TEA RESEARCH ASSOCIATION
Arunachal Advisory Centre
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QUARTERLY ADVISORY BULLETIN

Number 4 October - December, 2018

Arunachal Advisory Centre, Tea Research Association, Itanagar(AP) is issuing "Quarterly Advisory Bulletin, No-4, 2018" addressing the scientific cultural practices to be imparted in the tea fields within this quarter of the year for achieving best result in high quality backend crop harvesting as well as better prepared tea fields for the coming season. The Department of Trade & Commerce, Govt. of Arunachal Pradesh has extended their grand support in our effort. We hope the tea growers of the state shall go through this issue of the bulletin and implement the advices in their tea fields. We look forward for your valuable feedback to work together for the betterment of the upcoming tea industries of the state.

A. Plucking & management of unprune tea:

- Pluck close to janam in 7days round removing all the ready two and a bud and soft single banjhi shoots maintaining the plucking table flat & even. Small growing shoots should be retained on the table to build up constant sink for new growth.
- In conventional tea plantations, if all sort of pest population is under control, apply two rounds of the formulation Urea 4kg + Zinc sulfate 1kg + water 200 liters in fortnightly intervals after 2days of plucking targeting the under surface of top 10-15 cm foliage within the month of October.
- LP sections which would be kept unprune for the coming season should be plucked carefully leaving no exposed stubs on the plucking table. Exposed stubs should be broken back to keep the table flat and even. Existing pockets should be allowed to fill up by adopting liberal plucking at those points. If the maintenance foliage status of these sections becomes weak or thin due to pest attack or, infection of diseases, add up a fresh layer of foliage within 3-4 rounds of plucking within October- mid November.
- DS sections of current year has to be kept unprune in the coming season. During plucking of the backend crop at most care should be taken to keep the table flat and even without allowing exposing of any stubs on the table. There should not be any step up especially on those sections where DS was imparted on knotty frame to avoid the invitation of more banjhi shoots in the coming season. If require impart LOS within mid January to make the table flat & even when the bushes attain complete dormancy and the shade status is under standard condition.
- If the foliage status of DS sections is weak and thin for keeping unprune consider for medium skiff in late December.
- In conventional plantations, proposed unprune sections should be treated with the formulation MOP 2kg + Magnesium sulfate 2kg + water 200 liters in monthly intervals starting from mid November - February targeting the undersurface of the top 10-15 cm foliage to withstand drought. Organic plantation may apply mine grade Sulfate of potash (SOP) @ 2kg in 200liters of water.
- Necessary steps should be taken to mulch the unprune sections of both organic and conventional plantations with any green matter within mid December to avoid building up of Moisture stress in non-flushing period which eventually affects the first flush crop.

B. Pruning & Skiffing :

Pruning, the periodical cut back operation of mature tea bushes is a requirement to keep the vegetative phase of growth in active form for harvesting maximum crop with good crop distribution throughout the pruning cycle. In tea plantation a definite pruning cycle like LP-UP-DS

or, LP-UP-DS-UP/MS or, LP-UP-UP (in specific condition) has to be followed based on the age group of the teas. Judicious mixing of pruning and skiffing in a pruning cycle ensures not only steady production but also reduces the chances of pest/disease occurrence and ill effects of adverse climatic condition. In cold weather within the month of December to January all the pruning and skiffing operations must be completed to insure the next cropping season. Some important tips on LP, DS, MS and LOS operations are elaborated below for the benefit of the tea growers.

Light Prune (LP):

- In this pruning operation provide adequate allowance of 5cm (2") clean new wood above the last light pruned mark and as much as possible maintain equal frame height.
- Leave a breather at the centre at the time of pruning & remove the breather as and when bud break emerges.
- Complete this pruning operation within mid December- mid January. Remove all the foliage & unproductive branches from the bush by imparting knife cleaning operation (KCO) before bud breaking. During KCO judiciously remove 1-2 knot from the mid portion of the frame.
- Apply a round of Trichoderma suspension of 5% strength or, COC (1:400 HV) within 48 hours of pruning.
- Apply a round of lime wash (Quick lime 6kg + washing soda 12 kg + water 200 litres) on the frame using conventional sprayer. Clean the bushes after 7days of applying lime wash with a hessian cloth. This operation must be completed before the emergence of bud.
- Keep strict vigil at the time of bud breaking to restrict any incidence of sucking pest.

Deep Skiff (DS):

- Impart this skiff operation within mid November - end December at 13-15 cm above the last light pruned mark leaving the fork of at least 1.5 cm long formed at that level.
- Don't remove the left over foliage from the skiffed bush if there is no severe infestation of Red spider mite. Clean the bushes by hand to remove the unproductive twiggy branches.

Medium Skiff (MS):

- Finish this operation within December by taking appropriate measure to remove all the plucking points with the present year's 'crow's feet'.
- Don't remove the foliage, only careful hand cleaning should be done to remove the twiggy branches without defoliating the foliage.

Level-off Skiff (LOS):

- Execute this skiff operation on proposed unprune teas if the plucking table is required to be made flat and even using knife to remove 50-60% plucking points of the current year.
- Impart this skiffing operation at early January, when the teas attain total dormancy and the soil has sufficient moisture to prevent dieback of left over plucking points.

C. Management of Young tea:

- Mulch all the young tea with any green matter leaving 10-15 cm gap around the collar region where yet to achieve total ground coverage by the bushes.
- Foliar application of MOP @ 2% (for organic plantation 2% SOP) in monthly interval starting from the month of November - February is necessary to avert the effect of moisture stress.
- Keep strict vigil to arrest the chance of building up of any pest population in young tea areas by taking TRA approved appropriate protective measure.
- Improve the foliage status and fill up the existing pockets on the plucking table of proposed unprune young tea sections by adopting liberal plucking in the month of November.
- Maintain the ground flat and even and remove the collar depressions by a round of cheeling operation within November-December. If necessary upgrade the drainage system.
- Young teas where FFP-I or, FFP-II has to be imparted, stop plucking from the month of November for building up of adequate starch in root zone.
- Prune the +3 year plants (FFP-I) at the height of 35-40 cm from ground level and +5 years plants (FFP-II) at the height of 40-45 cm from ground level within January.

- If any new plantation is due in October- November in plain and low altitude areas the following schedule should be considered for bringing up. Facilities for irrigation should be ascertained during the dry spell.

Autumn Plantation (October-November) All measurements from ground level		
Plant Age	Month	Operation
0 Year	Oct. - Nov	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").
+ 2 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").
+ 4 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 70 cm (28").

D. Plant Protection Code(PPC) & Integrated Pest Management (IPM):

Due to the change in environmental factors the incidence of pest and diseases in plantation crop are increasing day by day. Moreover, indiscriminate use of chemical pesticides to control pest and disease in plantation crop like tea not only creates serious threat to the balance of natural flora and fauna but also causes a serious health concern for the consumer of this beverage. The research wings of Tea Research Association (TRA) introduces the Integrated Pest Management (IPM) practices based on the regulation of tea board of India through plant protection code (PPC) and approved chemicals of Central Insecticidal Board (CIB) to use in tea with the fixed maximum residue level (MRL) in made tea against each chemical. Adoption of proper scientific cultural practices, use of botanicals and other effective tools, least application of chemical pesticides at right time in approved dilution, adequate time gap between spraying of chemicals and harvesting, early detection of pest/disease emergence are the components of integrated pest management (IPM) practices. The tea growers should abide by the guide lines of TRA for pest management practices to thrive in the world consumer market of tea.

Salient points on IPM & PPC:

- Procure and use only TRA/CIB approved green/blue label chemicals with appropriate dilution and maintain appropriate interval between spraying and plucking to achieve maximum residue limit (MRL) of the applied chemical in made tea.
- Use proper nozzle and maintain adequate pressure (40 psi for pesticide sprayer and 10-12 psi for weedicide sprayer) in conventional spraying machine.
- As much as possible avoid blanket application of pesticide. Try to confine on spot treatment. Keep strict vigil on plantation for early detection of pest/disease occurrence.
- Put maximum thrust on appropriate cultural practices to reduce the attack of pest & disease.
- 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.
- 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.

- Keep the tea plantation healthy and maintain bush hygiene throughout the year to minimize the chance of pest/disease attack. Keep the surrounding environment of the planting area neat and clean without disturbing the natural flora & fauna to keep the activities of predators and parasite alive for natural control of pest/disease.
- Use naturally available and TRA approved effective crude water extract of native plants as alternate of chemical pesticides for controlling pest & disease.

Helopeltis management:

Helopeltis is one of the important sucking pest to keep strict vigil during this quarter of the year. The following measures should be taken to control this pest.

- 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 on the plucking table and the 'matidals' of the tea bushes should be trimmed and in cold weather the drainage should be upgraded properly to drain off the rain water in quick time to eradicate the moist condition of the tea field.
- 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.
- At the time of Pruning or Deep skiffing, leave some succulent bushes in few patches to trap the left over population of Helopeltis and treat this bushes after 1 week with a TRA/PPC/CIB approved insecticide & prune/skiff after a week of the treatment at the level of other bushes.
- If the infestation is noticed in patches apply high MRL chemical like Thiamethoxam 25 WG @ 50gm in 200 l of water or, Thiacloprid @ 200 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.
- Application of 10% water extract of leaves and succulent stem of common weeds like *Clerodendrum viscosum, Polygonum hydropiper, Cassia alata, Xanthium strumarium, Vitex negundo* etc are quite effective against this pest. 20 kg of the fresh leaves and succulent stems of these plants should be crushed and soaked in adequate water for around 36 hours. The filtrate of the soaked solution should be increased to 200 liters to get 10 % concentration of the original raw material in ultimate spray fluid. Apply this spray fluid immediate after plucking adopting barrier spraying technique at the morning/evening hours.

Red spider management:

Red spider is another major tea pest which attacks the maintenance foliage causing notable crop loss. The following measures should be taken to control this pest.

- Take appropriate measure to improve the shade status in plain areas and low elevation of hilly plantation.
- Erect hedge plant like *Phlogacanthus thyrsiflorus* (Titaphool) to protect the road side plant from accumulating dust on tea leaves. Accumulation of dust on tea leaves invites infestation of Red spider.
- Uproot the alternate host weeds *Borreria hispida*, *Scoparia dulcis*, *Melochia corchorifolia, Fussiala suffruticosa* etc from the plantations to reduce the chance of building up mites population.
- If infestation is noticed in patches apply a round of Fenazaquin 10% EC @ 500 ml in 200 l of water or, Hexythiazox @ 80 ml in 200 l water at 15 days interval. Alternate formulation should be sprayed in each round covering both surfaces of foliage.
- In organic tea plantations spray with Neem formulation like Azadiractin 5% @ 135 ml in 200 l of water.
- Spraying the crude water extracts of native plants like. *Clerodendrum viscosum* (leaves and succulent stem), *Melia azadirach* (seed kernel), *Vitex negundo* (leaves and succulent stem), *Terminalia chebula* (dry pericarp of the fruits); *Sapindus saponaria* (dry pericarp of the fruits) and *Nyctanthes arbor-tristis* (leaves) at 10% dilutions showed effectiveness in controlling red spider mite population.

Looper Caterpillar management:

Looper caterpillar is a major chewing pest of tea plants. The young caterpillar eats the young leaves making holes at the margin of leaf blades. Mature caterpillar not only eats away both young & mature leaves completely but also eats the barks of the branches. The caterpillar at the stage of pupa, pupate in the cracks & crevices of tea bush. The moths lay egg in the cracks & crevices of the shade tree trunk up to the height of 10'-12'. Peak egg laying is done during December-January & after hatching up spread over tea plants by making salivary thread. The looper caterpillar attacks the tea plant in mix broods. The following measures should be taken to control this pest during this quarter.

- Light trapping of moths should be done from October end to April-May.
- Heat treatment should be given around collar of the shade trees from November to March to destroy eggs.
- All the epiphytic plants grown on the shade trees should be removed.
- As soon as infestation is noticed during non plucking period on unpruned tea, apply a round of Flubendiamide @ 40 g in 200 l water. In case of pruned and deep skiffed teas it should be applied immediately after pruning and knife cleaning or skiffing, if any life population is noticed. Otherwise, caterpillars can survive initially eating on the barks followed by newly emerged buds and thus causing a serious problem of recovery of the bushes leading to mortality.

Termite management:

- Infested tea bushes and shade tree trunks should be properly cleaned by removing the earth run. Fork the soil around the collar region before taking up any control measure. Destroy termite mounds and queens.
- If the infested section is due for pruning, treat the bushes with Thiamethoxam 25 WG @ 50gm in 200 l of water *(250-300ml/bush) in* October- November and after completion of pruning 2nd round should be applied in January- February. A round of light irrigation is effective before taking up the chemical treatment for better penetration of the formulation in soil.
- Application of Matarhizium anisopliae, a fungal formulation is quite effective in termite management. Apply the 5% suspension of the formulation @ 250-300 ml/bush in collar region on wet soil within January- February.

Black rot disease management:

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. However in cold weather the pathogen reaches its dormancy and reappears in flushing period. The following measures should be taken up in black rot infected area in cold weather.

- Apply COC @ 500 gm in 200 l of water targeting the under surface of the infected leaves and cracks and crevices to eradicate the chance of sclerotia formation (winter dormancy of the pathogen) in cold weather.
- Application of COC on pruning litter is advisable to get good control over the pathogen of black rot. Apply lime wash on the pruned bush frame.

List of CIB/TRA/PPC approved Agro-chemicals for use in Tea as on 30th September, 2018

Name of Chemicals	Trade Name	Name of manufacturer	Dose		MRL (ppm)			Pre Harvest Interval (Days). As per PPC Ver. 9
ACARICIDES			HV	LV	India	EU	Japan	
Cyflumetofen 20 SC	–	–	1:500	1:250	–	–	40	–
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**	–	0.05	40	–
	Pyromite	Excel Crop Care Ltd.	-do-	-do-	-do-	-do-	-do-	-do-
Hexythiazox 5.45 EC	Endurer	Coromandel International	1:2500	1:1250	-	4	15	**12**
Propargite 57 EC	Mastamite	Chemtura Chemicals India Pvt. Ltd.	1:400	1:200	10	**10**	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	-	15	15	–
Flufenzine 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	-	30	30	**5**
Clothianidin 50 WDG	Dantotsu	Sumitomo Chemical India Ltd.	1:4500	1: 2250	-	0.7	50	**14 – 21**
Deltamethrin 2.8 EC	Decis	Bayer Crop Science Ltd.	1:2000	1:1000	-	5	5	**10**
Deltamethrin 11 EC	-	-	-	-	-	5	5	
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 1	20 –	–
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 (Ammonimum Salt) 71% SG	Excel Mera	Excel Crop Care Ltd	1.5 kg/ha for broad leaf, 2.0 kg/ha for mixed population	–	1	2	1	–
	Safal	Tropical Agrosystem (India) Pvt. Ltd.						
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 (Ammonimum Salt) 5% SL					1	2	1	
Oxyfluorfen 23.5 EC	Oxygold	–	0.25kg a.i./ha	–	-	0.05	–	–
Paraquat Dichloride 24% SL/ WSC	Herbucsone	Ankar Industries	500 ml – 1 L/ha in 200 lit of water	–	-	0.05	-	**7**
Oxyflurofen 2.5% +Isopropyl amine salt of Glyphosate 41%w/w SC	-	-	-	-		0.05 2	- 1	
Carfentrazone ethyl 0.43% + Glyphosate 30.82 EW	Glyfinity	FMC India Pvt. Ltd.	3000ml in 500 lit water/ha	– –	- 1	0.02 2	0.1 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	-	-	-	–
Hexaconazole 4% + Zineb 68% WP	-	-	-	-	-	0.05 -	-	
Hexaconazole 5 EC	–	–	1:1000	1:500	-	0.05	-	**12**
Propiconazole 25 EC	Tilt	Syngenta India Ltd.	1:1000	1:500	-	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***

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