BAB 1
CLASSIFICATION OF HORTICULTURAL PLANTS
Horticultural crops are popularly classified into the three broad divisions of fruits, vegetables and flowers. From time to time, horticultural crops have been classified into various groups depending on their growth habits, cultivation requirements, climatic needs, uses, etc. However, following points are considered to be most important basis for classification of the crops.

1. Classification by Growth Habit and Physiological Character
2. Classification by Life Span
3. Classification by Climatic Requirements (Particularly Temperature)
4. Classification by Season
5. Classification by Use
6. Classification by Elevation and Plant Life Zones
7. Classification by Ecological Adaptation
8. Classification by Stem and Leaf Structure

The purpose of classifying plants is to ensure that the right plants is correctly named or identified regardless of where one is on earth.

According to their botanical characters the plants in horticulture are normally classified either herbaceous or woody. **Herbaceous** plants are plants with softer stems, more succulent, and less fibrous compared to woody plants. **Woody** plants can also be grouped as deciduous or evergreen. The **evergreens** are plants that retain living leaves at all times (all year round). Ex. Mango, Coconut, Papaya, Banana. **Deciduous** plants are those without leaves during winter in temperate climate or during the dry season in the tropical climate. Ex. Fig. phalsa, Apple, Guava, Ber.

1.1. Classification by Growth Habit and Physiological Character

Growth habit and physiological character e.g. herbs, shrubs, climbers and creepers. **Growth habit also** refers to the genetic tendency of a plant to grow in a certain shape and to attain a certain mature height and spread. [Figure n.] **Trees** typically have a single trunk and mature height over 12 feet. **Shrubs** typically have multiple-branches from the ground and a mature height less than 12 feet. **Vines** have a climbing, dapping, or self-clinging growth habit. Examples: **Herbs**: Ageratum, Lawn Grasses; **Shrubs**:...
Nerium, Hibiscus; **Trees:** Mango, Tamarind, Rain tree; **Climbers:** Bougainvillea; **Creepers:** Bignonia, gracillis.

*Note:* Many landscape plants could be considered small trees or large shrubs. The terms tree or shrub is applied based on the general appearance of the plant. Plants have vastly different growth habits. It is important to understand growth habits in order to make knowledgeable decisions regarding plant placement, plant selection, pruning and maintenance requirements. The species, cultivar, and/or variety name sometimes indicates a particular characteristic of growth habit.

1.2. **Classification by Life Span**

From a horticultural perspective, life span is a function of climate and usage. In some cases plants are classified according to their vegetative habits. That is based on their *life cycle*. Three most common classifications are:

**A. Annuals:**

From the name it is clear that the plants live for one season or less. Annual plant is one which completed its life cycle (seed-plant-seed) from germination to seed formation within one season and then dies usually as a result of complete exhaustion of its food reserve in the process of reproduction. Mostly they complete their life history in 3 to 6 months. They comprise of several of most beautiful and easily grown plants, widely varying in from habit of growth and colour. Annuals are very effective, grown neither in pots or in ground. Particular annuals thrive best in particular period of the year. They are normally herbaceous. Ex. Rice, mungbean.
The annuals are conveniently grouped according to season as follows.

1. **Rainy Season Annuals:**
   They can stand more in rain than others and therefore grown to flower during rainy season. The time of sowing then would be from April to May in most places e.g. Mary gold, Aster, Salvia, Zinnia etc.

2. **Winter or Cold Season Annuals:**
   The thrive and bloom best during winter. These are sown in September, October e.g. phlox, Antirrithium. **Winter annuals** germinate from seed in the fall, with flowering and seed development the following spring, followed by plant death. Their growing season is from fall to summer. Examples include winter wheat and annual bluegrass. Many weeds in the lawn (such as chickweed and annual bluegrass) are winter annuals.

3. **Hot weather or Summer season Annuals:**
   They are sown in January - February and blooming period is April, May e.g. Sunflower, Gailardia, and Zinnia. **Summer annuals** germinate from seed in the spring and complete flowering and seed production by fall, followed by plant death, usually due to cold temperatures. Their growing season is from spring to fall. Examples include marigolds, squash, and crabgrass.

**B. Biennials:**
These plants usually requires two years or at least two growing seasons with more or less of a dormant season or lasting season between two completed life cycle. Seed sown in spring or summer, and vegetative growth is completed in first year and in
the following spring, flowering and fruiting takes place. Generally the period of growth is 6 to 9 months e.g. Gladioli, Dahlia. No hard and fast line can be drawn between annuals and biennials crops like turnip, carrot, cabbage and onion are classified as biennials. They are normally herbaceous. Quite often, they maintain a rosette growth habit the first season, meaning that all the leaves are basal. They flower and develop seeds the second summer, followed by death. Many biennial flowers self-seed, giving the appearance of a perennial growth habit. In the garden setting, we grow many biennials as annuals (e.g., carrots, onions, cabbage and beets) because we are more interested in the root than the bloom. Some biennial flowers may be grown as short-lived perennials (e.g., hollyhocks).

C. Perennials:
Perennials live through several growing seasons, and can survive a period of dormancy between growing seasons. These plants regenerate from root systems or protected buds, in addition to seeds. Any plant that lives more than two years is a perennial e.g. Mango, Citrus. These plants that are long lived, more than two years and are usually woody or herbaceous. Ex. Roses, Tuberoses, Chrysanthemum. These crops are classified in to two groups.

i) Herbaceous:
Herbaceous perennials are those with more or less soft succulent stems. They develop over-wintering woody tissue only at the base of shoots (e.g., peony and hosta) or have underground
storage structures from which new stems are produced. Note: Golden Vicary Privet and Blue Mist Spirea (Caryopteris spp.) can be either herbaceous or woody as grown in Colorado. In temperate climates the tips die off after seasons growth but root remains alive and produce new stem and tops on favorable conditions. In other words their tips are annual while ground parts are perennials lie many years and are classified as: a) Trees b) Shrubs c) Vines according to their habit of growth.

a) Trees:
Trees are upright in habit and stems take the form of central axis e.g. Mango, guava, Mandarins etc.

b) Shrubs:
Shrubs have no main trunk but a number of erect or semi erect stems are seen but do not forms the main frame work e.g. Hibiscus, Rose, and Lantana, Acalypha etc.

c) Vine:
Both woody and herbaceous have stems which are flexible and not in position to keep their branches and leaves erect. They either spread on the ground or require some support whether alive or man made e.g. cucurbit vines, Grape vines, Passion fruit etc.

Spring ephemerals have a relatively short growing season but return next season from underground storage organs (e.g., bleeding heart, daffodils).

Woody perennials develop over-wintering tissue along woody stems and in buds (e.g., most trees and shrubs grown in Colorado).

Combinations – Plants are usually classified as annual, biennial, or perennial on the basis of the plant part that lives the longest. For example, raspberries have biennial canes and perennial roots.

1.3. Classification by Climatic Requirements (Particularly Temperature)
Based on temperature requirements and response to different climatic conditions, horticultural crops have been classified in to three main groups and these are:

i) Temperate:
Temperate plants are commonly found in cold regions enjoying a mild and temperate climate. These plants endure cold and go to rest or dormancy by shedding of all their leaves during winter e.g. Apple, Plums cherry and almond etc. **Temperate-zone** plants require a cold winter season as well as a summer growing season, and are adapted to survive temperatures considerably below freezing. Examples include apples, cherries, peaches, maples, cottonwoods, and aspen. In temperate-zones, tropical and subtropical plants are grown as annuals and houseplants.

**ii) Tropical:**
Tropical plants are those which do not tolerate severe cold but can tolerate warm temperatures of about 100°F. Those plants need strong sunshine, warms, humidity and a very mild winter. **Tropical** plants originate in tropical climates with a year-round summer-like growing season without freezing temperatures. Examples include cocoa, cashew and macadamia nuts, banana, mango, papaya, and pineapple. They cannot stand far against frost e.g. Papaya, Banana and Pineapple.

**iii) Sub - Tropical:**
Sub - tropical plants like Orange, Litchi, Fig, Mango and cashewnut are intermediate in character. They need warmth and humidity and can tolerate mild winters. **Sub-tropical** plants cannot tolerate severe winter temperatures but need some winter chilling. Examples include citrus, dates, figs, and olives.

The above classification, based on climatic preference of plants, is more or less arbitrary and no sharp line can be drawn between these several groups. It however, indicates the broad difference in climatic needs of various plants. This does not necessarily mean that a plant belonging to one zone does not grow in other zones. For instances, annual crops of the temperate region like potato, knolknol and cabbage grow in tropical and sub - tropical regions also, but they come up well only in the winter season than other climatic zones.

**Cool season** plants thrive in cool temperatures (40°F to 70°F daytime temperatures) and are somewhat tolerant of light frosts. Examples include Kentucky bluegrass, peas, lettuce and pansies.
Warm season plants thrive in warm temperatures (65°F to 90°F daytime temperatures) and are intolerant of cool temperatures. Examples include corn, tomatoes and squash. Some warm season plants are sub-tropical and tropical plants grown as annuals in Colorado.

Tender plants are intolerant of cool temperatures, frost, and cold winds (e.g., most summer annuals, including impatien, squash and tomatoes).

Hardy plants are tolerant of cool temperatures, light frost, and cold winds (e.g., spring-flowering bulbs, spring-flowering perennials, peas, lettuce and cole crops).

Hardiness refers to a plant's tolerance to winter climatic conditions. Factors that influence hardiness include minimum temperature, recent temperature patterns, water supply, wind and sun exposure, genetic makeup and carbohydrate reserves.

Cold hardiness zone refers to the average annual minimum temperature for a geographic area. Temperature is only one factor that influences a plant's winter hardiness.

Heat zone refers to the accumulation of heat, a primary factor in how fast crops grow and what crops are suitable for any given area. This is only one factor that influences a plant's heat tolerance.

1.4 Classification by Season
Horticultural crops are also classified according to the season in which they grow best. In our country we have three main season.

i. The Summer season, which starts from March and lasts upto May.

ii. The rainy season from June to October and

iii. The winter season from November to February.

Rainy season crops are known as "Kharif" crops. These crops come up best when sown with the onset of monsoon in May, June. Vegetables like Snake gourd, Lady's finger, Chilies and Beans comes under the category.

Lupines are known as "Rabi crops". They are generally sown October, November.

Only a few annual crops thrive in the warm summer months between March and June in the plains. Leafy vegetables, cluster beans, Brinjal, Cucumber, and Gourds are the common summer
vegetables. The popular summer season Sunflowers, Cooks comb,
Rose, Zinnia etc. There are some vegetables like tomato, brinjal,
beans and flowers like which grow all the year count, but they
come up best when there is optimum season.
The yield of a crop is also dependent upon the time of sowing.
Crops which are sown under rain fed conditions are entirely
dependent on rain fed conditions for their survival and growth
and therefore, have to be sown just at the right time. Any delay in
sowing causes great harm to rain fed crops. Even crops like
sunhemp yield their best when sown in a particular optimum
season and give even half the normal yield if sown in the strong
season

1.5 CLASSIFICATION BY USE
Edible Plants - Vegetable:
a) Vegetables Grown for Aerial Portion:
1. Cole Crops: Cabbage, cauliflower
2. Legume Crops: Peas and Beans
3. Solanaceous Crops: Tomato Brinjal
4. Cucurbits: Cucumber, Red Pumpkin
5. Leafy Vegetables: Spinach, Methi
6. Salad Vegetables: Lettuce, Brocoli
7. Corn Vegetables: Sweet corn and Popcorn

b) Vegetable Grown for Underground Portion:
1. Root Crops: Beet, Carrot
2. Tuber Crops: Yam, potato.
3. Bulb Crops: Onion and Garlic

Edible Plants - Fruit
a) Temperate (Deciduous fruits):
1. Small Fruits: Grape, Strawberry
2. Tree Fruits: Apple, pear, Cherry
3. Nuts: Peach, Walnut

b) Tropical and Sub Tropical:
1. Herbaceous Perennials: Pineapple, Banana
2. Tree Fruits: Mango, Papaya
3. Nuts: Cashewnut, Aracanut

Ornamental Plants
1. Flowering Trees: Gulmohar, Neelmobor, Cassua
2. Road Side Trees: Neem, Baniyan tree, Rain tree
3. Shade Giving Trees: Rain tree, Mahogany
4. Flowering Shrubs: Nerium, Hibiscus, Tagar
5. Foliage Shrubs: Thuja, Casurina
6. Climbers and Creepers: Petrea, Bignonia, Ipomea
7. Bulbous Plants: Canna, Caladium, Tuberose
8. Hedge and Edges: Duranta, Clearadendron, Ageratum

Deciduous Tree:
Fig., Guava, Apple, Karvanda
Ber, Sweet cherry, Pomogranate
Grape, Mulberry, Phalsa
Almond

Evergreen trees:
Aracanut, Dates, Coconut, Pineapple,
Banana, Jackfruit, Avocads,
Sweet orange, Mandarin orange,
K. lime, Mango, Chicku, Papaya,
Passion fruit, Cashewnunt

Edibles
A. Fruits
   1) Tree fruits
   2) Small fruits
B. Vegetables
   1) Warm season vegetables
   2) Cool season vegetables
C. Herbs
   1) Culinary
   2) Medicinal
D. Nuts

II. Ornamentals/Landscape Plants
A. Woody plants
   1) Trees
   2) Shrubs
   3) Vines and ground covers
B. Herbaceous plants
   1) Flowers
   2) Vines and ground covers
C. Grass/turf

III. Potted plants, houseplants, gift plants
A. Flowering gift plants
B. Foliage plants

**Note:** Do not confuse the multiple uses of the word "fruit".

In reference to "fruits and vegetables", "fruit" refers to crops primarily used in some European cuisines as a dessert (peaches, apples, strawberries, and raspberries). "Vegetables" refers to crops served as part of the main entrée (potatoes, carrots, corn, and lettuce). In this frame of reference, tomatoes are vegetables.

In reference to "fruit" as a part of plant anatomy (i.e., roots, stems, flowers, fruits, and seeds), tomatoes, squash and watermelons are fruit.

1.6 CLASSIFICATION BY ELEVATION AND PLANT LIFE ZONES

Higher elevations have increasingly shorter growing seasons due to colder temperatures. High elevations have drier soils, stronger light, persistent winds, and greater temperature changes. Due to this harsh environment, alpine and tundra plants tend to be compact in form.

1.7 CLASSIFICATION BY ECOLOGICAL ADAPTATION

Many of our plant care problems arise as gardeners try to grow plants outside of their natural environment or "ecological adaptation." Characteristics of the Colorado high plains include low humidity, limited rainfall, and alkali soils low in organic matter. In higher mountain communities, the short frost-free season and low summer growing temperatures significantly limit plant selection. The following are a few examples of terms used to describe classifications based on ecological adaptation.

**Alpine plants** tolerate the short growing season, cold, and wind of higher mountain elevations. They are typically low-growing, small leaf perennials. Snow cover depth often dictates the plant’s growing height.

**Prairie plants** are adapted to the open sun and winds of the plains. These plants are further classified into dry, mesic, and wet prairie categories.
Woodland plants are adapted to a low light conditions and soils rich in organic matter. They typically have large leaves and small flowers.

Wetland plants tolerate continually moist soil conditions of a bog or a pond. Wetlands play a primary role in water quality as a filtering system for water-borne pollutants.

Xeric plants tolerate conditions of low water, bright light, and warm temperatures due to a variety of adaptations such as thick, waxy, or fleshy leaves, hairy leaves, small narrow leaves, taproots and succulent stems.

Native and adapted plants for the urban environment

Native (indigenous) plants refers to plants adapted to a given area during a defined time period. In America, the term often refers to plants growing in a region prior to the time of settlement by people of European descent. The term is so overused that it has little meaning. With recent interest in water conservation, many gardeners mistakenly consider “native” plants as “xeric” plants, and “xeric” plants as “native” plants. The two terms are not interchangeable. The concept of native should not refer to political boundaries, such as state or country, but rather to an ecological habitat during a defined chronological period. For example, Colorado blue spruce and quaking aspen are "native" to the ecological habitat referred to as the montane zone. They are not "native" to the Colorado high plains, or elevations below 8,000 feet. From a chronological reference point, what is now the grassland of the Great Plains was once an inland sea. Therefore, aquatic plants such as kelp would have been "native" at one time. Over time, the ecological habitat changed, changing the "native" plants along with it. Environmental change is an ongoing process, based both on global climatic events and on the activity of all organisms, including humankind.

Adapted (or introduced) plants are those that reliably grow well in a given habitat without specific attention from humans in the form of winter protection, soil amendments, pest protection, water, etc. Adapted plants are considered to be low maintenance plants.

Urban environment – For gardening purposes, the urban setting needs to be recognized as a unique ecosystem. Characteristics of the urban environment include:

• Soil compaction
• Rooting areas covered with buildings, roads, and parking lots
• Increased surface runoff creating significant water quality problems
• Higher temperatures and lower humidity
• Air pollution

Characteristics of an urban environment cultivated by humans may include:
• Reduced wind
• Increased availability of water due to irrigation
• Increased organic matter and soil fertility
• Reduced pests
• Increased soil stability
• Slower temperature fluctuations

1.8 CLASSIFICATION BY STEM AND LEAF TEXTURE

**Herbaceous** plants have non-woody stems.

**Woody** plants have woody stems that generally live for several years, adding new growth each year.

**Deciduous** plants shed all leaves at approximately the same time annually.

**Evergreen** plants retain some leaves longer than one growing season so that leaves are present throughout the year. Seasonal drop of some of the oldest interior leaves is a natural part of the life cycle.

**Semi-evergreen** refers to plants that may retain their leaves, depending on the winter temperature and moisture.

**Broadleaf** plants have a broad leaf blade (e.g., ash, maple, lilac, and beans). [Figure n]

[Narrowleaf plants have needle-like (e.g., pine, spruce) or awl-like (e.g. junipers) leaves. [Figure n]]
Grass-like plants have narrow leaves, usually arising from the base of the plant. The leaves may be soft (ornamental grasses) or stiff (yucca).

Reminder:

- Some evergreens are broadleaf (e.g., Oregon grape, most true hollies, and evergreen euonymus).
- Some narrow-leaf plants are deciduous (e.g., larch and bald cypress).
- **Conifer** refers to cone-bearing. Most conifers are narrow-leaf evergreens. A few conifers are deciduous (larch, bald cypress)