TEA RESEARCH ASSOCIATION

Arunachal Advisory Centre

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QUARTERLY ADVISORY BULLETIN

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The Arunachal Advisory Centre, Tea Research Association, Itanagar(AP) is issuing this 2nd edition of the "Quarterly Advisory Bulletin" with the support of the Department of Trade & Commerce, Govt. of Arunachal Pradesh for the benefit of the tea growers of the state. The cultural practices to be executed by the tea growers during this quarter of the season in the tea fields has been elaborated in this issue to upgrade the tea fields to produce high quality green leaves. We hope the growers shall go through this bulletin and implement the advices in their tea fields to achieve desired crop in this season. We expect your valuable feedback which will surely help us to work together for the betterment of the upcoming tea industries of the state. Our official address is "Arunachal Advisory Centre, Tea Research Association, C/o Dept. of trade & Commerce, APIDFC Building ltd, C-sector, Itanagar-791111".

A. Management of Unprune Tea:

- Pluck close to janam and pluck hard to remove all the banjhi shoots from the plucking table along with the growing two and a bud to keep the table productive from the initial period of the plucking season.
- Due to moisture stress, the numbers of banjhi shoots are predominant on the table during this period of the plucking season. Remove these banjhi shoots from the table to ensure growing phase of the tea bushes.
- The unprune sections of tea, where the top layer of the maintenance foliage is weak and thin, pluck liberally to add up a fresh layer of foliage to cover up the exposed stubs to prevent die back of these stubs. As and when the fresh layer of leaves has been uniformly add up within 2-3 rounds of plucking, adopt 7days round of janam plucking procedure.

B. Management of LP, DS and MS Tea:

- The Light prune, Deep skiffed and Medium skiffed teas should be tipped at the predetermined height removing only fully open two leaves and a bud in seven days interval.
- The peripheral primaries of light pruned and deep skiffed teas should be tipped at least 1 cm above the general height to achieve quick coverage of the ground and to facilitate spreading of the plucking table.
- The tipping measures of mature teas should be taken from the cut mark. The recommended tipping height of different types of pruning and skiffed teas is as mentioned below:

Tipping measures for different types of pruning/skiffing

Sl. No	Type of prune/ Skiff	Recommended height of tipping	Average numbers foliage to be retained over the cut mark
1	Light prune	20-25 cm above the cut mark depending upon the growth vigor of the tea	5 numbers of full leaves
2	Deep skiff	8-10 cm above the cut mark	2 numbers of full leaves
3	Medium skiff	5 cm above the cut mark	1 number of full leaf

C. Management of Young tea:

- De-budding of the teas planted in last autumn should be done above 20 cm from the ground as soon as the auxiliary buds starts growing for encouraging the lateral growth below. This operation can be done any time of the season as soon as newly planted plants are ready for the same by removing all growing buds from leaf axils and top of the plants leaving main stem and mother leaf undamaged.
- De-centering operation should be done at 20cm from the ground on those young tea sections where 2-3 laterals are emerged within the height of 20cm after debudding. The single steamer plants should be thumb pruned at 20cm from the ground. Both these operations should be completed within May as and when the plants are in inter-flush dormancy period.
- The tipping measures of the de-centered and frame formation pruned (FFP) teas should be done as given in the table below. The tipping measurement of young tea should be considered from the ground level.

Sl. No	Type of operation	Recommended height of tipping
1	De-centering/ Thumb prune	Above 65 cm from the ground in low altitude and plain area and 60 cm from the ground in high altitude above 1200 m above mean sea level.
2	FFP-1 at 30-35 cm above ground	-do-
3	FFP-2 at 35-40 cm above ground	-do-

D. Management of Pest & Disease:

Helopeltis

Infestation of Helopeltis is normally builds up from the month of April. The following measures should be taken to control this sucking pest at the early stage of emergence.

- The infested shoots should be plucked before taking up any chemical control measure. Adopt black plucking during the period of Helopeltis infestation.
- The ground and the surrounding areas should be kept weed free taking special removal measures of the secondary host plants.
- The hanging shade tree branches and the ‘matidals’ of the tea bushes should be trimmed and the drainage should be maintained properly to drain off the rain water in quick time.
- Application of insecticide should be taken up immediate after plucking. Adopt barrier spraying technique against Helopeltis. Spraying should be done in early morning or late afternoon when the pest is active on the tea bushes.
- If the infestation is noticed in patches apply Thiamethoxam 25 WG @ 50gm in 200 l of water or Thiacloprid @ 200 ml in 200 l of water or Clothianidin @ 45 ml in 200 l of water in spot. If infestation is already spread out, a blanket round may be necessary at 15 day intervals using alternate insecticide.

- Bio-garden should apply neem formulation like Azadiractin 5% @ 135 ml in 200 l of water. Common weeds like *Clerodendron viscosum, Polygonum hydropiper* etc can be tried at 10 % concentration. The fresh foliage with tender stem and flowers should be crushed and soaked in adequate water for around 36 hours. The volume should be increased to maintain 10 % concentration of the original raw material in ultimate spray fluid. Entomo-pathogenic fungal formulation of *Beauveria bassiana* @ 1:200 can also be applied.

Red spider:

Red spider mites are found active from the beginning of the season and build up rapidly from the residual population. Tea areas where the shade status is inadequate are more prone to spider mite. Take special care to improve the shade status of such sections. The following chemical measures are found to be effective in controlling Red spider mite.

- If infestation is noticed in patches apply a round of Propergite 57EC @ 500 ml in 200 l of water in spots only. The follow up round should be applied with Fenpyroximate 5EC @ 100 ml in 200 l of water, Hexythiazox @ 80 ml in 200 l water, Fenazaquin 10% EC @ 500 ml in 200 l of water etc in 15 days interval if live population is noticed. Alternate acaricide should be used in each round.
- Within the month of April under mild weather condition moderately infested sections may be treated with Sulfur 80WG @ 1 kg in 200 l of water.
- In organic tea plantations spray Paraffinic Oil @ 2-3 l in 200 l of water in the first round and follow up with Sulfur 80WG. Neem formulation like Azadiractin 5% @ 135 ml in 200 l of water is very much effective against red spider mite. The common weed *Clerodendrom viscosum* (*Dhapat tita*) at 10 % concentration can be tried from early stage of infestation.

Thrips and Green fly

- Infestation of Thrips and Green fly is noticed in unprune sections at the beginning of the season. If infestation persists adopt black plucking to remove the entire shoot from the plucking table leaving only un-open buds on the table.
- Apply a round of Thiomethoxam 25% WG @ 50 gm in 200 l of water in these sections with a follow up round with Thiacloprid 21.7% SC.

Blister Blight

Blister blight is a fungal disease generally occurred in the months of March to May if the weather remains cloudy and humid for a long period. This disease infected the pluckable shoots forming yellowish white blister on the under surface of the leaves. The following measures should be taken during the period of infection.

- All the infected shoots should be removed by adopting black plucking during the period of blister blight infection. The side branches of the severely infected sections should be trimmed to provide adequate aeration. The heavy shade should be thinned out for better light penetration in the section. Green crop in the young tea sections should be lopped during the period of blister blight infection.
- A round of Copper oxychloride 50WP @ 500 gm in 200 l of water or Hexaconazole 5EC @ of 200ml in 200 l of water by using hand sprayer. A follow up round with Hexaconazole 5EC should be sprayed in 7-15 days interval depending upon the level of infection.
- Bio-gardens should spray bacterial formulation of Bacillus subtilis @ 20 l in 200 l of water for 2-3 rounds in 15 days interval to achieve effective control of this disease.

Black rot

Black rot is a fungal disease which infects the mature leaves of the tea bushes. The infection of this disease generally occurs from the month of April and reaches the pick in June-July. The following measures should be taken up against this disease.

- Remove all the infected dried up leaves from the infected bush prior to take any chemical measure.
- Apply a round of COC @ 500 gm in 200 l of water targeting the under surface of the infected leaves following up with Hexaconazole 5EC @ 200 ml in 200 l of water in 15 days interval.
- Continue spraying in 15 days interval with Hexaconazole 5EC in severely infected sections for initial 2-3 rounds and thereafter in monthly intervals with COC till the disease disappear.

E. Weed management:

- In pruned and deep skiffed field, where ground is exposed and weed growth is heavy, Glyphosate 1000 ml in 200 l water can be applied on succulent weeds of 8-10 cm tall covering around 60 % of the ground. It should be repeated after 3-4 weeks in spots.
- After the above rounds, if only broad leaf weeds are growing, apply a round of Gluphosinate ammonium13.5 Sl @ 1.5 lit in 200 lit of water at tender stage.
- All the above rounds should be completed before monsoon.
- During monsoon Paraquat 500g in 200 lit of water should be applied, if necessary.
- In unprune tea Paraquat for grass or Gluphosinate Ammonium for broad leaf can be applied on need basis.
- Over grown weeds should be sickled first and herbicide should be applied on regrowth.
- Obnoxious weeds like Fern/*Polygonum* /*Mikania* etc. should be manually uprooted.

F. Management of Hail Damage:

Hail damage is a natural calamity of leafy crop like tea generally occurs from March to May. The following measures are found to be beneficial for quick recovery from the damage done by hail.

- Apply a round of COC @ 1000gm + Planofix- 50ml + MOP- 2 kg mixture in 200 l of water within 24 hours of occurring hail damage.
- Remove the broken primaries from the LP/DS bushes retaining the healthy portion of the primaries using sharp knife. Allow the new growth from the retained portion to reach the predetermined tipping height and tip them to form the plucking table. If the top layer of the foliage of unprune tea is severely damage than add a fresh layer of foliage by plucking liberally. Allow the created pockets to fill up at the earliest.
- As and when the new growth emerged from the damaged bushes apply the mixture of Urea 1kg + Zinc sulfate 500 gm + Boric acid 250 gm in 200 l water for 2 rounds in 15 days interval to encourage the growth.
- Keep strict vigil on such sections to protect from any pest attack or, infection of disease.

G. Fertilizer Management:

- In adequately moist soil (up to the depth of 45cm) apply the first round of chemical fertilizer on mature tea sections within mid May. First round fertilizer mixture should contain 60% of total Nitrogen and Potash and entire quantity of Phosphate. In unprune tea after 2-3 rounds of plucking and in LP/DS tea 2-3 new leaves should emerged from the primaries before applying fertilizer.
- The quantity of Nitrogen should be fixed up on the basis of cycle average yield and depending upon the soil test report potash fertilizer should be calculated. Phosphate amount should be within 20-50 kg per hactre/year.

- In plain areas, fertilizers should be applied uniformly on the ground as broadcast. In hilly areas, fertilizers should be applied in a half circular band on the up slope keeping a distance from the collar.
- The following table should be considered for fertilizer application in mature tea sections.

For Plain Areas						
Cycle average Yield (*KMTH)	Conversion in green leaf quantity (kg/ha)	Requirement of Nitrogen (kg/ha)	Requirement of Phosphate (kg/ha)	Requirement of Potash (kg/ha) (on the basis of soil test report)		
				Low (< 60 ppm)	Medium (60-100 ppm)	High (> 100 ppm)
Up to 1500	Up to 6670	Up to 90 (Urea~ 195 kg)	20 (RP~83)	Up to 90 (MOP~150)	Up to 70 (MOP~117)	Up to 50 (MOP~83)
1500-2000	6670-8890	90-110 (Urea ~ 195-240 kg)	20-30 (RP~ 83-125)	90-110 (MOP~150-183)	70-80 (MOP~117-133)	50-70 (MOP~ 83- 116)
2000-2500	8890-11110	110-140 (Urea~240-304)	30-50 (RP~ 125-208)	110-140 (MOP~183-233)	80-120 (MOP~ 133-200)	70-100 (MOP~ 116-167)
2500-3000	11110-13330	140-165 (Urea~ 304-358)	50 (RP~208)	140-165 (MOP~233-275)	120-140 (MOP~ 200-233)	100-120 (MOP~ 167-200)
For Hilly Areas						
Up to 600	Up to 2670	Up to 60 (Urea ~130 kg)	20 (RP~85 kg)	Up to 60 (MOP ~100 kg)	Up to 60 (MOP ~100 kg)	Up to 50 (MOP~ 85 kg)
600-1000	2670-4450	60-90 (Urea ~ 130 – 195 kg)	20 (RP ~ 85 kg)	60-90 (MOP ~ 100 – 150 kg)	60-90 (MOP ~ 100 – 150 kg)	50-70 (MOP ~ 85 – 116 kg)
1000-1400	4450-6230	90-120 (Urea ~ 195-260 kg)	20 (RP~ 85 kg)	90-120 (MOP ~ 150-200 kg)	90-120 (MOP ~ 150-200 kg)	70-100 (MOP ~ 116 – 166 kg)

*KMTH- kg made tea per hectare, RP- Rock phosphate (24% phosphate),ppm- an unit of measurement

- At formative stage of young tea, YTD mixture should be applied with Nitrogen, Phosphate & potash @ ratio 10:5:10 (Nitrogen 10kg, Phosphate 5kg and Potash 10kg in 100 kg YTD mixture) where soil available potash is above 100ppm. If potash level is below 100ppm then the ratio of Nitrogen, Phosphate & Potash should be 10:5:15. The table below indicates the requirement of Nitrogen, Phosphate & Potash to prepare YTD mixture @ 10:5:10 (urea as the source of Nitrogen, SSP as the source of phosphate and MOP as the source of potash), required total quantity of YTD mixture per hectare and the application procedure of the fertilizer mixture.

Age of the tea	**Nitrogen (kg/ha/yr)**	**Phosphate (kg/ha/yr)**	**Potash (kg/ha/yr)**	**Filler (kg/ha/yr))**	**Total quantity of YTD mixture including filler(kg/ha/yr)**	**Application method of YTD mixture**
0 year	20-40 (Urea 43-87)	10-20 (SSP 63-125)	20-40 (MOP 33-67)	61-121	200-400 (Depending upon the growth vigor of the tea plant)	Ring in 2-3 splits &15 cm apart from the collar region
+1 year	80-100 (Urea 173-217)	40-50 (SSP 250-312)	80-100 (MOP 133-167)	244-304	800-1000 (Depending upon the growth vigor of the tea plant)	Ring in 4 splits &15 cm apart from the collar region
+2 year	100-120 (Urea 217-260)	50-60 (SSP 312-375)	100-120 (MOP 167-200)	304-365	1000-1200 (Depending upon the growth vigor of the tea plant)	Ring in 4 splits & 20 cm apart from the collar region
+3 year	120-140 (Urea 260-304)	60-70 (SSP 375-438)	120-140 (MOP 200-233)	365-425	1200-1400 (Depending upon the growth vigor of the tea plant)	Ring in 4 splits & 20 cm apart from the collar region
+4 year	140-150 (Urea 304-326)	70-75 (SSP 438-469)	140-150 (MOP 233-250)	425-455	1400-1500 (Depending upon the growth vigor of the tea plant)	Strip in 2splits
+5 year	140-150 (Urea 304-326)	70-75 (SSP 438-469)	140-150 (MOP 233-250)	425-455	1400-1500 (Depending upon the growth vigor of the tea plant)	Strip in 2splits

- Filler should be incorporated with the chemical fertilizer to make up the volume and to avoid any chance of fertilizer injury to the young tea plant. Dry cattle manure, dry soil, dry coarse sand etc. may be used as filler.

- First split application of YTD mixture should be completed on moist weed free ground within April. A gap of 6-8 weeks should be maintained between two splits of application.
- In '0' year plant, if planting is done in March-April, 1st split application should be done in as and when the saplings produce some new growth indicating their establishment.
- In +4 & +5 year old plantations, 1st split should be completed in April-May and the 2nd split should be applied in late August.

H. Clonal Nursery Management:

- To raise VP nursery in spring, filling up of sleeves with top soil having pH range 4.5-5.0 and % of organic carbon not more than 1%, should be completed within April.
- Only semi hard green cuttings with swollen auxiliary bud collected from healthy primaries should be planted within June to achieve better strike rate.
- Already selected mother bushes (protected from pest infestation and disease infection) should be treated with 2kg MOP in 200 l water by means of foliar application for 2-3 rounds in 7days interval prior to take cuttings.
- Prepared cuttings should be dipped in 0.1% Zinc sulfate solution (10gm Zinc sulfate in 10 l water) for 5 minutes before planting in sleeves.
- Agro-shade nylon net having the capacity to resist 75% light should be used to erect the over head shade structure for VP nursery. The upper slope of the shade should be around 180 cm from the sleeve top and the lower slope should be 150cm to avoid drip and heat damage. In each slope, one sleeve bed of 120 cm width and with any convenient length should be covered. Sleeve beds should be separated by 30cm x 30cm drains to provide adequate passage to run off water.
- After planting of cuttings if the sleeve top is covered with moss, scrape out the mosses to provide aeration to the cuttings.

I. Shade Nursery Management:

In hilly area of low altitude and also in plain area, shade tree is an integral part of tea plantations. Adequate shade provides the condition of healthy growth of tea and thereby reduces the chance of pest infestation or, disease infection. Shade improves the micro-climate of the tea area and helps the tea plants to withstand in adverse climatic condition like drought, hail etc. The following measures should be taken to establish shade nursery.

- Shade nursery for both permanent and temporary species should be raised. Well drained high land having good water source nearby should be selected as site to raise the nursery of both permanent and temporary shade tree.
- TRA approved permanent species of shade tree are as given below:
  Anadenenthera perigrina, Albizzia sinensis, Albizzia odoratissima, Acacia lenticularis, etc.
  TRA approved temporary shade species are *Indigofera teysmanii, Leucaena leucocephala, Melia azadirach* etc.
- Dolomite @ 500gm per cubic meter of soil and SSP @ 1000kg per cubic meter of soil should be incorporated for filling up sleeves for shade nursery.
- The seeds should be collected from the selected disease and pest free mature trees. Collected seeds should be sown directly in sleeves sized 30 cm lay flat, 60 cm long and 300 gauge thickness within the month of April.
- After sowing seeds, light mulching should be done followed by regular watering to keep the soil moist. No overhead shade is necessary.

List of CIB-TRA approved Agro-chemicals for use in Tea by the member gardens of TRA(as on 1st April, 2014).

Name of Chemicals	Trade Name	Dose		MRL (ppm)		
ACARICIDES		**HV (Hand sprayer)**	**LV**	**India**	**EU**	**Japan**
Bifenthrin 8 SC	–	1:1600 (125ml/200 l)	1:800	–	5	–
Dicofol 18.5 EC	Diumite	1:400 (500 ml/200 l)	1:200	5	20	3
	Colonel-S	Do	Do			
Ethion 50 EC	Ethion	1:400 (500ml/200 l)	1:200	5	3	0.01
Fenazaquin 10 EC	–	1:400 (500 ml/200 l)	1:200	3	10	–
Fenpropathrin 30 EC	Meothrin					
Fenpyroximate 5 EC/SC	Sedna	1:2000 (100 ml/200 l)	1:1000	–	0.1	–
	Pyromite	Do				
Hexythiazox 5.45 EC	–	1:2500 (80 ml/200 l)	1:1250	–	0.01	–
Propergite 57 EC	–	1:400 (500 ml/200 l)	1:200	10	5	5
Sulphur 80 WG/WP	–	1:200 (1kg/ 200 l)	1:100	–	5	–
Wettable Sulphur 40 WP	Share			–	–	–
Spiromesifen 240 SC (22.9 w/v)	Oberon	1:1000 (200 ml/200 l)		–	0.02	–
INSECTICIDES						
Azadirachtin 5% EC	–	1:1500 (135ml/200 l)		0.01		
Bifenthrin 8% SC	–	1:1600 (125 ml/200 l)	1:800	–	5	–
Clothianidin 50 WDG	–	1:4500 (45 ml/200 l)	1:2250	–	–	–
Deltamethrin 2.8 EC	Decis	1:2000 (100 ml/200 l)	1:1000	–	5	5
Phosalone 35 EC	–	1:400 (500 ml/200 l)	1:200	–	–	–
Profenofos 50 EC	Celcron	1:1000 (200 ml/200 l)	1:500	–	0.1	1
Quinalphos 25 EC	Flash	1:400 (500 ml/200 l)	1:200	0.01	0.10	–
Quinalphos 20 AF	–	1:400 (500ml/200 l)	1:200	Do	D0	–
Thiacloprid 21.7% SC	Alanto	–	–	–	–	–
Tiomethoxam 25 WG	Thiomex	1:4000 (50 gm/200 l)	1:2000	–	20	20
HERBICIDES						
Glyphosate 41% SL	Globus	0.8kg a.i. /ha -1.2kg a.i. /ha		1	0.2	1
	Round – up	Do				
Glyphosate 71% SG	–	–		–	–	–
Glufosinate Amonium 13.5 SL	–	1.5 kg/ha for broad leaf – 2.0 kg/ha for mixed population				
Oxyfluorfen 23.5 EC	Oxygold	0.25kg a.i./ha				
Paraquat Dichloride 24% SL/WSC	Herbucsone	1lit/ha in 200 lit of water				
FUNGICIDES						

Copper hydroxide 77% WP	-	1:400 (500 gm/200 l)	1:200	-	-	-
Copper oxychloride 50 WP	-	1:400 (500 gm/200 l)	1:200			
Hexaconazole 5 EC	-	1:1000 (200ml/200 l)	1:500	-	-	-
Propiconazole 25 EC	-	1:1000 (200 ml/ 200 l)	1:500	-	-	-
STICKER						
Nonoxynol-10	Activa -80					
Non - ionic surfactant	Intron AE					
MICROBIALS						
Bacillus subtilis	-	5% cfu as foliar spray				
Beauveria bassiana	-	5% cfu suspension as foliar spray				
Chrysoperla carnea	-	2000 larve /ha				
Trichoderma biocide	-	5-10% cfu as spray on pruning cuts				
	-	20% cfu as paint				
	-	30 l/kg per ha during plantation				

N. B. : The above recommendation is in the line of Plant Protection Code issued by Tea Board of India in March, 2014

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