



Field screening methods to assess cocoa genotypes for resistance to tea mosquito bug

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Introduction

Cocoa as a perennial crop suffering with Tea mosquito bug (TMB) infestation during its single crop cycle specifically because of the change in climatic conditions. *Helopeltis antonii*, *H. theivora* and *H. bradyi* are reported in cocoa in South India and among these *H. bradyi* and *H. theivora* are more predominant during October to November in the post monsoon season. The nymphs and adults feeds on the new flushes arising after pruning and the peak abundance is observed then on in January to February and insect remain active throughout cocoa fruit development stage inflicting crop loss. Typical feeding damage appears as a discoloured, necrotic area or lesion around the point of entry and the plant tissue becomes darker with age and causing wilting of tender leaves and terminal death (Daniel, 2002). Damage on cherelles and pods appears as dark, circular lesions externally visible as hardened scars on the

Pods. Heavy infestations resulted in premature drop and pod malformation. The development and use of resistant cocoa varieties is one of the alternatives to chemical control in the era of organic and natural farming.

1. Field screening through damage assessment

Screening works mostly concentrated on assessment of field damage and ranking of genotypes according to their global reaction to mirid attacks. Mechanism involved in insect resistance is complex. Plant or pod attractiveness affects the level of infestation, antixenosis prevents mirid feeding while antibiosis disturbs mirid development, and finally cocoa tolerance is linked to the ability of a tree to contain damage and recover from it (Eskes *et al.*, 2000). Red coloured and smooth surfaced pods appear to be with less infestation. To assess the overall damage the following visual ratings were followed (Brun *et al.*, 1997; Alagar, 2012).

Damage Index	Dieback of twigs and drying of leaves	Damage characteristics of cherelles and pods
0	No dieback	No lesions found on cherelles and pods
1	25% of leaves and twigs showing dieback	25% of cherelles and pods with presence of lesions
2	50% of leaves and twigs showing dieback	50% of cherelles and pods with presence of lesions
3	75% of leaves and twigs showing dieback	75% of cherelles and pods with presence of lesions
4	Almost all the leaves and twigs showing dieback	Almost all the cherelles and pods showing symptoms of lesions



Dieback in twigs



TMB infestation in pods



2. Grading method for assessment of cocoa genotypes for field tolerance to tea mosquito bug (TMB)

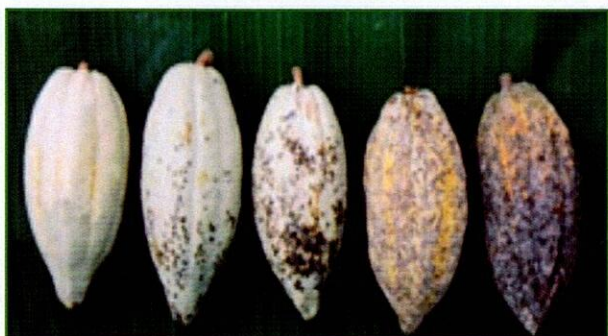
Since the severity of Tea Mosquito Bug (TMB) is increasing in the recent years, it necessitated development of grading system, instead of percentage of damage, for assessing the incidence and accumulated damage due to injuries, to work out the field tolerance

in cocoa genotypes. The feeding punctures observed in cherelles and pods were taken for calculation of the grade index. For example, if a tree is having a total of 30 pods, of which 20 pods are free of TMB, 7 pods at grade 1, 1 pod at grade 2, 1 pod at grade 3 and 1 pod at grade 4, the calculation will be $(20 \times 0) + (7 \times 1) + (1 \times 2) + (1 \times 3) + (1 \times 4) = 16 / 30$ (total no. of pods) and grade index will be 0.53. It denotes that most of the damage lies between 0-1.

Dieback in twigs



0 1 2 3 4



Dieback in twigs

Dieback in twigs



0 1 2 3 4



Dieback in twigs

Grade index	Classification
0	Highly resistant
>0- 1	Resistant
>1- 2	Moderately resistant
>2- 3	Moderately susceptible
>3- 4	Susceptible

Reaction of cocoa varieties/ hybrids to tea mosquito bug infestation based on grade index

S. No.	Varieties/ Hybrids	Grade index		Category
		Under arecanut	Under coconut	
1	VTLCH 1	0.32	0.45	Resistant
2	VTLCH 2	0.31	0.31	Resistant
3	VTLCH 3	1.10	1.15	Moderately resistant
4	VTLCH 4	1.00	1.05	Moderately resistant
5	VTLCH 5	0.38	0.61	Resistant
6	VTLCS 1	0.41	0.45	Resistant
7	VTLCS 2	0.56	0.66	Resistant
8	VTLCC 1	1.00	1.10	Moderately resistant





Integrated pest management for tea mosquito bug

Though identifying resistant/ tolerant genotypes is the priority, during sudden outbreak and severe infestation control measures to be taken up with integrated pest management strategies.

1. In India, die back symptoms in leaves are seen only in gardens without overhead shade and so the shade management, canopy architecturing and replanting in capsid pockets will considerably reduce the infestation.
2. With rise in temperature and reduction in rainfall, inspection and surveillance on TMB damage has to be carried out every month in post monsoon and summer seasons.
3. Removal of alternate hosts like neem, cashew, guava in the surroundings.
4. If infestation is less neem oil 3% may be sprayed. If infestation persists, spray may be repeated at 20 to 30 days interval, one spray each during flushing, flowering and fruiting seasons. Spraying shall be resorted during afternoon hours.
5. If number of trees are less, in household farms pod masking may be practiced with nets and cloth bags.
6. If economic damage is more, spraying any one of following insecticides viz., Lamdacyhalothrin 5EC (0.003 %) 0.3 ml /L (or) Imidacloprid 17.8 SL (0.004 %) 0.25 ml/L. may be advocated.



Pod masking with nets and cloth covers



Net cage to study the damage level

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