

### LEC. 3

## CLASSIFICATION OF FRUITS BASED ON CLIMATIC REQUIREMENTS, HORTICULTURAL AND BOTANICAL CLASSIFICATION

### Agroclimatic zones of India

Agro ecological zone is defined as a land unit in terms of major climates, suitable for certain range of crops and cultivars. Fruits are broadly classified on the basis of their temperature requirement such as, temperate, subtropical and tropical. However, some fruits may be grown under more than one climate. For example, mango is grown under both tropical and subtropical climates. Grape and peach can be grown in both temperate and subtropical regions. The agro climatic zones of India are as follows.

Zones

Temperate Subtropical Tropical

North western North eastern

Central southern coastal

### Characteristics of different zones

#### Temperate zone:

Vegetative and flower buds of most of the temperate zone fruits enter into dormancy in late summer or autumn and require a substantial amount of winter cold before they can resume growth in the following spring.

- i. these fruit plants are frost - hardy and even tolerant to snowfall and ice,
- ii. the soil is mainly shallow and acidic in nature, and
- iii. rainfall is adequate.

In India, temperate zone climatic environment occurs at sufficiently high elevations.

#### Subtropical zone:

- i. Temperature is of intermediate in nature,
- ii. chilling temperature, if occurs, is for a brief spell and beneficial for many fruits,
- iii. the fruits grown have no distinct rest period,
- iv. light frost may occur in this zone,
- v. rainfall varies widely from low to high,
- vi. soil reaction is generally neutral,

- vii. soil fertility status is not satisfactory,
- viii. the majority areas have sandy loam and alluvial soil, and
- ix. the fruits have no marked photoperiodic requirement.

**Tropical zone:**

- i. Chilling temperature is practically absent,
- ii. high temperature occurs during most part of the year,
- iii. day and night temperature variation is narrow,
- iv. photoperiodic requirement is very insignificant,
- v. rainfall varies widely,
- vi. soil type varies greatly (clay loam, alluvial, saline, sandy, laterite etc.,)

Besides, the arid region of India which occupies nearly 12 percent of the total land area is of immense importance for fruit growing because of the development of highly efficient irrigation management methods. In India, the hot, arid zone covers over 3.2 lakh Sq.km. in Rajasthan, Gujarat, Andhra Pradesh, Punjab, Haryana, Karnataka and Maharashtra. There is about 70,300 sq. km area under the cold arid zone of Ladakh in Jammu & Kashmir.

**These regions are characterized by distinct agro climatic features:**

- i. Annual rainfall is low with erratic distribution pattern and largely confined to the period from July – September with 9-12 rain spells out of 12-20 in the whole year. After April, the vapour pressure deficit is more than 24mb, and exceeds 30 mb during May and June causing heavy evapotranspiration. These conditions result in soil moisture and atmospheric water stress to the plants after the rainy season. The mean annual rainfall varies from 100 mm north-western to 450 mm in eastern boundary of the arid zone in Rajasthan. It varies from less than 30mm to 500mm in the arid zone of Gujarat and from 200mm to 450mm in Haryana and Punjab.
- ii. High solar radiation incidence (450 – 500 cal per cm<sup>2</sup> / day) and high wind velocity (20km/hour) result in a high potential evapotranspiration (6mm/day) and high mean acidity index (74-78%).
- iii. The soils being wind blown, have 85% sand and low organic matter (0.1 – 0.45%) with poor water holding capacity (25-28%) and high infiltration rate (9cm /hr).
- iv. The groundwater resources are meager and at a great depth (40-50mm).

Owing to the poor surface and subsurface drainage, the groundwater in a large part of the area (e.g. 60% of arid Rajasthan) is highly saline.

### **Fruit growing regions in India**

1. **Temperate zone:** Jammu & Kashmir, Himachal Pradesh, part of Uttar Pradesh, Arunachal Pradesh, part of Nagaland, Nilgiris and Pulney hills in Tamil Nadu.
2. **North western subtropical zone:** Rajasthan, Punjab, Haryana, part of UP, part of Madhya Pradesh.
3. **North Eastern subtropical zone:** Bihar, Assam, Meghalaya, Tripura, part of Arunachal Pradesh and part of West Bengal.
4. **Central tropical zone:** Part of Madhya Pradesh, part of Maharashtra, Gujarat, part of Orissa, part of West Bengal, part of Andhra Pradesh & part of Karnataka.
5. **Southern tropical zone:** Part of Karnataka, part of AP, part of TN & part of Kerala.
6. **Coastal tropical humid zone:** Coast of Maharashtra, Kerala, Andhra Pradesh, TN, Orissa, West Bengal, Tripura and Mizoram, part of Gujarat along sea and the Indian Islands.

**The ICAR, New Delhi, has recognized eight agro climatic zones for effective land use planning.**

### **S.No. Agro climatic Region Status**

1. Humid western  
Himalayan Region  
J&K, HP, Kumaon and Garhwal in Uttarnchall
2. Humid Bengal – Assam  
Region  
West Bengal & Assam
3. Humid Eastern  
Himalayan Region  
Bay Islands, Arunachal Pradesh, Nagaland, Manipur,  
Mizoram, Tripura, Sikkim, Meghalaya & Andaman &  
Nicobar Islands.
4. Sub-humid Sutlej-Ganga  
Alluvial plains

Punjab, Delhi, UP plains & Bihar.

5. Sub-humid to Humid

Eastern and south Eastern

Islands

Eastern Madhya Pradesh, Orissa and Bihar.

6. Arid western plains Haryana, Rajasthan, Gujarat, Dadra and Nagar Haveli and Daman and Diu

7. Semi-arid Lava plateaus and central Islands.

Mahastra, Western Central Madhya Pradesh and Goa.

8. Humid to Semi-arid

western Ghats

Karnataka, TN, Kerala, Pandichary and Lakshadweep Islands.

During 1985 – 90, the Planning commission accepted 15 broad agroclimatic zones based on physiography and climate for effective planning.

**These zones are:**

1. Western Himalayan Region.
2. Eastern Himalayan Region.
3. Lower Gangetic plains Region.
4. Middle Gangetic plains Region.
5. Upper Gangetic plains Region.
6. Trans – Gangetic plains Region.
7. Eastern Plateau and Hills Region.
8. Central Plateau and Hills Region,
9. Western plateau and Hills Region,
10. Southern plateau and Hills Region,
11. East coast plains and Hills Region,
12. West coast plains and Ghats,
13. Gujarat plains and Hills Region,
14. Western Dry Region, and

## 15. The Island Region.

Under National Agricultural Research Project (NARP) each agro climatic zone is divided into sub-zones. The sub-zones totaling 120, are primarily based on rainfall, existing cropping pattern and administrative units, where in each state is divided into 2-12 sub-zones. These delineations are too many for planning process at National level, having similar agro climatic conditions. The National Bureau of soil survey & land use planning (NBSS & LUP) Nagpur, delineated the country into 21 agro Ecological regions, using physiographic, soils, bioclimatic types and growing periods. Growing period (GP) was based on water balance starting with period having precipitation 0.5 excess of evaporation (PET) ending with utilization of 100 mm of stored soil moisture once precipitation falls below PET. In this system of delineations, arid zone had GP of 90 days, semi-arid region corresponded to 90- 150 days of GP and the sub-arid zone correlated with region having GP between 150 and 210 days. The humid and pre-humid zones had GP of 210-270 days and more than 270 days/year respectively.

### **The Climatic Zones of Tamil Nadu**

Tamil Nadu forms the southernmost state of Indian Union located between  $8^{\circ} 20'$  to  $13^{\circ} 10'$  north latitude and  $76^{\circ} 15'$  to  $80^{\circ} 20'$  east longitude. The mean annual rainfall is 974mm (Table) with the highest contribution from north-west monsoon 47 per cent of total rainfall), followed by south-west monsoon (32 per cent), summer (16 per cent) and winter (5 per cent). Based on the rainfall, altitude and irrigation source, the state has been marked into seven climatic zones (fig.44) whose characteristics are furnished below.

1. **North-eastern Zone:** (Chengai-Anna, North Arcot South Arcot districts): The mean annual rainfall is 1100mm out of which 566 mm is received during the North-East monsoon period with frequent occurrence of cyclones. The mean maximum temperature is from  $28.5$  to  $38.4^{\circ} \text{C}$  while the mean minimum temperature is from  $21$  to  $28^{\circ} \text{C}$ . The major soil types are red sandy loam, clayey loam and saline coastal alluvium. The major irrigation sources are tanks and wells. Since the rainfall is uniformly distributed from July to December, two crop sequences of groundnut followed pulses are practised. In the coastal area rain-fed rice is cultivated. The other crops like sugarcane and millets are raised with the help of wells. Two crop sequences are followed. In this zone a significant practice of transplanting finger millet, sorghum and tomato

purely under rainfed condition is followed. Established mango grooves in drylands are common in this zone.

2. **North – Western Zone:** (Salem and Dharmapuri Districts): The mean annual rainfall is 875 mm and about 42 per cent of rainfall is received during the South – West monsoon period. The mean monthly maximum temperature ranges from 30 to 37° C and the minimum temperature is from 19 to 25° C. The minimum temperature usually goes below 15 C in northern parts adjoining Karnataka. The elevation ranges from 800 to 1000 m(MSL). The Cultivation in drylands commences from the month of June and

3. **Western Zone:** (Coimbatore and Periyar Districts): The mean annual rainfall is 720 mm with a contribution of 49 per cent from the North-East period. The mean maximum temperature is from 30 to 35° C while the mean minimum temperature ranges from 19 to 24° C. The predominant soil types are black soils during September/October. With the receipt of early rain, groundnut is sown in red soils. In black soil areas, cotton for early rains and bengalgram for late rains are raised. In the southern part of this zone the rainfall is about 550 mm only and more area is devoted to pastures with hardy trees like white babul. With the help of well and canal irrigation crops, like cotton, finger millet and sugarcane are raised.

4. **Cauvery Delta zone:** (Thanjavur and Tiruchirapalli Districts): The mean annual rainfall varies from 900-1000 mm, out of which more than 50 percent is received through North-east monsoon period. The main source of irrigation is the Cauvery river. The mean maximum temperature ranges from 30.0 to 38.5° C and mean minimum temperature is from 21 to 27° C. The major soil type is alluvial in the old delta areas while red loamy and it has been rightly called as 'rice bowl of Tamil Nadu'. After the rice crop, pulses are raised with residual soil moisture. In places with supplemental irrigation through wells finger millet, cotton, groundnut and sesamum are raised as summer crops.

5. **Southern Zone:** (Pudukkottai, Madurai, Quaide- e-millath, Passumpon, Kamarajar, Ramanathapuram, Chidambaram and Tirunelveli): The topography of zone is undulating. This zone lies on the rain shadow area of the western ghats. The mean annual rainfall is 850 mm with a contribution of about 470 mm from North-East monsoon. The mean maximum temperature varies from 28 to 38.5° C, and the minimum temperature ranges from 21 to 27.5° C. The soils of this region fall under major groups, viz., black, red alluvial and lateritic. Saline coastal alluvial soils are also present in the coastal belt. In black soils only one crop, either cotton or sorghum is

raised. Direct seeded rice is cultivated under rainfed condition on light soils. On red soils, groundnut crop is raised. Under garden land conditions, pearl millet and chillies form the major crops.

6. **High Rainfall Zone:** (Kanyakumari District) : The mean annual rainfall is 1460 mm received in 64 rainy days, out of which 38 and 36 per cent are respectively received during South-west and North -East monsoon periods. The mean maximum temperature ranges from 28 to 33.5° C and minimum is from 22 to 26.5 ° C. The soils are deep red loam except the crop grown under rainfed condition followed by tapioca. Plantation crops like tea, pepper, clove, nutmeg, cardamom and coffee also cultivated on the hills.

7. **Hilly zone:** This zone comprises the hilly region of the Nilgris, the Shevroys, the Yalagiri, the Annamalais and the Palani. The rainfall varies from 1000 mm at the foot of the hills to 5000 mm at the peaks. The mean maximum temperature varies from 15 to 24° C and that minimum ranges from 7 to 13° C. The soil is mainly lateritic. The major crops are cole vegetables, potato, tropical and temperate fruit areas. At the foot of the hills minor millets are raised by hill tribes. At higher altitudes wheat cultivation is common during winter season.