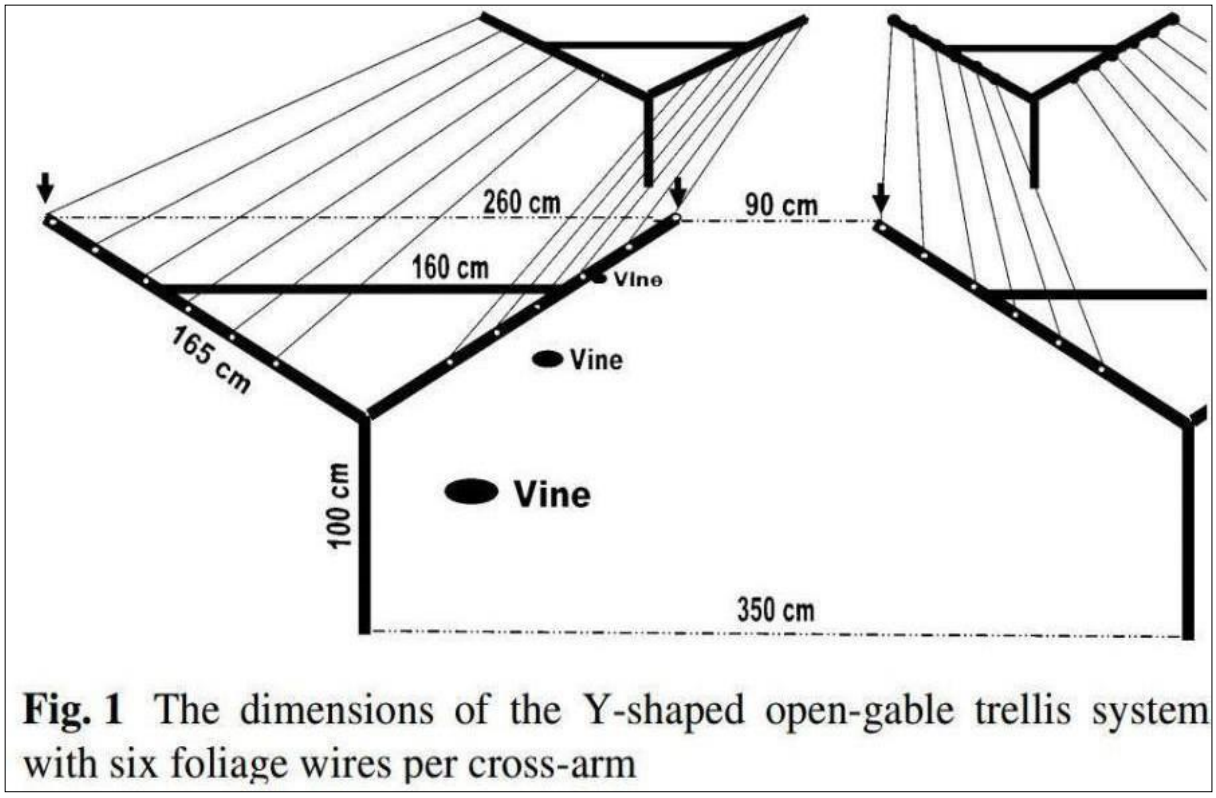
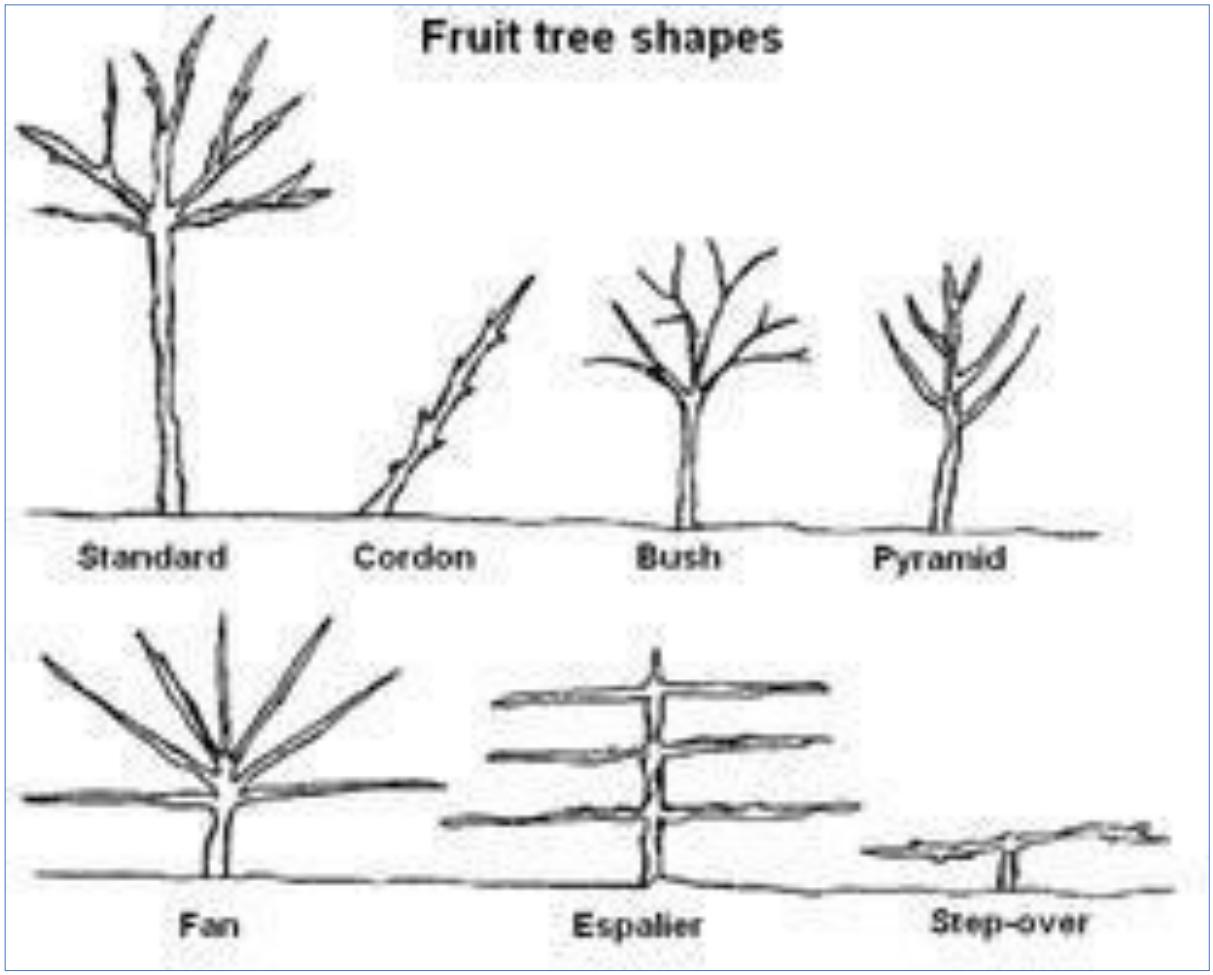
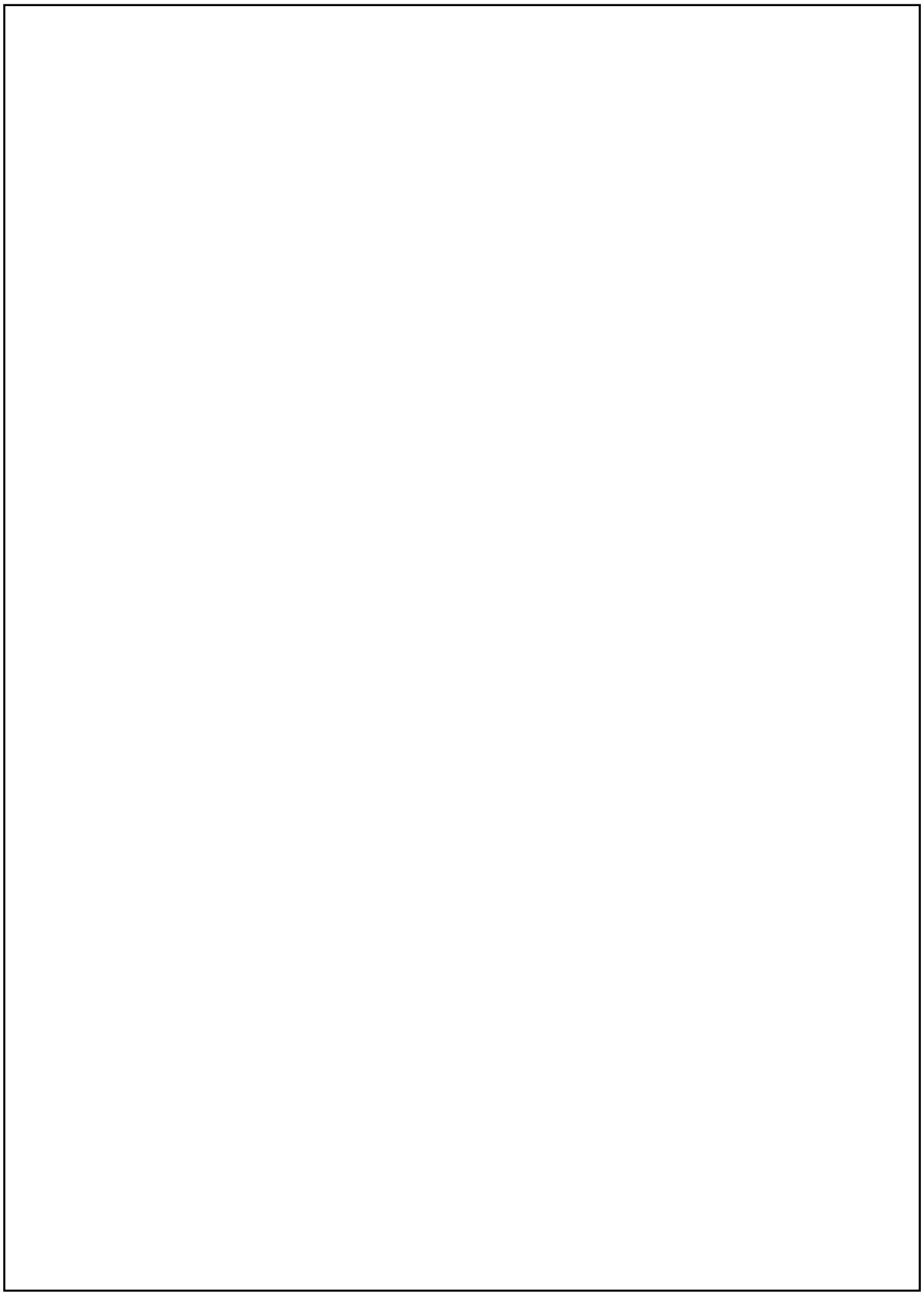


Fig. 1 The dimensions of the Y-shaped open-gable trellis system with six foliage wires per cross-arm



Observation Recorded



Conclusion

Remarks

Signature of Student **Signature of Faculty-In-Charge**

Experiment No.6: LAWN ESTABLISHMENT AND MAINTENANCE

Aim of the Experiment- To study about lawn establishment and their maintenance in garden.

A lawn can be defined as the green carpet for a landscape. It is an important feature for any type of garden. In a home garden a lawn improves the appearance of the house, enhances its beauty and increases conveniences and usefulness. The lawn provides a perfect setting for a flower bed, a border, a shrubbery, 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.

The site

It is not always possible to get the best site one would like to choose for the lawn. But a few points should be kept in mind before selecting a site.

Land preparation

- The soil should retain enough moisture and at the same time the drainage should also be adequate.
- Ideal pH is 5.5 to 6.0. If the pH is very low about half a kilogram of chalk or grounded limestone should be added per square meter area on a sandy soil or a similar quantity of slaked lime should be added to clayey loam soil. In an alkaline soil, gypsum should be added at the same rate.
- A depth of at least of 25-30 cm of good soil is required for obtaining a good lawn.
- In clayey soils, some kind of drainage must be provided. This may be done by drainage pipes or by adding a layer of broken pieces of bricks and gravel.
- The soil should be dug deep and turned up subsequently 2-3 times at weekly intervals. Clot of earth and roots of weeds should be removed.
- After the digging is over, the soil is to be manured and graded (levelled).

Commonly used lawn grasses

Sl. No.	Grass species		Texture of grass	Suitability
	Common Name	**Botanical Name**		
1.	Korean / Japanese grass	*Zoysia japonica*	Coarse	Poor sandy soil, open and sunny locations
2.	Mexican grass / Carpet grass	*Zoysia tenuifolia*	Soft	Open and sunny locations
3.	Bermuda grass / Haryali / Doob grass / Arugu	*Cynodon sp.*	Fine	Open, sunny locations
4.	Buffalo grass/ St.Augustine grass	*Stenotaphrum secundatum*	Coarse	Shady locations
5.	Blue grass/ Kentucky grass	*Poa pratensis*	Medium	Acid soils, higher elevations

Methods of lawn making

1. **Seeding**

- The suitable grass for seeding is "Doob" grass (*Cynodon dactylon*).
- Mix the grass seeds with 5 parts of fine sand for uniform seeding.
- Sow the seeds at a depth of 2 cm uniformly at 2.5 g/m2.
- Seeds take 5 weeks for germination.
- When the grass is about 5 cm in height give a clipping with garden shears.

2. Turfing

- Turf = piece of earth with compact grass on it.
- Uniformly cut turfs of 1 sq.ft with a thickness of 2 cm and free from weeds are prepared.
- The turf pieces are placed on the prepared ground site and beaten down with turf beater.
- Entire turf area should be rolled and watered liberally.
- Grass will establish within 10 days.
- Turfing is an expensive way of lawn making, but it gives an attractive lawn in a short time

3. Turf plastering

- Grass roots and stolon about 5 cm length are mixed with slurry made up of 1:1 ratio of red earth and cow dung.
- It spread uniformly on the surface of a perfectly leveled ground.
- Spreading thickness is 2.5 cm.
- Watering should be done with a rose can.

- The grass will shoot up in 15 days.

4. Dibbling

- Cheapest but time-consuming method.
- Grass slips or grass roots or grass stolon of 5 cm long are dibbled at 5 cm spacing after wetting the prepared ground.
- The stolon will establish in 15 days.

Maintenance of lawn

Having raised a lawn by one of the methods described above, the question of maintenance comes next. If the lawn is not properly maintained, it will become useless within no time. The various aspects of maintenance are discussed below.

a) **Weeding:** One of the main aspects of maintenance is the control of weeds. Without close attention or care a time will come when weeds will overcome the lawn grass, the soil will become sick. Weed is common in both new and old lawns. Therefore, as soon as a lawn is established weeding should start and continue at regular intervals or whenever the weeds come out. The frequency of weeding obviously will be more during the rains than in the colder months. The nut grass (*Cyperus rotundus*) is the most difficult weed to eradicate, because of its deep root system. This should be removed with the roots as deep as possible with a long narrow-bladed (1-1.5 cm) Khurpi. All weeds should be removed with the roots and these should never be allowed to seed.

b) **Rolling, mowing and sweeping:** The object of rolling is to help the grass anchor itself securely and also to keep the surface leveled. Rolling should be avoided when the soil is wet. Mowing is another important operation. The first thing is to obtain a good machine, which will cut evenly at a correct height. The frequency of mowing is determined by the amount of growth and will vary from season to season. But grass should not be allowed to grow more than 5-6 cm in length during any season. Sweeping the lawn thoroughly after each mowing is essential to clean the cut grasses, which might have fallen from the mower box. Sweeping is also done every morning to clean the fallen leaves and other debris. Sweeping may have to be repeated two or three times in a day during the season when the deciduous trees shed their leaves.

c) **Irrigation:** Doob grass is shallow-rooted and, therefore, frequent light irrigation is better than copious flooding after long intervals. Here again some people prefer flooding at long intervals as this saves labour. Labour as well as water can be saved to a considerable extent if sprinkler irrigation is used. The frequency of irrigation varies with the climate. Stagnation of water should not be allowed as it may kill the grass.

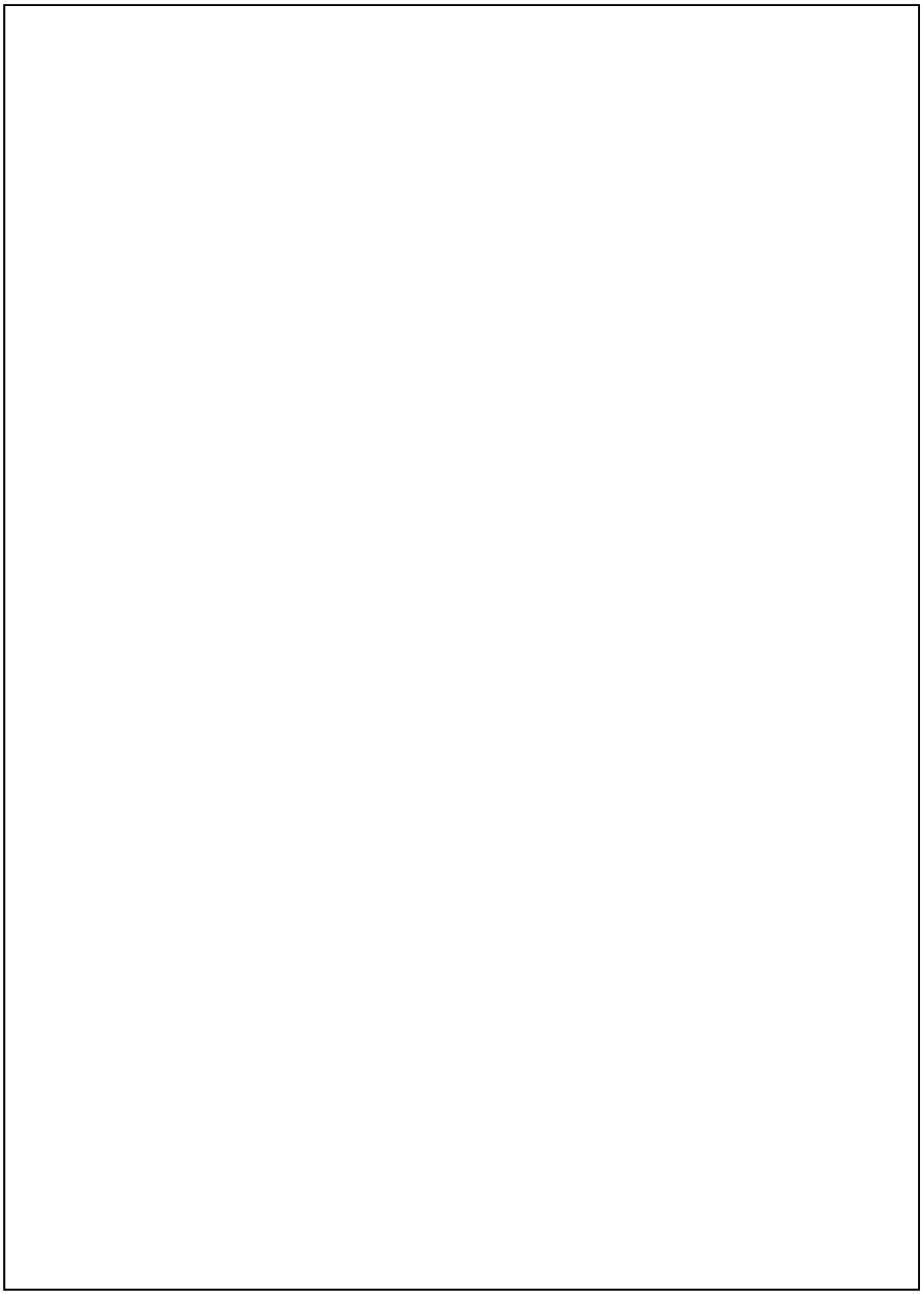
d) **Scraping and raking:** Continuous rolling, treading, and mowing may result in the formation of a hard crust and the lower part of the lawn may get matted and woody. For Mowing such lawns, the grass is scraped at the ground level with the help of a khurpi in the months of April and May. Scraping is followed by raking to break the crust. Where the condition of the lawn is good, hard and thorough raking is done both ways to loosen the old runners and to aerate the soil. Then the mower blade is lowered and the grass mowed close to the ground.

e) Top dressing with compost and fertilizer After scraping or raking, a compost consisting of good garden soil, coarse sand, and leaf-mould in the proportion of 1:2:1 (in sandy soil the proportion of sand should be reduced or eliminated altogether) is spread over the lawn to a depth of 3-5 cm. To cover to such a depth a 100 kg of compost per 100 square meters will be needed. Bone meal is also applied at the rate of 1 kg per 10 square meters. The same compost is used as top dressing again during September to October. From October to April, ammonium sulphate is applied once every month at the rate of 1 kg per 50 square meters area followed by watering. Application of fermented compost in liquid form is also very beneficial for lawns. This is prepared by fermenting 20 kg of compost in 100 liters of water for a few days. During fermentation, ammonium sulphate and super phosphate at the rate of 1 kg and 2 kg are added to this mixture. The concentrated mixture is strained through gunny cloth and diluted to tea colour and added to the lawn with water cans or by siphoning. After the application, the lawn is soaked with water. This can be applied twice a year (October and May-June). Raw cow dung may be fermented and used in the same way.

Problems in lawns

- **Frost-injury:** In cold regions, the grass is injured due to frost. This can be avoided to a great extent if the grass is sprayed with water every evening and in the early morning after frost.
- **Thatching:** Formation of straw like layers of dead stems, leaves and roots of grass is called thatching. It can be controlled by manual removal.
- **Yellowing:** It is more prevalent in wet weather. It is controlled by drenching with copper oxychloride / Dithane M-45 @ 3g/litre or Bavistin 1g/litre
- **Earthworms:** Affect lawn by depositing their excreta. Cause a circular ring of thin coloured or dead grass. They are controlled by drenching soil with Bavistin @ 1g/lit or Dithane M 45 @ 3g/lit. Oilcakes of neem / Pongamia @ 500g/10 m2 may be applied before rainy season.
- **Termites:** They are controlled by the application of Phoret / Thimet.

Observation Recorded



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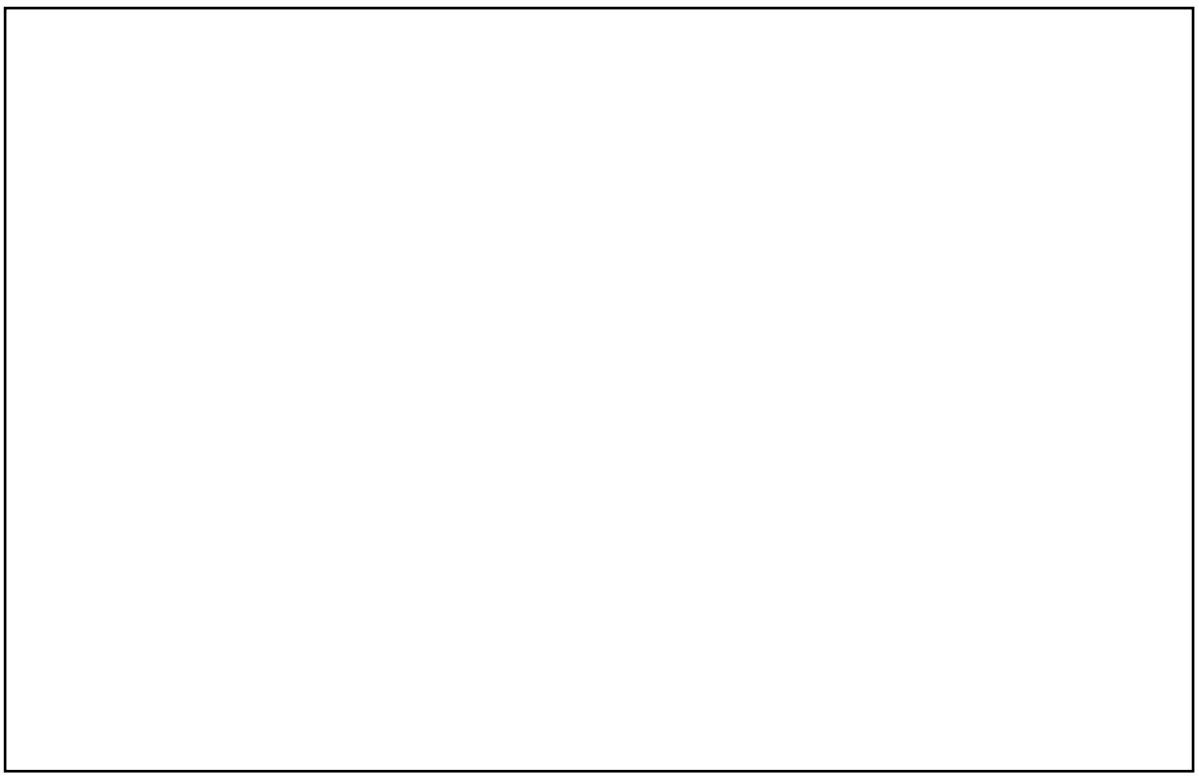

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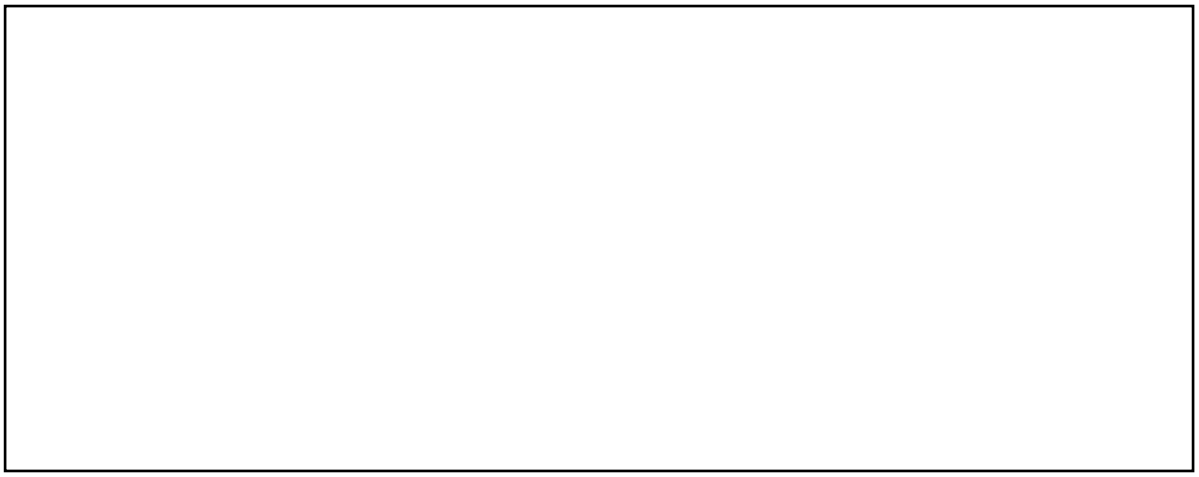

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Experiment No.7: LAYOUT OF FORMAL GARDENS, INFORMAL GARDENS AND SPECIAL TYPE OF GARDENS

Aim of the Experiment- To study about different types of gardens and their layout.

1. Formal style

- First plan is made on the paper and then land is selected accordingly.
- Plan is symmetrical in respect to all component.
- Garden having geometric designs, sheared trees, trimmed hedges and edges

The key features of formal design are

- The plan is symmetrical with square, rectangular.
- Roads cut at right angles.
- Flower beds are arranged in geometric designs.
- The arrangement of trees and shrubs is necessarily geometrical and kept in shape by trimming and training.
- The design is stiff as everything is done in a straight and narrow way.
- It has a sort of enclosure or boundary.
- 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.
- 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.

2. Informal style

- The idea behind this design is to imitate nature.
- Plan is asymmetrical.
- Plan is force to fit into the land.
- Informal garden reflects naturalistic effect of total view and represents natural beauty.
- Road path are made curvaceous and bending.

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.

3. Free style of gardening

- In Free style gardening best of both formal and informal styles are selected to secure the most picturesque effect.
- Rose garden of Ludhiana is example of this garden.

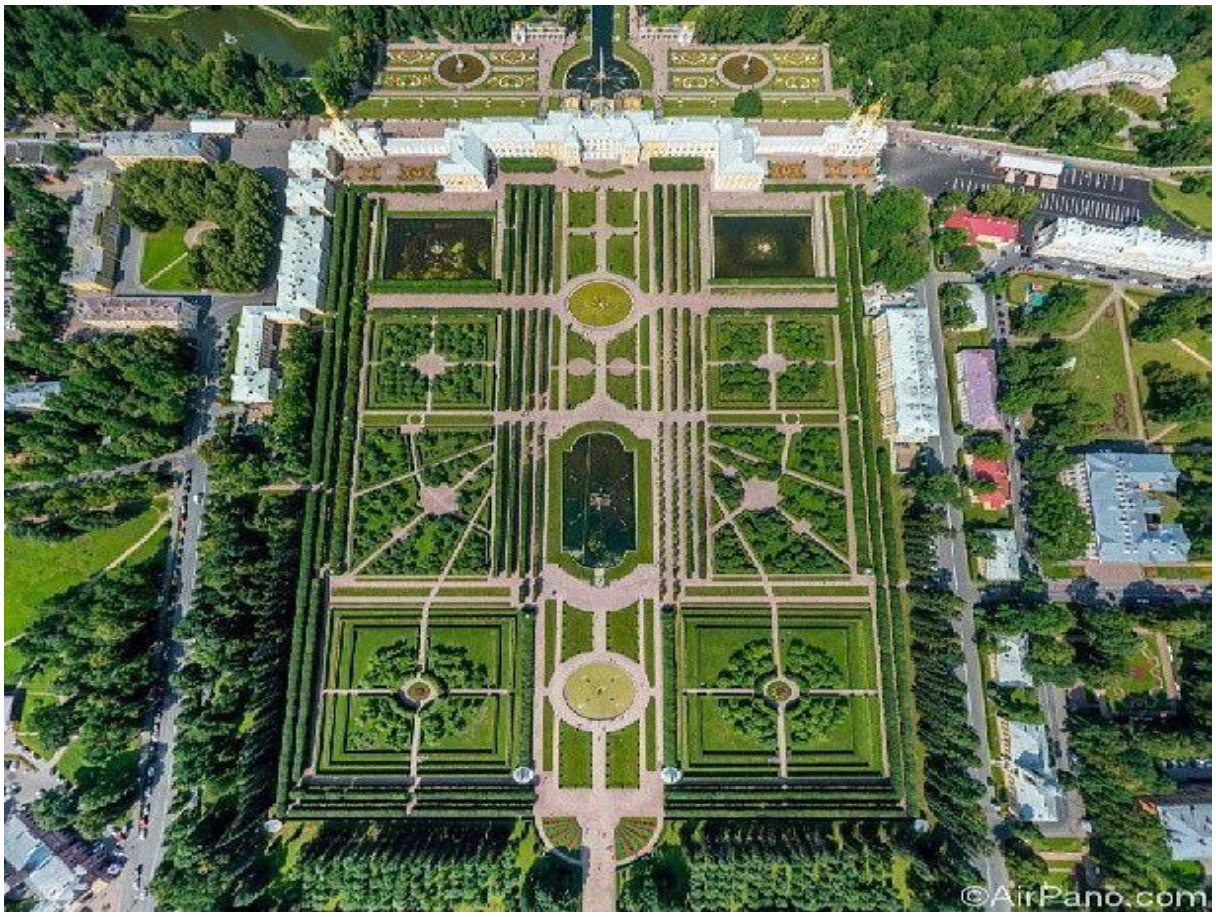
Special type of garden

A. Wild garden

- This is comparatively a recent style of gardening.
- Sir William Robinson was the first person to develop wild garden in the last decade of the nineteenth century.
- In free style gardening best of both formal and informal styles are selected to secure the most picturesque effect, whereas, in wild style gardening no rules are followed but aim is to make the garden beautiful and natural.

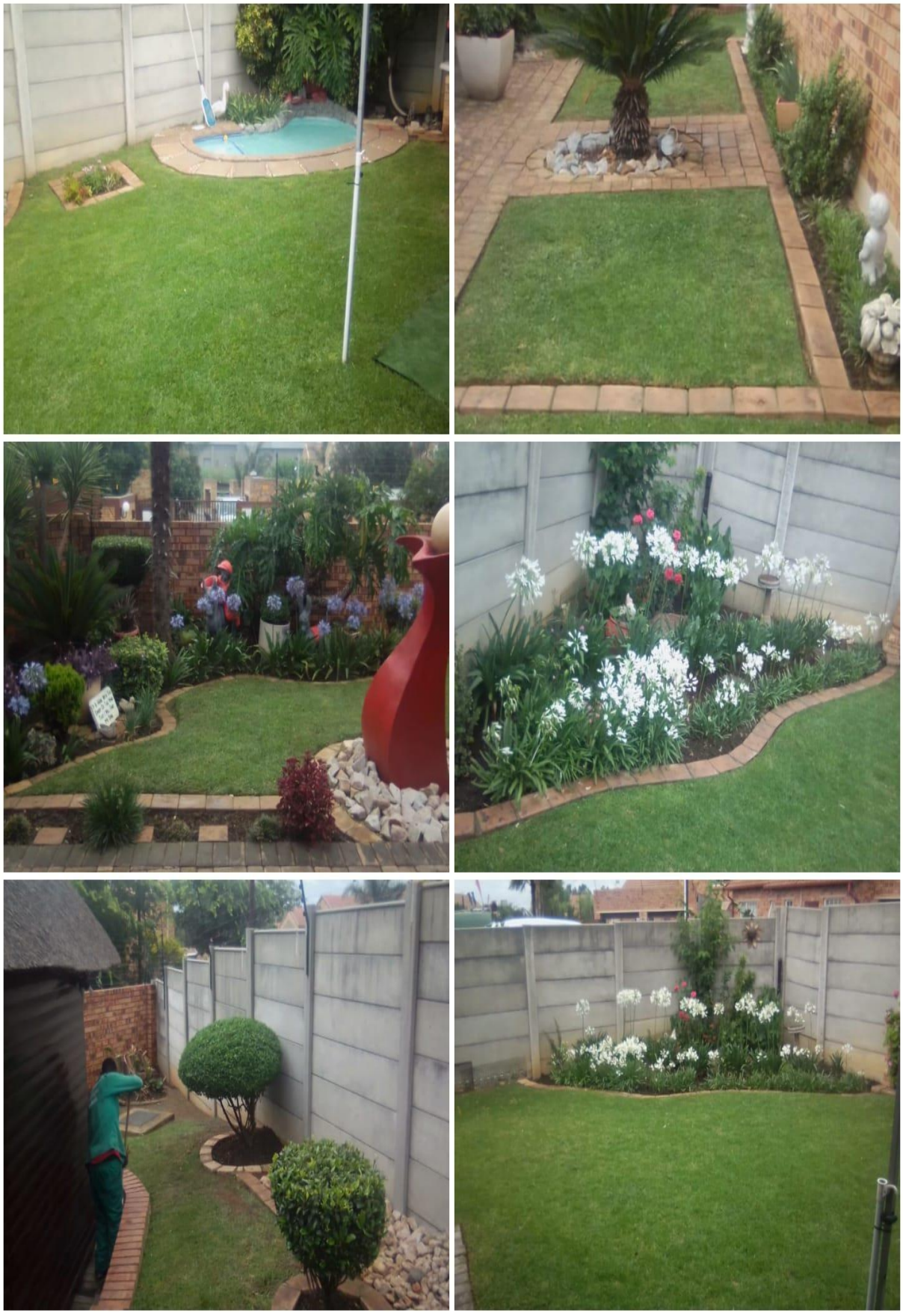
B. Cottage garden

- The cottage garden is a distinct style that uses informal design, traditional materials, dense plantings, and a mixture of ornamental and edible plants.
- The earliest cottage gardens were more practical than today's, with emphasis on vegetables and herbs, fruit trees, perhaps a beehive, and even livestock. Flowers, used to fill spaces, gradually became more dominant.
- G. Jekyell gave the concept of cottage garden.



Formal styleof garden

Informal style ofgarden

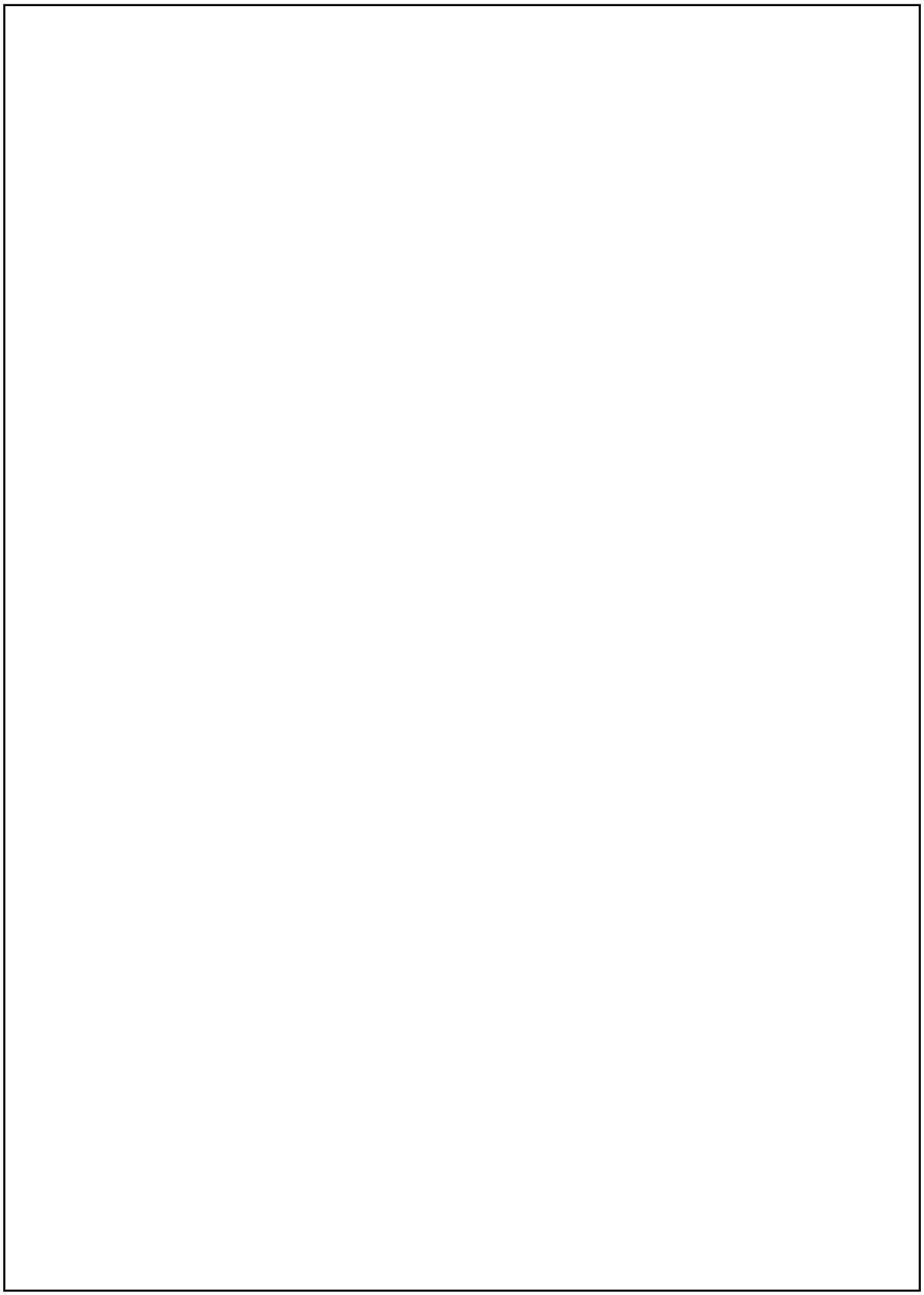


Free style of gardening

Wild garden

Cottage garden

Observation Recorded



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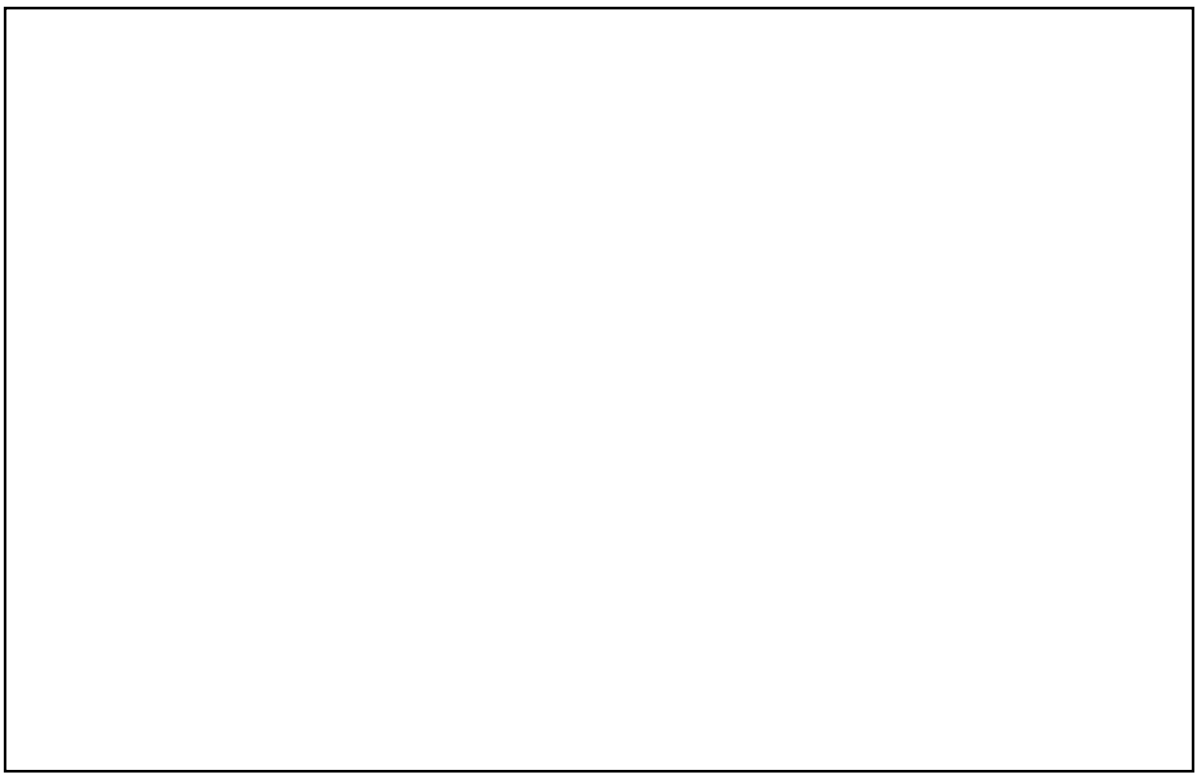

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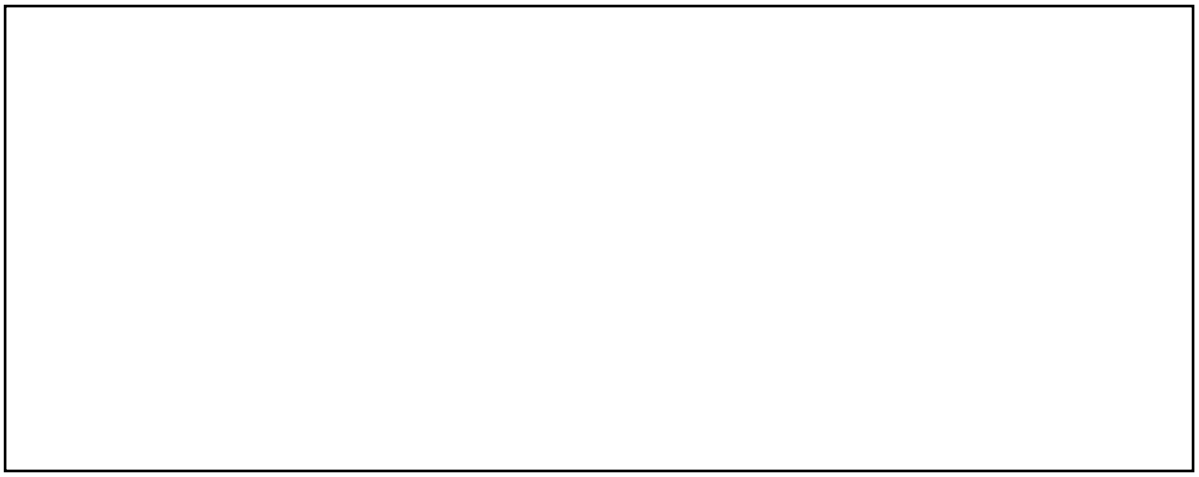

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Experiment No.8: DESIGNING OF CONSERVATORY AND LATH HOUSE

Aim of the Experiment- To study about designing of Conservatory and Lath House.

Designing of Conservatory

The plant growing structure like hot beds, cold frame, green house etc. exclusively useful only in temperate countries where winter is severe and the growing season is very much short. Therefore, the objective of green house in tropics (except in the hill) is not to protect the plants from cold but rather form the fierce sun's ray and strong winds, while also maintaining a fairly uniform and moist atmosphere. There are numerous kinds of ornamentals plants with beautiful foliage or flower or both, which cannot thrive in the open, exposed all the day time to sun and wind. The delicate ferns, graceful anthurium, alocasia, bright colour caladium, wonderful orchids and several other plants require a reasonable amount of shade and protection from the sun and hot or cold breezes. Therefore, for successful culture of the above kinds of plants, a green house is essential in a tropic. This plant growing structure is also known as fernery or conservatory. A conservatory is usually built on a slightly elevated area. A short masonry wall, 75 to 90 cm high, can be constructed all-round the fernery and enclosing it leaving gaps for entrance. The roofing is supported by stone pillars or iron or concrete posts and consist of strong frame work of iron girders and stout iron rods supporting a galvanized wire netting for the creepers to spread upon. Till the light creepers like *Antigonon leptopus* or *Ipomoea palmata* cover the roof, plaited coconut leaves may also be used to cover the top of the fernery. Humidity in the conservatory is increased by providing a small pool at the centre.

A glass house in the hill station of tropics provides ideal environmental conditions to grow tropical ornamental plants, orchids, cacti and succulents.

A conservatory is a glass and metal structure traditionally found in the garden of a large house or public park. Modern conservatories are smaller, can be made of PVC and are often added to houses for home improvement purposes. Whereas, a greenhouse is a structure with a glass or plastic roof and frequently glass or plastic walls; it heats up because incoming solar radiation from the sun warms plants, soil, and other things inside the building faster than heat can escape the structure. Air warmed by the heat from hot interior surfaces is retained in the building by the roof and wall. These structures range in size from small sheds to very large buildings. A garden conservatory is usually a small conservatory usually attached to a private house. In this context, a conservatory is distinguished from a greenhouse in having a role as a living space as well as being used to grow plants. If the space is not used to grow plants, is it best described as a solarium

There is actually very little difference between a greenhouse and a conservatory structurally but these differ as to the use to which they are put. Originally and etymologically the term greenhouse meant a house in which plants are kept there to grow. But sometimes a greenhouse may be used for a different purpose also. For example, in severe winter many plants are kept inside for winter protection only and are not likely to grow. The Americans use the term

greenhouse to mean any type of glass building inside which plants are grown, except the structures such as cold frames and hotbeds. In England, the term is defined as a glass structure in which plants not requiring a high temperature are cultivated or displayed. In a greenhouse, plants are exclusively grown in pots and tubs. According to the British terminology it has wide application as it may include houses in which plants are grown from seed to its maturity, or may mean a house exclusively used for displaying plants which were grown up to the flowering stage in another house.

A conservatory differs from a greenhouse in which permanent plants are planted in central beds and the side beds are used for continuous floral display. A conservatory is situated very near the dwelling house and should actually be included in the same architectural plan. This may be connected with the house by a corridor or a pergola. In India conservatory is also known as Fernery as in olden days ferns occupied predominant position in such houses.

It will be seen from the above discussion that there is no one terminology which will include all the glass plants houses. Some people may use the term glasshouse to include these but there are other glasshouses also in which plants are not grown. Hence, the best terminology is greenhouse meaning a structure use d for growing living or green plants.

In most parts of India, a greenhouse and conservatory or fernery, as it is called popularly, is meant for providing shade and cool temperature for the plants growing within it. A greenhouse provides a cool and pleasant retreat for the dwellers and friends in the hot summer. In high hills, a glass greenhouse is necessary to grow the more tropical plants to protect them from severe cold weather.

Designing of Lath House

It is a structure erected primarily to create shade to raise tender plants and to protect the plants from high temperature and light intensity, agro-nets of different shading intensities are used for erecting lathhouse.

By controlling light intensities, the lathhouse reduces moisture stress and decreases the water requirement of plants. Generally, wood or iron poles are used to erect support. Through these poles, crisscross arm of support is stretched. Over this support, agronets are covered. Mostly woven plastic materials are used in manufacturing of agro nets to provide shade. Agro nets are light weight materials and can be used on heavy wire fastened to supportive poles.

Under Indian climatic conditions, the term greenhouse includes a glasshouse for plants and any other structure including Lath house for growing shade loving or greenhouse plants. In the tropical plains of India hardly any glasshouse is used for growing plants except for researches on plant viruses. Even if glass structures are made say for growing cactus and for breeding purposes it is generally only the roof which is made of glass and the sides are covered with fine wire-mesh. Otherwise, a full glasshouse has to be air-conditioned to keep it cool during the summer months.

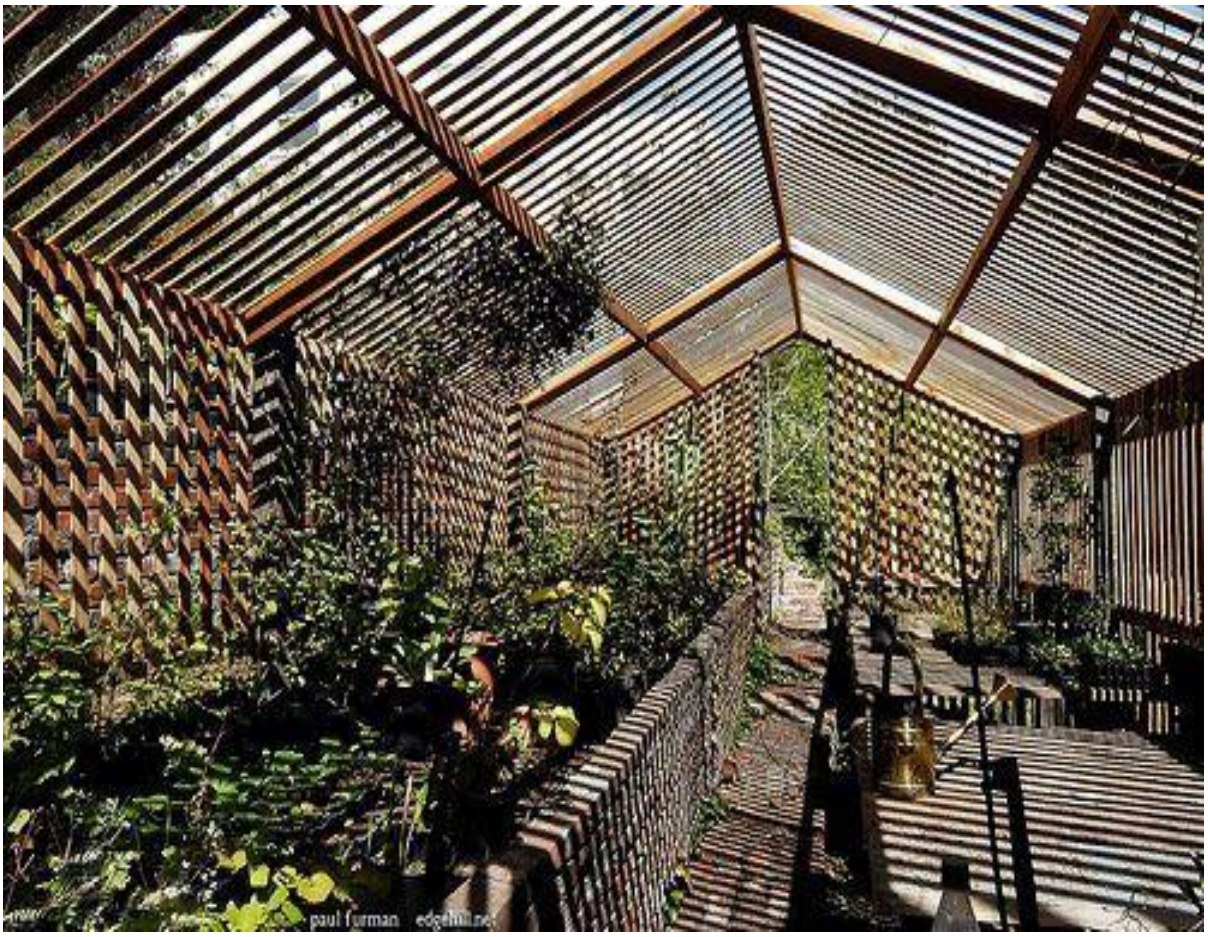
The glass used for a greenhouse works as a selective transmission medium for different spectral frequencies, and its effect is to trap energy within the greenhouse, which heats both the plants

and the ground inside it. This warms the air near the ground, and this air is prevented from rising and flowing away. This can be demonstrated by opening a small window near the roof of a greenhouse, the temperature drops considerably. This principle is the basis of the auto vent automatic cooling system. Greenhouses thus work by trapping electromagnetic radiation and preventing convection. A miniature greenhouse is known as a cold frame.

Lath house is a valuable asset in raising seedlings, rooted cuttings, and young rhododendron plants prior to setting them out in the garden. Properly used, it will modify the environment in which they are growing by offering protection from hot, drying summer winds, reducing the intensity of the sunlight, lowering temperatures, and by maintaining a higher humidity. During December, January and February, the sides may be covered by plastic sheeting, which will furnish additional protection from the winter cold.

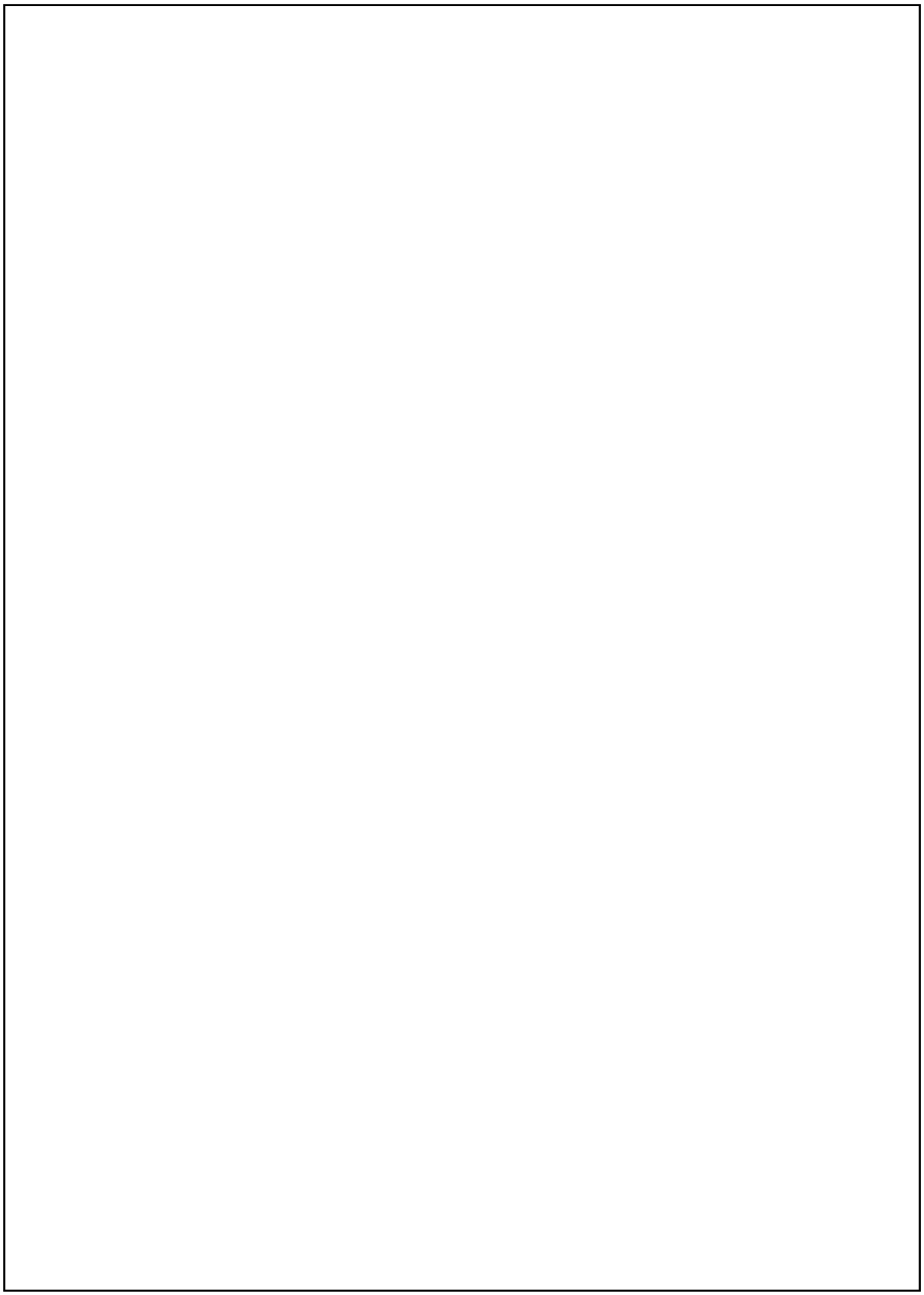
Under Indian climatic conditions, the term greenhouse includes a greenhouse for plants and any other structure including lath house for growing shade loving plants.

Designing of Conservatory



Designing of Lath House

Observation Recorded



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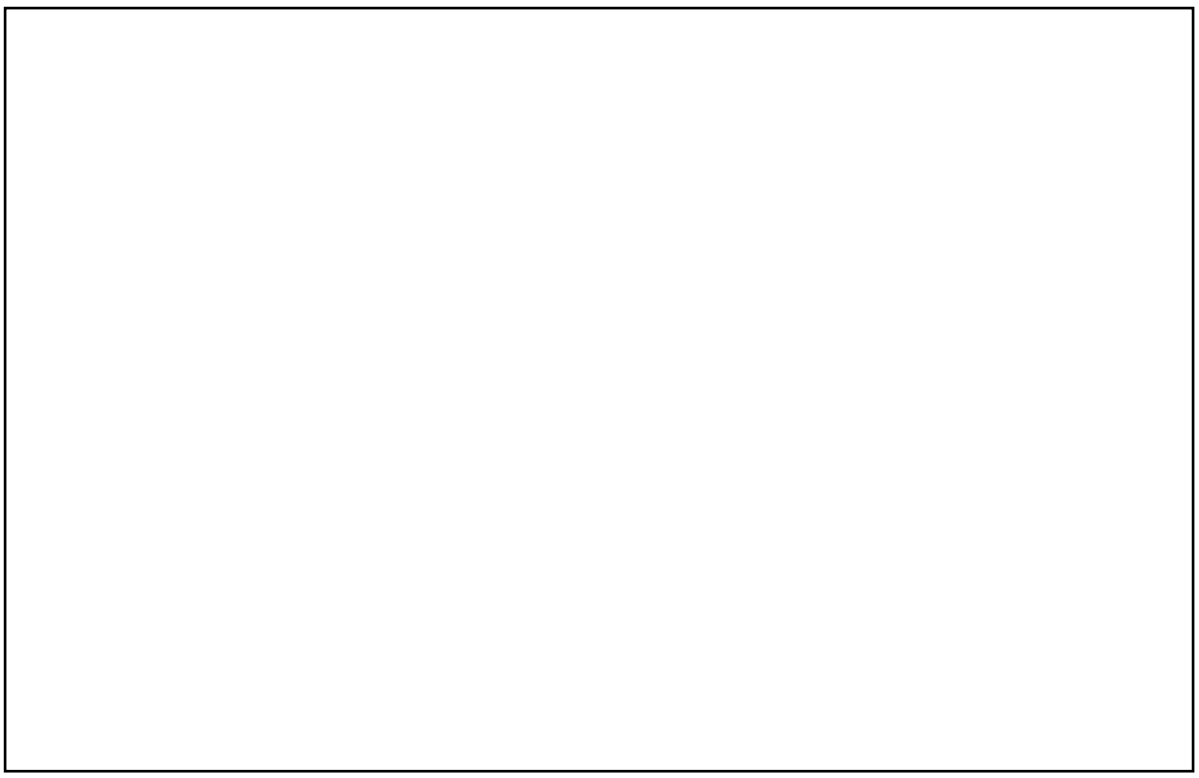

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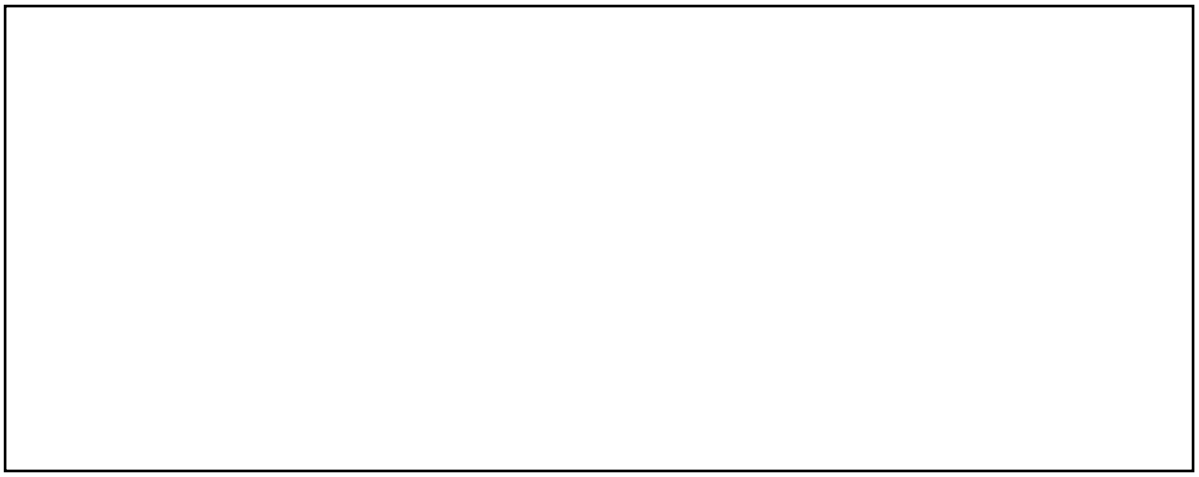

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Experiment No.9: USE OF COMPUTER SOFTWARE

Aim of the Experiment- Use of Computer Software to designing a Plan for Landscape

A garden is a versatile outdoor living place. All the plant and non-plant components in a garden are to be in a perfect scale with each other so as to bring an authentic display. This needs an ideal design or plan that suits the respective environment. Design plays a major role in any garden plan, since the aesthetic and utility values of the garden are achieved through this.

Usually developing or designing a garden plan for a small area is always been a challenging task than designing for a larger or open area for any professional designer since it requires more creativity. So obviously, landscape architects or the horticulturists involved in garden designing needs good aesthetic, creative, scientific, thematic and computer skills to make an ideal garden plan to match the specific locality. The contemporary garden designs in this digital era have revealed the importance of the role of computer applications in this arena. The garden plans designed through different/various software are called as 'Compute Aided Designs' or 'CAD'.

Land designer, Land CAD, Garden CAD.....likewise various garden designing software are available in the market. These software are having inbuilt garden designs and models which can be used according to the client's preference. But to bring out a realistic image of the garden design with appropriate scale and magnitude, AUTOCAD (20), ARCHICAD (2D & 3 D), 3D MAX and photoshop are the key software globally used. These software help in developing a perfect design as if like a graph sheet. Among these software, AUTOCAD and ARCHICAD (ARCHITECTURAL CAD) are originally meant for developing engineering drawings and 3D Max is meant for developing 3D models with animation. Since the modern-day landscape gardening is a synergy of science and business, the professionals should acquire working knowledge in handling these software so as to develop garden designs which are competitive in all domains.

The following details have to be drawn by students through using AUTOCAD software

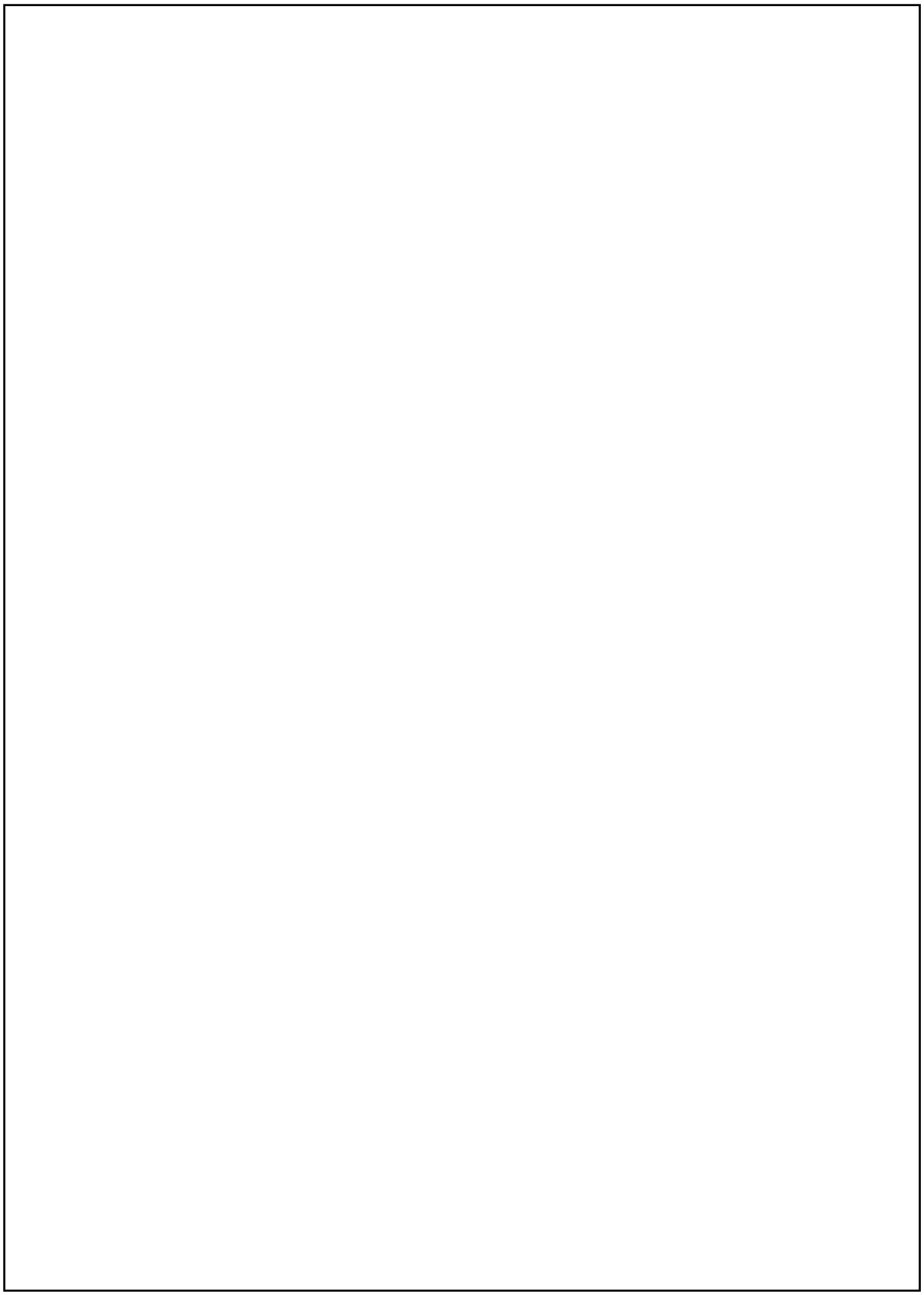
How to draw basic features like Line, Polygon, Rectangle, Circle, Arc, etc.?

How to used Modifying Tools like Erase, Move, Copy, Extend, Trim, Array, Rotate, Break, Mirror, Scale, Explode, etc.?

How to used File handling functions like Save, Close, Open, etc.?

How to add Text properties into a design and other function?

Observation Recorded



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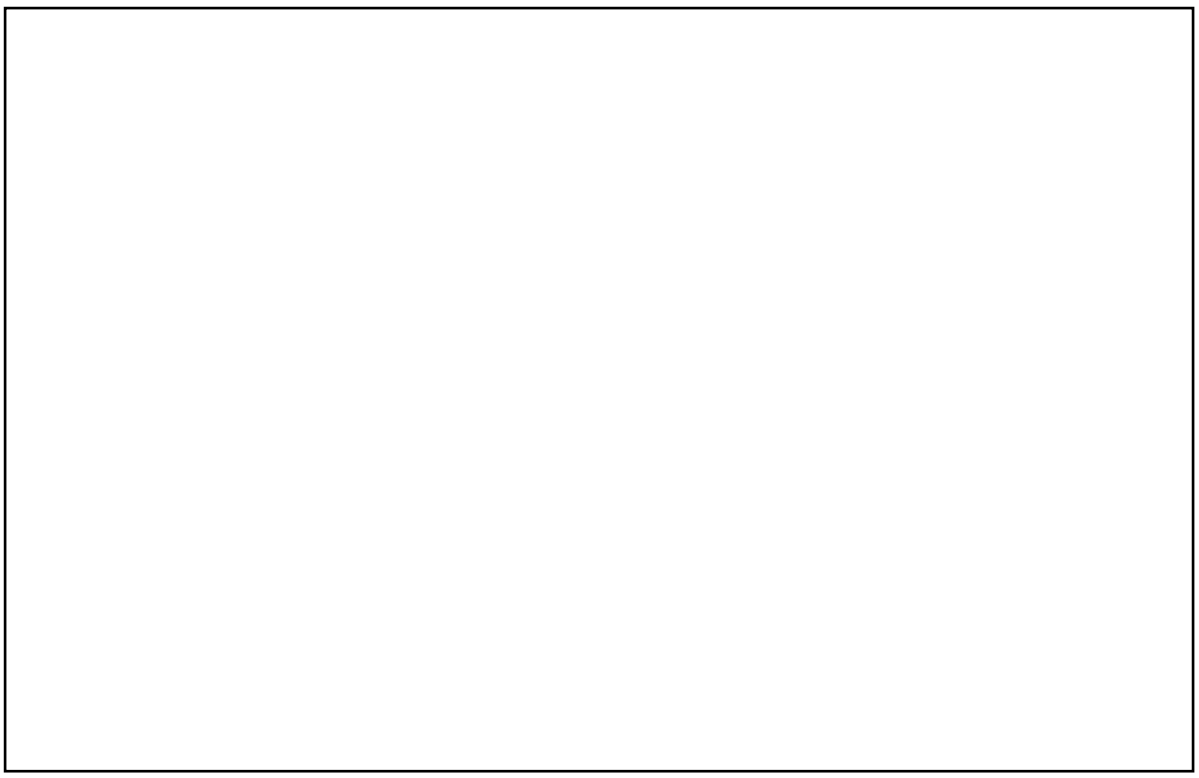

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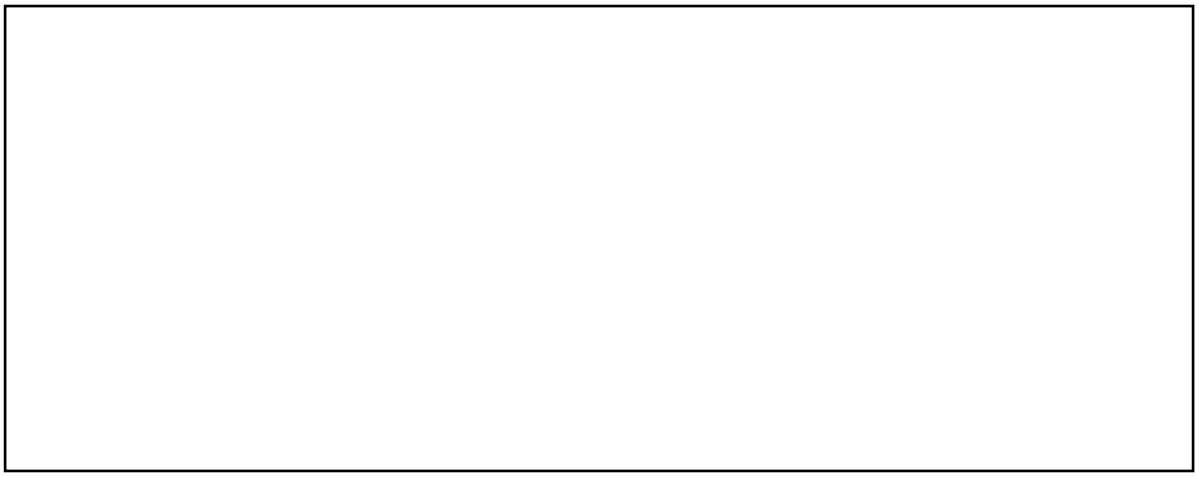

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Experiment No.10: VISIT TO IMPORTANT GARDENS/PARKS/INSTITUTES

Aim of the Experiment- To study about details of Garden/Park/Institutes.

Popular Gardens in India

- **Lal Bagh, Bengaluru (Karnataka)**
  - 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.
  - The most attractive features of the garden-
  - A large glasshouse- annual flower show is held, used for holding important meetings, conferences and for receiving important dignitaries.
  - The tall majestic looking Araucarias, especially Araucaria excelsa (Syn. A. Cookii)
  - Ficus benjamina near the glasshouse
  - Three species of the flowering tree Tabebuia namely, Tabebuia argentea, T. avalandii and T. Spectabilis.
  - Collections of foliage plants, pergolas, arbours, statues, fountains, water garden, the aquarium, the rose garden and the natural rock formations.
  - The total area of the garden is about 50 hectares.
- **Brindavan Gardens, Mysore (Karnataka)**
  - The garden lies adjoining the Krishnarajasagara dam which is built across the river Cauvery and Cauvery divides the garden into two parts, therefore, visitors enjoy a boat ride in the river. The work on laying out this garden was started in the year 1927 and completed in 1932. It is 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.
- **Government Botanic Gardens, Ootacamund (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.

❖ **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.
- 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 completed in 1929 and was officially inaugurated in 1931. It was renamed as 'Rashtrapati Bhavan' in 1950. Designed by the British architect Sir Edwin Lutyens. It has 340 decorated rooms and a floor area of two lakh square feet.
- 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 bounded from all sides by a paved red stone path. Two canals run from north to south and two similar canals intersect these to form a 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 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. The garden remains open for about a month for the general visitors during the winter months when the seasonal flowers are in full bloom.

❖ **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, then the 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. The garden is connected with the Dal Lake by a 1.6 km canal which is about 10.8 m wide which is source of running water. On both sides of the canal there are broad green paths lined by majestic chenar trees.
- The garden consists of three terraces- 1st terrace -a baradari and the Diwan-e-Am; 2nd terrace -the Diwan-e-Khas. But unfortunately, 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. 3rd 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 was laid out by Fidai Khan during seventeenth century. The original name of the place Panchapura or Panjpur has association with the five Pandavas of epic Mahabharata. The garden is uniquely laid out in an area of 25 hectares and is divided into six terraces. The garden is situated at the foothills of the Himalayas at an altitude of about 600 m.
- 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. There are three magnificent buildings - the Shish Mahal, the Rang Mahal, and the Jal Mahal
- Paths are decorated with 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. 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. The garden was started in December 1966 and at present about 1,500 named roses are there in the museum.
- 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 been planted with a large number of scented cultivars, which fill the whole area with exquisite fragrance. This garden is a wonderful place to visit.

❖ **Taj Mahal Gardens, Agra**

- The Taj Mahal in Agra is built by the Mughul Emperor Shah Jehan (1592-1666) in memory of Mum Taz, his beloved wife, who died in childbirth., 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, fountains 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 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. A large number of trees and shrubs from temperate countries and also from humid tropics have been successfully introduced here. 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 beautiful scenery.

❖ **The Indian Botanic Garden, Kolkata (West Bengal)**

- The Acharya Jagadish Chandra Bose Botanical Garden (previously, Indian Botanical Gardens, estab-1787) is situated at the opposite side of the river Hoogly. It is under Botanical Survey of India (BSI) of Ministry of Environment and Forests, Government of India. It ranks among the great botanical gardens of the world.
- The gardens exhibit a wide variety of rare plants and a total collection of over 12,000 specimens spread over 109 hectares. The garden has 15,000 trees and shrubs in the open, representing 2,500 species
- The feature which attracts most visitors
    i. The giant 200-year-old banyan tree (Ficus benghalensis) and the large collection of palms with a pond in the foreground.
    ii. The garden has 26 lakes.
    iii. Giant lily (Victoria regia)- giant disc-like leaves, leaves floating on the surface of water can withstand the weight of a baby.
    iv. The palm houses, orchid houses, and ferneries house several thousand herbaceous plants.
    v. The Royal Palm Avenue near the

❖ **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 further 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 bioaesthetics. 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 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.

Details to be collected by students

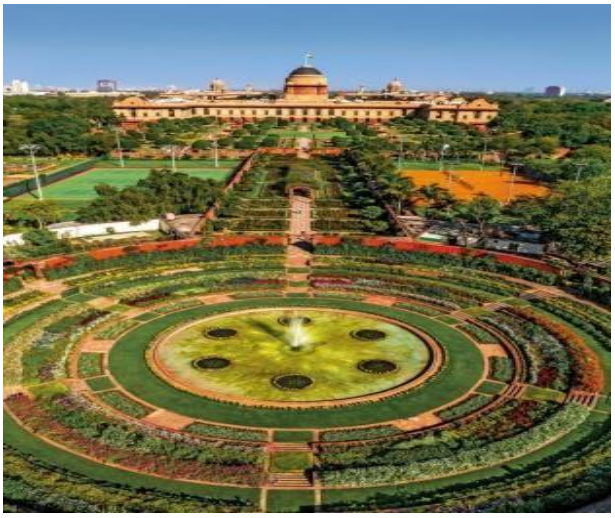
- Overall objective / purpose of the garden
- Area of garden
- Agroclimatic aspects and topography
- Gardening style adopted
- Plant components
- Non-plant components
- Garden principles adopted

Lal Bagh, Bengaluru (Karnataka)

Brindavan Gardens, Mysore (Karnataka)

Government Botanic Gardens, Ootacamund (Tamil Nadu)

The Bryant Park, Kodaikanal (Tamil Nadu)



Rashtrapati Bhavan Garden, New Delhi

Mughal Gardens of Kashmir

Shalimar Garden

The Mughal Garden, Pinjore (Haryana)

Chandigarh Rose Garden

Taj Mahal Gardens, Agra

The Sim's Park, Coonoor

The Indian Botanic Garden, Kolkata (West Bengal)

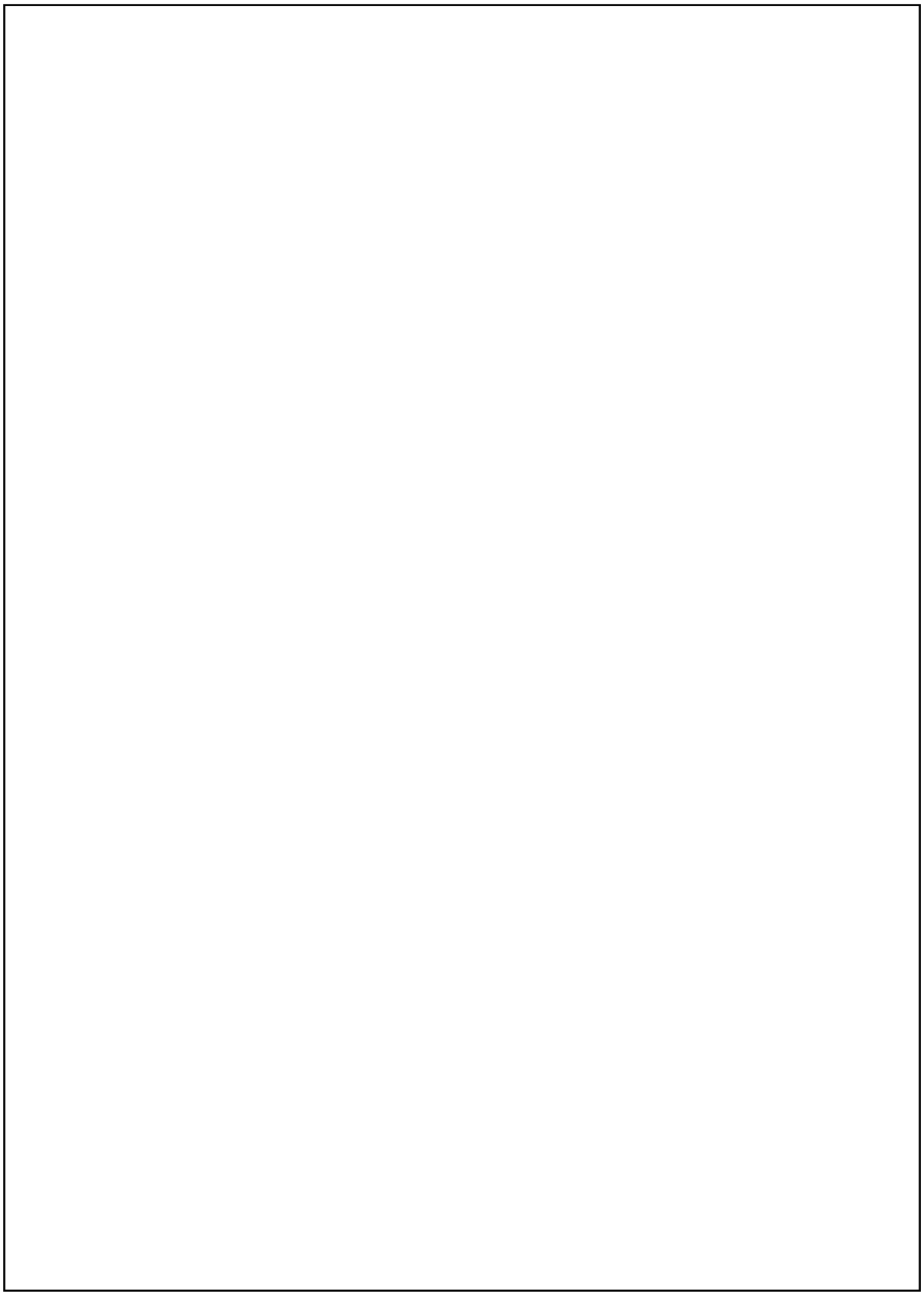
Llyod Botanic Garden, Darjeeling (West Bengal)

National Botanical Research Institute, Lucknow (Uttar Pradesh)

Rock Garden of Chandigarh

The Ramoji Film City Gardens, Hyderabad

Observation Recorded



Conclusion

Remarks

Signature of Student **Signature of Faculty-In-Charge**