

Horticulture &

gardening

**- DR. V. VISHNUPRASAD
(S.Y.B.Sc. Sem-IV Paper-III Unit-I)**

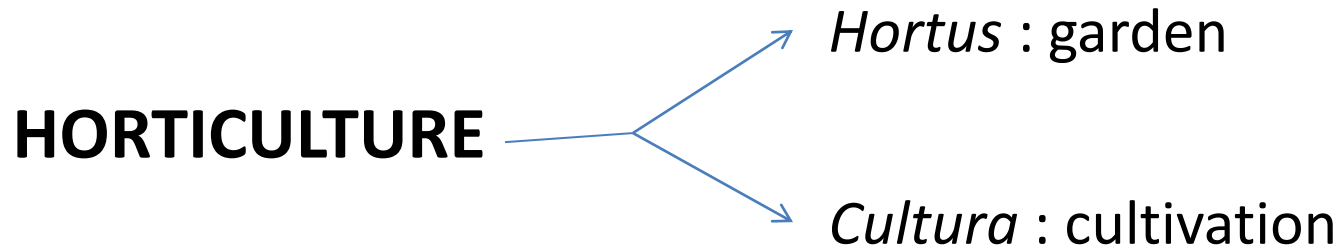
SCOPE OF THE UNIT

- Introduction to Horticulture; Branches of Horticulture
- Bonsai, Dish Garden and Terrarium
- Flower Arrangements – Bouquets, Gajra, Veni, Garland, Floral rangoli
- Types of Gardens – Formal and Informal
- National Park: Sanjay Gandhi National Park
- Veermata Jijabai Udyan (Victoria Garden) – Botanical garden

REFERENCE BOOKS

1. Fundamentals of Horticulture – Edmund
2. Vegetable growing – S. C. Dey
3. Horticulture and plant breeding – V. Kumaresan
4. Principles of Horticulture – S. Prasad
- 5. Textbook of Horticulture – Manibhushan Rao**
6. Horticultural, medicinal and aromatic plants – D. K. Sharma
7. Ornamental Horticulture – Vishnu Swarup
8. Horticulture – V. L. Sheela
9. Introduction to Floriculture – Larson
10. Vegetables - B. Chaudhury
11. Flowering trees - M. S. Randhawa
12. Horticulture of everyday life – K. A. Denisen

INTRODUCTION



“Science and art of cultivating, processing and marketing of fruits, vegetables, nuts and ornamental plants”

- As a general term, it covers all forms of **garden management**, but in ordinary use it refers to **intensive commercial production**.
- Scholars have been writing about horticulture for centuries, including **ancient Greek and Roman scholars**. Among the Romans, Cato the Elder, Varro, Columella, Virgil, and Pliny the Elder stand out.
- **Virgil**, better known for his *Aeneid*, set down his reflections on horticulture in the *Georgics*. As a poet, his work on the subject is appreciated more for the way he related the information than for the factual content.



BRANCHES OF HORTICULTURE



➤ **Pomology**

➤ **Olericulture**

➤ **Floriculture**

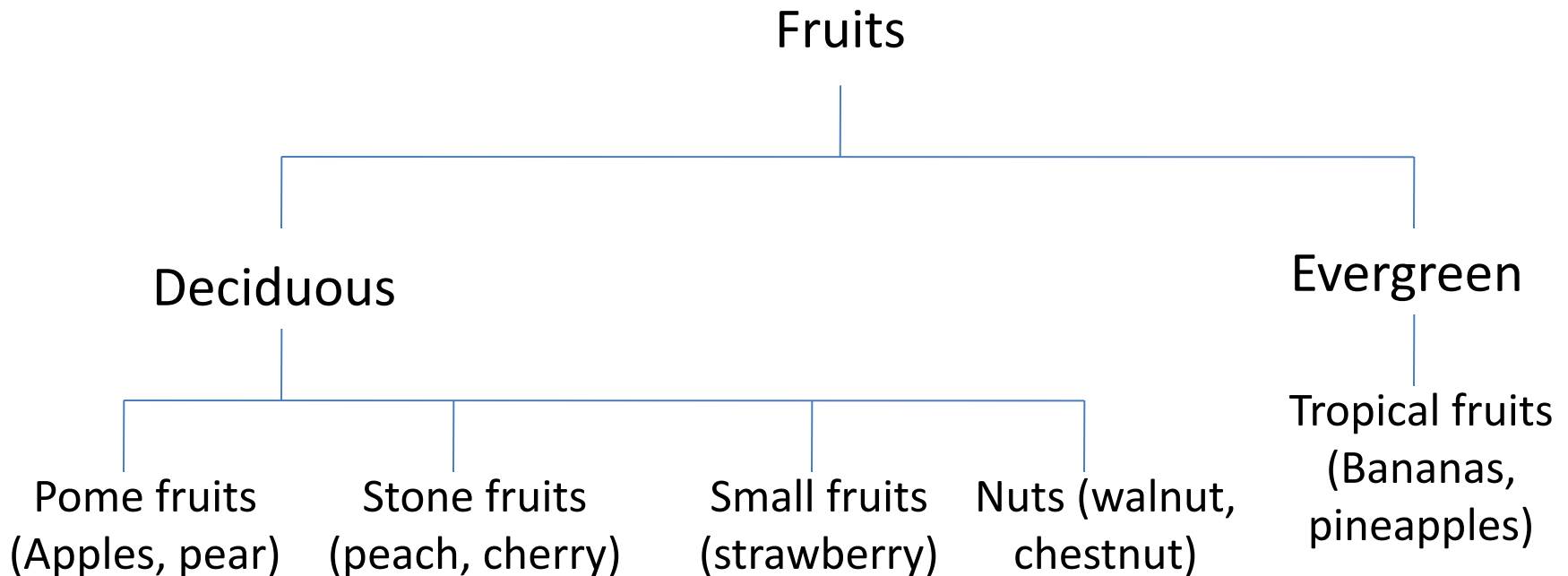
➤ **Nursery culture**

➤ **Landscape gardening**

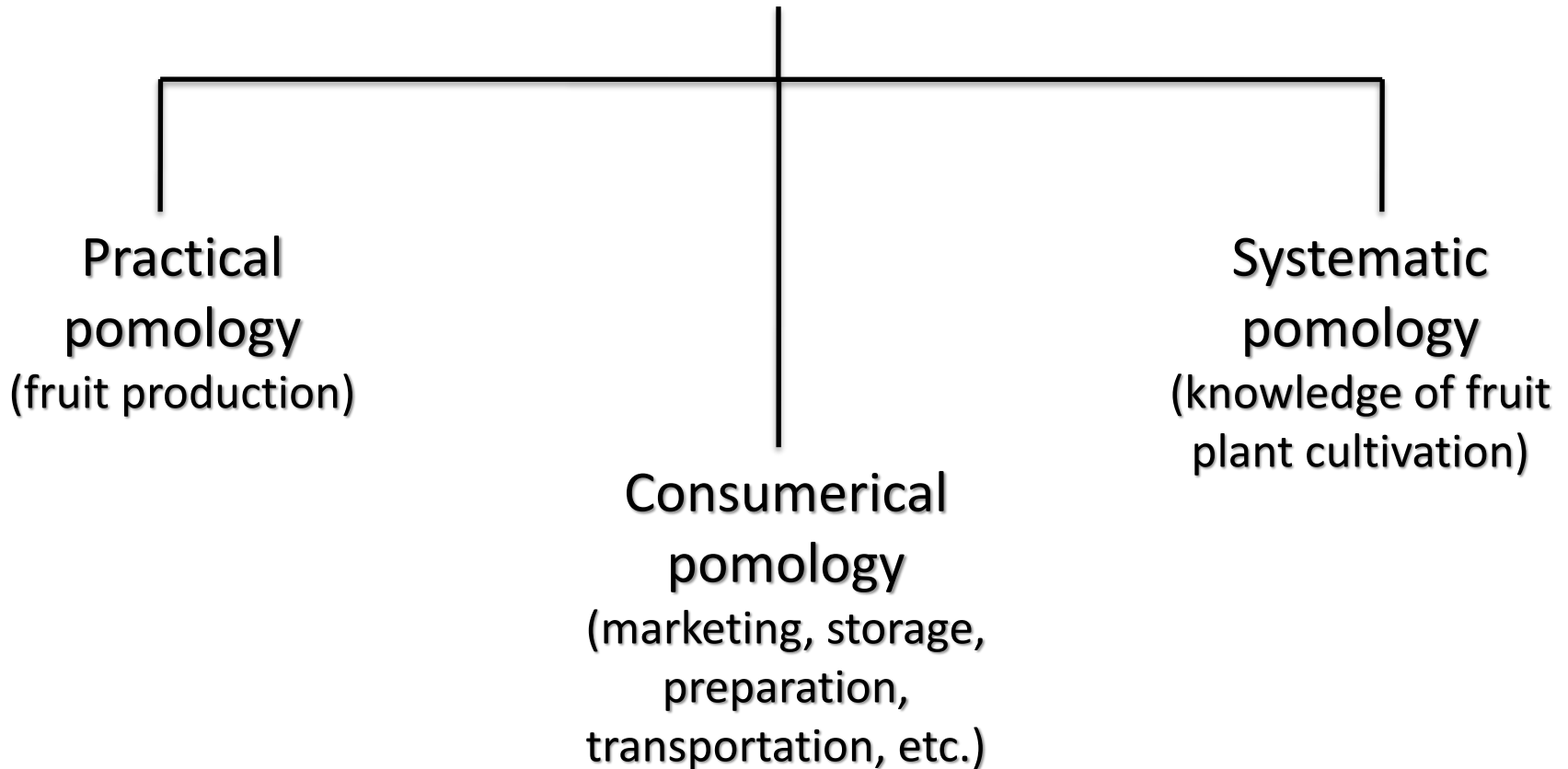


POMOLOGY

- Study of **fruit production** and **marketing**
(*pome* : fruit; *logy* : branch of learning)
- Workers are called **pomologists**
- First developed in **USA**



CLASSES OF POMOLOGY

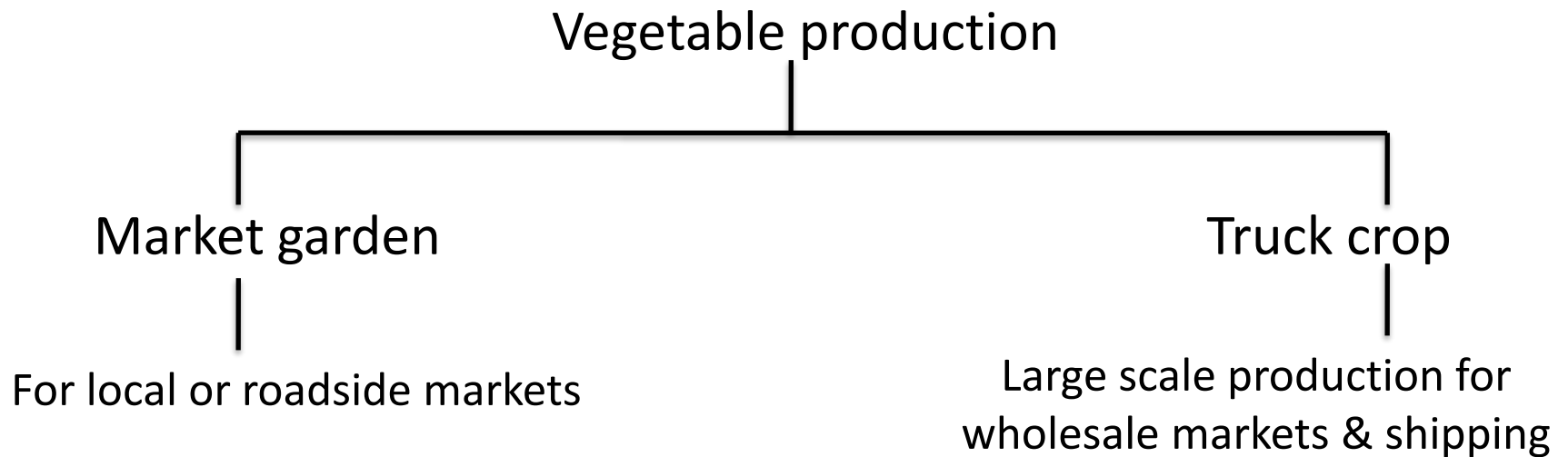


Popular Indian Fruits in the market



OLERICULTURE

Production and marketing of vegetables, either fresh or processed. (vegetable : edible portion of herbaceous garden plant)



For an olericulturist:

- **Precise timing is important**
- **Many skills required**
- **Knowledge and understanding**
- **Abundant supply**

KNOWLEDGE REQUIREMENTS FOR VEGETABLE AND FRUIT GROWING

- Soil requirement
- Climatic requirement
- Water requirement
- Phenology of crop
- Manuring and fertigation
 - Sowing methods
- Training, pruning, weeding, etc
- Disease and pest management
 - Harvesting methods
 - Post-harvest storage
- Processing and packaging
 - Marketing

Popular Indian vegetables in the market





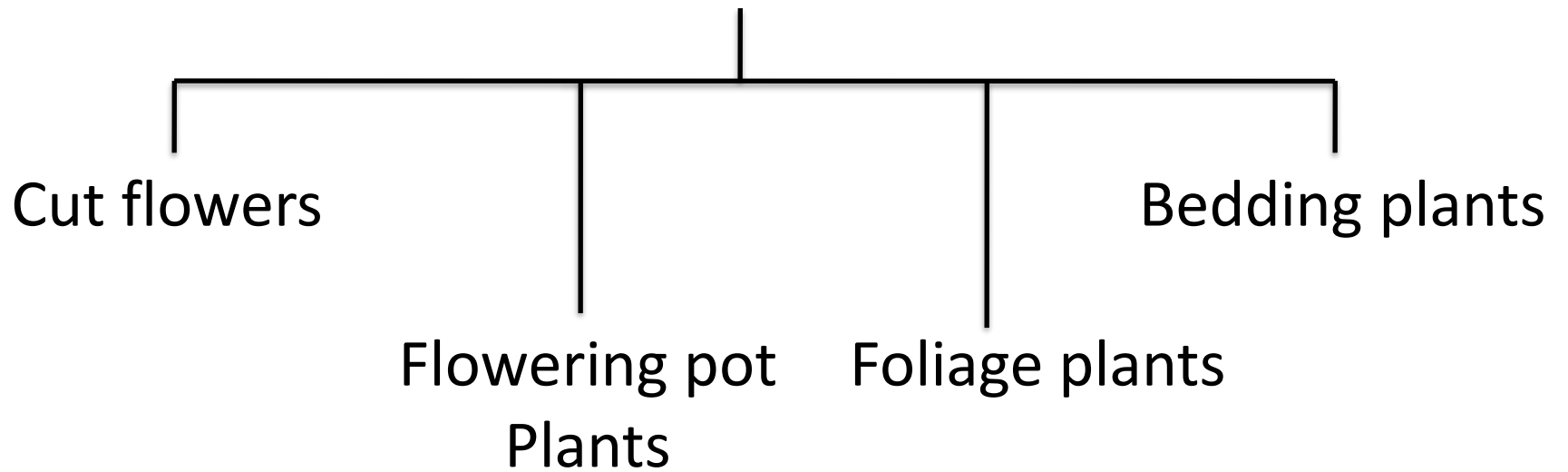
floriculture

Practices and operations relating to growth of plants cultivated for their flowers or foliage

SIGNIFICANCE OF FLOWERS

- Integral part of life for **expressing emotions**
- Quite significant in **religious context**
- **Aesthetic** value
- **Floral ornaments** (gajra, veni, bouquet, etc.)
- **Export** earns lot of foreign exchange

FLORICULTURAL PLANTS



Cut flowers



roses



carnations



orchids

Flowering pot plants



Easter
lily



poinsettia



begonia

Foliage plants



Philodendron



ferns



palms

Bedding plants



Petunia



marigolds

FLOWERS GROWN IN GREENHOUSES



HARVESTING OF FLOWERS



LAVENDERS



ROSES



GERBERAS



JASMINE

PACKAGING OF FLOWERS



COLD STORAGE FOR FLOWERS



FLOWERS IN THE MARKET.





NURSERY MANAGEMENT

Nursery

- ❑ Nursery is the place where planting materials are raised either by seeds or by vegetative means with care before transplanting at desired site.
- ❑ The word 'nursery' is also used sometimes for young saplings raised by seeds.
- ❑ Often, we consider the nursery management and the plant propagation are same, though they are altogether different but inter-related.
- ❑ In fact, mass multiplication of quality planting materials is the central theme of nursery management but nursery management is a trade-oriented dynamic process, which refers to efficient utilization of resources for economic returns.

TYPES OF PLANTS GROWN IN NURSERY

- Fruit trees
- Ornamental plants
 - Annuals
 - Biennials
 - Perennials
- Young trees
- Evergreen trees

The main phases of nursery management are

- ❑ Planning edaphoclimatic and socio-economic considerations;
- ❑ Demand for planting materials
- ❑ Provision of mother block
- ❑ Requirement of land area
- ❑ Proper layout
- ❑ Water supply
- ❑ Working tools
- ❑ Growing structures and inputs availability
- ❑ Accessibility
- ❑ Trained man power
- ❑ Plant protection
- ❑ Disposal of planting materials etc

NURSERY OF ORNAMENTALS



NURSERY OF YOUNG TREES



NURSERY OF AQUATIC PLANTS



Production Nurseries

Retail

- Generally smaller in size-50 acres or less.
- Usually sell to the ultimate user- mostly homeowners.
- Often offer other related products.
 - Fertilizers, media, and other supplies.

Wholesale

- Usually larger operations.
- Sell in volume to industry related customers .
 - "Big Box" garden centers.
 - Municipalities.
 - Landscape contractors and others.

Wholesale Specialty

- Typically produce products to sell to other wholesale nurseries to grow on.
 - Rooted cuttings
 - Seedlings
 - Liners and tissue culture.

Greenhouse Crops

- Floraculture crops -selling mainly to retail stores.
- Vegetable starts
- Cut flowers to wholesale distributors.

LANDSCAPE GARDENING

LANDSCAPE GARDENING

Use of ornamental plants and other elements to fulfill aesthetic and functional purposes.

- Helps to **beautify** a given area
- Due to enhancement of property, it becomes an **integral part** of home construction
- Professionals called as **landscape architects**

GOALS OF LANDSCAPE GARDENING

- **Privacy**
- **Safety**
- **Ease of maintenance**
 - **Convenience**
 - **Comfort**
 - **Flexibility**

OTHER MODERN GOALS

- To enhance the aesthetic appeal
- To increase the property value
- To blend the concrete and architectural creations with the natural scenery
- To create recreational grounds
- To reduce noise and environmental pollution

... and many specific desirable goals..

PLACES WHICH CAN BE LANDSCAPED



OUTSIDE HOMES



RESIDENTIAL COMPLEXES



SHOPPING MALLS



PARKS AND RECREATIONAL AREAS

IMPORTANCE OF HORTICULTURE

1. Horticulture is an intensive subset of agriculture that deals with flowers, landscape plants, vegetables, and fruits.
2. Today, horticulture is focused on finding new and environmentally-responsible ways of managing plants and pests to help increase crop and ornamental plant viability.
3. Plants are also very important in environmental protection.
4. They are used to re-vegetate and restore land disturbed by human or natural activities, they control erosion, and they help to clean the air and water.
5. Plants also have an important role in the beautification of urban and rural landscapes and recreation areas.
6. Horticulture is socially important because it improves how we use plants, for food and other human purposes, as well as repairing the environment and personal aesthetics.
7. There are several direct and indirect job opportunities in the field of horticulture. One can be a greenhouse manager, nursery manager, florist, flower grower, researcher, extension officer, sales or marketing officer, teacher, farm manager, etc. Other supporting or service industries also offer good job opportunities.

MORAL OF THE STORY

Horticulture offers a wide arena of choices based on one's interest, dedication and skills and provides guaranteed benefits in terms of demand, scope, economy, prosperity if one decides to use one's knowledge to the best of the mankind as well as the environment. An aesthetic appeal is the only required taste!

QUICK REVIEW!

1. The art and technique of vegetable cultivation is known as _____.
2. Flowers are mainly in demand for their attractive and fragrant _____. (thalamus / sepals / petals)
3. Aesthetic appeal can be added to an area with the help of proper and planned _____.
4. *Gerbera* is an example of _____ in floriculture. (bedding / cut flowers / foliage plant)
5. _____ is an important factor for landscaping. (shape / symmetry / colours)
6. _____ is / are available in a nursery. (soils / saplings / baskets / all of these)
7. Fruit cultivation is a specialized branch of horticulture known as _____.
8. _____ is a good foliage plant. (*Chrysanthemum* / *Philodendron* / Marigold)



BONSAI

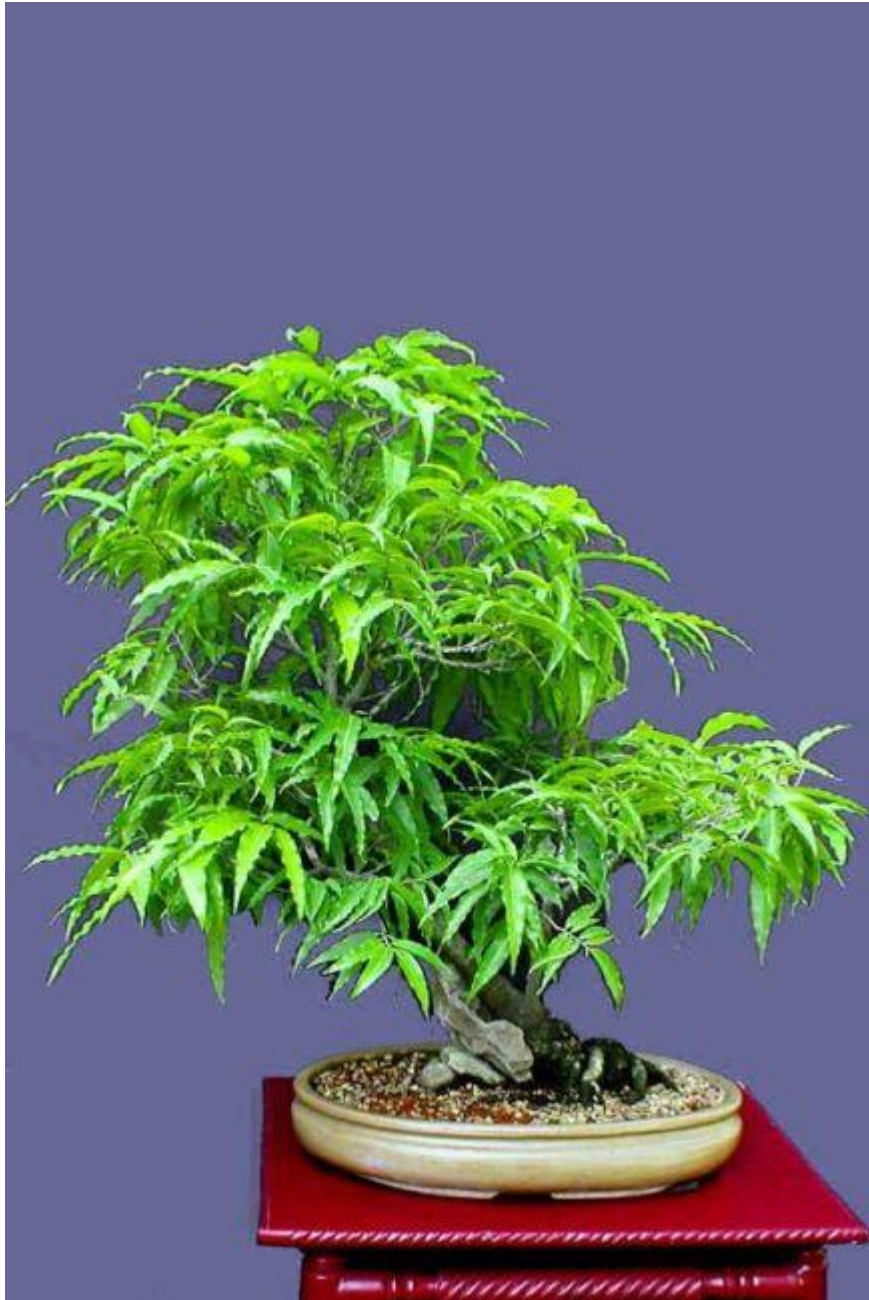
- *bon* – shallow container; *sai* – planting
- derived from an ancient Chinese horticultural practice, part of which was then redeveloped under the influence of Japanese Zen Buddhism
- ultimate goal of growing a Bonsai is to create a miniaturized but realistic representation of nature in the form of a tree
- Bonsai are not genetically dwarfed plants
- Symbol of Japan's old and new 'compact culture'
- Contribution of late V. P. Agnihotri of New Delhi was remarkable – he perfected a technique on dwarfing common trees and built up a collection of few bonsai specimens

SELECTION OF PLANTS FOR BONSAI

- Should be an **ornamental plant**
- Attractive **fruit**, decorative **foliage**, **floral** display or **elegant** form
- Must be **sturdy**
- Long **life span**
- **Withstand** the climatic conditions of a place
- The **best preferred** is *Ficus benghalensis*



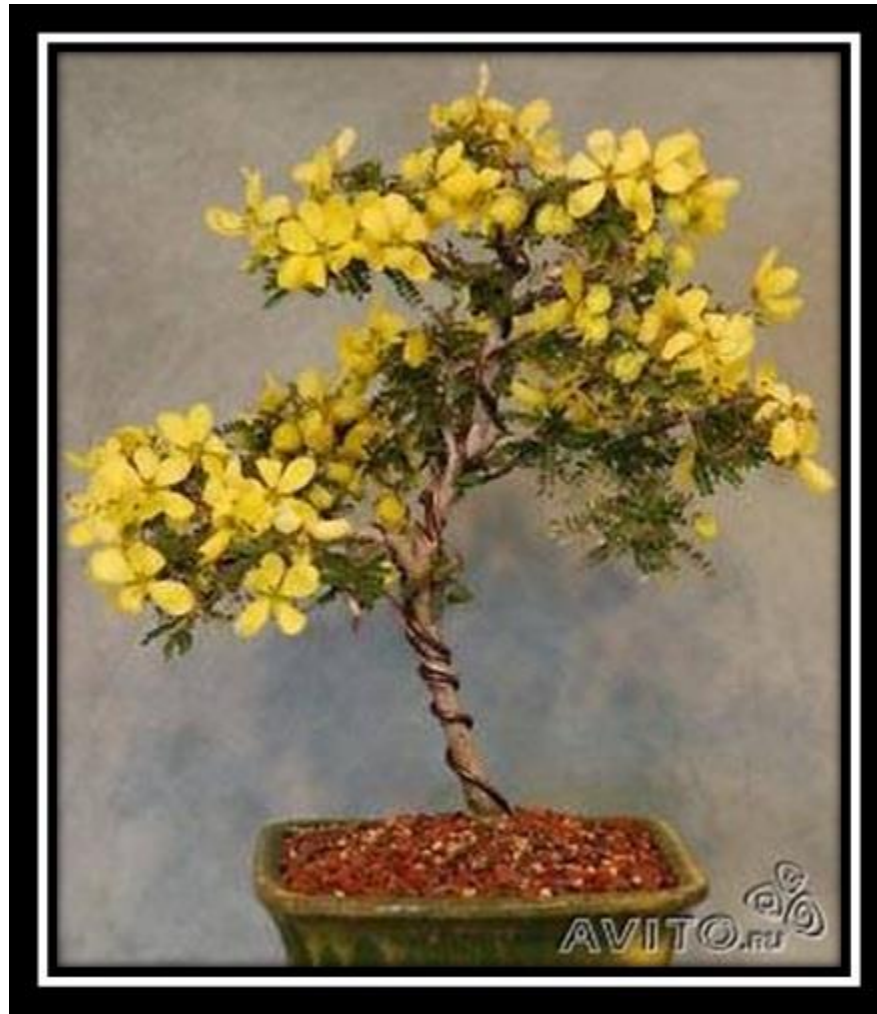
Ficus religiosa



Polyalthia longifolia



Delonix regia



Cassia fistula



Mangifera indica



Punica granatum



Psidium guajava



Acrus sapota



Ixora coccinea



Juniperus chinensis

- Bonsai can be started with young seedlings, plant cuttings, grafts or with air layering of mature trees
- Three important items for a successful bonsai –
 - Choice of the plant
 - Selection of container
 - Type of soil medium used

1. SHEARS



Shears are available in many sizes and shapes. They are meant for cutting twigs, smaller branches, leaves or roots.

2. CONCAVE CUTTERS

Concave cutters are needed for removing branches from the trunk where we want to achieve deepened cuts which will heal without leaving a swollen scar.



3. SAWS AND KNIVES



When branches have to be cut, trunks or roots which are too thick or too hard for using a plier, one should use an appropriate saw. For smoothening the cuts and wounds left by pliers and saws, grafting knives are most suitable.



For removing the rootball from the pot there are special sickle knives and sickle saws which are used to cut along the inside of the pot.



4. ROOT HOOKS AND ROOT RAKES



Root hooks and root rakes, which are available in different sizes and variants, with one, two or three teeth, are used for opening the rootball, carefully combing the roots and removing old soil between the roots.

5. SIEVE SETS

If one uses granular soil components then one should sieve them before use, to separate different grain sizes and remove the smallest, dusty particles.



6. SCOOPS



For filling the soil into the Bonsai pot there are scoops in different sizes which are specially shaped for pouring soil under overhanging low branches.

7. TWEEZER SPATULA

For applying moss or removing weeds etc. one can use a tweezer spatula, which is also useful for pressing wet moss to the soil or for excavating persistent weeds.



8. TOOLS FOR WIRING AND BONSAI WIRE



For wiring a Bonsai tree one needs wire in various diameters, a wire cutter and a plier for bending the wire which is also used for deadwood (jin). Those tools are available in different shapes and sizes.

9. TOOLS FOR BENDING & PROTECTIVE MATERIAL

If one wants to bend branches or trunks very heavily, protective measures are advisable to prevent the wood from breaking and the bark from tearing and to help minor cracks and fissures heal without risking the branch or trunk to die. The traditional method is to wrap wet raffia tightly around the part to be bent before the wire is applied. Fusing rubber tape (wrapped on top of a layer of gauze) or bicycle tube is also suited for this purpose. Thin, transparent rubber tubes (fish tank or infusion hoses) are helpful for protecting trunks, branches and roots where fixation or guy wires are attached. For heavy bending there are tools like ergonomically designed massive steel levers padded with rubber. Special screw clamps, available in various shapes and sizes, can be useful for some purposes. Turnbuckles can help to tighten strong guy wires more and more in intervals. Iron rebar can be used as a lever for bending strong trunks if one uses wooden wedges as a counterpart and guy wires for fixation.



10. TOOLS AND CARVING KNIVES FOR DEADWOOD



The main objective of working on deadwood is that it should look naturally and that no traces of human work should be perceptible. The **branch splitter** is a sharp plier for multiple splitting of dead branches and stumps. For pulling fibers (on conifers with fibrous wood) or breaking of little wood particles (on deciduous trees with less fibrous wood) the **jin plier** is used. A **slim chisel** which should not be too sharp is well suited for lifting wood fibers. Various **loop knives** and **carving hooks** are used for peeling off bark and for carving slight furrows, which should follow the course of the fibers.

11. PRESERVATIVES

For preserving decayed deadwood you can use **wood hardener**, which consists of **liquid plastics diluted in acetone**. The well-known Japanese jin liquid consists of **lime sulphur** which is mostly used for whitening the deadwood but also has some preserving effect.

12. WATERING TOOLS AND WATERING SYSTEMS



For watering a small collection of Bonsai trees a ball-shower or a watering can is fine. There are different shapes and sizes of watering cans, but it should have a fine nozzle and a long neck to produce enough pressure to get the water out of the tiny holes of the nozzle.

STEPS FOR MAKING A BONSAI



1. Selection of plant
2. Removing sapling
- 3, 4. Removing soil around roots
5. Pruning roots
6. Placing roots in water
- 7, 8, 9. Preparing pots
- 10, 11. Potting
12. Top dressing & repotting
13. Watering
14. Bonsai ready!

STYLES OF BONSAI

Over the years many styles to classify Bonsai trees have been advanced, closely resembling circumstances in nature. These styles are open to personal interpretation and creativity, meaning that trees do not necessarily need to conform to any form.



1. HOKIDACHI [BROOM STYLE]



The broom style is suited for deciduous trees with extensive, fine branching. The trunk is straight and upright and does not continue to the top of the tree; it branches out in all directions at about 1/3 the height of the tree. The branches and leaves form a ball-shaped crown which is also a stunning sight during winter months.

2. CHOKKAN [FORMAL UPRIGHT]



The formal upright style is a very common form of Bonsai. This style often occurs in nature, especially when the tree is exposed to lots of light and does not face the problem of competing trees. For this style, tapering of the upright-growing trunk must be clearly visible. The trunk must therefore be thicker at the bottom and must grow increasingly thinner with the height. At about 1/4 of the total length of the trunk, branching should begin. The top of the tree should be formed by a single branch; the trunk should not span the entire height of the tree.

3. MOYOGI [INFORMAL UPRIGHT]



The informal upright style is common in both nature and in the art of Bonsai. The trunk grows upright roughly in the shape of a letter 'S' and at every turn branching occurs. Tapering of the trunk must be clearly visible, with the base of the trunk thicker than the higher portion

4. SHAKAN [SLANTING STYLE]



As a result of the wind blowing in one dominant direction or when a tree grows in the shadow and must bend toward the sun, the tree will lean in one direction. With Bonsai, the leaning style should grow at an angle of about 60 - 80 degrees relative to the ground. The roots are well developed on one side to keep the tree standing. On the side toward which the tree is leaning, the roots are clearly not as well developed. The first branch grows opposite the direction of the tree, in order to create a sense of visual balance. The trunk can be slightly bent or completely straight, but still be thicker at the bottom than at the top.

5. KENGAI [CASCADE STYLE]



A tree living in nature on a steep cliff can bend downward as a result of several factors, like snow or falling rocks. These factors cause the tree to grow downwards. With Bonsai it can be difficult to maintain a downward-growing tree because the direction of growth opposes the tree's natural tendency to grow upright. Cascade Bonsai are planted in tall pots. The tree should grow upright for a small stretch but then bend downward. The crown of the tree usually grows above the rim of the pot, but the subsequent branches alternate left and right on the outermost curves of an S-shaped trunk. These branching should grow out horizontally in order to maintain balance of the tree.

6. HAN-KENGAI [SEMI CASCADE]



The semi-cascade style, just like the cascade style, is found in nature on cliffs and on the banks of rivers and lakes. The trunk grows upright for a small distance and then bends downwards / sideways. Unlike the cascade style, the semi-cascade trunk will never grow below the bottom of the pot. The crown is usually above the rim of the pot while subsequent branching occurs below the rim.

7. BUNJINGI [LITERATI]



In nature this style of tree is found in areas densely populated by many other trees and competition is so fierce that the tree can only survive by growing taller than all others around it. The trunk grows crookedly upward and is completely without branching because the sun only hits the top of the tree. To make sure that it looks even tougher, some branches are “Jinned” (without bark). When the bark has been removed from one side of the trunk, the trunk is referred to as a “Shari”. The idea is to demonstrate that the tree has to struggle to survive. These trees are often placed in small, round pots.

8. FUKINAGASHI [WIND-SWEPT]



The windswept style also is a good example of trees that must struggle to survive. The branches as well as the trunk grow to one side as if the wind has been blowing the tree constantly in one direction. The branches grow out on all sides of the trunk but will all eventually be bent to one side.

9. SOKAN [DOUBLE TRUNK STYLE]



The double trunk style is common in nature, but is not actually that common in the art of Bonsai. Usually both trunks will grow out of one root system, but it is also possible that the smaller trunk grows out of the larger trunk just above the ground. The two trunks will vary in both thickness and length, the thicker and more developed trunk grows nearly upright, while the smaller trunk will grow out a bit slanted. Both trunks will contribute to a single crown of leaves/canopy.

10. KABUDACHI [MULTI TRUNK]



In theory the multi trunk style is the same as the double trunk style, but with 3 or more trunks. All trunks grow out of a single root system, and it truly is one single tree. All the trunks form one crown of leaves, in which the thickest and most developed trunk forms the top.

11. YOSE-UE [FOREST STYLE]



The forest style looks a lot like the multi-trunk style, but the difference is that it is comprised of several trees rather than one tree with several trunks. The most developed trees are planted in the middle of a large and shallow pot. On the sides a few smaller trees are planted to contribute to one single crown. The trees are planted not in a straight line but in a staggered pattern, because this way the forest will appear more realistic and natural.

12. SEKI-JOJU [GROWING ON ROCK]



On rocky terrain, trees are forced to search for nutrient rich soil with their roots, which can often be found in cracks and holes. The roots are unprotected before they reach the ground so they must protect themselves from the sun: a special bark grows around them. With Bonsai the roots grow over a rock into the pot, so caring for this tree isn't really different from caring for any other style.

13. ISHISUKI [GROWING IN A ROCK]



In this style the roots of the tree are growing in the cracks and holes of the rock. This means that there is not much room for the roots to develop and absorb nutrients. Trees growing in rocks will never look really healthy, thus it should be visible that the tree has to struggle to survive. It is important to fertilize and water often, because there is not much space available to store water and nutrients. The rock in which the Bonsai grows is often placed in a shallow pot, which is sometimes filled with water or fine gravel.

14. IKADABUKI [RAFT BONSAI]



Sometimes a cracked tree can survive by pointing its branches upward. The old root system can provide the branches with enough nutrients to survive. After a while new roots will start growing, eventually taking over the function of the old root system. The old branches which now point into the air develop into trunks with multiple branching as a result of the increased influx of nutrients. These new trunks contribute to one single canopy.

15. SHARIMIKI [SHARI STYLE]



As time passes, some trees develop bald or barkless places on their trunks as a result of harsh weather conditions. The bald part usually begins at the place where the roots emerge from the ground, and grows increasingly thinner as it continues up the trunk. Intense sunlight will bleach these parts, forming a very characteristic part of the tree. With Bonsai the bark is removed with a sharp knife and the barkless spot is treated with calcium sulfate in order to speed up the bleaching process.

PLANTS USED FOR BONSAI

The two most popular species used are *Ficus spp* and *Juniperus spp*

Deciduous tree species:

1. *Acer palmatum* (Japanese maple)
2. *Acer buergerianum* (Trident maple)
3. *Punica granatum* (Dwarf pomegranate)
4. *Ulmus parviflora* (Chinese elm)
5. *Magnolia stellata*
6. *Quercus* spp. (Oaks)
7. *Celtis* spp. (Hackberry)

Broadleaf evergreens:

1. *Ligustrum* spp. (Privet)
2. *Buxus sempervirens* (Boxwood)
3. *Serissa foetida* (Snow rose)
4. *Olea europaea* (Olive)
5. *Ficus* spp. (Fig tree)
6. *Rhododendron* spp.

Conifers and pines:

1. *Juniperus* spp. (Juniper)
2. *Picea* spp. (Spruce)
3. *Taxus* spp. (Yew)
4. *Podocarpus macrophyllus* (Buddhist pine)
5. *Cedrus* spp. (Cedar)
6. *Larix* spp. (Larch)