



TEA RESEARCH ASSOCIATION

Arunachal Advisory Centre, Dist. Papum-pare, Itanagar-791111 website-www.tocklai.net

QUARTERLY ADVISORY BULLETIN

Number 1

January – March, 2015

The Arunachal Advisory Centre, Tea Research Association, Itanagar (Mobile no: 08471948330, e-mail ID: b.bordoloi@tocklai.net) is situated at the address "C/o Department of Trade & Commerce, Govt. of Arunachal Pradesh, APIDFC Building Ltd., Ground Floor, C-sector Itanagar-791111. This advisory centre is an extension service counter of Tocklai Tea Research Institute, Tea Research Association, Cinnamara, Jorhat-785008 (Assam), more than 100 years old and the largest tea research institute of the world to provide appropriate technical guidance on tea cultivation to the tea growers of Arunachal Pradesh. The centre can provide adequate guidance in selection of land for tea planting, quality planting material for both plain & hilly areas, planting spacing & design of tea & shade tree plants, land preparation methodology, drainage design for plain & hilly areas, plant protection technology, soil management technique and many other modern agricultural practices related to tea science. We hope the progressive tea growers of the state of Arunachal Pradesh will surely come forward to take the appropriate technical guidance from this centre to find them in a prestigious position in the age old Indian tea industry by producing high quality green leaves or, made tea of their own. The centre issues Advisory Bulletin in each quarter of the year starting from January, loaded with all sort of technical inputs required for the best management of the tea fields throughout the year. Bulletins are available at the website www.arunachalpradesh.gov.in/trade, the official website of Dept. of Trade & Commerce, Govt. of AP.

The Tea Board of India implemented stringent regulation called Plant Protection Code (PPC) on use of Plant Protection Formulation (PPF) for pest management so that the tea growers can reduce the load of pesticide in tea fields by adopting appropriate cultural practices for pest management to thrive in the competitive world market of tea. This vital issue is always addressed in each bulletin for appropriate implementation of plant protection technique in the cultivation fields. We hope the tea growers of the state shall go through all the bulletins issued from this station with the support of the department of Trade & Commerce, Govt. of AP and equip themselves with scientific cultural practices of tea field management.

This is the first issue of the bulletin in the year 2015. We wish all the tea growers of the state of Arunachal Pradesh a very happy and prosperous NEW YEAR 2015 and request all of you to come forward to take necessary technical guidance from this centre for better future of the upcoming tea industry of the state. Send your email ID to b.bordoloi@tocklai.net to receive a copy of the bulletin directly and send any technical query related to cultural practices in tea for instant help.

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Important factors need to be addressed during first Quarter:

- Ensure soil testing to know the fertility status of the soil before finalizing the fertilizer program for the ensuing season. Based on the soil test report and average yield during a pruning cycle of 3 or 4 years adopt appropriate fertilizer policy to boost up crop production as well as to maintain good soil health.
- Repeat mulching the young tea ('0'- '+2' year old) area where necessary within the month of January with any green material to evacuate the ill effect of adverse climatic condition at the beginning of the season.
- Retain the pruning litters in the tea fields to provide sufficient mulch on the pruned fields to preserve adequate soil moisture.
- Level the uneven ground of planting area to vacate the chance of localised water logging.
- In flat area if soil is heavy, deep hoeing should be done in between two tea rows to improve soil aeration followed by levelling.
- Clean and re-grading the field, collector and contour drains to ensure free flow of rain water in quick time from the planting ground.
- Keep the plantation area weed free and take special care in removal of secondary host plant of Red spider mite and Helopeltis.
- Lime wash the pruned bush frame with the formulation of 3 kg quick lime + 6 kg washing soda + 100 litres water to eradicate the mossy growth and to destroy the hibernation of pest in the cracks & crevices on the bush frame. Prepare the formulation in overnight and filtrate through doubled layered leaf bag. Spray the filtrate on frame using hand sprayer.
- Lime washes the shade tree trunk up to the height of 10-12ft to reduce the chance of egg laying by sewing pest like looper.
- Fork the soil around the collar region (15-20 cm) of the 1-2 year old young tea areas prone to cockchafer infestation and collect the grub to reduce the infestation.
- Necessary shade lopping should be carried out in the Helopeltis infested areas to reduce the hibernating sites of the pest in the cropping season.

Management of Unpruned Tea:

- If plucking table is uneven with exposed mature leaves a level off skiff may be done during first half of January just to level the table. The cut should not be too deep to expose brown wood. If table is reasonably uniform, the banjhi shoots above table level can be plucked off by a round of hand levelling.
- Spraying of the mixture of MOP 2 kg + Magnesium Sulfate 1kg + 100 litres water by high volume sprayer at fortnightly interval till end February is beneficial against drought.
- If any pests like Helopeltis, Thrips, Green-fly, etc. are still active, spray a round of TRA/CIB approved systemic insecticide by using hand sprayer.
- Pluck close to *janam* by adopting 7-days plucking round from the beginning of the season. Break back all the overgrown shoots at the level of the table to keep the table flat and even. Adopt liberal plucking in the patches having pockets on the table and allow filling up these pockets at the earliest.

Management of Pruned Tea:

- In LP teas complete the knife cleaning operation before the emergence of new buds. Remove all the banjhi/ diseased branches from the frame during KCO without removing any productive parts from the bushes. In deep skiffed (DS) teas clean the bushes by hand and no maintenance foliage should be detached from the bushes if there is no evidence of mite pest.
- Monitor the pruned/skiffed tea fields regularly to protect from any incidence of sucking pest. If requires, apply a round of TRA & CIB approved systemic insecticide like Thiamethoxam.

Tipping of Pruned/Skiffed Tea:

- The recommended tipping measures of different types of pruned and skiffed teas are mentioned below.

<u>Type of Prune/Skiff</u>	<u>Tipping allowance</u>
1. Light prune (LP)	20-25 cm above the cut mark (Depending upon growth & vigour of tea).
2. Deep skiff	2 full leaves (8-10 cm) above skiffing mark.
3. Medium skiff	1 full leaf (4-5cm) above skiffing mark.
4. Level off Skiff/Unprune	No allowance, pluck close to <i>janam</i> .

- Tip only full grown two and a bud from the newly growing primaries at the pre-determined tipping height in weekly intervals to form the plucking table at the earliest.
- Tip the peripheral shoots about 1cm above the predetermined height for better ground coverage.

Management of Young Tea:

- The teas planted in last October-November should be de-centred at dormant phase within early February at the height of 20 cm from ground level retaining 2-3 laterals below that height. Single stemmer teas should be thumb pruned at 20cm from the ground level retaining good numbers of foliage below that point. If such preconditions are not available and weather is dry delay these operations to inter flush dormancy period of April-May after few good showers.
- Most of the branches of young tea plantations in +2 or +3 (high elevation) years attaining the pencil thickness should be pruned at 35 cm - 40 cm (FFP-I) in end January to early February. Apart from removal of twiggy banjhi branches at the centre no defoliation should be done in FFP-I.
- FFP-II should be imparted after 2 or 3 (at high elevation) years from FFP-I at 40 cm - 45 cm in end January. At the time of this operation bushes should be cleaned properly but not to remove the central branches excessively so that the central portion does not become hollow.
- A general guideline of TTRI on bringing up practices of young tea is given below.

Method of bringing up young tea in plain areas
(All measurements mentioned below are from ground level)

Autumn Plantation (October-November)			Spring Plantation (April –May)		
Plant Age	Month	Operation	Plant Age	Month	Operation
0 Year	Oct. - Nov	Plant tea & allow to grow.	0 Year	April – May	Plant tea & allow to grow.
+ 1 Year	February – April June - July	Decentre/ Thumb prune at 20cm (8") when the plant is dormant. Remove thick branch at 25 cm (10"). Pluck the new growth at 65 cm (26").		July – August	Decentre/ Thumb prune at 20cm (8") when the plant is dormant. Pluck the new growth at 65 cm (26").
+ 2 Year	Whole year	Keep unprune & Pluck close to janam.	+ 1 Year	Whole year	Keep unprune & Pluck close to janam.
+ 3 Year	End January – mid February Within mid Sep. – mid Oct	Prune (FFP 1) the plant at 35-40 cm (14" – 16"). Pluck at 65 cm (26"). Step up the plant by 1 leaf to 70 cm (28").	+ 2Year	End January – mid February Within mid Sep. – mid Oct	Prune (FFP 1) the plant at 35-40 cm (14" – 16"). Pluck at 65 cm (26"). Step up the plant by o1 leaf to 70 cm (28").
+ 4 Year	Whole Year	Keep unprune & Pluck close to janam.	+ 3 Year	Whole Year	Keep unprune & Pluck close to janam.
+ 5 Year	End January – Mid February	Prune (FFP 2) the plant at 40-45 cm (16" – 18"). Pluck at 65 cm (26").	+ 4 Year	End January – Mid February	Prune (FFP 2) the plant at 40-45 cm (16" – 18"). Pluck at 65 cm (26").

Method of bringing up young tea in hilly areas
(All measurements mentioned below are from ground level)

Low elevation (June – July)			High elevation (June – July)		
Plant Age	Month	Operation	Plant Age	Month	Operation
0 Year	April - June	Plant tea & allow to grow	0 Year	April- June	Plant tea & allow to grow
+ 1 Year	January-February	Decentre/ Thumb prune at 15 – 20 cm (6"- 8") when the plant is dormant. Remove 1-2 thick branches at 20-25 cm (8"-10"). Pluck the new growth at 55-60 cm (22"-24")	+ 1 Year	January-February	Decentre/ Thumb prune at 15 – 20 cm (6"- 8") when the plant is dormant. Remove 1-2 thick branches at 20-25 cm (8"-10"). Pluck the new growth at 55-60 cm (22"-24")
+ 2 Year	Whole year	Keep unprune & Pluck close to janam.	+ 2 Year	Whole year	Keep unprune & Pluck close to janam.
+ 3 Year	End Jan.– mid Feb. Within mid Jul. – mid Aug	Prune (FFP 1) the plant at 30- 35 cm (12" – 14"). Pluck at 55-60 cm (22"- 24") Step up the plant to 65 cm (26")	+ 3 Year	End Jan.– mid Feb Within mid Jul. – mid Aug	Prune (FFP 1) the plant at 30- 35 cm (12" – 14"). Pluck at 55-60 cm (22"- 24") Step up the plant to 65 cm (26")
+ 4 Year	Whole Year	Keep unprune & Pluck close to janam.	+ 4 & + 5 Year	Whole Year	Keep unprune & Pluck close to janam.
+ 5 Year	End January – Mid February	Prune (FFP 2) the plant at 35- 40 cm (14" -16"). Pluck at 60-65 cm (24"-26")	+ 6 Year	End January – Mid February	Prune (FFP 2) the plant at 35- 40 cm (14" -16"). Pluck at 60-65 cm (24"-26")

Management of VP & Seed Nursery:

- In hilly areas raise the VP/seed nursery at low elevation and within the slope of 30%. The nursery site should be well drained and protected by contour drains to check the flow of surface and sub-surface water.
- Prepare the Nursery beds of 120 cm width along the contour line to ensure protection from soil erosion.
- Well drained areas with natural water resources nearby should be selected for nursery site in plain areas.
- The sleeve size should be 15 cm lay flat and 22.5 cm long. Fill up the sleeves with sandy loam top soil having organic carbon percentage within the level of 1%. The pH range of the soil should be 4.5-5.0 and eelworm count per 10 gm soil should not be more than 6. Ensure these soil parameters through soil testing before filling up of sleeves.
- The top soil collected for sleeve filling should be sieved through 4 mesh sieve (4 numbers of square hole/inch) and incorporate 500 gm SSP per cubic meter of sieved soil.

- Allow the filled up sleeves to settle down for a month period before planting of cuttings or sowing seed.
- Complete the seed sowing in ready sleeves within January by placing the seeds at 1cm depth and facing the eyes towards bottom. Carefully regulate the watering on seed sown sleeves to avoid the infection of *Fusarium solani*. Overhead shade is not required for seed nursery.
- Mother bushes raised for cuttings collection should be protected from any attack of pest and disease. Planting of semi hard green cuttings should be completed within April to June.
- Nylon net having the capacity to reduce 75% sun light should be used as overhead shade material in VP nursery. The frame of the overhead shade should be erected with adequate height and slope to avoid drip and heat damage. It should be 1.8 cm and 2.7 cm along lower and higher side of a roof covering one bed under one slanting roof.

Management of pest & disease:

In cold weather, infestation of pests or infections of diseases are generally low but such residual population could build up rapidly in cropping period. The cultural and chemical practices of managing some of the major tea pests and diseases in cold weather are elaborated below for the benefit of the tea growers. Tea growers should abide by the TBI regulations of Plant protection Code (PPC) in every step of management practices in tea pest or, disease. Prior to elaborate discussion about the pest/disease management practices some salient features of the PPC are pointed out below.

Do's:

1. Follow Good Agricultural Practices (GAP) to maintain good health of your tea.
2. Apply all possible and safer methods of pest management like cultural, mechanical, physical, botanicals, biological etc to minimize load on inorganic pesticides.
3. Procure and use only TRA/CIB/PPC approved pesticides and apply in appropriate dilution and maintain appropriate interval (minimum 7 days) between spraying and plucking to achieve maximum residue limit (MRL) of the applied chemical in made tea.
4. Use proper nozzle and maintain adequate pressure (40 psi for pesticide sprayer and 10-12 psi for weedicide sprayer) in conventional spraying machine.
5. As much as possible avoid blanket application of pesticide. Keep strict vigil on plantation for early detection of pest/disease occurrence and apply pesticide in infested spot only.
6. Always use protective gear at the time of pesticide application. Store the pesticide in safe ventilated places away from child, livestock, fire, water resources etc.
7. Use naturally available and TRA approved effective crude water extract of native plants as alternate of chemical pesticides for controlling pest & disease.

Don'ts:

1. Do not apply any chemical pesticide restricted or banned for tea cultivation.
2. Do not use the empty container of pesticide for household purpose. Dispose the empty container by burying at least 50cm depth in barren soil which is no use for cultivation purpose.

Helopeltis

- If any infestation persists after LOS, remove the infested shoots. Apply a round of Thiomethoxam 25% WG @ 50 g in 200 liters or, Thiacloprid 21.7%SC @ 67ml in 200 liters of water by using hand sprayer. Bio gardens should apply Neem formulation @ 135 ml in 200 litres of water .
- Adopt barrier spraying on the peripheral bushes of the infected area and then spray the inside bushes. Clean the nearby jungle to eradicate the secondary host of the pest.
- Apply botanicals like *Polygonum hydropiper*, *Clerodendrum viscosum*, *Vitex negundo* etc. Crush the leaves with tender stems and flowers and soaked for 4-5 days followed by straining with muslin cloth. The extract collected from 10 kg of such herbal mixtures should be diluted up to 100 litres by adding water followed by spraying.

Red spider

- Take appropriate action to improve the shade status to reduce the infestation of Red spider. Eradicate the secondary host of this mite pest from the planting ground.
- Apply a round of Propergite @ 500 ml in 200 l water or, Fenazaquin @ 500 ml in 200 l water or, Hexythiazox 5.45% EC @ 80ml in 200 liters of water by using hand sprayer . Bio garden can apply Sulfur 80WG formulations @ 1kg in 200 liters water. The botanicals suggested for Helopeltis can also be applied.

Thrips and Green fly

- In thrips and green fly infested sections apply a round of Thiomethoxam 25% WG @ 50gm in 200 liters of water by using hand sprayer.
- Pluck hard if these pests are active at beginning of the season. Protect the newly emerged buds of LP & DS bushes by applying a round of Thiomethoxam 25% WG.
- Use Yellow Sticky Delta trap within these sections to reduce the infestation of these sucking pest. 10-12 Delta traps are required per ha.
- A photograph of such trap is enclosed at the end of this bulletin.
- The botanicals suggested for Helopeltis can also be applied.

Looper

- In looper infested sections heat treatment should be given around shade tree trunk, where eggs are laid, with flame (Mashal) up to the height of 15-20 ft to destroy the eggs of looper laid in the cracks and crevices.
- Use light trap with burning mashal inside the vacant spaces of the sections prone to looper to kill the moths.
- At very early stage of caterpillars noticed on tea leaves, apply Quinalphos (1:400, high volume). In case of bigger looper apply a round of Deltamethrin 2.8 EC @ 100ml in 200 litres or Bifenthrin 8 SC @ 125 ml in 200 litres of water by using hand sprayer.

Termite

- In termite infested LP and DS tea areas, remove the mud run from the bush frame. Destroy the hives of the termite and kill the queen.
- Apply Thiamethoxam or Thiacloprid on the frame and soil around collar region. A light irrigation prior to treatment would be helpful for better penetration of the formulated fluid into deep soil.

- Dig out the termite mound noticed in and around the tea area and kill the termite queen.

Drainage management:

- The recommended drain spacing and depth should be maintained as mentioned below with fully functional Main drain system.

<u>Type of drain</u>	<u>Spacing</u>	<u>Width x Depth</u>
Field drain (Plain)	15 - 25 meter (Depending upon soil texture)	30cm x 90-105cm
Collector drain (Plain)	45 –55 meter (Depending upon soil texture)	45 cm x 120cm
Contour drains (Hill)	5-18 meter (Depending upon hill slope %)	30 cm x 30cm

- The excavated drain soil in plain area should be evenly spread inside the planting area keeping the drain side free for easy run off of surface water during rainfall. In hill slope spread the excavated soil towards the lower side of the elevation.

Management of Shade Nursery:

- Complete the preparation of seed bed within January. The well drained high organic Carbon enriched area with natural water resources nearby should be selected for shade nursery.
- Incorporate Dolomite @ 2 t/ha and decomposed cattle manure @ 25 t/ha at the time of final land preparation. At the time of final bed preparation apply 125 gm SSP/Sq. meter area.

Depth of sowing seed	:	0.5 – 1.0cm
Spacing from seed to seed	:	20cm
Interline spacing	:	30cm
Drain depth between two beds	:	60cm

- Lightly mulch the seed bed after seed sowing with green matter. Treat the mulch material with TRA/CIB approved insecticide to avoid the emergence of termite and other soil borne pest. Watering in timely interval is necessary to maintain soil moisture at field capacity level.

Photograph of Yellow Sticky Delta Trap:



List of CIB-TRA approved Agro-chemicals for use in Tea

Name of Chemicals	Trade Name	Dose		MRL (ppm)		
		HV	LV	India	EU	Japan
ACARICIDES						
Bifenthrin 8 SC	-	1:1600	1:800	-	5	-
Dicofol 18.5 EC	Diumite	1:400	1:200	5	20	3
	Colonel-S	Do	Do			
Ethion 50 EC	Ethion	1:400	1:200	5	3	0.3
Etoxazole	-	-	-	-	-	-
Fenazaquin 10 EC	-	1:400	1:200	3	10	[UL 0.01]
Fenpropathrin 30 EC	Meothrin				2	25
Fenpyroximate 5 EC/SC	Sedna	1:2000	1:1000	-	0.1	10
	Pyromite	Do		-		
Hexythiazox 5.45 EC	-	1:2500	1:1250	-	4	-
Propergite 57 EC	-	1:400	1:200	10	5	5
Sulphur 80 WG	-	1:200	1:100	-	-	-
Wettable Sulphur 40 WP	Share			-	-	-
Spiromesifen 240 SC (22.9 w/v)	Oberon	1:1000		-	50	30
INSECTICIDES						
Azadirachtin 5% EC	-	1:1500		-	0.01	-
Bifenthrin 8% SC	-	1:1600	1:800	-	5	25
Clothianidin 50 WDG	Dantasu 50 WDG	1:4500	1:2250	-	0.7	-
Deltamethrin 2.8 EC	Decis	1:2000	1:1000	-	5	10
Phosalone 35 EC	-	1:400	1:200	-	0.1	2
Quinalphos 25 EC	Flash	1:400	1:200	0.01	0.1	0.1
Quinalphos 20 AF	-	1:400	1:200	0.01	0.1	0.1
Thiacloprid 21.7% SC	Alanto	-	-	-	10	30
Thiamethoxam 25 WG	Thiomex	1:4000	1:2000	-	20	20
HERBICIDES						
Glyphosate 41% SL	Globus	0.8kg a.i. /ha -1.2kg a.i. /ha		1	2	1
	Round - up	Do				
Glyphosate 71% SG	-	-		-	2	1
Glufosinate Amonium 13.5 SL	-	1.5 kg/ha for broad leaf – 2.0 kg/ha for mixed population		0.01	0.1	0.3
Oxyfluorfen 23.5 EC	Oxygold	0.25kg a.i./ha			0.05	[UL 0.01]
Paraquat Dichloride 24% SL/WSC	Herbucosone	1lit/ha in 200 lit of water		-	0.05	0.3
FUNGICIDES						
Carbendazim12% + Mancozeb 63% WP	-	-	-	-	-	-
Hexaconazole 5 EC	-	1:1000	1:500	-	0.05	0.05
Propiconazole 25 EC	-	1:1000	1:500	-	0.1	0.1

N. B. Prepared in the line with the list of approved PPFs for Plant Protection Code (PPC): version 3.0 by the technical group of PPC in its meeting at TTRI, Jorhat on 26th November 2014.

Issued by Advisory Department, Tocklai Tea Research Institute, TRA, Jorhat, Assam.