PRACTICAL 1 : LAND PREPARATION FOR PLANTING OF TEA

1.1 OBJECTIVES

After doing the practical you will be able to:

- Plan the works to be done for planting tea.
- List the works to be done in sequence.
- Clear the area for planting tea in the virgin and uprooted land.
- Prepare the land for planting tea.
- Take the precautions while doing the job.

1.2 INTRODUCTION

Land preparation for planting tea is an important operation. Any faulty land preparation techniques may destroy the good structured soils or result in failure of the establishment of tea. For planting in virgin land, the area needs to be cleared completely by removing all vegetation and then it is prepared for planting tea. If the area was under tea or some other crops, land preparationneeds extra care before replanting tea in such uprooted areas.

In this practical, you will be given a guideline to prepare a plan for planting tea both in virgin as well as uprooted land.

1.3 GUIDELINES

A) VIRGIN LAND

Operation		Key points	
1.	**Soil testing**	i)	Test the soil of the proposed area at least one yearahead of planting.
		ii)	Assess the suitability of the land depending upon the chemical characteristics of soil and other factors like soil depth, slope, rockiness etc.

2.	**Survey and planning**	i)	Survey the area by a competent surveyor and prepare a contour map.
		ii)	Identify the catchments on the map using a tracing paper.
		iii)	Mark the main and subsidiary water channels and ridges on the map.
		iv)	Mark the main features on the site
		v)	If the gradient is more than 2%, dig the field drains; construct the road-setc. according to the topography.
3.	**Land clearing**	i)	Kill the big trees by "Ring Barking" method i.e. by removing a layer of the bark of approximately 30 cm width at 1-2 meter above the ground and brushed the exposed wood with a mixture of 2,4-D and burnt engine oil.
		ii)	Carry out Ring Barking one year ahead of planting
		iii)	Uproot the entire stump along with the root system of the dead trees after felling.
		iii)	Fill up the pits formed due to uproot-ing of stumps with the excavated soil.
		iv)	Remove the termite mounds, if any, taking care to remove the honey comb structure completely. Apply Chloropyrophos; fill up the pit with top soil. Improve the soil pH by adding Aluminium sulphate. Plant Guate-mala grass.
		v)	Cut the weeds and jungles and retain the litter *in situ.*

		vi)	Do not encourage burning of the jungles.
		vii)	Clear only that area which is proposed for planting during the year.
		viii)	In undulating area, clear the area catchment-wise.
		ix)	Start clearing from the top of the catchment, if the entire catchment cannot be cleared or not required.
		x)	Layout the drains and path in the area based on the contour map and clear the lower portion of the catchment.
4.	**Land preparation**	i)	Level the area with minimum soil disturbances
		ii)	Plough, if necessary and level the area.
		iii)	Don't plough in sloppy terrain.
		iv)	Don't level the area by cutting the elevated portion to fill the depression.
		v)	Complete the land preparation before the onset of monsoon.
5.	**Diggingof field drains**	i)	Dig the field drains at the recommended spacing making only one foot deep.
		ii)	Mark the graded contour drain lines in the sloppy areas.

B) UPROOTED LAND

	Operation		**Key Points**
1.	**Selection of the old tea sections for uprooting**	i)	Select sections yielding less than 65% of the estate average.
		ii)	Select thosesections where the vacancy is over 25%

		iii)	Select sections below breakeven yield (BEY).
2.	**Target of uprooting**	i)	2.5% of the old area every year.
3.	**Process of uprooting**	i)	Deep skiff the area/section before uprooting.
		ii)	Kill the shade trees one year ahead of uprooting by Ring Barking method.
		iii)	Uproot the tea bushes and the shade trees along with the entire root system.
		iv)	Fork the soil upto a depth of at least 45 cm for removing the smaller roots of pencil thickness which can also serve as source of disease infection.
		v)	Fill up the subsidiary drains after uprooting
4.	**Methods of uprooting**	**A)**	**Manual method**
		i)	Dig out the bushes with the hoe. It is the most common method but not the best. One worker can uproot 30-40 bushes per day.
		ii)	Remove the roots with a diameter larger than pencil thickness.
		B)	**By elephant**
		i)	Uproot the bushes by elephant using a chain. One elephant can uproot 100 bushes per day (4 hours).
		ii)	Remove the smaller roots using hand and hoe.
		C)	**By tractor & tackle**
		i)	Use a 50 HP tractor equipped with 10 tones winch and anchor along with specially made high tensile uprooting

			tackle. It is the most efficient and economical method.
		ii)	Smaller roots are also extracted while uprooting by tractor.
		iii)	A gang of 12 men including the tractor driver can uproot in a light textured soil a minimum of 1500 medium sized bushes per day.
		iv)	With larger bushes in heavy soil,a gang of 19 men including the driver
			can uproot a minimum 700 bushes per day.
5.	**Land preparation**	i)	Fill up the unwanted drains and holes created by uprooted tree stumps.
		ii)	Level the area by hand hoeing and by using a leveler.
		iii)	Apply lime or dolomite to correct the soil pH. Two tonesof dolomite per ha increases pH by 0.5 unit.
		iv)	Survey the land and prepare the contour map.
		v)	Carry out ploughing, harrowing, sub-soiling, if needed (both ways at right angle to each other) and re-leveling.
		vi)	Sub soiling up to a depth of 75 cm in heavy and compact soil using an 80-90 HP tractor with a 10 cm wide shoe.
		vii)	Mark the drain lines and roads according to the survey map.
		viii)	Dig the drains, spread out the excavated soil.
		ix)	Grow Guatemala grass for a period of 12-18 months for soil rehabilitation.

6.	**Land preparation for land under other crops**	i)	Plough the area, level and put under soil rehabilitation crops for a year or so.
		ii)	The area which was under sugarcane or other crops continuously for many years need rehabilitation before planting tea.

1.4 PRECAUTION

i) The big trees should not be felled by cutting .The trees should be killed first, and then removed. If the roots are left in the soil, it may harbor soil borne pathogens.

ii) The virgin land should not be exposed to the sun and rain for a long period. It will destroy the organic matter of the soil. Similarly,burning of the jungle should be avoided for clearing the area.

iii) The cleared area should be planted with tea as soon as possible .If planting is delayed due to some unavoidable reasons, some cover crops should be grown to protect the soil from the sun and rain.

iv) Clearing of the area should be done from the top of the catchment to check soil erosion and loss of top soil.

v) Uprooted lands are poor in fertility and soil physical properties. Soil rehabilitation by growing grasses like Guatemala should be done before replanting.

vi) Thetermite mound should be removed completely from the area and the soil should be improved by adding organic matter or should be put under rehabilitation crops. Tea plants cannot establish in such pockets, if planted without treatment.

vii) While uprooting, fresh roots should not be left out in the soil. It may harbor primary root rot causing pathogens.

1.5 EXERCISE

1. Prepare a chronological schedule of work for land preparation for the following types of land
   a) Virgin plain land
   b) Virgin sloppy land
   c) Uprooted plain land
2. Write the answers of the following key questions.

1.6 KEY QUESTIONS

Q.1. Why are the big trees killed before felling?

Q.2. Whyshould burning of jungles be avoided for land clearing?

Q.3. What is a catchment?

Q.4. Whyshould the uprooted land be rehabilitated before replanting?

Q.5. What is sub-soiling? How is it done?

Q.6. What are the criteria for selecting old tea areas for uprooting?

PRACTICAL 2 : PLANTING OF TEA

2.1 OBJECTIVE

By conducting the practical you will be able to:

- Plan the works for planting tea.
- Select the nursery plants for planting.
- Determine the spacing of planting.
- Mark the tea rows and dig the pit properly.
- Carryout planting operation.
- Take the precaution while planting tea.

2.2 INTRODUCTION

Planting is a simple process, but if not done properly, it can cause serious setback to the establishment, growth and development of the young tea. Any error at the time of planting may cause high mortality during the establishment period and may also persist for years together after planting. It is, therefore, essential to take adequate care at the time of planting.

In this exercise, you will carry out the planting operation and note the key points while carrying out the job.

2.3 PLANNING

- Prepare the planting programme well ahead.
- Take decision on spacing, planting materials and time of planting.
- Plan preparation of land by clearing the area and rehabilitating, if needed, well in advance.
- Raise plants in the nursery previous year or arrange plants from the genuine nursery.
- Never purchase clonal cuttings/biclonal seeds from unknown sources.

2.4 GUIDELINES

	Operation/Step		Key points
1.	**Time of planting**	i)	**Autumn planting :** Carry out planting during October-December while the soil is still moist after the post monsoon period. Conserve the soil moisture by mulching
		ii)	**Spring planting :** Carry out planting during March to June after the pre-monsoon showers penetrate into the top soil.
		iii)	**In droughty areas:** Plant in spring.
		iv)	**In hilly areas of N.E.India :** Plant during June-July
		v)	Plant at any time of the year if irrigation facilities are available.
		vi)	Avoid planting in rainy period
		vii)	Always carry out planting in moist soil only.
2.	**Plant size and age**	i)	Select only healthy and vigorous nursery plants
		ii)	Discard sub-standard plants, plants with damaged branches and leaves and broken '*bheti'.*
		iii)	Plants which are around 45 cm in height with a stem thickness of 0.5-0.8 cm (9-12 months old) and with 12-16 leaves are ideal for field planting.
		iv)	Select plants of uniform height as far as possible.

3.	**Spacing and plant population**	i)	Select spacing considering the type of planting materials**.**
		ii)	For the planting materials having compact frame, select a spacing to accommodate 15,000-16,000 plants per hectare
		iii)	For planting materials having a spreading frame, select a spacing to accommodate 14,000-15,000 plants per hectare
		iv)	Maintain a minimum spacing of 60 cm between plants in a row and 105 cm between rows in plains of N.E.India.
		v)	In hilly areas, maintain a spacing of 90 cm between rows.
		vi)	Accommodate higher plant population in poor soil.
		vii)	Plant in single hedge only. Double hedge planting is not recommended nowadays.
4.	**Staking**	i)	Make 40-60 cm long stakes/pegs of split bamboo.
		ii)	Requirement of stakes is equal to twice the number of plants to be planted in a day with an additional 10% to make the lost or damaged stakes.
		iii)	Use planting chain (Gunter chain) or planting *Pati* (with markings at the required spacing) for staking.
		iv)	Make reference lines or Base lines in all sides of a square or rectangle with the stakes. Use Pythagoras formula

			($AC^2 = AB^2 + BC^2$) to make a perfect square or rectangle. (See the figure below)
		v)	Put the stakes in the base lines at the desired spacing.
		vi)	Place the stakes either midway between or at the pre-determined position of the plants. Depending upon the position of the stakes, pit may be dug either between the stakes or at the position of the stakes.
		vii)	Use a notched bamboo strip to locate the accurate position of the plant.
5.	**Pit digging**	i)	Dig the pits at the time of planting only.
		ii)	Dig the pits making cylindrical in shape which are 45 cm in diameter and 45 cm in depth.
		iii)	Remove pebbles, roots and other undecomposed materials from the excavated soil
		iv)	In heavy soil, loosen the base of the pit up to another 15 cm depth.
6.	**Pit mixture preparation**	i)	Mix 4-5 kg well rotten dry cattle manure with the excavated soil. Use vermicompost, if available, in place of cattle manure.
		ii)	MixTrichoderma biocide (10% suspension) with the excavated soil/ compost @ 100 ml per pit.
		iii)	Refill the pit after mixing with the recommended doses of fertilizers, manures and chemicals.

		iv)	Apply 30 g Rock phosphate at the bottom of the pit and 30 g Single Super Phosphate about 5 cm below the ground level mixing with the excavated soil.
		v)	Apply granular systemic insecticide like Thimet 10 g (phorate) @ 2.5 g per pit in the upper half of the pit.
7.	**Planting**	i)	Carry out planting during early morning or in the late evening.
		ii)	Fill up the pit with the excavated soil after mixing with all the materials mentioned above and press the soil inside the pit with bear feet.
		iii)	Alternatively, fill up the pits batch-wise and ram simultaneously after placing the *'bheti'* of the plant in the pit properly.
		iv)	Open a small hole of the size of the *'bheti'* or polythene sleeve in the pit with a *khurpi.*
		v)	Remove the polythene around the '*bheti*'of the nursery plants before planting.
		vi)	Cut the over-grown roots at the bottom of the sleeves,if any, with a knife. Do not break the '*bheti'.*
		v)	Place the sleeve grown seedlings/ clonal plants in such a way that the top of the sleeve remain just above the ground level.
		vi)	Ram the soil properly around the '*bheti*' and not on the '*bheti'*

		vii)	Level the land by cheeling after the planting is over.
8.	**Aftercare**	i)	Apply Chloropyrophos @ 1:300 or Endosulphan at 1:400 dilutions(HV) at the collar region of the plants against soil borne insects
		ii)	Apply Simazine @ 1 kg/200 litre of water or Oxyflurofen @ 0.5 litre/200 litre of water on clean moist soil as pre emergent herbicide.
		iii)	Spray a cocktail mixture of acaricide and insecticide against mites and insets, if necessary.
		iv)	Mulch the area with green vegetative materials. Mulch 10 cm away from the collar of the plant.
		v)	Put the mulching materials at sufficiently thickness, at least 10 cm thickness.
		vi)	Sow seeds of green manuring crops such as *Crotalariaanagyroids* after every 3-4 rows of tea and lop it periodically.
		vii)	Plant shade trees along with the tea.

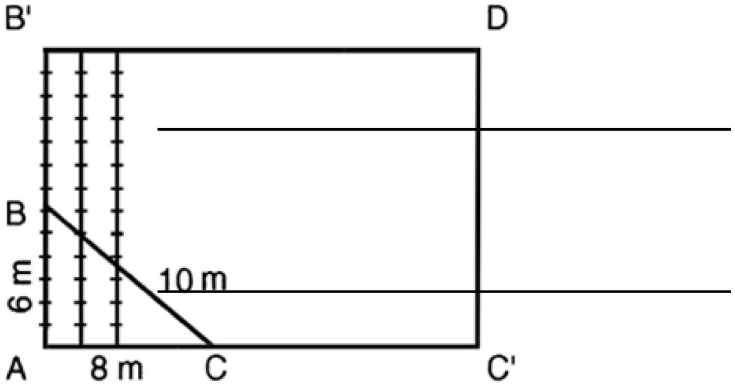


Fig. 2.1 : Staking for planting tea

2.5 PRECAUTION

i) Do not carry-out planting on heavy rainy days.
ii) Maintain the optimum pit size. An under sized pit hamper the establishment and development of the young plant
iii) Make sure that the polythene sleeve is removed before planting.
iv) While planting the roots should not be bent.
v) Ramming should be proper and there should not be any air gap.
vi) Planting should be done in such a way to avoid stagnation of water around the collar of the plant.

2.6 EXERCISE

1. Stake an area for planting.
2. Carry out planting of tea and describe the procedure of it.
3. Write the answers of the following key questions.

2.7 KEY QUESTIONS

Q.1. Whyshould planting in heavy rainy days be avoided?
Q.2. Why should the planting pit be of the size of 45 cm^3?
Q.3. Why are the phosphatic fertilizers applied at the time of planting?
Q.4. Why should the area be leveled by cheeling after planting is over?
Q.5. Whyis a mulching done in young tea area?

PRACTICAL 3 : METHODS OF FRAME FORMATION IN TEA

3.1 OBJECTIVE

After doing the practical, you will be able to:

- Carry out the different operations adopted for frame formation.
- Test the starch reserve in roots.
- Prune the young tea plants for frame formation.
- Take precaution while carrying out the work.

3.2 INTRODUCTION

The tea plantwhich is, by nature, a small tree or shrub is pruned to form a low spreading bush by adopting different methods during the initial period. During this formative period of about 4-5 years after planting, the bush frame is developed.

The objectives of formative prune at the young stage of the tea plants are :

- to induce proper bush architecture for long sustained yield.
- to suppress thecentral dominanceand apical growth and therebyto distribute the vigour for an even and radial spread of the plant.
- to ensure uniformity in distribution and thickness of the branches of the bush frame.

The above mentioned objectives of frame formation are achieved in three stages, viz,

– Debudding /Decentering/Lung pruning
– First frame formation prune after 20-26 months of planting
– Final frame forming prune.

The permanent frame is formed at a height which will ensure optimum coverage of the ground. Normally, the height of the permanent frame is 35-45 cm from the ground level.in hilly areas; it should be 35-40 cm.

In this practical, the learners will be given the detailed guidelines for carrying out different operations and they will practice some of the important operations adopted for frame formation.

3.3 GUIDELINES FOR DIFFERENT OPERATIONS

	Operation/Step		Key points	
1.	**Debudding**	i)	Do it should preferably in the nursery about a week before transferring the plants to the main field for planting.	
		ii)	Nip off the top two leaves and a bud shoot from the nursery plants two weeks before debudding.	
		iii)	Remove all the axillary buds with the help of a forceps or a sharp blade or a sharpened piece of bamboo at 20 cm above the collar of the plant.	
		iv)	Repeat the process,if there is any re-growth.	
		v)	After development of laterals from the lower part, decenter the plants	
2.	**Starch test**	i)	Prepare the Iodine solution for starch test as follows:	
			a)	Weigh 1 g Iodine and 1 g Potassium iodide and put it in a beaker
			b)	Add 4-5 ml distilled water and shake the beaker gently until the iodine dissolves completely.
			c)	Make the volume upto 100 ml with distilled water. Keep the solution away from the light in a dark coloured bottle. Or wrap the bottle with a carbon paper.

		ii)	Select 15-20 plants at random as samples for thetest
		iii)	Collect roots of pencil thickness (5 mm dia) by digging holes upto 15 cm deep about 10 cm away from the collar of the sample plants. In case of older plants, root samples need not to be drawn so close to the collar.
		iv)	Give a sharp cut with a blade at one end of the sample root.
		v)	Apply 1-2 drops of Iodine solution to the smooth cut surface of the root by holding it upright.
		vi)	Keep the root in that position for about 5 minutes, shake of the iodine solution and note the change of colour of the cut surface.
		vii)	Deep blue colour spread over the entire cross section of the root indicates high concentration of starch. In case there is no colour development or it is pale,plants require a period for starch build up.
		viii)	Carry out starch test prior to decentering, first and final frame forming prune.
3.	**Decentering**	i)	Cut the main stem at 18-20 cm height from the ground level leaving 2-3 lateral branches below.
		ii)	Cut the laterals at 35 cm from the ground level
		iii)	Use 7.5 cm long, sharp knife.

		iv)	Put your leg firmly at the base of the plant while centering.
		v)	Decenter the plants when they become *banjhi* after making a flush of growth following transplanting
		vi)	Do not decenter the single stemmers. Instead go for lung pruning or thumb breaking
4.	**Lung Pruning or Thumb Breaking**	i)	Half break the single stemmers at 20 cm height from the ground using a small knife by holding the plants between thumb and index finger.
		ii)	Bend the stem southward or westward depending upon the row direction and in such a way that tissues on one side are left intact.
		iii)	Remove the broken portion after the branch below it produces a flush of growth and goes *banjhi.*
		iv)	After 6-8 weeks of this operation, any primary growing faster and getting thicker (than normal) should be headed back to 25-30 cm above the ground level.
5.	**First Frame Forming Prune**	i)	Impart it to 20-26 months old plants.
		ii)	Check the starch reserve of the roots before pruning.
		iii)	Prune the plants at 35-40 cm height from the ground.
		iv)	Head back the strong central or thicker branches and criss-cross branches on merit.

		v)	Do not open the centre of the bush, but be selective
		vi)	Carry out the operation during end January to early February ion the plains of N.E.India.
6.	**Final Frame Forming Prune**	i)	Impart it 2-3 years after the first frame forming prune
		ii)	Prune the plants at 40-45 cm height from the ground.

3.4 PRECAUATION

i) Do not decenter when the plants are actively growing.
ii) Donot pull out the young plants while decentering.
iii) While lung pruning or thumb breaking the broken part of the stem should remain bending towards the ground.
iv) At the final frame forming prune, the thickness of the branches at the pruning height should be 5mm in dia.
v) The cuts should be sharp and clean.
vi) Much cleaning not required if due care is taken at first prune. Otherwise complete clearing is needed.



(A) **(B)** **(C)**

Fig. 3.1 : (A) Decentering (B) Lung pruning (C) Debudding



Fig. 3.2 : Lung pruning



Fig. 3.3 : Frame Forming Prune

3.5 EXCERCISE

1. Test the starch content in the roots and write the procedure.
2. Carry out centering, thumb breaking/lung pruning and debudding in a young tea area. Describe the procedure and precautions taken while carrying out the operations.
3. Give a frame forming prune to a young tea plant.
4. Write the answers of the following key questions.

3.6 KEY QUESTIONS

Q.1. Why is decentering not done while the plants are actively growing?

Q.2. Why is starch test needed before decentering?

Q.3. When is lung pruning done?

Q.4. What is the objective of debudding?

PRACTICAL 4 : FERTILIZER APPLICATION IN YOUNG TEA

4.1 OBJECTIVES

After doing the practical, you will be able to:

- Prepare the YTD mixture with different inorganic fertilizers.
- Know the method of application.
- Develop skill for application of YTD in young tea.

4.2 INTRODUCTION

Adequate fertilizer application during the formative years of tea is of great importance for proving the plants with the essential nutrient requirements for developing of a healthy frame and at the same time bring them into economic bearing as soon as possible. The major nutrients (NPK) are applied as YTD mixture in young tea at the recommended proportion depending on the soil fertility status and are applied in splits at frequent interval. The rate and method of application of YTD mixture varies with the age of the plant.

In this practical, you will calculate the quantities of different fertilizers for preparation of YTD mixtures, calculate the requirements of YTD for the garden and also apply YTD mixture in young tea area.

4.3 GUIDELINES

A) Preparation of YTD Mixture

Operation		Key points	
1.	**Selection of fertilizers**	i)	Select appropriate nitrogenous, potassic and phosphatic fertilizers available in the market.
		ii)	Procure the fertilizers from the genuine source only.

<table>
<tr><td>2.</td><td>Decision on the type</td><td colspan="3"></td></tr>
<tr><td></td><td>of YTD mixture</td><td>i)</td><td colspan="2">If the available soil potash is below 100 ppm, prepare 10:5:15 YTD mixture for application.</td></tr>
<tr><td></td><td></td><td>ii)</td><td colspan="2">If the available soil Potash is above 100 ppm, prepare 10:5:10 YTD mixture for application.</td></tr>
<tr><td></td><td></td><td>iii)</td><td colspan="2">Use sand or dry and well decomposed powdered cow dung or dolomite as filler material.</td></tr>
<tr><td>3.</td><td>Computation of the amount of YTD mixture</td><td>i)</td><td colspan="2">Decide on the amount of YTD mixture to be applied depending on the age of the plants. (Refer : Unit 8 : Mineral Nutrition and fertilizer application)</td></tr>
<tr><td></td><td></td><td>ii)</td><td colspan="2">Compute the total quantity of YTD mixture for the entire section/area and for that split. (Example as follows):</td></tr>
<tr><td></td><td></td><td></td><td>Area of the section</td><td>10 ha</td></tr>
<tr><td></td><td></td><td></td><td>Age</td><td>+ 2 year</td></tr>
<tr><td></td><td></td><td></td><td>Spacing</td><td>105 cm x
75 x cm</td></tr>
<tr><td></td><td></td><td></td><td>Dose</td><td>60 g per plant</td></tr>
<tr><td></td><td></td><td></td><td>Number of split</td><td>4</td></tr>
<tr><td></td><td></td><td></td><td>Growth and production of the section</td><td>Average</td></tr>
<tr><td></td><td></td><td></td><td>Amount of YTD mixture per split</td><td>$\frac{13,000 \times 10 \times 60}{4}$
= 1950 kg</td></tr>
<tr><td></td><td></td><td>iii)</td><td colspan="2">Compute the quantity of YTD mixture to be applied per plant when applied in Ring Method.</td></tr>
</table>

<table>
<tr><td rowspan="13">4.</td><td rowspan="13">Computation of individual fertilizers</td><td>i)</td><td colspan="3">100 kg 10 : 5 : 10 YTD mixture contains 10 kg N, 5 kg P_2O5 and 10 kg K_2O. Again 100 kg 10 : 5 : 15 YTD mixture contains 10 kg N,5 kg P_2O_5 and 15 kg K_2O.</td></tr>
<tr><td rowspan="8">ii)</td><td colspan="3">List the nutrient content of different fertilizers to be used for preparation of YTD mixture.</td></tr>
<tr><td colspan="3">The nutrient content of different fertilizers are as follows:</td></tr>
<tr><td>Urea</td><td colspan="2">46% N</td></tr>
<tr><td>SSP</td><td colspan="2">16 % P_2O_5</td></tr>
<tr><td>RP</td><td colspan="2">20-24 % P_2O_5</td></tr>
<tr><td>MOP</td><td colspan="2">60% K_2O</td></tr>
<tr><td>SOP</td><td colspan="2">50% K_2O</td></tr>
<tr><td>DAP</td><td colspan="2">18% N and 46% P_2O_5</td></tr>
<tr><td rowspan="7">iii)</td><td colspan="3">Compute the quantity of different fertilizers required to prepare 100 kg YTD mixture. For example:</td></tr>
<tr><td>YTD mixture to be prepared</td><td colspan="2">10:5:15 NPK</td></tr>
<tr><td>Available fertilizer</td><td colspan="2">Urea, SSP and MOP</td></tr>
<tr><td colspan="3">Requirement of fertilizers for 100 kg 10 : 5 :15 YTD mixture :</td></tr>
<tr><td rowspan="5"></td><td>Urea :</td><td>22 kg</td></tr>
<tr><td>SSP :</td><td>31 kg</td></tr>
<tr><td>MOP :</td><td>25 kg</td></tr>
<tr><td>Filler :</td><td>22 kg</td></tr>
<tr><td>Total :</td><td>100 kg</td></tr>
<tr><td>5.</td><td>Preparation of YTD mixture</td><td>i)</td><td colspan="3">Calculate and weigh the different fertilizers separately for each split for the entire section/area.</td></tr>
</table>

		ii)	Mix the fertilizers (except SSP) and the filler thoroughly on a concrete/ hard, dry and clean floor or on a sheet of tarpaulin spread over the ground.
		iii)	Use rotary shifter if the quantity of fertilizers is large.
		iv)	Mix SSP just before application.
		v)	Prepared only the required quantity to be applied just before application.
		vi)	Never store YTD mixture.

B) Application of YTD mixture

Operation/Step		Key Points	
1.	**Time of application**	i)	Apply the first application following a few showers in spring during March-April.
		ii)	Ensure that the soil is moist. Soil should be moist up to a depth of about 45 cm.
		iii)	Apply on weed free clean ground.
		iv)	Do not apply immediately after planting.
		v)	In unpruned tea,apply the fertilizer after the bushes have made some new growth.
		vi)	In pruned tea, apply the fertilizer after the bushes have produced few new leave.
		vii)	Avoid application during heavy rainy days.
		viii)	Apply YTD mixture in split as recommended at 6-8 weeks interval.

2.	**Method of application**	i)	Clean the collar region of the plant by scrapping weeds and other debris.
		ii)	Fork the area lightly before application.
		iii)	Apply YTD mixture in Ring method during 0 to +3 years as follows:
			a) Keep 1/3rd area of the spread of the bush from the centre un-manured. For example, if the spread of the bush is 60 cm dia, then a ring of 10 cm radius from the collar if left un- manured.
			b) Apply fertilizer mixture only in the remaining 2/3rd area at the periphery of the ring. For example, since the spread of the bush is 60 cm dia, 2/3rd of 60 is 40 cm dia. This area and a further 10 cm outside the ring (i.e. 40cm + 10cm) are manured.
		iv)	Stir the soil after application of fertilizer and cover with the weeds/ debrises.
		v)	Apply YTD mixture in +4 and +5 years in strip by broadcast, 10 cm away from the collar of the plants.

4.4 PRECAUTION

i) Do not apply fertilizers until the plants establish well in the field.

ii) Care should be taken so that the applied fertilizers do not come in contact with the collar of the plant.

iii) Do not apply fertilizers on dry ground.

iv) Mix SSP only just before application otherwise the mixture will become muddy.

v) Broadcast the YTD mixture in strips on either side of the row only when the ground cover is almost covered by the bushes.

4.5 EXERCISES

1. Calculate the quantities of different fertilizers to prepare 500 kg of 10:5:15 YTD mixture using the following fertilizer combinations
   i) Urea, SSP and MOP
   ii) Urea, DAP and MOP
2. Given that :
   Area of the section : 10 ha
   Spacing : 105 cm x 60 cm
   Age of the plant : +3 year
   Available soil Potash : 110 ppm
   Available in the store : Urea, SSP and MOP
   i) Calculate the total quantity of individual fertilizers including the filler for the section.
   ii) Calculate the quantity of fertilizers to be applied per split.
3. Apply YTD mixture in a young tea section and write the procedure you followed. Mention the precautions you took while applying the fertilizers.
4. Write the answers of the following key question.

4.6 KEY QUESTIONS

Q.1. Why are the fertilizers inyoung tea appliedin the form of YTD mixtures?

Q.2. Why does YTD is applied in spilt application?

Q.3. Why does YTD mixture is applied by broadcastingafter +3 years?

Q.4. Why should filler be used in preparing the YTD mixture?

Q.5. Why is SSP not mixed beforehand for preparing the YTD mixture?

PRACTICAL 5 : FERTILIZER APPLICATION IN MATURE TEA

5.1 OBJECTIVES

After doing this exercise, you will be able to:

- Determine the time of fertilizer application.
- Determine the dose of application.
- Apply the fertilizers in mature tea.
- Prepare the manuring programme for a tea garden.

5.2 INTRODUCTION

Fertilizer application is one important operation in a tea plantation. The doses of fertilizer application depend on a number of factors such as the yielding ability of the section, the type of prune/skiff, soil fertility status etc. For efficient management, each garden should have a proper manuring programme and accordingly the garden should procure the fertilizers in time.

Secondly, it is also important to apply the fertilizers at proper time adopting suitable method. This exercise will help the learners in preparing a manuring programme for the tea plantation and provide a guideline for application of fertilizers. (See Unit8: Mineral Nutrition and Fertlizer application).

5.3 GUIDELINES

A) Soil Application

Operation/Step		Key Points	
1.	**Time of application**	i)	Apply fertilizers after receiving first spring rain during March-April on moist soil.
		ii)	Soil should be moist upto a depth of 45 cm.

		iii)	Apply fertilizer on weed free clean ground.
		iv)	Inunpruned sections, apply fertilizers after the bushes have made some growth.
		v)	In prune tea or skiffed tea,apply fertilizers after the bushes have produced a few leaves.
		vi)	Do not apply fertilizers during heavy rainy days.
2.	**Number of splits**	i)	Apply fertilizers in two splits.
		ii)	Apply the first split during March-April and the second split during August-September.
		iii)	Apply 60% N, 100% P_2O_5 and 60% K_2O in the first split and 40% N and 40 % K_2O in the second split.
3.	**Selection and procurement of fertilizers**	i)	Select the fertilizers available in the store or in the market.
		ii)	Procure fertilizers from a reliable source or dealer.
4.	**Computing the quantity of fertilizers**	i)	Determine the rate of application of NPK on the basis of average yield during the last pruning cycle and soil potash status.
		ii)	Calculate the total quantity of individual fertilizer material required for the whole section/area.
		iii)	Calculate the total quantity of different fertilizer material required for the split.
		iv)	Apply secondary nutrients like Sulphur at the recommended dose along with NPK fertilizers.

5.	**Mixing of fertilizers**	i)	Weigh the computed amount of fertilizer separately.
		ii)	Mix the fertilizer near the site of application.
		iii)	Use rotary drums for proper mixing of the fertilizers
		iv)	Alternatively, spread the different fertilizers in alternative layers on a tarpaulin sheet, fold it backward and forward and mix the fertilizers thoroughly using a hoe.
		v)	Good supervision for thorough mixing of the fertilizers is a must.
		vi)	If the fertilizer mixture weighs more than 75 kg, mix the fertilizers in two or more batches for uniform mixing.
		vii)	Apply the mixture as soon as possible.
6.	**Method of application**	i)	Broadcast the fertilizer mixture uniformly over the area covered by the tea canopy.
		ii)	Take care not to apply the fertilizers on or near the collar of the bush and on the leaves.
		iii)	Note that fertilizers are not applied in lumps on the collar region.This may cause injury to the roots.
		iv)	Preferably use the plastic buckets of convenient size for carrying the fertilizers inside the section.

B) Foliar Application

	Operation/step		Key Points
1.	**Application of nutrients and care**	i)	Apply recommended doses of NPK mixture,Zinc sulphate ($ZnSO_{4)}$ and Magnesium sulphate $MgSO_4$) andalso, if necessary, Manganese sulphate ($MnSO_4$) and Boric acid, as foliar spray.
		ii)	Apply foliar spray at the recommended periods of the year.
		iii)	Most fertilizers,except lime sulphur,
			are compatible with fungicides and pesticides.
		iv)	Check compatibility chart prior to mixing, if you wish to mix.
		v)	While mixing,see that the total solids do not exceed 4% (8 kg in 200 litres of water) in mature tea and 2% in young tea.
		vi)	Monitor the spraying equipment and also the speed of the person who is spraying to avoid drip (excessive spray fluid) on the plant parts, as it may cause sun scorching of the foliage.
		vii)	On hot sunny days, spray during late afternoon/evening.
		viii)	Spray the fluid on the under surface of the leaves also.
		ix)	Use hand sprayer or power sprayer as per requirement and availability.
		x)	Clean the sprayers thoroughly after spraying.

5.4 PRECAUTION

i) Fertilizers should be mixed thoroughly.
ii) Fertilizer mixture must be applied uniformly.
iii) Fertilizers should be mixed just before application.
iv) Do not spray fertilizer mixture on hot sunny day.
v) Never use sprayers used for herbicide application.

5.5 EXERCISE

1. Given that :

   Area of the section : 10 ha

   Available soil K-status : 85 ppm

   Fertilizers available in the store : Urea, SSP and MOP

   Yield of the section in last three years :

Year	Pruning/skiffing	Yield (KMTH)
2010	LP	2100
2011	UP	2550
2012	DS	2310

   a) Recommend the fertilizer doses (NPK) for 2013.
   b) Calculate the quantities of different fertilizers to be applied in the section.
   c) Calculate the quantities of fertilizers in the first split and second split.
2. Carry out foliar spraying of urea in a tea section and write the precautions you took while spraying.
3. Answer the following key questions.

5.6 KEY QUESTIONS

Q.1. On what basis are the doses of NPK fertilizers fixed for mature tea?
Q.2. Under what situation is foliar application of fertilizers recommended?
Q.3. Why are fertilizers not applied on dry soil?
Q.4. Why is split application recommended?
Q.5. What do you mean by leaching and volatilization loss of fertilizers?

PRACTICAL 6 : PRUNING AND SKIFFING OF MATURE TEA

6.1 OBJECTIVES

After doing this practical, you will be able to:

- Determine the height of different types of prune and skiff.
- Select the pruning knives of optimum size.
- Carry out the operation.
- Take necessary steps before pruning.
- Take precaution while carrying out the pruning or skiffing operation.

6.2 INTRODUCTION

Pruning and skiffing of tea are the most important operations in tea production.Nowadays, tea bushes are pruned at an interval of three to four years and in between the bushes are skiffed or even kept untouched. This type of pruning is called light prune. Skiffings are also of different types. In addition to the normal pruning and skiffing,tea bushes have to prune drastically for reduction of their height for convenience in plucking.

In this practical, a guideline will be given so that you can carry out and supervise the operations.

6.3 PRUNING AND SKIFFING

Terminology	Meaning
Light prune (LP)	It is a cut given 4-5 cm above the last prune level (i.e. leaving 4-5 cm new wood) in order to remove the congested top hamper and to renew the shoot system for more vigorous growth.
Medium prune (MP)	When the height of the bush frame reaches a height(beyond 80 cm) and plucking

	becomes difficult, bushes are pruned at 50-65 cm height above the ground. Removal of knots, unproductive wood, congestion of the bush frame and its sanitation are some other objectives of medium prune.
Rejuvenation prune/ Heavy prune (RP/HP)	Its sole objective is to improve the yielding capacity of some old but reasonably good sections of tea to minimize loss of crop during uprooting and replanting. It is done 40-45 cm above the ground level in the plains of N.E. India and 15-37 cm above the ground level in China hybrids of hilly region.
Height Reduction prune (HRP)	It is done at 70-75 cm height from the ground in plains only. It aims at reducing the height of the bush frame with minimum loss of crop.
Collar prune (CP)	Entire above ground portion is cut leaving only up to a maximum of 10 cm when the bush becomes unproductive and root system is still healthy.
Deep skiff (DS)	It is a cut given midway between the pruning and tipping level, normally at 10 cm above the previous pruning level.
Medium skiff (MS)	When done on light pruned tea tipped at 20 cm or deep skiffed tea tipped at 10 cm, this will be a cut at a height of 15 cm from the pruning mark or 5 cm below the last tipping level. However, when MS is done one or more years after unprune, light skiff of level-off-skiff years, this is a cut just below the “Crows’ feet” formed during previous years plucking.

Light skiff (LS)	This is a cut given at current year's tipping level or 1 cm below to re-establish a table.
Level-off-skiff (LOS)	This is a cut given at least 5 cm above the previous tipping level to remove the plucking points and old leaves that stick above the table at the end of the season.

6.4 GUIDELINES

A) Light prune

	Operation/Step		Key points
1.	**Time of pruning**	i)	In non-droughty areas of N.E.India, carry out the operation during mid-November to third week of December.
		ii)	In drought prone areas,carry out the operation during mid-December to mid-January
2.	**Assessment of suitability**	i)	Assess the thickness of the wood at the pruning height. It should be of around 1 cm diameter.
		ii)	If not suitably thick,postpone the prune by a year or more and skiff the section.
3.	**The pruning operation**	i)	Use sharp pruning knife of 450 g weight and 15 cm long blade.
		ii)	First find out the last prune mark in the centre of the bush.
		iii)	Cut out a branch from the centre of the bush at 4-5 cm above the last prune mark.
		iv)	Work out the knife from the centre towards the periphery of the bush in clock-wise direction.

		v)	The cut end should be clean, sharp, slanting and face inward.
		vi)	Do not allow splitting of the branches.
4.	**Knife Cleaning out (KCO)**	i)	Use a knife having 7.5-10 cm long blade.
		ii)	Remove the dead, diseased and criss-cross branches and *banjhi* shoots or twigs.
		iii)	Carry out KCO as soon as possible after pruning.
		iv)	It should never be delayed beyond natural bud break
		v)	Avoid excessive cleaning out.
		vi)	Smear Indopaste or bitumen paste to the large cuts.

B) Medium and Rejuvenation Prune

	Operation/Step		**Key points**
1.	**Time of pruning**	i)	In droughty areas, carry out MP/RP during January
		ii)	In other areas, it should be done dur-
			ing end-November to mid-January.
2.	**Pre pruning operations**	i)	Raise temporary shade at least one year ahead of pruning.
		ii)	Rest the bushes for a periodof 6-8 weeks before pruning.
		iii)	Check the starch reserves of the roots. If required give rest for few more days.
		iv)	Apply additional dose of potash and phosphate in the year of prune preferably during end August to early September.

3.	**The pruning operation**	i)	Use 20 cm knife and, if necessary, use pruning saw.
		ii)	Give a sharp cut to the branches at the recommended height
		iii)	The cuts should face inward.
		iv)	Remove the knots at the pruning height.
4.	**Post pruning operations**	i)	Remove the knots, even below the pruning level.
		ii)	Remove the *banjhi* shoots, dead and diseased shoots.
		iii)	Do the above operations immediately after pruning.
		iv)	Apply caustic wash to the bush frame and cover with pruning litters immediately after prune.
		v)	OR, Spray one round of approved Copper Oxychloride formulation at 1:400 dilution on the cut surface within 48 hours.
		vi)	Prepare the caustic wash solution by mixing 4-6 kg of Quick lime and 12kg Washing soda in 200 litres of water.
		vii)	Seal the large cut surfaces with therecommended bituminous paint of Trichodermabiocide (20%) immediately cleaning the bushes.
		viii)	Remove the lungs/breathers at the onset of bud break and apply Indo-paste on the cut surfaces.
		ix)	Complete the cultural operations like cleaning and deepening of drains, uprooting of dead shade trees and tea stumps.

		x)	Fill up the depressions and level the ground before bud break.
		xi)	Carry out infilling and inter planting,if required, in this year of medium or rejuvenation pruning.
		xii)	Apply pre-emergent herbicide.
		xiii)	Protect the newly emerging shoots from sucking insects like Aphids, Jassids and Thrips by spraying recommended chemicals.

C) Skiffing

	Operation/step		**Key points**
1.	**Time of skiffing**	i)	Carry out DS during mid-December and early January
		ii)	Carry out MS during early January and mid-January
		iii)	Carry out LS/LOS in third week of January.
		iv)	Note that deeper the skiff (cut) earlier is the skiffing time.
		v)	Follow the sequence of operations as DS first followed by MS, LS and LOS.
2.	**The skiffing operation**	i)	Use sharp skiffing knife.
		ii)	Measure the heights from the last pruning mark.
		iii)	For the mixed seed population,take an average measures for skiffing after taking random measurements.
		iv)	Work out the knife from the middle of the bush towards periphery in clock-wise direction.

3.	**Cleaning out**	i)	In DS sections, remove the banjhi shoots from the bushes by hand (Hand clean out).
		ii)	Do not defoliate the bushes completely.

6.5 PRECAUTION

i) Do not prune the bushes if the thickness of the branches at the pruning height is not sufficiently thick (one cm dia).The recovery from the pruning will be poor and there may be die back of branches.

ii) Always use knives of proper size to avoid splitting of the pruned branches.Sharpen the knives frequently while pruning is in progress.

iii) Cleaning out operation should not be delayed. It will damage the new shoots if done after the bud break.

iv) In heavy pruning, the cuts should be protected from the growth of pathogens. The cut ends are entry points of the fungi.

v) Proper resting and adequate application of fertilizers are important before going for medium pruning/Rejuvenation pruning.

vi) Prune the breathers just before the bud break.

6.6 EXERCISE

1. Visit a tea garden and give samples for light prune, deep skiff, medium skiff and light skiff. Describe the points you considered while giving the sample cuts on the bushes.
2. Study the different types of knives used for pruning and skiffing of tea.
3. Write the answers of the following key questions.

6.7 KEY QUESTIONS

Q.1. In light prune, why is 4-5 cm new wood kept while pruning?

Q.2. What is pruning cycle?

Q.3. What are the objectives of Knife Cleaning out (KCO)?

Q.4. Why should the cuts in a pruned bush face inward?

Q.5. Why are knots formed in some bushes?

Q.6. What is the difference between Cut across prune and Light prune?

Q.7. What are the criteria to give a light prune in a section?

PRACTICAL 7 : TIPPING AND PLUCKING OF TEA

7.1 OBJECTIVES

After doing this exercise, you will be able to:

- Determine the height of tipping for different types of prune/skiff.
- Pluck the tea bushes.
- Determine the standard of plucking.
- Learn how to pluck under different situations.
- Take care in handling the green leaves.
- Develop skill in for supervising plucking.

7.2 INTRODUCTION

Plucking in tea is synonymous with the harvesting in other crops. The tender apical portions of the shoots consisting of two to three tender leaves and the terminal buds are nipped off in plucking. Before starting the normal plucking in the season, the tea bushes are tipped at a pre-determined height retaining a few maintenance leaves and a flat plucking table is formed for convenience of plucking.

Plucking accounts for the maximum cost in tea cultivation .The quality of the made tea largely depends on the green leaves plucked. Plucking is carried out by pluckersin the tea gardens and a strict supervision is necessary to maintain the quality of green leaves.

In this practical, you will be given a guideline for carrying out tipping and plucking and supervising the operations.

7.3 TIPPING AND PLUCKING

Terminology		Meaning
1.	**Primaries**	The shoots or branches developed from the light pruned bush are called primaries.
2.	**Tipping**	When the primaries grow above a pre-determined height, these are decapitated or tipped at that height

<table>
<tr><td></td><td></td><td colspan="3">parallel to the ground surface. Initial few rounds of plucking are termed as tipping.</td></tr>
<tr><td>3.</td><td>Tipping height</td><td colspan="3">The height at which the tea buses are tipped above the pruning/skiffing mark is the tipping height. Its main objective is to retain the maintenance leaves on the bush. The tipping heights for different types of prune and skiff are as follows:</td></tr>
<tr><td></td><td></td><td colspan="2">Types of prune/skiff</td><td>Tipping height (over prune/skiff level)</td></tr>
<tr><td></td><td></td><td colspan="2">Medium/Heavy prune</td><td>30 cm or 5-6 full leaves</td></tr>
<tr><td></td><td></td><td colspan="2">Light prune</td><td></td></tr>
<tr><td></td><td></td><td>i)
ii)</td><td>Vigorous tea
Tea with average vigour</td><td>25 cm or 5 full leaves
20 cm or 5 fullleaves</td></tr>
<tr><td></td><td></td><td colspan="2">Deep skiff</td><td>7-10 cm or 2-3 full leaves</td></tr>
<tr><td></td><td></td><td colspan="2">Medium skiff</td><td>4-5 cm or one full leaf</td></tr>
<tr><td>4.</td><td>Plucking system</td><td colspan="3">It varies according to the agro-climatic situations which influence the rate of shoot growth. In N. E. India, usually “Janam” plucking is practiced. In this system, plucking is done above the upper most janam.</td></tr>
<tr><td>5.</td><td>Standard of plucking</td><td colspan="3">It denotes the types of shoots harvested. Generally two standards of plucking are followed viz., Standard and Black:</td></tr>
<tr><td></td><td></td><td>Plucking standard</td><td>Types of shoots plucked</td><td>Types of shoots left on the plucking table</td></tr>
<tr><td></td><td></td><td>Standard</td><td>Large 1+B, all 2+b, Small 3+b, single banjhi</td><td>Buds and small 1+b</td></tr>
<tr><td></td><td></td><td>Black</td><td>All</td><td>Unopened buds</td></tr>
<tr><td>6.</td><td>Plucking Round</td><td colspan="3">It is the time interval in days between successive plucking operations in the same area. In N.E. India,</td></tr>
</table>

		plucking round varies from 4-14 days though 6-8 day plucking round is the most common.
7.	**Step-up plucking**	It denotes plucking above a normal leaf to restore the volume of maintenance foliage when required.
8.	**Creep**	Undue rise in the plucking table is creep. Creep results in crop loss. Creep should not be allowed to exceed than the permissible limits under normal conditions.
9.	**Breaking back**	This is an operation in which leaves and stubs which stick above the plucking table, are broken back to level-off the plucking surface. This is to be done when plucking round cannot be maintained due to certain reasons and pluckable shoots are longer than desired length.

7.4 GUIDELINES FOR TIPPING AND PLUCKING

	Operation/Step		Key points
1.	**Take the tipping measure**	i)	Fix the tipping height according to the type of pruning/skiffing.
2.	**Tipping pruned and Skiffed teas**	i)	Start tipping whenever the shoots attain the tipping height.
		ii)	Tip the primaries when these produce 2+b shoot above the pre-determined height.
		iii)	Maintain uniform height of tipping.
		iv)	Provide measuring sticks to the pluckers to maintain the height.
		v)	Do not tip the immature shoots or shoots below the tipping level.
		vi)	Do not delay tipping by waiting for maximum shoots to attain tipping level.
		vii)	Strictly maintain a flat table.

3.	**Plucking of unpruned tea during early season**	i)	Pluck close to *janam*
		ii)	Leave buds and small 1+b shoots
		iii)	Raise the table by one leaf if maintenance foliage is inadequate.
		iv)	Remove all *banjhis*on the table.
		v)	Follow black plucking during initial rounds.
4.	**Plucking of Rain flush crop**	i)	Follow Standard plucking.
		ii)	If necessary, follow shorter plucking round.
		iii)	Don't allow creep.
		iv)	Do airy skiffing in UP sections, if unavoidable to level off the table.
		v)	Do not go for step-up plucking.
5.	**Plucking towards the end of the season**	i)	Follow Black plucking.
		ii)	Remove the *banjhies* as much as possible.
		iii)	Follow longer plucking round depending upon the growth.
		iv)	Remove the creep or maintain the table in sections particularly which are to be kept untrue (UP) for the next season.
6.	**Plucking in droughty condition**	i)	Follow liberal plucking
		ii)	Add a layer of maintenance leaves in unprune (UP) sections
		iii)	In case of severe defoliation or die-back of plucking points,step-up the table by one leaf
		iv)	Do not lower the tipping height even if the primaries go *banjhi* before reaching the tipping height.

7.	**Plucking in hail damaged areas**	i)	Pluck the affected young tea retaining one or two additional layers of maintenance foliage.
		ii)	In UP sections, pockets created by hail should be allowed to be filled up to the original level.
		iii)	Ste-up the table by one leaf in severely affected sections.
		iv)	If recovery is quick, step up is not necessary in LP/DS/MS sections.
8.	**Plucking of water-logged bushes**	i)	Follow Black plucking at shorter rounds to avoid excessive *banjhi* formation.
9.	**Plucking during Blister blight and other pest attack**	i)	Tip low in blister blight affected MP and LP sections.
		ii)	Raise the plucking table to the pre-determined height on expiry of the vulnerable period
		iii)	Follow Black plucking in blister blight affected UP sections. Remove all tender shoots
		iv)	Follow Black plucking in sections heavily infested with pests like Thrips and tea Mosquito bug.
10.	**Green leaves handling**	i)	Do not allow the pluckers to keep the leaves in hand for long time.
		ii)	Do not allow to over-load leaves in *tukri/topa* or bags
		iii)	Keep the leaves in *tukri* or bags loosely in shade.
		iv)	An ideal plucking basket of 55 cm x55 cm x55 cm can accommodate 15 kg of green leaves without damage.

		v)	Do not allow the pluckers to keep *topas/tukris*/bags or their belongings over the plucking table.
		vi)	Do not store leaves in the garden for a longer period of time.
		vii)	Transport the leaves to the factory in open and well ventilated leaf trolleys.

7.5 PRECAUTION

i) All the *banjhies* on the plucking table should be removed while plucking.

ii) The shoots below the tipping level or plucking table should not be plucked.

iii) The table should be leveled by removing the projected hard leaves while plucking.

iv) The mature leaves projecting above the table should not be torn half way.

7.6 EXERCISE

1. Visit a tea garden and observe the plucking operation. Check the creep in the sections and comment on it.
2. Assess the standard of plucking followed in the garden.
3. Give the answers to the following key questions.

7.7 KEY QUESTIONS

Q.1. What are the objectives of tipping?

Q.2. What do you mean by plucking round?

Q.3. Mention the permissible creeps for different types of prunes/skiffs.

Q.4. What is standard of plucking?

Q.5. What do you mean by reddening of leaves?

Q.6. What precautions you should take in handling of green leaves?

Q.7. What is a single *banjhi?*

Q.8. When to go for tipping?

PRACTICAL 8 : IDENTIFICATION AND PREPARATION OF HERBARIUM OF WEEDS, SHADE TREE SPECIES, GREEN CROPS, COVER CROPS AND REHABILITATION CROPS

8.1 OBJECTIVES

By doing the exercise, you will be able to:

- Identify the different species of shade tree, weeds and other crops.
- Describe the different species.

8.2 INTRODUCTION

Weed management in tea plantations is one of the important operations. For proper management, it is important to identify the weeds. The weeds may be monocot or dicot and the chemicals or the herbicides used for controlling them are different for different weed flora. Similarly, a number of other plants like shade trees and crops like rehabilitation crops, green crops, cover crops are used in tea plantations.

In this practical, you will collect the specimen and prepare the herbarium and describe the species.

8.3 WEED SPECIES

A few common weed species found in tea plantation of N.E.India.

Botanical name	English Name	Local name
Broad leaved / dicotyledonous weeds		
Mikania micrantha	Mile a minute	Mikania or Japanihabi
Borreria hispida	Bagracote	Gahori bon
Ageratum conzoides	Goat weed	Gondhowa bon
Chenopodium album	Smooth pig	Jilmil

Alternanthera sessilis	–	Matikaduri
Amaranthus spionsus	Spiny amaranthus	Hatikhutura
Amaranthus viridis	Amaranthus	Khutura
Eryngium foetidum	–	Bondhania
Mimosa pudica	Sensitive plant	Nilaji bon
Oxalis corymbosa	Wood sorrel	Bortengesi
Oxalis corniculata	Creeping sorrel	Sarutengsi
Eupotariumodoratum	Siam weed	German habi
Grasses and other monocotyledonous weeds		
Imperata cylindrica	Thatch grass	Ulu or kher
Elusine indica	Goose grass	Bobosa bon
Setaria glauca	Fox tail grass	Bisa bon
Arundinella bengalensis	–	Topasali
Axonopus compressus	Carpet grass	Carpet ghah
Cynodon dactylon	Bermuda grass	Dubori bon
Setaria palmifolia	–	Nogahabi
Saccharum spontaneum	–	Kahua
Digitaria sanguinalis	Crab grass	Makarjuli
Cyperus rotundus	Nut grass	Muthaghah
Cyperus pilosus	–	Harkota bon

8.5 SHADE TREE SPECIES

A few recommended shade tree species used in tea plantation

Species	**Local name**
Albizzia odoratissima	Sil Koroi or Sam koroi
Albizzia chinensis	Sau koroi
Albizzia lebbek	Kathia koroi
Derris robusta	Mou chita
Acacia lenticularis	–
Adenanthera pavonina	Ronga chandan
Dalbergia sericea	–
Indigofera teysmanii	Nil

Albizzia moluccana	–
Albizzia procera	–
Dalbergia sisso	–
Melia azadarach	Ghora neem
Leucaena lecucephala	Subabul
Gliricidea maculeata	Medura

8.6 OTHER CROPS/PLANTS

1. **Soil Rehabilitation crops :**

   Guatemala grass (*Tripsacum laxum*). It is the most commonly used soil rehabilitation crop.

   Pusa Giant Napier (*Pennisetum purpureum*)- a soil rehabilitation crop

2. **Green Crops :**

   Crotalaria anagyroides,

   Tephrosia candida (Bogamedelua),

   Priotropie cytissoides,

   Desmodium gyroides,

   Calopogonium muscoides,

   Stylosanthes guyanensis,

   Centrosoma pubescence,

   Pureria phasioloides.

3. **Cover crop :**

   Mimosa invisa.

8.7 EXCERCISE

1. Collect specimen of different plant species and paste in herbarium.

PRACTICAL 9 : VISIT TO COMMERCIAL TEA ESTATES AND SMALL TEA GARDEN

9.1 OBJECTIVES

The objective of the visits to the commercial tea estates and small scale tea plantation is to learn the field practices by on the spot study. You need to visit the estates **four to five** gardens at different times so that you can observe various field operations.

9.2 INTRODUCTION

In a tea garden, different operations are carried out throughout the year. You can observe the operations carried out by the workers and can acquire the knowledge and skill to perform these. Further by visiting the gardens, many important information relating to the management of the garden can be gathered.

9.3 GARDEN VISIT REPORTS

After visiting the gardens,you should prepare a report on the following aspects:

1. Name of the garden : .....
2. Address : .....
   .....
   .....
3. Date of visit : .....
4. Aspects to be covered in the Reports :
   a) Nursery and the Nursery techniques
   b) Planting techniques

c) Young tea management practices

d) Pruning and pruning programme followed

e) Plucking and green leaf handling

f) Manuring programme followed

g) Pests and diseases and control measures adopted

h) Spraying techniques of plant protection chemicals

i) Any other aspects observed in field management