

**CLIMATE AND SOIL
FOR
HORTICULTURAL CROPS**

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Climatic Requirement

Climate is the most important factor on which choice of the crop for a region depends and therefore, understanding about climate and its requirement for different crops for optimum production on sustainable basis is important for horticulturists.

Climate is defined as the whole of average atmospheric phenomena for a certain region calculated for a period of thirty years. These phenomena are light, heat, water and air.

Light:

- The light intensity can be estimated from the number of hours of bright sunlight or from the cloudiness of sky.
- Generally horticultural crops need a lot of light and must be grown in sunny climate, but there are some crops which can tolerate shade e.g. **turmeric and ginger**.
- There are others like young **mangosteen, coffee, cocoa and tea** need shade during part of their development.
- A third group requires permanent shade like salak palm, duku, and carambola.

The duration of light for the time elapsing between dawn and dusk referred as **photoperiod or day length**. This exerts considerable influence on flowering.

Based on the response by plants we classify plants in nine classes but the major classes are following. However, fruit crops for such categories are not known.

(i) Long day plants: Cabbage, Cauliflower, Onion, Beet, Radish, Carrot, Spinach, Potato, Dill and Plantago.

(ii) Short day plants: Strawberry, Pineapple, Chrysanthemum, Poinsettia, Aster, Balsam, Salvia, Euphorbia and Xanthium.

(iii) Day neutral plants: Tomato, most fruit crops, Pepper, Cucumber, Snapdragon, Mirabilis and certain varieties of peas.

Heat:

Heat is a non-mechanical energy transfer with reference to a temperature difference between a system and its environmental surrounding.

Temperate fruit crops like apple, pear, peach, plum and almond become dormant due to short day conditions in the region and need chilling of various lengths to break dormancy.

Frost and chilling are harmful for tropical and subtropical plants. On the other hand extremely high temperatures found in arid region cause wilting, sunscald, necrotic spot and even death of plants. Therefore, under such conditions appropriate choice of plants and provision of protection become important.

Based on the temperature variations on the surface of the earth we have the following climates.

- Tropical equable climate with no distinct winter.
- Subtropical Climate with distinct winter and summer.

- Temperate: Distinct winter, summer and autumn with temperature below freezing during winter is common.

Tropical : Mango, Banana, Papaya, Sapota, Pineapple, Coconut, Cashew, Arecanut, Breadfruit, Jackfruit and Avocado.

Subtropical: Guava, Grape, Citrus, Date palm, Phalsa, Pomegranate, Litchi and Loquat.

Temperate: Apple, Pear, Peach, Plum, Quince, Apricot, Walnut, Almond, Strawberry and Cherry.

However, this choice is not very rigid as some tropical crops which can be grown in subtropics and vice versa. There are low chilling temperate crops which can be grown in sub-tropics like peach, pear, strawberry etc. Short duration crops like vegetables and flower crops are classified as warm season and cool season crops accommodated in various types of climates depending on temperature variations within a year.

Soil requirement

Soil is the upper most crust of earth surface which supports plant growth. It is defined as a three phase system in which plants grow. These phases are solid, liquid, and gas and are essential. Solid part is frame which provides space for other two. This consists of minerals, clay minerals and organic matter.

The soil is also a living system with millions of microbes that breakdown organic matter and builds it again. Microbes are essential and survive only when soil is well aerated and rich in organic matter and devoid of waterlogged conditions.

Texture of soil depends on the size of solid particles and classified as gravel, coarse and fine sand, silt and clay.

Likewise, arrangement of these particles is referred as structure, and both texture and structure lend soil physical properties like water holding capacity, aeration and bulk density. **Generally loamy soils and crumb structure are most preferred for fruit crops.**

According to level of organic matter, soils are classified as mineral soil or organic soil and soil having more than 20% organic matter is organic soil like peat and muck.

Minerals and salts lend chemical properties to the soil like pH, alkalinity, sodicity, salinity and cation exchange capacity which influence the availability of nutrients in soil.

Therefore, for making choice for soil, soil analysis in terms of following criteria is essential to decide on land capability.

Criteria for land capability class:

- (I) Slope and erosion hazard.
- (ii) Soil depth .
- (iii) Drainage.
- (iv) Workability.
- (v) Stoniness and rockiness.
- (vi) Water holding capacity.
- (vii) Permeability.
- (viii) Nutrient availability.
- (ix) Fertility status.
- (x) Salinity, alkalinity and acidity hazards.

Based on these criteria there are 8 capability classes of which (i) to (iv) are suitable for cultivation and (v) to (viii) are not suitable for cultivation.

A good soil is one which have the capacity to nourish and sustain plant growth by providing mineral particles (nutrients) in an available form to plants by their interaction with soil air, moisture, microbes and humus. Generally a loam soil is considered to be a good soil.

Generally fruit crops need porous, aerated, deep (2 m) uniformly textured soils and the pH of soil should be within range of 6-8. Soil with hardpan within 120 cm from surface, soil with high clay content at surface and very less at subsurface or vice-versa are not suitable for fruit crops. Fruit crops are susceptible to waterlogged condition and growth is adversely affected by salinity, sodicity and alkalinity.

It is, therefore, important that soil be analyzed for its quality and then choice of the crop is made for sustainable production. If the soils are problematic like poor aeration or drainage, sodicity, alkalinity, acidity and salinity, they require improvement or reclamation before taking up crop production or the venture would fail. Alternatively tolerant or resistant crops can be chosen for different problems.

Salinity tolerant crops: Kair, Khirni, Woodapple, Date palm, Ber, Aonla, Fig, Sapota etc.

Sodicity tolerant crops: Ber, Tamarind, Woodapple, Date palm, Aonla, Karonda, Fig, Phalsa, Pomegranate, Guava, Bael and almond.

Drought tolerant crops: Ber, Aonla, Ahalsa, Lasoda, Kair, Custard apple, Karonda, Fig, Guava etc.

If we know the soil and the requirement of soil for the crops, then choice of the crop can easily be made. Let us examine the example of coconut plant for which the suitable soil is indicated below.

Soil characteristics for coconut:

Slope	0.02%
Drainage	good
Texture	Clay loamy-sand
CEC	Any
Base saturation	+ 20
EC	Any
ESP	Any

Grouping of fruits according to their tolerance to salinity:

(i) **High salt tolerance:** Date palm, Ber and Aonla.

(ii) **Medium salt tolerance:** Pomegranate, Fig and Grape.

(iii) **Low salt tolerance:** Apple, Orange, Almond, Lemon and avocado.

Soil analysis in terms of its physical and chemical attributes.

- ❖ Bring the soil to its optimum potential by applying organic matter, chemical fertilizers, micronutrient and amendments depending on soil analysis report.
- ❖ Adoption of soil conservation technique like green manuring on regular basis.
- ❖ Use of improved water management techniques like drip irrigation and check basin or Furrows.
- ❖ Incorporation of large quantity of bulky organic matter each year.
- ❖ Creation of appropriate drainage around the plot.
- ❖ Scrapping of salts, and reclamation of soil by application of gypsum, iron pyrites, press mud etc. On regular basis in case of salinity problem.
- ❖ Replenishment of nutrients harvested by the crop on regular basis by preparing a balance sheet for nutrients.
- ❖ Recycling of organic waste.
- ❖ Soil is the most important natural resource for fruit culture and it needs to be protected and improved.