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**Climatic Requirements of Horticultural Crops**

**Temperature:**

Every fruit plant has a rarely well defined range of temperature to which it is tolerant and below or above which the plants of that variety are liable to be injured.

**1. Minimum Temperature:**

Plants cease to grow at the onset of sufficiently cold wealth or the exact temperature range varying with the kind of plant and its stage of growth and maturity. It is generally regarded that at stage of growth and maturity. It is generally regarded that at 320F or below the growth is suspended while above this it proceeds shed. The minimum temperature that one plant can endure maybe much lower than that which another will tolerate. Hardiness to the cold is not the absolute water content which brings about the hardiness but the latter is related to the form in which water is held by the tissues. The water in the plant tissues is usually held in three forms.

1. Fire water

2. Osatically held water and

3. Bend or colloidal held water

Plants containing larger amount of "bound water", are usually more resistant to cold is therefore, important for the grower not only to know what the minimum temperatures are in the region where he has to grow his fruit crops but also approximate minimum temperatures that the particular plant or crop will with and at different stages of growth.

It the minimum winter temperature in a region is expected to be very close to the freezing point, the grower should realize that though it is safe to grow all apples and pears an attempt to culture oranges and lemons is likely to be an utter failure. Similarly, if minimum temperature, is going to be low but not slow as to cause frost for a long period, he should understand that the culture of brings and Grape fruit would be safe but that of Mango will not be that safe.

**2. Maximum Temperature:**

Just like the minimum temperature, there is maximum temperature which the plant endures. This also various with kinds of plant and its growth stage and maturity. Though the absolute minimum for the living protoplasm is very close to boiling point for most of the higher plants, the lethal point less some where between 110 to 1300F. A x number of growth processes are much retarded as temperature considerable under the so points. In tomatoes the flower fails to set fruits when the temperatures in shade rises above 90 - 1000F. It is also some times observed that if the flowering of AmbeBahar in Santra is usually delayed i.e. sometimes the flowers appear in late February. The fruit set in these flowers is very low one account of higher temperature during that period.

**Optimum Temperature:**

It is somewhere between the minimum and the maximum temperature range, that plant or fruit can sustain its growth the range being usually narrower. This in known as Optimum Temperature.

**3. Atmospheric Humidity :**

Higher humidity and Higher temperature are favorable for growth of certain crops like Banana and Pineapple. It is usually observed that the Ambebahar fruits of santra and more juicy than these of MrigBahar probably due to the fact that the atmospheric humidity during the growing season of Ambebahar crop. Thus the atmospheric humidity effects that juiciness of the fruit. As regards to the fruits growing in higher humidity are less tasty and do not have good keeping quality, higher humidity, being congenial for growth of fungus bacteria and pests which may be harmful to the fruit trees.   
  
**4. Rain Fall:**

The quantity of annual rainfall as well as its distribution plays an important role in the success of failure of fruit growing excessive rains occurring in short periods are generally unfavours to fruits as they load to water logging. Rains at the blooming period may was away pollens and thereby inhibit the pollination. In low rainfall regions to cultivation of fruits crops is difficult adequate and cheap irrigation facilities are not available.

**5. Wind :**

The wind causes damage to the fruit trees in several ways. High wind blow away the trees and break the branches. The situation exposed to wind causes a greater evaporation of soil moisture ant there by necessitating more irrigation. Hot winds at the time of blossoming may cause failure of pollination due to drying of stigmatic fluid and due to reduced activity of the pollinating insects. However, this damage can be reduced by planting wind breaks.

**6. Hail:**

Hail storms are very rare in Maharashtra. However, in northern India, the fruit crops are greatly affected by hail. They causes shedding of young fruits and flowers while maturing fruits become almost unmarketable.

**7. Sunlight:**

The sunlight is found to affect the quality of the fruit. Fruits exposed to sunlight are found to be better in quality as compared to those receiving loss of the sunlight. This is due to more quantities of carbohydrates prepared in the leaves. In Santra it has been observed that the fruits borne on upper half of the tree and consequently receiving more sunlight were found to be richer in Vitamins 'C' content. They also contained more sugars as compared to those on lower half of the trees. Fruits, constantly exposed to strong sunlight are likely to be 'sunbrant'. In places where the summer temperatures are high as in Vidarbha. Region of the State, the stems of the plants are likely to suffer from sunburn and as a protection against this, an application of Bordeaux paste is recommended. In tropical regions the sunlight is not a problem but in temperate regions care has to be taken that the trees receive enough sunlight for which it is necessary to train and prune the trees in a particular fashion.

**Soil Requirements for Horticultural Crops**

Soil and climate are the important natural factors. Favorable combination of its, is essential for the production of Horticultural Crops. Little Human control is possible over unfavorable climatic and soil condition. All fruits and vegetables cannot be grown in all types of soil and climate. Hence zone wise cultivation is made.

**A) Soil:**

It may be defined as "Superficial earth crust" which functions as store house of reservoir of water and nutrient at the same time providing the necessary physical support to the plant".

A typical soil is heterogeneous mixture of different components which includes solids like minerals, living organism, water and air.

**Properties of Soil:**

Soil exhibits physical as well as chemical properties of which are mostly influenced by the mineral matter of the soil and by the size of soil particles i.e. Sand Silt and Clay.

Sand Particles:0.15 to 1 mm in diameter

Silty: 0.002 to 0.05 mm in diameter

Clay:  0.001 to 0.002 mm in diameter

On account of small size and relatively large surface area they exhibits colloidal property and are capable of increasing the water as well as nutrient retention capacity of the soil. In a typical soil there should be proper proportion of these soil particles. It is possible to alter the physical condition of the soil by adding organic to alter the physical condition of the soil by adding organic matters which improves the structure and texture of the soil. The soil which support the growth and production of perennial plants.

**A) Physical Properties of Soil :**

**1. Soil Structure:**

Soil structure should be uniform favorable for water penetration, soil aeration and drainage. Soil structure may be vary in different layers. Hence soil profile pits have to be taken and examined the structure.

**2. Soil Aeration and Drainages:**

Soil should provide good aeration and drainage. Soil aeration is necessary for growing aerobic organism in the soil to promote the metabolic activities of these organisms. Fruit and vegetable crops required well drained soils. Drainage is effected by the nature of sub soil. It affects the deep rooting capacity of the trees and drainage of the soil. In a good sub - soil trees can stand drought better, because of deeper root penetration on wet heavy soils with impermeable sub soil. Poor performance is observed due to poor aeration and inadequate drainage. Therefore, a well drained soil is essential. Extreme wet and dry soil should be avoided.

**3. Water Table:**

Availability of water at a certain depth in the soil that is called Water Table. High water table can give rise to water logging condition of the soil and ultimately the fruit and vegetable crops decline. Therefore, water table should be always below 2 meters throughout the year. High water table leads to por aeration and water logging condition. Rotting of roots may occurs due to prolonged water logging condition of the soil.

**4. Soil Depth:**

Extreme conditions of soils like very heavy (Clayey) and very light (highly sandy) with It accounts for at least half the action exchange capacity of soil. Whenever the soil contain more amount organic matter than there will be greater the yield of fruits and vegetables. Therefore soil should have more organic matters.

**6. Soil Texture:**

Fruits and vegetables crops generally required medium textured soil. Fine and coarse textured soil should be avoided.

**7. Soil Temperature:**

Soil temperature affects the root activity and is influenced by aeration and drainage. In cold soils, chemical and biological activities are slow and availability of nutrients like N.P.S. and Ca is limited. Nitrification would not start when the temperature is 40C. For successful growth of horticultural plants the soil temperature should be within the range of 26 to 320C. Due to low temperature absorption and transport of water and nutrient is adversely affected.   
              
**B) Chemical Properties of Soil:**

**1. Soil Fertility:**

Moderate fertility in the soil is necessary with high amount of humus. Loam and sandy loan soils are not suitable for growing the plants. N, P, K, Ca, Mg, and S are important elements required for growth and development of plants. Micro - nutrients like Fe, Mn, Zn, Bo, Cu, MO etc. are also required. Premature decline of sweet orange in Punjab is associated with the micronutrient deficiencies predominated by Zinc.

**2. Soil Reaction :**

Soil analysis is important to find out the and Chemical composition. Neutral reaction is favorable. The safe pH range is from 6 to 8. Saline and alkaline soils should be avoided. In alkaline soils, concentration of sodium salts above 0.1% is harmful; Boron is deficient in alkaline soils and is unavailable in acidic soils. Iron is available in acidic soils. Calcium and Magnesium are deficient in acid soils. K, Mn, Fe, and BO are deficient in alkaline soils. pH above 8.7 is considered as critical High sodium content of soils with high pH may have direct toxic effects.

**3. Soil Salinity:**

Information on salt tolerance is necessary to select salt tolerant varieties and to adopt proper soil management practices.

**i) Salt tolerant Crops (6-8 mmohs / cm) :**

Date palm, phalsa, Guava, Sapota, Fig, Grape, Anola, Wood apple, Ber, Chicory, Potato, Sweet Potato, Watermelon etc.

**ii) Moderate Salt Tolerant Crops (3 - 6 mmohs/cm) :**

Pomegranate, Grape fruit, Lemon, Apple, Pear, Plum, Beans, Cucumber, Brinjal, Garlic, Radish, Pea, Tomato, Turneep.

**iii) Salt Sensitive Crops (1.5 - 3 mmohs/cm) :**

Orange, Peach Avocado, Straw berry, Asparagus, Beet, Cabbage, Cauliflower, Palak, Leek, Lettuce.

In general, it may be stated that soils for fruit growing should be porous, deep and aerated. They should not be water logged, marshy, saline or acidic and there should be no hard pan at the bottom layers.

**Essential Plant Nutrients for Horticultural Crops**

According to-the present state of our knowledge, sixteen-elements are considered essential for growth of fruit plants. These are Carbon, Hydrogen, Oxygen, Nitrogen, Phosphorus, Potash, Calcium, Magnesium, Sulphur, Zinc, Manganese, Copper, Iroa, Boron, Molybdenum and Chlorine. New refinements in experimental; techniques may add in the future more elements to this list of essential elements of the sixteen essential elements, Carbon, Hydrogen and Oxygen are obtained from air and water. Carbon makes up the great bulk of the plant and is obtained from carbon dioxide in the air. Plants synthesis carbohydrates by the process, of photosynthesis. Hydrogen is derived mainly from the breakdown of water. Oxygen is obtained from air as well as water. Lack of oxygen in the soil may result in injury to .the roots, particularly if soils are full of water, but there is no lack of oxygen in the tree for direct nutrient use as long as moisture is present

The rest of the thirteen element/s are obtained from mineral arid organic components of the soil. Based on/Jie quantities required for optimum plant development, these elements are grouped into major and minor or macro and micro-nutrients. The role of these essential nutrient elements in the growth and fruiting of plants is as follows:

**1. Nitrogen:**

Nitrogen is an essential constituent of proteins and chlorophyll and is present in many other compounds of great physiological importance in plant metabolism such as nuclectides, phosphatides, alkaloids, enzymes, hormones, vitamins etc. It increases chlorophyll content imparting dark green colour to foliage and promotes rapid early growth. The nitrogen supply governs to a considerable degree, utilization of potassium, phosphorus and other elements.

**2. Phosphorus:**

Phosphorus is a constituent of nucleic acid phytin and phospholipids. It is essential in laying down the primordial for the reproductive parts of the plant. Phosphorus is also an essential constituent of a majority of enzymes which are of great importance in carbohydrate metabolism, fat metabolism and also in respiration. It is closely related to cell multiplication and development. Phosphorus stimulates root growth, flowering and aids in fruiting.

**3. Potassium:**

Unlike all other major nutrients, potassium does not enter into the composition of any of the important plant constituents such as fat protein chlorophyll and carbohydrates concerned in plant metabolism. As such, its role in difficult to determine.  It occurs in a state of solution in the cell sap. It imparts increased vigour and disease resistance to plants.   It regulates utilization of available water in the plant. It is essential in the formation and transfer of starches and sugars. Thus, potassium is required in large quantities of banana. It accelerates enzymic action, helps in the formation of protein and chlorophyll and improves keeping quality of fruits. With citrus fruits, however, an excess of potash has a bad effect on quality.

**4. Calcium:**

Calcium promotes root development and growth, influences the Water economy of the plant and many physiological processes. The effects of calcium are, however, antagonistic to those of potassium. Therefore,, an optimum ratio of potassium to calcium is of great importance for a favorable water balance. Calcium improves intake of other plant nutrients, such as nitrogen, iron, boron, zinc, copper and manganese by correcting soil pH.

**5. Magnesium:**

It is a constituent of chlorophyll and plays a part in the production of carbohydrates, proteins fats and vitamins and in certain catalytic reactions in the enzyme systems. It acts as a carrier of phosphorus in the plant and promotes the formation of fats. It helps in the translocation of starches and regulates the uptake of other nutrients.

**6. Sulphur:**

It is not a constituent of chlorophyll but helps in its formation and encourages vegetative growth and root development. It is an essential constituent of many proteins and enzymes and essential oils.

**7. Boron:**

It is primarily concerned with-the-uptake and efficient use of calcium in the plant. It helps in absorption of nitrogen. It is associated with cell division, flowering    and fruiting processes, pollen germination, metabolism of carbohydrates, nitrogen, water and pectin substances, absorption of salt and hormone movement in the plant. It is necessary in the translocation of sugar in the plant.

**8. Manganese:**

The function of manganese is regarded as being closely associated with that of iron. It also supports the movement of iron in the plant. It helps in chlorophyll formation, acts as a catalyst in oxidation - reduction reactions in plants. As a constituent of chlorophyll, it helps in respiration and in protein synthesis. A good managanese supply sometimes helps in counteracting the bad effect of poor aeration.

**9. Iron:**

Though it is not a constituent of chlorophyll it helps in its formation. It is very immobile element within the plant. It helps in absorption of other elements. As a constituent of enzyme systems which bring about oxidation - reduction reactions in the plant, it regulates respiration, photosynthesis and reduction of nitrates and sulphates. These reactions are essential for plant development and reproduction. It is also essential for the synthesis of proteins contained in the chloroplast.

**10. Zinc:**

It is a constituent of several enzyme systems and also influences the formation of some growth hormones in the plant. It regulates utilization of water in the plant.

**11. Molybdenum:**

It acts in enzyme systems which bring about oxidation - reduction reactions, especially the reduction of nitrates to ammonia prior to amino acid and protein synthesis in the cells of the plant.

**12. Copper:**

Copper has an important function in root metabolism as well as in utilization of ammonical nitrogen by plants. It acts as "Electron Carrier" in enzymes which bring about oxidation - reduction reactions in plants. It helps in utilization of iron in chlorophyll synthesis. It regulates respiration in the plant.

**13. Chlorine:**

Chlorine has been proved to be an essential plant nutrient in 1954 by T.C. Broyer and his associates at the University of California (U.S.A). The need for chlorine for proper plant development has been established for sugar - beer carrot cabbage lettuce, barley, wheat, cotton and clover. The exact role which chlorine plays in plant nutrition has not yet been clearly defined.

**Use of Growth Regulators in Horticultural Crops**

**1. Propagation:**

They are applied in the form of paste and solution. The concentration of the chemical varies with plant species and types of cutting and method of application.   
Rooting in stem cutting 9 Hard to root).

IAA, IBA, and NAA.

**a) Soak Method:**

10 to 100 ppm for 12 -24 hrs called soak method.

**b) Quick Dip Method:**

1000to 5000 ppm for 5 seconds. Some G.R are used in layering, grafting and budding for getting high success.

**2. Seed Germination:**

GA significantly accelerates seed germination in many plant species. Pre soaking the seed with G. Such as bhendi and sugar beet increase germination.

**3. Induction of Flowering:**

Plant growth regulators like NAA at 10 to 50 ppm causes early flowering in pine apple. 2, 4 D at 6 to 10 ppm has used to induce flowering in pine apple. Flowering can be delayed by 1 to 2 weeks NAA at 200 to 800 ppm application in apple, cherries, pears, peaches, and plums.

**4. Sex Expression:**

Plant growth regulators can change the sex of the flowers. Male sterility can be induced in corn by MH 9 malic hydrozide). It is used in plant breeding for induction of male sterility. Application of NAA, IAA and GA at 50 to 100 ppm increases female flowers in pumpkin, cucumber to get more yield.

**5. Flower and Fruit Thinning:**

Many fruit trees produces heavy flowering and fruit in one year and few or one in next year. By using G.R the normal bearing can be maintained NAA at 5 to 10 ppm and NAA at 5 to 7 ppm for thinning of apple, peaches and grapes.

**6. Pre Harvest Drop of Fruits:**

Flower and fruit drop is a problem in many fruit crops. Application of NAA 10- 50 ppm in mango, citrus and chilies reduce fruit drop by preventing formation of abscission layer.

**7. Fruit Development:**

Application of 50- 100 ppm GA in grapes increases the berry size.

**8. Early Maturity:**

Early maturity fetches higher prices in the market. In pine apple application of 20 ppm NAA induces early flowering and early maturing at least by two months. Spraying of 50 ppm NAA reduces maturity in grapes, use of 250 – 400 ppm of Ethrel induces early maturity in Ber.

**9. Early Ripening and Colour Development:**

Fruits like mango, banana, papayaripes after harvest. Dipping of fruits in 20-50 ppm Ethrel solution induces golden yellow colour to fruit induces early maturity.

**10. Delayed Maturity:**

Delay in ripening is required when fruit are to be sent to long distance market. Dipping of fruit in 2,4-D, 2,4- 5- T or MH- 40 extends storage life of fruits.

**11. Sprouting of Bud:**

Ethrel, GA, thio urea, IBA and Cyotkininn, spray induces sprouting of buds.

**12. Braking of Dormancy:**

GA, Ethrel, NA are used in breaking dormancy in seeds and buds.  
Some Defination:

**1. Bulk Pruning:** Removal of large limbs as contrasted to removal of larger number of small branches.

**2. Crotch:** The angel made by the attachment of a branch.

**3. Deheading:** a server hesing back of major limbs of a tree.

**4. Fine Pruning:** Removal of small branches or twing over the entire plants as contrasted to removal entire plants limbs.

**5. Heading Back:** Removal of a large amount of wood from the plant. This may be either coarse or fine.

**6. Leader:** the most prominent and upright branch through the center of the tree which tends to dominate all others.

**7. Pruning:**The removal of plant parts for the purpose of increasing the value of the reamaing parts.

**8. Scaffold Branch:** The main branches arising difficulty from the trunk of the tree.  
  
**9. Secondary Branches:** The main branches arising from the main branch.

**10. Shoots:** New growth which bears leaves.

**11. Spur:** A shoot or twing of limited growth.

**12. Thinning Out:** Removal of an entire twing or branch at its point of origin.

13. Modification of form or shape by pruning:

**14. Trunk:** The main axis of the plant from ground level to the point of branching.

**15. Water Sprout:** A very vigours shoot arising out of advantages buds on main scaffold branches, on the leader or in the vicinity of large pruning wounds.