TEA

(*Camellia* sps) Family : *Camelliaceae* (= Theaceae)

Camellia sinensis L.

(2n =30)

<u>Introduction</u> :

Uses

1) As a beverage: Tea contains alkaloids called thein (2 to 5 %) which is a caffeinaceus alkaloid relieving body fatigue. However, excessive tea drinking is harmful to our digestive systems.
2) Polyphenols present in tea reduces blood cholesterol and cures hepatitis, hypertension, stone formation etc. (Heart attack is due to cholesterol + triglycerides which is a saturated fatty acid)
3) Medicinal properties: Black tea (a fully fermented tea) is anti ulceric and ant carcinogenic in nature.

Research Stations Board working on tea cultivation and in India

1. UPASI = United Planters Association of Southern India, UPASI Tea Research Institute, Nirar Dam B.P.O, Velparai – 642 127, Dist: Coimbatore, TN.

agrilearner whatsapp group 9715962

Origin and distribution of tea

Origin:

- Chinese people were the first users of tea.
- South East Asia
- South Western China
- North Eastern India (Assam)
- Adjoining areas of Upper Burma (Myanmar) are probable place of origin of origin of tea.
- The region from South East China (Szechwan-Yunnan) to Assam (India) has been reported as the centre of origin of the tea plant.
- Now tea cultivation is extending from Argentina in the south (27 ºS) to Georgia (Transcaucasia at 43 ºN) and
- From almost sea level upto 2,460 m MSL

agrilearner whatsapp group 8201783962

Distribution of tea

World: Major tea growing area in the world (Nearly 93 %) is in developing countries.

- Asia = 86 % of area and
- Africa =8 % of total area (during 1986 %)
- Asia: India, China and Sri Lanka are the main tea producing countries in the world.
- India produces nearly 30 % of world tea production followed by
- China (22 %) and
- Sri Lanka (8%).
- However China is having maximum area under tea in the world(over 40 % of world area) but the maximum production is from India mainly because of higher productivity (414 kg /ha in China compared to 1570 kg per ha in India during 1986)

Other countries:

- Kenya (8 %) , Turkey, Indonesia, Japan, Mauritius, Bangla, USSR, Iran, Argentina,
- (Argentina at 27º S and Georgia (Southern part of USA)

agrilearner whatsapp group 2017 38962

Support Agrilearner App On Social Sites















- Agriculture Schemes=>Click to Read
- Agri Exam Important 10000 Agriculture Mcq=>Click to Read
- Agriculture Current Affairs =>Click to Read
- PDF Available To Download =>Click to Download
- IBPS SO Agricultural Officer previous year solved papers (6 years)=>Click to Download
- IBPS AFO 2019-2020 Question paper with solution=>Click to Read
- IBPS AFO exam pattern Pdf Download=>Click to Download

India:

- In India 80 % of the area is above 50 ha in size and most of them are in corporate sector (United body)
- North India = Nearly 80 per cent of total area in India,
- South India = Nearly 20 % of total area in India

Distribution in India:

- Assam = 53 %
- West Bengal = 24 %
- Tamil Nadu = 13 %
- Kerala = 8 %
- Other states = 2 % (It is from Karnataka, Tripura, Himachal Pradesh, UP, Bihar, Sikkim, Manipur)
- Although Darjeeling produces the finest quality of tea, its productivity is low. The average yield in Darjeeling (635 kg/ha in 1981) is reported to be less than half of the all India average.

agrilearner whatsapp group 6201733962

1) China bush: small leaved china bush,

- *Camellia sinensis* L. var sinensis (Syn: *Thea sinensis)* commonly known as china tea. It is indigenous to China and cultivated in India, Nepal etc.
- **Features:**
- It is hardy, multistemmed, slow growing shrub or a small tree (1-6 m height).
- Branches : Young branches are rather stout, hairy(hairy) to glabrous and older branches are grey.
- Leaves **:** Small i.e., 4 to 10 cm long, erect, shortly stalked, elliptic, leathery, dark glossy green above and light green below.
- Economical life : The variety has a economical life of about 100 years. However, pruning and continuous plucking reduces the life span.
- Winter hardy : It can with stand severe winters and hot droughts on northern India. Hence, it is grown at an altitude above, 1050 m. Eg. Darjeeling.
- Quality : It is highly valued for its flavor

agrilearner whatsapp 6201733962

- **2) Assam tea:** Large leaved Assam tea have been recognized. = ***Camellia sinensis* L. var *assamica* (Syn: *Camellia assamica, and Thea assamica)***
- It is apparently indigenous to Assam, Mynmar, Thailand, Vietnam and South China.
- **Features:**
- Quick growing: It is quick growing tender plant of more southern distribution.
- Stature: It grows into a single stemmed tree about 17 m in height if allowed to grow unimpeded.
- Leaves: Larger leaves of 15 – 20 cm long usually thinner drooping leaves more or less acuminate at the apex, light green, glossy, puberulous chiefly along the mid rib below.
- Economical life: It has a economical life of about 40 years.
- Quality : The tea made from China plants have a definite character and flavour, but lack strength and quality which are marked in Assam teas when grown in certain areas
- Distribution : Assam tea is used in North East India, South India, Sri Lanka, Indonesia, Africa and South America
- Numerous hybrids between China and Assam types are known around Darjeeling in India. As tea is largely cross-pollinated and most of the commercial crop is raised from

agrilearner whatsapp 6201793962

3) Cambodia tea race

- Southern form of tea is closely related to *Camellia assamica* and is named *Camellia assamica* subsp *lasiocalyx*

Distribution: It is cultivated in the Nilgiris and in Western ghats near Mangalore ad is commonly known as Southern form of tea or as the Cambodia race. It is a small tree with long narrow up-turned leaves. Base of the petiole is pinkish red in colour which is a distinctive feature of this variety.

Features

- Stature : 4 to 5 m tall trees
- Leaves : Hard and small (long narrow upturned leaves)
- Yield: Poor yielder.

agrilearner whatsapp group 8281753962

Differentiating features between Assam tea and China tea

Sl. No.	Features	Assam tea (*Camellia sinensis* var *assamica)*	China tea (*Camellia sinensis* var *sinensis)*
1	Stature	Tree	Shrub/bush
2	Branches and growth rate	Few robust branches and quick growing	Abundant branches and slow growing
3	Leaves	Large (15 to 20 cm long) and glossy and less serrated	Small (4 to 10 cm long), leathery and more serrated

agrilearner whatsapp group 6201739962

5	Yield	High yield	Low yield
6	Susceptibility to drought and frost	Susceptible	Hardy and resistant (Winger hardy)
7	Distribution	Countries near to equator viz., India, Sri Lanka, S.E. Assia, Central Africa etc	Cold countries and high altitude areas like , N- Iran, , or China *etc*
8	Economic life	Less (40 years)	More (Over 100 years)

agrilearner whatsapp group 6201733962

Climate and soil requirement for tea

Climate:

- Tea is a **subtropical** species.
- In south India tea is grown in hilly areas and in
- North India = Plains
- Tea prefers a climate which is
- 1) Moist,
- 2) Warm and
- 3) Winter is not too cold

Temperature: Optimum = Mean maximum of 29.5 ºC and mean minimum of 13 ºC

- South India vs North India
- Tea is cultivated on hilly tract around 1000 m and above, the temperature is relatively low here where as in North India the temperature is high during summer on the plains, which is unfavourable for high tea productivity and a good stand of shade trees is therefore grown for optimizing productivity.

Altitude: It ranges from sea level upto 2460 m above MSL. In North India tea plantations are located in plains while in South India tea is cultivated in hilly terrain.

agrilearner whatsapp group 6201733962

Support Agrilearner App On Social Sites















- Agriculture Schemes=>Click to Read
- Agri Exam Important 10000 Agriculture Mcq=>Click to Read
- Agriculture Current Affairs =>Click to Read
- PDF Available To Download =>Click to Download
- IBPS SO Agricultural Officer previous year solved papers (6 years)=>Click to Download
- IBPS AFO 2019-2020 Question paper with solution=>Click to Read
- IBPS AFO exam pattern Pdf Download=>Click to Download

China tea is grown on higher altitudes.

- Cardamom hills of South India = 2460 m above MSL

Rainfall: Well distributed rainfall ranging between 125 and 750 cm. In North Eastern India tea receives copious rainfall (150 to 500 cm). However, the distribution is most uneven.

- The annual rainfall in South Indian tea growing areas varies between 90 and 800 cm.
- **Day length:**
- **Critical day length for vegetative growth** =10.5 hours. It varies from 9.4 h to 15 h in North India
- Where the tea growing area lies between 24 º N and 28 ºN latitude day length varies from 10 to 13 hours during different season

Winter = November to March = Shorter day length = Vegetative growth almost ceases

- However, this is compensated during July to September (Summer) = Long and conducive to good vegetative growth.

agrilearner whatsapp group 8217335962

In South India

Day length is = > 11 hours

- Here tea growing areas lies below 12.5 ºN latitude and characterized by minimal diurnal variation = Minimum day length not falling below 11 hours= Leads to uniform vegetative growth in tea throughout the year, except during the monsoon when productivity falls.

Relative Humidity

- North India = High (> 60 %) throughout the year.
- South India = Falls as low as 15 % in February to March. This necessitates protecting the nursery plants against desiccation with polythene cloches.

Frost: Causes adverse effect on tea bush, especially in the ravines.

Soil

- Wide range of soils which are acidic in reaction. In North East India, the soils under tea range from the lightest of sands to the stiffest of clays and include silts and loams and even peat soils.

agrilearner whatsapp group 8217333962

- It prefers soils rich in organic matter with well drained situation.
- It grows not only on hill slopes but also on low-lying flat lands as in some areas of North India, provided the soil is well drained. Some of the finest plantations in Assam are found on level ground. In Darjeeling where agroclimatic conditions are similar to those in the hilly tracts of western ghats and the Nilgiri hills in South India, tea is cultivated on **hill slopes.**

Calcifuge nature of tea

- Tea is a calcifuge and an aluminium accumulator. Performance of tea in soils with higher Ca is not satisfactory. It grows on soils which are generally rich in iron and manganese.

Planting material and plant propagation in tea

I. Seed propagation: Seed is convenient to use as planting material in tea. Till today tea is generally propagated from seed.

- But during recent years to use of high yielding clonal material = Hence Vegetative propagation. Tea is out breeding, and will not produce true seeds because of sterility. Genetically it is heterogeneous for potential yield, disease resistance and manufacturing quality.

agrilearner whatsapp group 6201733982

Vegetative propagation:

- Different vegetative propagation methods can be adopted in tea:
- 1) By budding
- 2) By grafting on rootstocks
- 3) By layering
- 4) By cutting = popular method of vegetative propagation.
- Vegetative propagation by budding, grafting or by layering are too labourious to adopt.
- **Grafting**: It is practiced for successful propagation of high yielding drought - susceptible clone used as scion on to drought - hardy clone used as root stock. In south India nursery grafts have been made using high yielding clones such as UPASI -3, UPASI – 8 and UPASI -17 as scions and drought hardy clones UPASI-2, UPASI-6, UPASI-9, UPASI-10 , UPASI-24,ATK-1, SA-6 and TRI 2025 as root stocks.
- In view of the grafting success, survival, graft vigour of the composite plants and yield the following graft combinations have been recommended for commercial exploitation in southern India.

agrilearner whatsapp 9535902178962

Vegetative propagation by cuttings:

- Commercial method of propagation is through single node cutting (Semi hard wood cuttings is preferred method). Elite clone should be selected with desirable characters like yield, quality, quick recovery etc.,

Features of mother bush

- 1) Compactness: Number of stems per unit area should be high and should be uniformly distributed.
- 2) Individual stem should be thick and uniform.
- 3) Bushes should have early filling tendency.
- 4) Bushes should have lateral spreading habit.
- 5) Main stem and primary branches should have upright growth after pruning.
- 6) Density of Plucking point/units should be high.
- 7) Flushes/leaves should have pubescence.
- 8) Bushes should be resistant to blister blight and free from other pests and it should be drought tolerant.
- 9) High yield, Yield per unit area of plucking table should be high.
- 10) Flowering tendency: Selected bushes should not have flowering tendency.
- 11) Bushes should not have too many bhanji buds.
- 12) Secondaries and tertiaries in bush should have upright growth.

agrilearner whatsapp group 6201733962

Selection of site and establishing tea plantation

New estate establishment: Clearing of forest growth by removing all unwanted plants and leaving only permanent shade trees. Take appropriate steps to prevent soil erosion. General burning is not advocated as it

- 1) Makes the soil alkaline and
- 2) Reduces the soil fertility

Note: If necessary burning is done away from the planting site.

- Tea bushes will be having an economical life of over 40 years. While selecting sites following precautions should be taken;
- 1) Slopy land or hilly terrains or jungles: Take adequate soil conservation measures to protect soil erosion and also moisture conservation.
- 2) Soil: Acidic soil with adequate depth, good drainage etc.
- 3) Temporary shade trees: Shade has to be provided for young developing plants

agrilearner whatsapp group 9741733962

Time of planting:

- North India (Assam): Winter season with low rainfall but with plenty of mist is desirable i.e., October– November.
- South India: Summer season (Rainy season) is most suitable time for planting i.e., May – June.

Planting operation

a) Pit size: Planting hole or trenches of 45 cm diameter and 60 cm depth.

- Or pits of 30cm x 30cm x 45cm (depth) and if land is not good
- 45cm x 45cm x 45cm (depth) or
- 60cm x 60cm x 60cm (depth)

Spacing: Plant population of tea bushes vary from 14 to 18 thousands per ha. Higher plant population showed adverse effect after 4 to 5 years. Spacing varies from region to region and variety to variety

- 1.5 m x 1.5 m or
- 1.5m x 0.75 m = 14000 plants per ha closer spacing gives quick covering
- 1.2 m x 0.75 m or
- 1.2 m x 0.60 m = accommodates more than 16,000 plants per ha

agrilearner whatsapp group 9201733962

Methods of planting

Single Hedge System

In this method, the spacing adopted is 1.20 x 0.75 m accommodating 10,800 plants/ha.

Double Hedge System

In this method, the spacing adopted is 1.35 x 0.75 x 0.75 m accommodating 13,200 plants/ha.

Training and pruning in tea

- Normally tea bushes are established within a month after planting. Within a period of 12 to 18 months they reach a height of 60 – 75 cm (Field plucking stage) and after this stage pruning is taken up.

Pruning operations for bush formation

Framing and shaping = Training

Maintenance pruning = Production pruning

- Duration from planting to regular plucking field stage = 18 to 20 months.

Initial operations: Initial post planting operations (Training) are designed

agrilearner whatsapp group 6201723962

i) Centering : In South India, the leader stem is removed (Centered) at 20 to 25 cm from the ground level leaving 8 – 10 mature leaves on the plant. It is done to induce secondaries. When secondaries reach more than 60 cm, they are tipped at 50 to 55 cm height by removing leaves and bud to induce tertiaries. Further, training /pruning involves regular plucking with hand. This aims at getting an inverted dome or cone shaped bush.

Height of plucking table = 65 to 90 cm. It depends on the spacing, convenience for plucking and sustained yield for a considerable period without requirement of height reduction. Plant population adopted during recent years is about 15,000 per ha due to close spacing. **Height of plucking table varies from 65 cm to 90 cm**. The permanent frame should be established at an initial height of around 45 – 50 cm.

- A frame of lower than 45 cm would
- Create plucking problem and
- Inadequate growth in thickness of stem.

Season of pruning: Pruning is carried out during the pre-monsoon or post-monsoon periods since adequate soil moisture is a pre-requisite for pruning.

Purpose of pruning in tea are:

1) Space utilization: Shaping trees to make the best use of space between trees. (15,000 plants per ha)

agrilearner whatsapp group 6205766962

2) To induce vigor in growth/ to maintain plants permanently in vegetative phase: Re establishment of initial vigour of the shoot system to stimulate growth there by maintaining the plant **permanently in vegetative phase**. It stimulates the production of young shoots

3) To maintain the height of the plucking table: To facilitate convenient hand plucking of young buds with tender leaves and shoots at a cheaper cost. The plucking table continues to rise as the age from pruning advances and pruning assists in keeping the height of the bush within the bounds of easy and efficient plucking.

4) To remove interlaced (criss cross) branches, dead, diseased, knots and over aged wood. By doing this the bush will be rejuvenated.

5) To create congenial microclimate within the plant: Providing an environment with in the plant which is conducive for maximum crop production but minimizes the spread of pests and diseases.

agrilearner whatsapp group 8247389823

6) To maintain a balanced number of branches and sufficient volume of mature foliage to meet the physiological needs of the plant. There should be optimum balance between actively growing branches and foliage as to meet the physiological needs of plant. There should be an optimum amount of wood so that plants remain in a steady state of productivity.

7) Drought tolerance : Pruning helps in overcoming the drought effect; it also exposes the bark of frames which had been shaded for a few years.

8) Maintaining the quality of tea :by rapid renewal of flush suitable for manufacture of good quality tea.

9) To minimize pest and disease attack on tea bush.

10) To pluck maximum number of tea shoots/ leaves from convenient height.

agrilearner whatsapp group : 8017833502

Types of pruning: The criterion for determining the height of pruning should be the thickness of branches.

- Generally, a 4-year pruning cycle is followed in the mid elevation areas and 5-year cycle at high elevations.

1. **Skiffing**: It is a lightest pruning. Here foliage is leveled off, only green stems are removed. Here top 5 – 8 cm new growth is removed so as to obtain uniform level of plucking surface. If the bushes are pruned about 75cm, it is referred to as skiffing. In plains of north-east India, tea is pruned every year when bushes enter the dormant phase. Though this method is no longer practiced, bushes are cut very lightly every year and this is called skiffing. Nowadays, certain estates do not do skiffing every year and leave the bushes unpruned for 2 successive years. At the end of the pruned year, the bushes may be skiffed deep, medium, light or level. Skiffing may be repeated for 2-6 years. Deep skiffing is given at a height mid-way between pruning and tipping levels. In medium skiff, the cut is nearer to the tipping height, say 5cm below the tipping height/ Bushes which have been light or level skiffed are not tipped. The introduction of skiffing in place of pruning in north-eastern India has helped to increase

agrilearner whatsapp group

2. **Tipping**: It is the first round of harvesting of young shoots. Good frames could be developed with correct tipping. The first plucking of recovering bushes is called tipping. The objective of tipping is to establish a level plucking surface, to provide adequate maintenance foliage for the quick production of secondary branches.

3. **Lung pruning or fringe pruning**: Here criss cross branches are removed so that bush maintains a uniform height. Here all the leaves below the pruning level are left including peripheral branches. In this method dieback and death of plants is minimized.

4) **Medium pruning: To** check the bush growing to a inconvenient height this type of pruning is practiced. It stimulates new wood and maintenance foliage at lower level. It is done occasionally (once in 12 to 18 years). Medium style of pruning refers to pruning between 45 and 55cm.

5). **Rehabitation pruning or collar pruning**: 30 to 40 cm height. It is deep/heavy/severe pruning done to rejuvenate the bush when plants become uneconomical to maintain and grown out of hand. Here bush is cut off at ground level. Since this type of pruning is more severe casualties of plants may be high. A pruning height of 30-40cm is termed a hard prune when primary frames are healthy and if secondary branches have numerous knots and are cankered, a hard or medium pruning becomes necessary. In such cases, pruning is done into the secondary wood.

agrilearner whatsapp 9[illegible]6201[illegible]

Shade maintenance and management in tea plantation

- Tea requires filtered light and if it is exposed to direct sun its growth is affected. Tea bushes with semi – erect leaves don't require shade as the **leaves are not overheated when exposed and allow more light penetration into the bush.** Hence, the tea bushes with semi-erect leaves have highest yield potential as against the types with horizontal leaves. Broad leaved bushes perform better under shade. However, shade in tea has drawbacks like
- **Purposes of shade regulation in tea are** (Beneficial effects of shade trees in tea cultivation)
- 1) **Protection**: To protect tea plants from direct sun and hot weather They help to reduce the injury caused to tea leaves by UV radiation.
- 2) **Fertility improvement**: Addition of organic matter in the forms of fallen leaves of shade trees apart from loppings obtained during shade regulation. About 20 to 25 tonnes of leaf litter is added per year out of shade trees. Increase the fertility of soil by adding 8-10 tonnes of organic matter/ha/year.
- **Note**: 1) Fertility breakdown or degradation at 32º C is three times higher than at 16ºC
- 2) For each 1 per cent increase in organic matter we have to add 22 t of organic matter per ha i.e., @ 2.2 kg per square meter.

agrilearner whatsapp group 6201783503

- 3) **Breaking up of sub soil**: Shade trees break up the heavy subsoil layer due to root penetration.
- 4) **Temperature effect**: These trees help to regulate temperature and humidity at bush level
- **Summer**: checks the raising of temperature of plantation during summer up to 5 to 7 ºC compared to open. Day time they reduce the temperature and during night time increase the temperature by 5 to 7 ºC compared to open.
- 5) **Wind breaks**: Shade trees serve as wind breaks
- 6) **Erosion control**: They also help in minimizing soil erosion.
- 7) **Additional income**: As timber, fuel, supporting tree for pepper etc
- 8) Decrease in pest incidence: Mite (*Acaris theae)*(Under shade 24 mites per leaf compared to 61 mites under open or unshaded leaves)
- 9) UV radiation: They help in reducing the injury caused to tea leaves by UV radiation. Shade trees trap 30-40 per cent of full mid day sun thereby minimizing the harmful effects of solar radiation.
- 10) Increased soil fertility: By adding 8-10 tonnes of organic matter per ha per year.

agrilearner whatsapp group 8281733944

- 11) Regulation of humidity and minimized evaporation loss : Shade trees help to regulate temperature and humidity near the bush level apart from minimizing the loss through evaporation and transpiration.
- **Types of shade trees**
- Initial spacing of the shade trees may be about 6m x 6m which can later be thinned out to 12 m x 12m
- Initially 6 m x 6m ---- reduced to 6m x 12 m at about 8-10 years age ---- reduced to 12 m x12m at the age of 12 to 24 years age.
- 1) **Permanent shade trees** : Have similar longevity as that of tea and hence are planted during planting of tea. They are slow growers.
- Spacing = 12 m x 12m
- Eg : Albizzia spp (A. odoratissima and A. *stipulate, A. procera, A. moluccana and A. chinensis. Albezzia lebbeck ,* silver oak etc)
- *Dalbergia sericea, Dalbergia assamica, Derris robusta* etc

agrilearner whatsapp group 6201733962

- **2) Temporary shade trees** : Are fast growing tress planted to provide shade to tea plants during their initial growing period. Planting of temporary shade trees should be planned is such a way that, they will be 18 to 24 months old when the tea is planted.
- Spacing: 6 m x 6m
- Eg : *Indigofera teysmani, Glyricidia sepium, Leucaena glauca, Erythrina spp.*(E. *subumbrans and E. lithosperma* i. e., dadap for lower elevations is also used for shading purpose in south India) etc.
- In south India (Nilgiri hills) silver oak (*Grevillea robusta)* is a shade tree of choice plated at 6 m x 6m and which can later be thinned out as required to 6 m x 12 m or 12 m x 12 m).
- When permanent shade trees attain adequate height the temporary ones are removed by gradual lopping and uprooting.
- **Shade regulation in tea plantation:** Shade trees should be lopped regularly to maintain the clear trunk upto the height of about 8 – 10m (singling).
- Season of lopping: At the commencement of monsoon. Lopping of shade trees can be generally done twice a year at the commencement of monsoon. Trees of *Acacia* spp donot withstand lopping and hence need very light lopping. Shade trees in the beginning are planted at 6m x 6m and later be thinned out by removing alternate trees as required to 6 m x 12 m or 12 m x 12 m

agrilearner whatsapp group 8017993992

Manuring in tea

- Economical part: Tender growing shoots
- Hence, the recommendations are for
- 1) Suppression of reproductive phase and exploiting vegetative growth during growing season.
- 2) Balancing the harvest of growing paoings without affecting general health of bushes.
- Normal dose of fertilizer for tea is
- Nitrogen = Ten kg of Nitrogen for every 100 kg of crop
- P_2O_5 = 30 to 40 kg
- K_2O = 40 to 50 per cent of amount of Nitrogen applied depending on soil type and weather conditions.
  Manuring should be done 2 months after planting. Phosphorous should be applied at 80 - 100 kg/ha as Rock phosphate once in a year by placement at 15 - 25 cm depth up to the first pruning and thereafter once in two years. N : K ratio 2 : 3 should be adapted for the first 3 years and a ratio 1 : 1 thereafter.

agrilearner whatsapp group 6201733962

Year of application	Total weight kg/ha/ annum		No. of applications	Qty/plant (g)	
	N	K		Ammonium Sulphate	Urea
I year	180	270	5	13	27
II year	240	360	6	23	15
III year	300	450	6	29	18
IV year onwards	300	300	6	33	19

agrilearner whatsapp group 6201753962

Plant protection in tea

- Tea is grown as monoculture under varying agroclimatic conditions, remote from its natural environment. Hence, they are prone to the attack of many pests and diseases. Important ones are listed here under
- **Diseases of tea:** Diseases due to fungi, bacteria, virus, animal parasites , physiological disorder and mechanical damages are observed.
- Bacterial and viral diseases are not that problematic in tea when compared to fungal and algal diseases under Indian conditions
- **A) Leaf diseaseas**
- **1) Blister blight:** Cause : *Exobasidium vexans* (a fungal disease) :
- **2) Black rot**

B) Root diseases

agrilearner whatsapp group 6201728982

- **Blister blight disease of tea and its control**
- **A) Leaf disease**
- **1) Blister blight:** Cause : *Exobasidium vexans* (a fungal disease) :
- It is commonly found fungi in South India, Darjeeling and Assam but moderate in Himachal Pradesh. This disease is endemic to the growing areas of Asia. It has been reported from almost all tea growing regions of India. The disease is more severe in South Indian plantations than that of North East Indian tea plantations
- Congenial conditions for disease spread : Cool, Moist an relatively still air favors infection.
- **Symptoms:**
- Presence of blisters on upper leaf surface & young shoots : Formation of circular or oval translucent spots. The spots become depressed forming a concave **blister** on the infected upper surface of leaves.
- Convex under surface of leaves : Undersurface of leaves will produce convex surface and it becomes grey and finally white
- Death of shoots :

agrilearner whatsapp group 2017

- **Control measures**:
- **Chemical control**:
- 1) Application of copper fungicides i.e., COC @ 0.25 per cent.
- 2) Systemic fungicide: Calixin (Tridemorph 50 EC) best control. @ 1 ml per litre of water (0.1%).
- 3) Pruning schedule: Pruning operation should be shifted to dry weather period for minimum infection.

agrilearner whatsapp group 6201733982

Harvesting (Plucking), Yield and Manufacturing of Tea

- **(Syllabus :** Plucking, processing and yield of tea.)
- **Types of shoots in tea:**
- 1) Aperiodic shoot / (Primary shoot) : From pruned sticks. Are the ones arising from the buds on the pruned frame/sticks. It produces large leaves and production of banji buds is only occasional.
- When these aperiodic shoots or primaries grow above a predetermined height, they are cut or tipped. The branches of primaries are the first order laterals which when plucked give rise to the second order laterals. These again produce the third order laterals.
- 2) **Periodic shoots** / **Flush shoots/Crop shoots** : Arising from the axils of leaves. It constitutes the crop shoots. Periodic shoots exhibits cyclic pattern producing 7 -8 leaves (including scale leaves- fig -24 of Wealth of India book) in a cycle before terminating in a “Banji” whose growth and expansion ceases temporarly. When the crop shoot is harvested, generally the bud on the axil of the top most leaf of the stem develops into a new crop shoot.

agrilearner whatsapp group 6281733961

- **Janams**: The axillary bud, while unfolding, generally produces in succession two scales (first 2 scale leaves (cataphylls)), a small foliar structure in the shape of a thumb called Thumb leaf (also called Janam).
- **Fish leaf**: A slightly larger but unserrated blunt leaf is designated as fish leaf (bigger thumb leaf). Above the scale leaves or janams is the smooth 'fish leaf'.
- **Mother leaf:** Fish leaf is followed by a series of three or four **normal foliage leaves**, first of which is called the mother leaf after which bahji is exposed.
- **Plucking in tea:**

  Plucking in tea :It consists of collecting the newly grown vegetative shoots i.e., Harvesting in tea involves the regular removal of young shoots comprising an apical bud and 2 or 3 leaves, immediately below it. Tea crop consists of terminal buds and two or three leaves just below with the stalk. The retention of adequate maintenance foliage for the continued health and productivity of the bush is necessary.

agrilearner whatsapp 8910201763962

- **Stage/Age of plucking:** Plucking stage is attained when tea plant is of 3 to 4 yeas old. However, plucking stage under ideal management conditions is attained in 18 to 20 months stage.
- Young leaves with more of **tannins and polyphenols** produces better quality tea than old leaves with less tannin content. Maximum yields (stable/economical stage of yield) are obtained in 6^{th} or 7^{th} year and there after the yields remains constant.
- It is clear that, plucking of the terminal bud only or with terminal bud with I leaf gives excellent quality tea. Bud is usually plucked with I and II leaves. (i.e., **Best plucking is two leaves and a bud)**
-

agrilearner whatsapp group 6301763962

Kinds of plucking depending on the extent of maturity of shoots

- Young leaves with more tannin and polyphenol content produces superior quality tea.

1) Two and a bud**:** plucking of terminal bud and two most recently opened/expanded leaves. Two leaves and a bud is considered as one plucking unit.

- Two and a bud is called fish leaf or Janam flucking.

2) Fine tea: Anything less than two and a bud. It is also known as fish or janam plucking. Young leaves will produce superor quality tea.

3) Coarse tea: Anything more than two and a bud. Older leaves will produce coarse quality tea.

4) Light plucking or light pruning: Carried out during initial years to encourage side branches and to make the bush full with tender branches.

5) Too tender shoot/One leaf and a bud: Produces very good quality tea but yield goes down drastically.

agrilearner whatsapp group 8201758902

- Shoots may be plucked above janam, fish leaf or mother leaf. These system of plucking are known as janam plucking, fish leaf plucking or mother leaf plucking, respectively.
  - In north-eastern India, janam plucking is the most common practice.
  - In south India, continuous scale leaf or fish leaf plucking is not adopted.
- **Time of plucking:** Better quality tea is obtained from the shoots plucked in the morning than in the evening hours.
- **Morning:** More soluble proteins are present and produces good quality tea.
- **Afternoon**: Insoluble proteins will be increased.
- **Night**: Break down of amino acids and formation of amino acids
- **South India**
- In south India, plucking differs from that of north-east.
- The climatic conditions in south India force growth into 2 impulse periods (High cropping /Rush cropping) where in 60

agrilearner whatsapp group 6201783962

- From April to June and
- From mid-September-November. About 60% of the total crop is harvested in this period and availability of workers becomes a serious constraint to invest the crop completely. Plucking is to Janam or fish leaf.
- **Low cropping /lean cropping:** July to September (Rainy season) and January to March (Winter) = About 40 % of the crop is harvested at an interval of 12 to 15 days.
- **Cost of plucking:**
- Plucking is normally (Most of the tea grown throughout the world) done by hand by woman or children. Major drawback in mechanizing the harvesting process in tea is the steep and irregular slopes on which tea is very often grown
- Plucking in tea accounts for
- 15 to 20 % of total production cost and
- 60 to 70 % of total labour involved in tea estate.

agrilearner whatsapp group 6291733962

- **Use of hand held shears: It** is now recommended to use handheld shears to harvest the crop during these high cropping seasons. Use of shears is advised only to the high cropping periods and that too for fields which are **more than 18 months old from pruning**. Continual shear harvesting is proved to depress the crop and adversely affect the bush physiology.
- **Life span of tea bush:**
- **Stage/Age of plucking:** Plucking stage is attained when tea plant is of 3 to 4 yeas old. However, plucking stage under ideal management conditions is attained in 18 to 20 months stage.
- **Maximum yields (stable stage of yield)** : are obtained in 6 th or 7 th year and there after the yields remains constant.
- **Economical life of bush:**
- **North East India**: 40 to 50 years, though there are individual bushes surviving as many as 200 years.
- **South India :** 80 years or even more

agrilearner whatsapp group 6261733967

Yield

- **Yield of made tea:** 20 to 30 q per ha
- 20 q /ha = Low yield
- 20 – 30 q /ha = Medium yield
- > 30 q/ha = high yield
- **<u>Manufacture of tea \ processing of tea</u>**
- Tea contains 4.5 to 5 % Nitrogen compounds ¾ of which can be attributed to proteins and amino acids and ¼ to alkaloids. Chief alkaloids are thein , theobromine and theophyllomine.
- *** Maximum caffeine content allowed is 3 %**
- **Classification of tea** (Based on the method of manufacture in general and the extent of fermentation i.e., enzymatic oxidation in the true sense)
- 1) **Green tea**: produced without fermentation. Green tea is un-withered, unfermented tea prepared by drying tea leaves either by steaming or passing hot air over leaves. Unlike in black tea in green tea enzymes are destroyed by steaming or blowing hot air avoiding fermentation. The final product is green in colour.
- 2) Black tea: Fully fermented. About 73 per cent of global out put is black tea and
- 3) Oolong tea: partially fermented

agrilearner whatsapp group 6261 75962

- Several types of commercial teas are known such as
- Black,
- Green, these two (Black and green) is processed to a maximum extent in India.
- oolong,
- brick and
- Let- pet teas.
- Each of teas has its own characteristic aroma and taste.
- Oolong, brick let-pet and other types of tea are manufactured chiefly for export and on experimental scale.
- Basically there are three types of processing in tea (Based on the method of rolling in the preparation of black tea).
- **1)** Orthodax method: Rolling operation is done in a series of rollers (i.e., based on the traditional method)
- **2)** CTC (Crush, Tear and Curl) method: It has a CTC machine consisting of series of a pair of
- rollers adjusted to crush and tear leaves.
- **3)** LTP (Laurie Tea Process (LTP): LTP is essentially a pulverizing machine. It carries many sets of beaters.
- In the preparation of black tea, four principal operations are involved viz., (a) withering, (b) rolling, (c) fermenting, and (d) drying.

agrilearner whatsapp group 6201738962

Irrespective of the method of manufacturing tea it involves following steps

- Manufacture black tea either by the CTC (Crush, Tear and Curl) or the orthodox method involves steps viz.,

1.Withering: Moisture content of leaves is reduced (to about 55 %) by drying in a trough receiving artificial air. Duration of drying varies from 12 to 18 hours.

2.Rolling: During rolling cells of leaves are broken to liberate sap containing polyphenol

- oxydase (and enzyme). Rolling takes place for about 30 to 40 minutes.

3.Fermentation: Rolled tea material is spread on concrete floor or trays under high humidity and proper temperature to undergo fermentation. Properly fermented tea will attain **golden red colour** deciding the quality of tea. Theaflavins: and Thearufigens are compounds responsible for colour of tea.

4.Drying: Slow reduction in moisture content as to stop fermentation process. Moisture

- content is reduced to **about 4 per cent**. Duration of drying is for about 30 to 40 minutes.

5.Cleaning & grading: Remove stalky fibers and grade the tea by passing through different sized meshes.

agrilearner whatsapp group 6207833962

- **1) Withering:** The first step in processing of black tea is withering.
- The main **objective** of withering is
- 1) Reduce moisture content of tea leaves**:** It lowers moisture content to about 55 per cent (by
- removing 15 to 20 % moisture). During this the leaves undergo physical and chemical withering. Leaves are withered in troughs for about 12-18 hr.
- 2) When leaves have been withered correctly, it becomes flaccid and suitable for rolling during which polyphenols are mixed with enzyme **polyphenol oxidase (PPO).**
- **Judging the end point of withering**
- **No cracking sound:** Well withered leaves will not produce any cracking sound when squeezed i.e., it must not be too dry.
- **Compact ball:** Withered leaves when pressed by hand should form compact ball.
- **No brittle stalk:** The stalk of the withered leaves should not be brittle.
- **Feel test:** Withered leaves will have silk hand kerchief feel to touch.

agrilearner whatsapp group 8201783903

- Withering may be of
- 1) Natural or Chung withering: 18 to 20 hours
- 2) Artificial withering: 3 to 4 hours.
- Some chemical changes, besides loss of moisture, also take place during withering.
- a) **Chemical changes**: A slight increase in caffeine and a relatively large increase in some of the amino acids are the earliest chemical manifestations. The extent of chemical changes in the tea is more in natural wither, less in artificial wither and least in wither under humid conditions.

- b) Quality: The chemical changes during withering and the degree of wither of tea shoots are partly responsible for the **liquor characteristics**, **physical appearance** and **overall quality** of the made tea.
- **Black tea:** Withering is not considered essential for the manufacture of black tea although it does have an influence upon the appearance and quality of the finished product.

agrilearner whatsapp group 6201763962

2) Rolling:

- **Leaf damage**: The withered leaf is passed on to rollers where it is twisted so as to cause sufficient damage to the individual leaf cells and to initiate enzymic oxidation.
- Duration and extent of rolling : Rolling is usually done for 30 minutes and the rolled mass is sifted and the finer portions of the leaf are allowed to ferment
- While the coarser portions are subjected to heavy rolling. Rolled for 3 to 4 times.
- Sometimes a third rolling may be given; rolling is essentially a batch operation. Due to rolling the **catechins (** Polyphenol **)** are thoroughly exposed to the polyphenol oxidase. (PPO)
- Three major manufacturing methods commonly used are
- i) **Orthodox**.: Which employs non-cutting rollers. The orthodox tea has superior flavour but poor in colour.
- ii) Crushing, tearning and curling (CTC) which employs rotoravanes and cutting rollers. CTC tea is more economical with red colour and popular in India and

agrilearner whatsapp group 6201753962

3) Fermenting (enzymetic oxidation) – Actually fermentation starts /commences at the time of rolling and continues till the entry into the driers.

- The main operation in the manufacture of black tea is **enzymatic oxidation** which was originally termed fermentation and the term is still in vogue today. In tea processing, fermentation is the term employed to denote enzimatjc oxidation, by which the polyphenols in the leaf get oxidized with the help of PPO (Polyphenol oxydase).
- Method of fermentation : The coarse and fine fractions of the rolled leaf are spread on clean cement floors or other suitable platforms to a thickness of 2.5- 10.0 cm depending upon the season and condition of the leaf, and allowed to ferment for 2-4 hours depending upon the type of roller used.
- Two types of compounds are formed during fermentation process.
- 1) Theaflavins (TF) === **Orange red**.
- 2) Thearubigins (TR) === **Darker brown**.
- The quantity of TR and TF formed will be related to the period of fermentation and the temperature of fermenting leaves.

agrilearner whatsapp group 6

4. Drying or Firing

- Objective of drying is to arrest fermentation.
- **Moisture of the made tea**: The dried product contains 3-**4 percent** moisture, and can withstand long storage and transit
- **5) Sorting and Grading** -
- The black tea is sold loose or in packets, under different brand names.
- Stalk is removed during sorting. There are four main sizes, viz.,
- I. whole leaf,
- II. brokens,
- III. fanning's and
- IV. Dusts.

agrilearner whatsapp group 6201733962

Packing and grading in tea

- Dried tea is cleaned of stalk fibres (petioles/stalks/ fibres) by passing through fiber separating machines.
- Bulk tea is passed through different meshes which aid in separation into different grades;

agrilearner whatsapp group 6201733962

Join IBPS AFO Preparation Course For Mains & Interview By Agrilearner { agriguru.in }

Weekly Full Length Mock-test On The Pattern Of IBPS AFO

Monthly Agriculture Current Affairs In Detail & MCQ With Explanation

Subject Wise Notes In Very Short And Concise Way

All Agriculture Subject Is Divided Into Modules In Course & All Modules Are Arranged In On The Basis Of Their Importance

Important Downloadable Notes Are Provided + Summery Sheet Before Exam For Quick Revision

Whole Course Is Designed By Observation Of 10 Year Previous Paper & And Syllabus Of IBPS AFO

Full Guideline By The Scholars {Pre Qualified Students} For The Preparation Of Pre , Mains & Interview

Chat Support For Any Doubt Clearance Related To Subjects By Experts.

Every Module Have Video Explanation Of That Topic

Price Is Very Much Low That Every Student Who Wants To Become AFO Can Enrol In This Course Normal Price Rs: 2500/- With Coupon Code "agrilearner" It Will Cost Rs: 1899/- Only

CLICK TO CHECK COURSE