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, 2016" for the benefit of the tea growers of Arunachal Pradesh. Department of Trade & Commerce, Govt. of Arunachal Pradesh, the nodal department of tea development in the state provides logistic support in our effort and circulate the bulletin among the tea growers of the state. We hope the growers shall go through this bulletin and implement the advices in their tea fields to achieve desired crop in this season. Tea growers may communicate us for clarification on any measures suggested in this bulletin and any other technical guidance on tea field management at the address "Arunachal Advisory Centre, Tea Research Association, C/o Dept. of Trade & Commerce, APIDFC Building Ltd, C-sector, Itanagar-791111, Contact no- 08471948330 (M)".

A. Management of Unprune Tea:

- The prevailing moisture stress in tea soil induces banjhi shoot formation at the initial period of the plucking season. During this period adopt hard plucking to remove all the banjhi shoots along with the growing two and a bud shoots to augment productive phase of growth.
- The unprune tea with thin maintenance foliage status should be plucked liberally at the initial 2-3 rounds for adding a fresh layer of new foliage to prevent die back of the exposed stubs. After that follow 7days round of janam plucking in consecutive plucking rounds. Do not dip hand inside the existing pockets of the plucking table; allow the pockets to fill up naturally.
- If the soil moisture status suffice new growth but not adequate to apply fertilizer in soil, and weather is congenial, spray the mixture of 4kg urea + 2 kg zinc sulfate + 200 l water for 2-3 rounds in 15 days interval targeting the under surface of top 10-15 cm foliage after 2days of plucking to enhance shoot growth. Alternately a mixture of NPK comprising with 800 gm Urea + 700 gm DAP + 500 gm MOP in 200 lit of water can also be applied at fortnightly intervals.

B. Management of LP, DS and MS Tea:

- Take the tipping measures of mature teas from the prune mark. Confine with the tipping height of different types of pruning and skiffed teas as suggested below.
- In Light prune, deep skiffed and medium skiffed teas only fully open two leaves and a bud should be tipped in seven days interval so that the top layer foliage can tolerate heat without having any scorching damage.
- Pluck the peripheral primaries of light pruned and deep skiffed teas at least 1 cm above the general height for acquiring quick ground coverage through well spreading plucking table.

Tipping measures for different types of pruning/skiffing

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

C. Management of Young tea:

- De-bud the teas planted in last autumn above 20 cm from the ground by removing the growing buds from the leaf base along with the apical shoot at 45 cm height from the ground. During this operation take necessary care for avoiding any damage to the stem and the mother leaves.
- Already de-budded plants, which produce 2-3 laterals from main stem within the height of 20cm from the ground should be decentred at 20cm during the inter-flush dormancy period in April-May. During the time of this operation the ground should be moist enough for encouraging growth. Thumb prune the single steamer plants by breaking the main stem half way at 20cm from the ground within this period.
- The tipping measures of the de-centered and frame formation pruned (FFP) teas are suggested below.

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. 60 cm from the ground in high altitude above 1200 m AMSL.
2	FFP-1 at 30-35 cm above ground	-do-
3	FFP-2 at 35-40 cm above ground	25 cm above pruning level

D. Management of Pest & Disease:

Some key points of Plant Protection Code:

- Follow good agricultural practices (GAP) to reduce the occurrence of pest and disease in your tea fields.
- Avoid the chances of detecting residue of pesticides in finished product beyond MRL by maintaining the recommended time gap of minimum 7days between spraying and plucking.
- Procure and use only TRA/CIB/PPC approved high MRL chemical pesticides as per the attached list. Judiciously apply these chemical formulations at recommended dilution.
- Adequate measures should be taken on cultural practices and biological/mechanical control measures to reduce the chances of building up of pest population/ pathogen of disease in the tea fields to reduce the load of chemical pesticides in the tea fields.

Helopeltis

Helopeltis is a major sucking pest which has the capability of flying 10-12 ft at one go. Infestation of this pest is normally noticed from the month of April. Appropriate control measures should be taken to control this sucking pest at the early stage of emergence.

Cultural measures:

- In unprune tea, pluck all the infested shoots along with the healthy shoots by adopting black plucking prior to initiate any control measure. In light pruned and deep skiffed bushes black plucking should be done only after establishment of the plucking table.
- Keep the ground and the surrounding areas weed free and take special measures to remove the secondary host plants.
- Trim the hanging shade tree branches 10-12 ft above the plucking table and the 'matidals' of the tea bushes.
- Keep the drainage system fully functional for quick discharge of rain water from the tea area. Keep the ground even and flat to eradicate the chance of localized water-logging.
- Complete the application of insecticide immediate after plucking in early morning or late afternoon when the pest is active on the tea bushes.. Adopt barrier spraying technique against Helopeltis.

Organic control measure:

- 10% Water extract of common weeds like *Clerodendron viscosum, Polygonum hydropiper, Vitex negundo* etc are very much useful in controlling the infestation of this pest. 20kg of fresh foliage with tender stem and flowers should be crushed and soaked in 15-20 lit of water for around 36 hours. Strain this soaked mixture through muslin cloth and make up the volume of the filtrate up to 200 lit to get 10% concentration of the original raw material in ultimate spray fluid. Spray this solution on infested tea field immediate after plucking.
- Apply Neem formulation like Azadiractin 5% @ 135 ml in 200 l of water.

Chemical control measure:

- 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. In case of spread out infestation, blanket round may be required at fortnightly intervals using alternate insecticide.

Red spider:

Red spider mites are found active from the beginning of the season and build up rapidly from the residual population.

Cultural measures:

- Thinly shaded tea areas are more prone to spider mite. Shade density should be improve up to the recommended level.
- Establish hedges along the roadside boundary with herbs having insecticidal property and not preferred by cattle like *Vitex negundo*. Maintain higher height of the hedge than the tea plant to protect the teas from dust accumulation.

Organic control measure:

- Apply the herbal extract as suggested under Helopeltis.
- Within the month of April under mild weather condition moderately infested sections should be treated with Sulfur 80WG @ 1 kg in 200 l of water.

Chemical control measure:

- If necessitate, 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. Alternate acaricide should be used in each round.

Thrips and Green fly

- Infestation of Thrips and Green fly is noticed in unprune sections at the beginning of the season. Adopt the following measures to combat with the infestation of Thrips & Greenfly**.**

Cultural measures:

- If infestation persists adopt black plucking to remove the entire shoot from the plucking table leaving only un-open buds on the table.
- Use yellow sticky traps against green fly and thrips. These traps can be made using yellow colored semi hard poly sheet shaped in prism having the size of 30cm x 30cm x 30cm. Smeared the structure with Hot Melt Pressure Sensitive Adhesive (HMPSA) diluted by adding 300 ml adhesive in 1000 ml of normal Thinner and placed it at the height of plucking table at an angle of 60^0 fixing on a bamboo post. Such treated yellow sticker may be wrapped on shade tree at the level of plucking table also. This trap is very much effective against these pests till the month of June. In a hectare of plantation 60-70 nos of such trap is required.

Organic control measure:

- Apply the organic formulation as suggested in Helopeltis.

Chemical control measure:

- If necessary 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

In high elevation garden this fungal disease may occur during monsoon period from June – September, if weather is foggy with temperature around 20 ^{0}C. Yellowish white blister are formed due to fungal growth on the under surface of the tender leaves, if the weather remains cloudy and humid for a long period. If the same climatic condition persist in plain area within the month of March-May infection of blister blight may be noticed. The following measures should be taken during the period of infection.

Cultural measures:

- Adopt black plucking to remove all the infected shoots.
- 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.

Organic control measure:

- Application of bacterial formulation of *Bacillus subtilis* on the site of infection @ 5% is quite effective in controlling this disease.
- Take 20 kg green parts of the herbal plants *Clerodendrum viscosum,* Xanthium strumarium, Vitex negundo, Cassia alata etc. Add 15-20litres water after crushing these mixed plant parts in a sizeable container. Keep it for 36 hours and strained out the extract. Diluted the extract to 200 liters and spray on the infected sites immediate after plucking.

Chemical control measure:

- A round of Hexaconazole 5EC @ of 200ml in 200 l of water by using power sprayer for faster coverage. A follow up round should be sprayed in 7-15 days interval depending upon the level of infection.

Black rot

Black rot is a fungal disease which infects the mature leaves of the tea bushes resulting in decay/drying up and defoliation. 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.

Cultural measures:

- If section is over shaded, lop shade tree branches for aeration and adequate sunlight.
- Improve drainage, if waterlogging.
- Remove ‘matidal’ of tea bushes in case of dense section to improve aeration.

- Remove all the infected dried up leaves from the infected bush prior to take any chemical measure.

Organic control measure:

- Application of bacterial formulation of *Bacillus subtilis or,* plant herbal extract as mentioned above give satisfactory result in controlling this disease.

Chemical control measure:

- Apply a round of Hexaconazole 5EC @ 200 ml in 200 l of water targeting the under surface of the infected leaves following up with 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 in spot only till the disease disappear.

E. Weed management:

- In pruned and deep skiffed field, where ground is exposed and weed growth is heavy, Glyphosate 41%SL @ 1000 ml in 200 l water should be applied on succulent weeds of 8-10 cm tall if it covers 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.
- Both 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 followed by herbicide application on re-growth.
- Obnoxious weeds like Fern/*Polygonum* /*Mikania* etc. should be manually uprooted.

F. Management of Hail Damage:

Hail damage is one of the major natural calamities basically occurs from March to May. The following measures should be taken up for quick recovery from the damage done by hail.

- Apply a round of recommended fungicide within 24 hours of occurring hail damage to prevent secondary infection. Treatment of hail damaged tea should be planned like Young tea – LP – DS - MS – UP.
- Application of a round of Trichoderma suspension @ 5-10% depending upon the severity of damage within 48 hours of incidence also quite effective against any secondary infection.
- Allow the new growth to reach the predetermined tipping height and tip/re-tip them to form the plucking table.
- If the top layer of the foliage in unprune tea is severely damaged 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 foliar nutrition as suggested above.
- 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. 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.
- First round fertilizer mixture should contain 60% of total Nitrogen (Urea) and Potash (MOP) and entire quantity of Phosphate (Rock Phosphate).

- The quantity of Nitrogen (Urea) should be fixed up on the basis of pruning cycle average green leaves production and depending upon the soil test report Potash (MOP) fertilizer should be calculated.
- 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 Green Leaf production (kg/ha)	Requirement of Urea in terms of Nitrogen (kg/ha)	Requirement of RP in terms of Phosphate (kg/ha)	Requirement of MOP in terms of Potash (kg/ha) (on the basis of soil test report)		
			Low (< 60 ppm)	Medium (60-100 ppm)	High (> 100 ppm)
Up to 6500	Urea- 187	RP-75	MOP-150	MOP-112	MOP-75
6500-9000	Urea – 187-225	RP- 75-112	MOP- 150-187	MOP- 112-135	MOP- 75-112
9000-11000	Urea- 225-300	RP- 112-187	MOP- 187-225	MOP- 135-187	MOP- 112-165
11000-13500	Urea- 300-337	RP-187	MOP- 225-262	MOP- 187-225	MOP- 165-187
For Hilly Areas					
Up to 2700	Urea –112	RP-75	MOP –90	MOP –82	MOP-60
2700-4500	Urea – 112-187	RP –75	MOP – 90-150	MOP – 82-112	MOP – 60-82
4500-6500	Urea – 187-262	RP- 75	MOP- 150- 187	MOP – 112-165	MOP – 82-112

*** ppm- an unit of measurement (one part in one million part)**

- 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, Single Super Phosphate as the source of phosphate and MOP as the source of potash), required total quantity of YTD mixture per hectare per year and the application procedure of the fertilizer mixture.

Age of the tea	**Urea (kg/ha/yr)**	**Single Super Phosphate (kg/ha/yr)**	**MOP (kg/ha/yr)**	**Filler (kg/ha/ yr))**	**Total quantity of YTD mixture including filler(kg/ha/yr)**	**Application method of YTD mixture**
0 year	43-87	63-125	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	173-217	250-312	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	217-260	312-375	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	260-304	375-438	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	304-326	438-469	233-250	425-455	1400-1500 (Depending upon the growth vigor of the tea plant)	Strip in 2splits
+5 year	304-326	438-469	233-250	425-455	1400-1500 (Depending upon the growth vigor of the tea plant)	Strip in 2splits

- Filler like sand/soil/cattle manure/compost/vermin-compost etc 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.
- 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 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 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 Zinc sulfate 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 height at higher side of slope of the shade should be around 2.7 m cm from the sleeve top and the lower side should be 1.8cm to avoid drip and heat damage. In each slope, two beds 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:

- Shade nursery for both permanent and temporary species should be raised in well drained high land having nearby perennial water source.
- TRA approved permanent species of shade tree are as given below:
  Anadenenthera perigrina, Albizzia sinensis, Albizzia odoratissima, Acacia lenticularis, *Derris robusta* etc.
  TRA approved temporary shade species are *Indigofera teysmanii, Leucaena leucocephala, Melia azadirach* etc.
- Dolomite @ 500gm and SSP @ 1 kg per cubic meter of soil should be incorporated for filling up sleeves for shade nursery.
- If seeds are sown directly on beds apply SSP 125 g/sq. m of soil.
- 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 chemicals (as on April, 2016)

Name of Chemicals	Trade Name	Dose		MRL (ppm)		
ACARICIDES		**HV**	**LV**	**India**	**EU**	**Japan**
Bifenthrin 8 SC	–	1:1600	1:800	–	5	25
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
Fenazaquin 10 EC	–	1:400	1:200	3	10	0.01
Fenpropathrin 30 EC	Meothrin	1:1600	1:800		2	25
Fenpyroximate 5 EC/SC	Sedna		1:1000	–	0.1	10
	Pyromite					
	Mitigate					
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	–	–	–
WettableSulphur 40 WP	Share	1:200	1:100	–	–	–
Spiromesifen 240 SC (22.9 w/v)	Oberon	1:1000	1:500	–	50	30
Etoxazole 10 SC						
INSECTICIDES						
Azadirachtin 5% EC	–	1:1500		–	0.01	–
Bifenthrin 8% SC	–	1:1600	1:800	–	5	25
Clothianidin 50 WDG	Dantotsu 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	1:1000	1:500	–	10	30
Thiamethoxam 25 WG	Thiomex	1:4000	1:2000	–	20	20
Emamectin Benzoate 5% SG		80gm/200lit	-			
Flubendiamide 20% WG		40gm/200lit	-			
HERBICIDES						
Glyphosate 41% SL	Globus	0.8kg a.i. /ha -1.2kg a.i. /ha		1	2	1
	Round – up					
Glyphosate 71% SG	–	1.5 kg/ha for broad leaf – 2.0 kg/ha for mixed population		–	2	1
GlufosinateAmonium 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	0.01
Paraquat Dichloride 24% SL/WSC	Herbucsone	1lit/ha in 200 lit of water		–	0.05	0.3
FUNGICIDES						
Copper oxychloride 50WP		1:400	1:200	150 as Cu	40	-
Hexaconazole 5 EC	–	1:1000	1:500	–	0.05	0.05
Propiconazole 25 EC	–	1:1000	1:500	-	0.1	0.1
Carbendazim 12% + Mancozeb 63% WP		1:400	1:200			