



TEA RESEARCH ASSOCIATION
Arunachal Advisory Centre

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QUARTERLY ADVISORY BULLETIN
Number 1 **January – March, 2018**

Arunachal Advisory Centre, Tea Research Association, Itanagar is disseminating technical knowhow of tea cultivation among the tea growers of Arunachal Pradesh by issuing Quarterly Advisory Bulletin since January 2014. This is the 1st issue of the bulletin in the year 2018. We hope the tea growers of the state shall go through the bulletin and harvest tremendous crop during this quarter by implementing appropriate technique of best tea field management.

Key points to be addressed during first Quarter:

- Get the soil tested and if the test report has suggested necessary soil amelioration should be done within February. Prepare the fertilizer policy in advance on the basis of soil test report and pruning cycle average yield of your tea plot.
- If mulching of young tea areas ('0' - '+2' year old) was not done in October-November do it at the beginning of the season.
- Retain the pruning litters in the tea fields by spreading equally to provide sufficient mulch to conserve soil moisture as well as improve the organic matter status.
- Level the ground of plain tea areas to eliminate the chance of localised water logging during rainy season.
- Mature tea sections of flat area should be deep hoed within January to improve soil aeration followed by completion of necessary levelling within February.
- Clean and re-grade the drainage and thinly spread the drain bed soil inside the planting ground or, may be utilised to improve the paths of the section.
- Clean the bed of contour drains and open the mouth of these drains in natural vertical depressions. Do not remove the vegetations from the lower bank of the contour drains and from both the banks of vertical depressions to protect soil erosion.
- Keep the plantation area weed free by taking special removal measure of secondary host plant of tea pest, but take necessary measures in preserving/growing the weed plants having pesticidal properties in the areas where tea is not grown.
- Lime wash the pruned bush frame with the formulation of 6 kg quick lime + 12 kg washing soda + 200 litres water to eradicate the mossy growth and to destroy the hibernation of pest in the cracks & crevices on the bush frame. Clean the lime washed bush frames with hessian cloth after 3-4 days of lime application. White washes the shade tree trunk up to the height of 10-12 ft to reduce the chance of egg laying by looper.

- Fork the soil around the collar region (15-20 cm apart from the sapling) of the 1-2 year old cockchafer prone young tea areas and collect the grub to arrest the infestation. In these areas turn the mulch in fortnightly interval to eradicate the chance of building up fresh population of cockchafer. Apply microbial formulation of *Metarhizium anisopliae* 5% cfu (250-300 ml/plant) in moist ground around the collar region of the infected tea fields within the month of February.
- Necessary shade lopping should be done in the *Helopeltis* infested areas to reduce the hibernating sites of the pest in the cropping season.

Management of Unpruned Tea:

- In unpruned teas where plucking table is uneven with exposed stubs, level off skiff (LOS) should be done within mid January without exposing any brown wood. If the table is at a uniform level remove the exposed banjhi shoots by hand at the level of plucking.
- Continue spraying of MOP 4 kg + Magnesium Sulfate 2kg + 200 litres water targeting the under surface of top 10-15 cm foliage using conventional sprayer at fortnightly interval till end February to reduce the effect of moisture stress.
- If any sucking pests are still active which may be in patches, spray a round of TRA/CIB/PPC approved systemic insecticide through spot application.
- Pluck close to *janam* by adopting 7-days plucking round from the beginning of the season followed by breaking break of stubs of over grown shoots at the level of the plucking table. Adopt liberal plucking in the patches having pockets on the table and allow to fill up these pockets at the earliest.

Management of Pruned Tea:

- Complete the knife cleaning operation (KCO) in LP teas before bud breaking. Remove 1-2 Central knots and all the banjhi/ diseased branches from the frame during KCO without removing any productive wood from the bushes.
- In deep skiffed (DS) teas clean the bushes by hand without defoliating the maintenance foliage if there is no severe infestation of mite pest.
- Monitor the pruned/skiffed tea fields regularly to protect from any incidence of sucking pest at the time of bud break. Need based spot application of TRA/PPC/CIB approved systemic insecticide is suggested if any infestation is noticed.

Tipping of Pruned/Skiffed Tea:

- TRA recommended tipping measures of different types of pruned and skiffed teas are as follows:

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

Management of Young Tea:

- De-centre the teas planted in last October-November within mid February at the height of 20 cm from ground level retaining 2-3 laterals below that height. Thumb prune the single stemmer teas at 20cm from the ground level retaining good numbers of healthy foliage above that height.
- If foliage status of single steamer is weak and soil moisture status is poor thumb prune of single stemmer saplings should be delayed till inter flush dormancy period of April-May.
- Impart FFP-I in young tea plantation of +2 years (+3 years in high altitude) within January at the height of 35-40 cm from the ground level. During this operation remove only the twiggy branches from the centre without defoliating the maintenance foliage. Pluck the new growth at the height of 65 cm (60 cm in high altitude) from the ground level.
- Impart FFP-II at the height of 40-45 cm from the ground level in +4 years (+5 years for high altitude) within mid to end January. Clean the pruned bushes by complete defoliation and removal of unproductive twiggy branches without making the central portion of the frame excessively hollow. Pluck the newly emerged primaries at the height of 65 cm (60 cm in high altitude) from the ground level.

Management of VP & Seed Nursery:

- Raise the VP/seed nursery of hilly areas in low elevation within the slope of 30% and the area should be protected by contour drains across the slope to check the flow of surface and sub-surface water. Prepare the sleeve beds of 120 cm width having any convenient length along the contour line. Beds should be separated by 30 cm x 30 cm (width x depth) drains.
- In plain areas well drained areas with natural water resources nearby should be selected for nursery site. Bed should be prepared 120 cm width with any convenient length. Beds have to be separated by 45 cm wide and 30cm deep drains and should be connected with nearby collector/main drain.
- The sleeve size should be 15 cm lay flat and 22.5 cm long filling up 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 thoroughly 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.

- Selected mother bushes should be light pruned within early January for collection and planting of semi hard green cuttings within mid April to June. Newly emerge primaries of mother bushes should be well protected from any pest/disease attack.
- Complete the seed sowing in ready sleeves within January by placing the seeds at 1cm depth by 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.
- 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 m and 2.7 m along lower and higher side of a roof covering one bed under one slanting roof. In hill slope overhead shade should be in flat structure with a height of 1.8 m.

Management of pest & disease:

Infestation of pests or infections of diseases are generally goes down in cold weather but residual population could build up rapidly in cropping period. The cultural, botanical, biological and chemical management practices of some major tea pests and diseases in cold weather are elaborated below for the benefit of the tea growers. Prior to elaborate discussion about the pest/disease management practices some salient features of the Plant Protection Code (PPC) regulated by Tea Board of India (TBI) are scripted below and should be abide by the tea growers in every step of pest or disease management practices in tea.

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 chemical pesticides.
3. Procure and use only TRA/CIB/PPC approved pesticides and apply in appropriate dilution and maintain appropriate interval (as appended with the bulletin) 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

- In unprune tea (LOS) apply crude extract of *Polygonum hydropiper*, *Clerodendrum viscosum*, *Vitex negundo* etc @ 10% concentration is quite effective in controlling Helopeltis. Crush the leaves with tender stems and flowers of these beneficial weeds and soaked in water for 36 hours followed by straining through 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.
- If any infestation still persists, remove the infested shoots. Apply a round of Thiomethoxam 25% WG @ 50 g in 200 liters or, Thiacloprid 21.7%SC @ 200ml in 200 liters of water in spot application by using hand sprayer. 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.
- If necessary apply follow up round with Neem formulation @ 135 ml in 200 litres of water.

Red spider

- Take adequate measure to improve the shade status to reduce the propagation and 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 .
- Organic plantation can apply Sulfur 80WG formulations @ 1kg in 200 liters water. The botanicals suggested for Helopeltis can also be applied.

Thrips and Green fly

- If these pests are active at the beginning of the season black pluck the infested sections. If necessary apply a round of Thiomethoxam 25% WG @ 50gm in 200 liters of water or, Thiacloprid 21.7%SC @ 200ml in 200 liters of water by using hand sprayer.
- Use Yellow Sticky trap at the height of the plucking table within the infested sections to control these sucking pests.
- 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 10-12 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 for trapping the moths during December to April.
- If very early stage of caterpillars is noticed on tea leaves, apply Quinalphos 25EC @ 500 ml in 200 litres of water. In case of bigger looper apply a round of Emamectin Benzoate 5%SG 80gm 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. Dig out the termite mound noticed in and around the tea area and kill the termite queen.

- Application of fungal formulation, *Metarhizium anisoplae* 5% cfu @ 250-300 ml in soil around collar region of the infested tea bushes is quite effective for controlling termite.
- Spraying of Thiomethoxam 25% WG @ 50 g in 200 liters or, Thiacloprid 21.7%SC @ 200ml in 200 liters of water on the frame by hand sprayer and soil application around the collar region of infested bushes @ 250-300ml of aforesaid dilution can produce good control over termite pest.
- A light irrigation prior to take above treatments would be helpful for better penetration of the formulated fluid into deep soil.

Drainage management:

- The adequate drain spacing and depth recommended for tea plantations in terms of fully functional main drain system is as follows:

<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.

**Arunachal Advisory Centre, Tea Research Association,
Wishes all the tea growers of the state of Arunachal Pradesh**

A Very Happy & Prosperous New Year, 2018

List of CIB/TRA/PPC approved Agro-chemicals for use in Tea as on 30th December, 2017

Name of Chemicals	Trade Name	Name of manufacturer	Dose		MRL (ppm)			Pre Harvest Interval (Days). As per PPC Ver. 9
			HV	LV	India	EU	Japan	
ACARICIDES								
Cyflumetofen 20 SC	-	-	1:500	1:250	-	-	15	-
Dicofol 18.5 EC	-	-	1:400	1:200	5	20	3	16
Ethion 50 EC	-	-	1:400	1:200	5	3	0.3	10
Fenazaquin 10 EC	-	-	1:400	1:200	3	10	10	12
Fenpyroximate 5 EC/SC	Mitigate	Isagro (Asia) Agrochemicals Pvt. Ltd.	1:1500	1:750	0.2 BT*	0.05	40	-
	Pyromite	Excel Crop Care Ltd.	-do-	-do-	-do-	-do-	-do-	-do-
Hexythiazox 5.45 EC	Endurer	Coromandel International	1:2500	1:1250	1	4	15	12
Propargite 57 EC	Mastamite	Chemtura Chemicals India Pvt. Ltd.	1:400	1:200	10	0.05	5	20
Sulphur 80 WP	-	-	1:200	1:100	-	-	-	10
Sulphur 40 WP	-	-	1:200	1:100	-	-	-	10
Sulphur 52 SC	-	-	-	-	-	-	-	-
Spiromesifen 240 SC (22.9 w/v)	Oberon	Bayer Crop Science Ltd.	1:1000	1:500	-	50	30	14
Etoxazole 10 SC	Etoxazole	Sumitomo Chemical India Pvt. Ltd.	1:1600	1:800	0.01	15	15	-
Flufenazine 20 SC	-	-	-	-	-	0.1	-	-
INSECTICIDES								
Azadirachtin 1% EC	-	-	-	-	-	0.01	-	-
Azadirachtin 5% EC	Ecotin	P.J. Margo	1:1500	-	-	0.01	-	-
Bifenthrin 8% SC	-	-	1:1600	1:800	0.05	30	30	5
Clothianidin 50 WDG	Dantotsu	Sumitomo Chemical India Ltd.	1:4500	1:2250	0.2	0.7	50	14 – 21
Deltamethrin 2.8 EC	Decis	Bayer Crop Science Ltd.	1:2000	1:1000	2	5	10	10
Deltamethrin 11 EC	-	-	-	-	-	5	10	-
Phosalone 35 EC	-	-	1:400	1:200	-	0.05	15	-
Quinalphos 25 EC	-	-	1:400	1:200	0.01	0.05	0.1	20
Quinalphos 20 AF	-	-	1:400	1:200	0.01	0.05	0.1	-
Thiacloprid 21.7 % SC	Alanto	Bayer Crop Science Ltd.	1:1000	1:500	5	10	30	7 – 14
Thiamethoxam 25 WG	-	-	1:4000	1:2000	-	20	20	10
Emamectin Benzoate 5% SG	Missile	Crystal Crop Science Ltd.	1:2500	-	-	0.02	0.5	7
Fenpropathrin 30 EC	-	-	1:1600	1:800	-	2	25	8
Flubendiamide 20 WG	Takumi	Rallis India Ltd.	1:5000	-	-	0.02	50	30 – 40
Thiamethoxam 12.6% + L- Cyhalothrin 9.5%	Alika	-	1:2666	1:1333	-	20	20	-
						1	15	
BIO-PESTICIDES								
Beauveria bassiana 2.5 WP (Cfu count 2X10 gm)	-	-	-	-	-	-	-	-
HERBICIDES								
Glyphosate 41% SL	Globus	Nagarjuna Agri chem. Ltd.	2-3 L/ha	-	1	2	1	-
	Round - Up	Monsanto India Ltd.	-do-	-	-do-	-do-	-do-	-
	Glycel 41 %	Excel Crop Care Ltd.	-do-	-do-	-do-	-do-	-do-	-
	Run out	G.S.P. Crop Science	-do-	-do-	-do-	-do-	-do-	-
Glyphosate (Ammonium Salt) 71% SG	Excel Mera	Excel Crop Care Ltd	1.5 kg/ha for broad leaf, 2.0 kg/ha for	-	1	2	1	-
	Safal	Tropical Agrosystem (India) Pvt. Ltd.		-	1	2	1	-

			mixed population					
Glufosinate Ammonium salt 13.5 SL	Basta	Bayer Crop Science Ltd	1kg in 200 l water for broad leaf and 3kg in 200 l water for monocot	–	0.01	0.1	0.3	–
Glyphosate (Ammonium Salt) 5% SL					1	2	1	
Oxyfluorfen 23.5 EC	Oxygold	–	0.25kg a.i./ha	–	0.2	0.05	–	–
Paraquat Dichloride 24% SL/ WSC	Herbucosone	Ankar Industries	500 ml – 1 L/ha in 200 lit of water	–	0.05	0.05	0.3	7
Oxyfluorfen 2.5% +Isopropyl amine salt of Glyphosate 41% w/w SC				–		0.2	–	
						2	1	
Carfentrazone ethyl 0.43% + Glyphosate 30.82 EW	Glyfinity	FMC India Pvt. Ltd.	3000ml in 500 lit water/ha	–	0.02	0.02	0.1	–
				–	2	2	1	
FUNGICIDES								
Copper Oxychloride 50 WP	–	–	1:400	1:200	150 as Cu	40	–	7 – 14
Carbendazim 12 % + Mancozeb 63% WP	–	–	1:400	1:200	0.53	–	–	–
Hexaconazole 4% + Zineb 68% WP	–	–	–	–	–	0.05	–	–
Hexaconazole 5 EC	–	–	1:1000	1:500	0.02 BT*	0.05	–	12
Propiconazole 25 EC	Tilt	Syngenta India Ltd.	1:1000	1:500	0.1	0.05	0.1	14
Spray adjuvant (Sticker) recommended by TRA								
Magic Shakti	–	Nivshakti Bioenergy Pvt. Ltd.	20 ml in 200 L spray fluid	–	–	–	–	–
Nutrastick	–	Gassin Pierre Pvt. Ltd.	20-50 ml in 200 L spray fluid	–	–	–	–	–
Tip Top	–	Krishi Rasayan	100 ml in 200 L spray fluid	–	–	–	–	–
APSA 80	–	Amway India Enterprise (P) Ltd.	100 ml in 200 L spray fluid	–	–	–	–	–
Dhanuvit	–	Dhanuka Agritech Ltd.	120 ml in 200 L spray fluid	–	–	–	–	–
Active - 80	–	Modicare Ltd.	100 ml in 200 L spray fluid	–	–	–	–	–

* **BT = Black Tea** * **GT = Green Tea**

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