TEA RESEARCH ASSOCIATION
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QUARTERLY ADVISORY BULLETIN

Number 3 **July-September, 2018**

Arunachal Advisory Centre, TRA, Itanagar always keeps encouraging the tea growers of the state to adopt & implement the TTRI invented modern and time tested agricultural practices in their tea fields. As a part of our effort, the advisory centre is issuing the 3rd edition of the "Quarterly Advisory Bulletin, 2018" with grand support from the Department of Trade & Commerce, Govt. of Arunachal Pradesh. We hope tea growers shall go through this bulletin and implement the advices in their tea fields to produce high quality tea in large quantity to strengthen their position in the tea map of India.

A. Management of Unprune Tea

- Maintain uniform plucking table keeping no exposed stubs on the table. Pluck close to janam in 7 days interval.
- Remove all the banjhi shoots at softer stage along with ready two and a bud. Small growing shoots should be retained on the table to ensure continuation of growing phase.
- If there is any weak patches in unprune sections with poor status of maintenance foliage, adopt liberal plucking for 2-3 rounds to cover up the exposed stubs. Don't dip hands inside the pockets of the table; allow the pockets to fill up itself to merge with the flat plucking surface.
- Teas proposed to keep unprune in next season should plucked close to janam maintaining flat and even plucking surface by adopting breaking break process allowing to build up no undue creep.

B. Management of LP, DS and MS Tea:

- If any section of light pruned teas yet to form uniform plucking table should continue to tip at the predetermined height removing only fully open two leaves and a bud in seven days interval.
- The LP, DS & MS teas where the table is satisfactorily formed continue to pluck close to janam in 7 days round. The peripheral primaries of light pruned and deep skiffed teas should be plucked at least 1 cm above the general height to facilitate spreading of the plucking table.

C. Management of Young tea:

- De-budding of the teas planted in March-April should be continued above 20 cm from the ground to encourage the lateral growth below the referred height by removing the swell up auxiliary buds without damaging the main stem and mother leaf.
- De-centered the teas planted in March-April within the month of August at the height of 20cm from the ground where 2-3 laterals are emerged below this height. The single steamer plants should be thumb pruned at 20cm from the ground.
- Teas planted in October- November where de-centering is already done heading back operation should be imparted 5cm above the de-centering mark to remove the thick branches which may be 1-2 in numbers in a plant to facilitate equal spreading of the frame. This operation should be done within August at the time of inter flush dormancy.
- The de-centered/head backed teas should be tipped at 65cm from the ground (60 cm in hilly areas of high altitude) to form the plucking table.

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D. Management of Pest:

Helopeltis

Helopeltis is one of the major tea pests to keep strict vigil during this quarter of the year. The following measures should be taken to control this sucking pest if infestation is noticed.

- 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.
- 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 in early morning or late afternoon. Adopt barrier spraying technique against Helopeltis.
- 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 using alternate insecticide.
- In rainy season evaluating the weather condition, apply a round of TRA/CIB/PPC approved synthetic pyrethroids in short rain free period if spraying is unavoidable.
- Bio-garden should apply neem formulation like Azadiractin 5% @ 135 ml in 200 l of water.
- Application of 10% water extract of common weeds like *Clerodendrum viscosum, Polygonum hydropiper* etc are quite effective against this pest. 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.

Red spider:

Usually in rainy season population of Red spider are reduced but resurgence of this pest is found in favorable weather condition from the tea areas where the shade status is inadequate. Take special care to improve the shade status in 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 Fenazaquin 10% EC @ 500 ml in 200 l of water, Hexythiazox 5.45EC @ 80 ml in 200 l water, Fenpyroximate 5EC @ 133 ml in 200 l of water etc at 15 day interval if live population is noticed. Alternate acaricide should be used in each round.
- The common weed formulation mentioned above is giving satisfactory control at early stage of infestation.

Looper caterpillar:

This is the most devastating Sewing pest which attacks the foliage. 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 insect pupates in the cracks & crevices of tea & shade tree and the collar soil of tea & shade tree. The moths lay egg in the cracks & crevices of the shade tree trunk up to the height of 10'-12' & after hatching up spread over tea plants through salivary thread. The looper caterpillar attacks the tea plant in mix broods.

- Keep strict vigil for early detection of the pest incidence.
- If infestation is noticed on tea bushes by small caterpillar (^{1st} instar) spray Quinalphos 25 EC @ 500ml in 200 l of water targeting the site of attack.
- In case of mixed brood attack Emamectin Benzoate 5%SG @ 80g in 200 l should be applied covering entire tea bush.
- After chemical treatment, survived big caterpillars should be collected by hands, if infestation is confined to limited tea areas.

Greenfly & Thrips:

- Black pluck the infested section prior to initiate any chemical control measure.
- Take the chemical measures as mentioned against Helopeltis.

- Crude water extract of common weeds mentioned above is also quite effective against these pests.
- Yellow sticky trap is a very effective tool for controlling these pests. Place the trap at plucking table level fixing on shade tree trunks or, on bamboo post @ 60-70 traps per hectare of infested planting area.
- Ready to use Yellow sticky card traps are available in the market. Alternately adhesive smeared bright yellow colored polythene sheet may be wrapped on the trunk of shade tree at the level of plucking table for trapping these pests. The adhesive should be prepared by mixing Hot Melt Pressure Sensitive Adhesive (HMPSA) with normal thinner @ 300ml HMPSA in 1000ml of thinner.

E. Management of Disease:

Red rust:

This algal disease normally infects the young branches & maintenance foliage of tea. The infected leaves of young branches become yellowish in patches. Brick red fructification is noticed on infected leaves & branches. Infected branches die in patches.

- Predisposing factors of this disease such as inadequate shade, water-logging, low soil potash, improper soil pH, presence of overgrown green crop should be eradicated by taking appropriate measures in time.
- If fructification persists in young stem or foliage spray Copper Oxy-chloride 50WP @ 500gm in 200litres of water using hand sprayer; first two rounds at 15 days interval and subsequent two rounds at monthly intervals.
- Spray should be targeted to the foliage as well as the young branches. Use of a sticker is beneficial.

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 this quarter of the season. 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 two rounds of Hexaconazole 5EC @ 200 ml in 200 l water targeting the under surface of the infected leaves in 15 days interval.
- Continue spraying in 15 days interval with Hexaconazole 5EC in severely infected sections for initial 2 rounds and thereafter in monthly intervals with COC till the disease disappear.

F. Management of Weed:

- Hand weeding is strictly recommended in young tea sections up to +2 years.
- In hilly areas go for strip weeding to protect soil erosion. Plant Citronella grass along the path.
- If the weed growth is heavy go for sickling first followed by cheeling. Direct cheeling in heavy weed may encourage undulation of the ground.
- Obnoxious weeds should be uprooted manually.
- In pruned and deep skiffed field, where ground is yet to cover up and weed growth is heavy, apply a round of Glyphosate 41% SL @1000 ml in 200 l water on succulent weeds of 8-10 cm tall before onset of monsoon.
- In unprune tea Paraquat (doses mentioned in the attached PPC list) for grass & Gluphosinate Ammonium 13.5 SL (doses mentioned in the attached PPC list) for broad leaf can be applied on need basis.

G. Nutrition Management:

- The second round of the chemical fertilizer should be applied within the month of August at a rain free weather condition and on weed free ground to get maximum utilization of the fertilizers by the tea plants.

- 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					
Production of Green leaf (kg/bigha)	**Requirement of Nitrogen (kg/bigha)**	**Requirement of Phosphate (kg/bigha)**	**Requirement of Potash (kg/bigha) (on the basis of soil test report)**		
			Low (< 60 ppm)	**Medium (60-100 ppm)**	**High (> 100 ppm)**
Up to 900	Urea 25 kg	RP 10 kg	MOP 20 kg	MOP 15 kg	MOP 10 kg
900 - 1200	Urea 25 to 30 kg	RP 10 to15 kg	MOP 20 to25 kg	MOP 15 to18 kg	MOP 10 to 15 kg
1200 - 1500	Urea 30 to 40 kg	RP 15 to 25 kg	MOP 25 to 30kg	MOP 18 to 25 kg	MOP 15 to 22 kg
1500 - 1800	Urea 40 to 45 kg	RP 25 kg	MOP 30 to35 kg	MOP 25 to 30 kg	MOP 22 to 25 kg
For Hilly Areas					
Up to 360	Urea 15 kg	RP 10 kg	MOP 14 kg	MOP 11 kg	MOP 8 kg
360 - 600	Urea 15 to 25 kg	RP 10 kg	MOP 12 to 20kg	MOP 11 to 15kg	MOP 8 to 11 kg
600- 850	Urea 25 to 35 kg	RP 10 kg	MOP 20 to 25kg	MOP 15 to 22kg	MOP 11 to 15 kg

* **1 Hectare = 7.5 Bigha = 2.47 Acre (Land area measurement)**

* **RP- Rock phosphate (24% phosphate),ppm- an unit of measurement**

- At formative stage of young tea, YTD mixture should be applied in four splits at two monthly intervals 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), total quantity of YTD mixture per *bigha* per year and the application procedure of the fertilizer mixture.

Age of the tea	**Nitrogen (kg/bigha /yr)**	**Phosphate (kg/bigha /yr)**	**Potash (kg/bigha /yr)**	**Filler (kg/bigha /yr)**	**Total quantity of YTD mixture including filler(kg/bigha/yr)**	**Application method of YTD mixture**
0 year	Urea 6-12	SSP 8-17	MOP 4-9	8-16	26-54 (Depending upon the growth vigor of the tea plant)	Ring in 2-3 splits &15 cm apart from the collar region
+1 year	Urea 23-29	SSP 33-42	MOP 18-22	33-40	107-133 (Depending upon the growth vigor of the tea plant)	Ring in 4 splits &15 cm apart from the collar region
+2 year	Urea 29-35	SSP 42-50	MOP 22-27	40-48	133-160 (Depending upon the growth vigor of the tea plant)	Ring in 4 splits & 20 cm apart from the collar region
+3 year	Urea 35-40	SSP 50-58	MOP 27-31	48-56	160-185 (Depending upon the growth vigor of the tea plant)	Ring in 4 splits & 20 cm apart from the collar region
+4 year	Urea 40-43	SSP 58-62	MOP 31-33	56-60	185-198 (Depending upon the growth vigor of the tea plant)	Strip in 2splits
+5 year	Urea 40-43	SSP 58-62	MOP 31-33	56-60	185-198 (Depending upon the growth vigor of the tea plant)	Strip in 2splits

- Filler as mentioned in the table 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.
- In +4 & +5 year old plantations, the 2nd split of YTD mixture should be applied in late August.

H. Clonal Nursery Management:

- To raise VP nursery in autumn, 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 September.
- In spring raised sleeve nurseries 1st round of sorting should be completed within September to facilitate equal growing condition to young saplings.

- Application of YTD mixture should be started from the month of August @ 10:5:10 diluted to 1:9 part by adding soil in monthly interval on the saplings attained the height of 15 cm with 4-5 leaves.
- Precaution should be taken in timely adjustment of the over head shade to prevent drip damage of the sleeves.
- Hand weeding should be done time to time to avoid the dominance of weed growth on the sleeves. Mossy growth should be scraped out to provide better aeration to the root zone of the young saplings.
- Protect the saplings from pest/disease attack by adopting TRA approved pest/disease management practices. Keep the drains free flow to provide prompt drain out of rain water from nursery site.
- To collect autumn cuttings, deep skiff the selected mother bushes at an allowance of 12-13 cm from the last LP mark in the month of July. Remove the *banjhi* shoots, weak branches, dead and diseased branches from the skiffed table to get good growth of the new primaries.
- Protect the newly developed shoots from pests by spraying pesticides at regular interval.
- Apply second split of NPK mixture (2:1:2) within August for obtaining adequate shoot growth.

I. Shade Nursery Management:

- In hilly area of low altitude and 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 established shade nurseries should be monitored regularly to facilitate adequate drainage, protection from pest & disease attack to produce healthy shade sapling to meet the requirement of shade plantation.
- Thinning out of small samplings should be done if beds are congested. The extra plants can be used for infilling.
- After some growth lower laterals should be removed to avoid congestions.

J. Important guidelines on PPC:

- Procure only TRA/CIB/PPC approved chemicals and apply in recommended dilution adopting appropriate spraying technique. Always maintain minimum interval of 7 days between spraying and plucking to achieve the endorsed maximum residue limit (MRL) of the applied chemical in made tea.
- Maintain adequate pressure (40 psi for pesticide sprayer and 10-12 psi for weedicide sprayer) in conventional spraying machine. Use proper nozzle for spraying.
- As much as possible avoid blanket application of pesticide, 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 that area well fenced as a protective measure.
- 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 parasitoids alive for natural control of pest/disease.

List of CIB/TRA/PPC approved Agro-chemicals for use in Tea as on 30th June, 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	–	–	–	–
Dicofol 18.5 EC	–	–	1:400	1:200	5	20	–	**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	1	4	15	**12**
Propergite 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	–
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	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	–	–
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	–	**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 populatio n	–	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	–	0.2	0.05	–	–
Paraquat Dichloride 24% SL/ WSC	Herbucsone	Ankar Industries	500 ml – 1 L/ha in 200 lit of water	–	0.05	0.05	0.3	**7**
Oxyflurofen 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	–	–
				–	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	-	-	-	-	-	–	-	
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***

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