T.R.I. ADVISORY CIRCULAR No.PM 3

Issued in: June 2003 Serial No: 6/03

LIVE-WOOD TERMITES OF LOW GROWN TEA AND THEIR MANAGEMENT

(This Advisory Circular replaces Circular No. I 1 and I 2, Serial No. 9/71 and 1/76)

1. Introduction

Live-wood Termites of tea emerged as economically important key pests in the Low-country in the 1960's following rapid increase in area under vegetatively propagated tea clones since their introduction a few years earlier. It was coincidental that the highest yielders of those clones that were used to replant old seedling tea areas, also turned out to be the most susceptible host plants for the two most prevalent species of live-wood termites in the low-country.

On account of their high yield potential, clones TRI 2023 and 2026 became very popular and were therefore the most widely planted. They were also the clones most susceptible to this group of pests, and as a result the impact of termite damage on tea in the low-country was immediately felt. The significance of live-wood termites as a group of primary, and very injurious, pests became apparent within a matter of a few years of large-scale planting of these two clones.

2. Species Attacking Low Grown Tea

The most prevalent species of live-wood termites attacking tea in the low-country are *Glyptotermes dilatatus* and *Neotermes greeni.* The former is commonly referred to as the "Low-country Live-wood Termite" and is the most widely distributed of the two species. It attacks tea from sea level to an elevation of about 1,000 m amsl. *N greeni* is usually encountered in the upper elevations of the low-country and also occasionally in the mid-country. *N greeni* closely resembles the "Up-country Live-wood Termite" which is more or less confined to the Maskeliya and Dimbulla districts. Live-wood termites of the low-country differ from the up-country live-wood termites only in their mode of entry into the host plant, the former entering through dead snags in pruned branches while the latter entering through the roots of the tea bush.

3. Behavioural Pattern

Biology, habits, preference for host plants, and dispersal are fairly similar for the species of low-country live-wood termites, and are described below:

3.1. Dispersal: The winged reproductives of the two sexes pair off and shed their wings in flight during dispersal and alight on suitable host plants. They make their way into the bush through a "soft-spot" on the stem. These "soft-spots" originate as wounds on pruning cuts which have been acted upon by wood rotting organisms to form dead snags. They facilitate easy and fast entry of the termite pair, and the greatest incidence of termite damage is seen to occur in fields that have been pruned 3-4 times without the adoption of sanitary measures.

3.2. Colony Formation: Once inside the stem, the parent pair gradually excavate a short gallery and the female deposits the eggs, and the brood that develops from these eggs form the initial colony. The first set of larvae, nursed by the parent pair, develop into nymphs which then take over the function of gallery making and caring for all other inmates of the colony.

The nymphs which function as workers are an immature stage that can either develop further into mature castes like soldiers and reproductive stages or remain as they are with arrested development, according to the requirement of the colony. Therefore, they are referred to as false workers or *pseudergates.*

The nymphs developing into reproductive adults get transformed into two types. In one, the adult is devoid of wings but reproductively it is active and more sclerotized than others. They perform the function of egg laying and building up of the colony. These non-winged reproductives are referred to as "supplementary reproductives" as they, in effect, supplement the function of the parent pair. The other type, which is also reproductively mature, develops wings but does not mate or lay any eggs in the parent colony. These are referred to as "primary reproductives", or alates, and are responsible for dispersal and founding of new colonies elsewhere. Their dispersal is associated with increased atmospheric humidity, especially during the pre-monsoon period, but swarming populations have, however, been encountered in the air throughout the year. This results in the susceptible host being prone to infestation at any time in the year.

3.3. Type of Damage: Until the main trunk is fully colonized and the second generation alates start to emerge in dispersal, the host plant does not exhibit any external symptoms. It is only when the galleries traverse across the conducting tissues of the vascular ring that free movement of water and nutrients are interfered with, within the plant. At this stage symptoms of wilting or scorching of individual branches are seen, particularly during periods of water stress.

Newly planted VP tea, even though it is of a susceptible clone, is not generally infested until after the first proper prune. This is because many wounds, which later provide "soft-spots" for the termite colony founders to enter through, are created only at the time of the first prune. Termite susceptible clones are generally known to be prone to excessive die-back following pruning. Once inside the bush, the individuals are perfectly protected from external mortality factors as they seal off the gallery openings with their faecal matter. With time, the infestation progresses deep into the core of the bush whereby the bush becomes debilitated, and this result in direct yield loss from the field.

4. Their Management in Tea

Management of live-wood termites in the low-country requires a multi-pronged approach with focus being centered on host-plant resistance. Planting of tea clones that are totally immune to this primary pest, if available, would be the most ideal means of control as it does not involve any additional cost. However, very few clones have total immunity to infestation of this termite. Yet a large number of clones exhibiting a high degree of resistance or tolerance have now been identified. Many other popular clones are susceptible and should not be selected for future planting in termite-active areas.

5. Integrated System of Control

The important features of the integrated system of control of the low-country live-wood termite are as given below:

1. High yielding clones having immunity or high resistance to this termite should be planted wherever possible. A use of a mix of clones is also desirable.

2. The trap crop *Gliricidia sepium*, which is a common low shade tree, is also useful in the control of this termite. At the usual planting density (final spacing of 6m x 7.2m or 20' x 24'), it may not have the necessary level of cushioning effect on tea, particularly when the clone used is of the susceptible kind. However planting *G. sepium* as much as possible in the tea as well as in the surrounding non-tea areas would help to reduce the number of colony founders attacking the tea.

3. Tolerant clones with high yield potential may be planted provided additional termite control measures could be adopted.

4. The implementation of the low-cost control measure of sanitary pruning plays a major role in an integrated system of management of this pest. Here all galleried stems are removed by pruning them progressively down until no residual colony is seen within the stems. Such action should be taken from the second prune onwards. Protection of the pruned cuts with an anti-microbial wound dressing (such as Bacor 3PA or Candarsan) is also desirable.

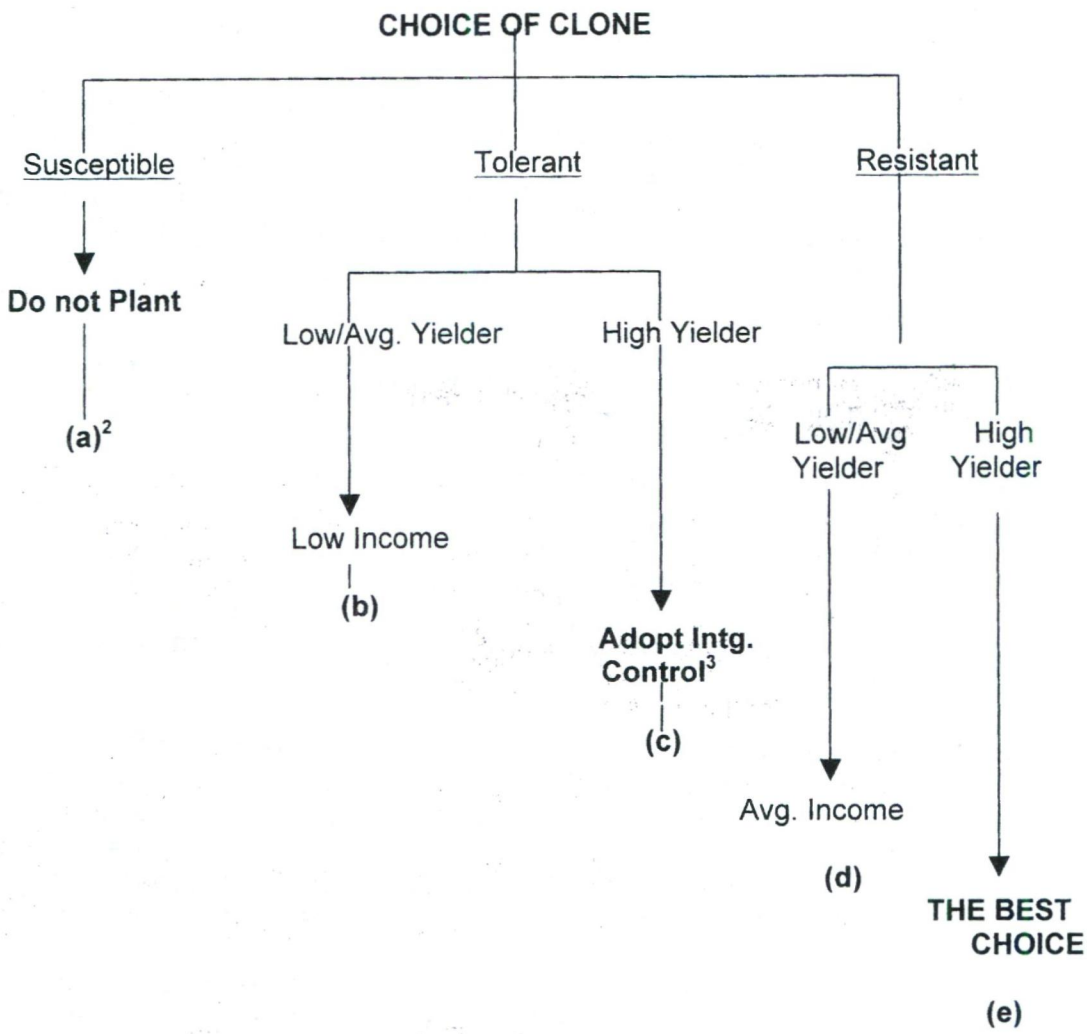
5. Microbial pesticides, of an entomopathogenic nature, that have been pronounced as effective on these termites could also be used to treat the residual colony that cannot be practically removed. Among such microbial pesticides are entomopathogenic nematode populations such as "Biosafe", and an entomopathogenic fungus *Metarhizium anisopliae*[1]. Chemical Termiticides, on the other hand, have no use in the control of this pest in tea.

6. Augmentation of natural predators would contribute towards the natural control of this pest to a large extent. It is necessary that these predators are provided with suitable conditions. Lizards, toads and frogs require humid and unexposed resting sites while birds and bats would require adequate perching points in the vicinity of tea.

A flow chart on the use of Integrated Pest Management system for the Low-country Live-wood Termites is given below:

[1] Please contact the TRI for source of supply.

IPM for Low-country Live-wood Termites



6. Classification of Clones based on their degree of Resistance

Clones could be classified according to the degree of their resistance to the Low-country Live-wood Termite, coupled with their yield ability, as follows:

[2] (a), (b), (c), (d) and (e) refer to clones in such designated columns in the Table given below.

[3] Adopting Integrated Control includes: I. Planting of Trap Crops, II. Augmentation of Predators, III. Adoption of sanitary prune, and IV. Use of Microbial Pesticides to eradicate residual colonies.

Classification of Clones

(a) Susceptible	(b) Tolerant Low Yielder	(c) Tolerant High Yielder	(d) Resistant Low Yielder	(e) Resistant* Highyielder
TRI 3063, 2023, 2026, 2043, 2045, 3033, 4005, 4055.	TRI 2151, H 1/58	TRI 2021, 2022, 2025, 2027, 62/1, 62/6, 62/9, 62/2, 62/5, 3014, 3018, 3052, 3029, 3060, 3065, 4002, 4053, 4054, 4058, 4061, 4063, S 106, KP 204, DG 39, P 26, P 101, P 37, P 80, PW 39, NIL 262, NIL 12.	TRI 2016, 2039, 3041, 3043, 4052, 4068, 4077, PW 55, CW 21, SJ 2, GMT 9	TRI 3055, 3025, 3069, 3021, (3047)**, KEN 16/3, NIL 211, P 104, TRI 4049, 4048, 4004

Clones of the Best Choice are listed in their order of merit.

** For limited planting only, as it is highly prone to Stem Canker in the Low country.

Clones selected on the basis of the above classification should then be viewed in the light of other limiting factors in a given plantation or district of the low-country. Planting the best suited clone for the district alone will not bring the best results. Caring for the plants, thereafter, with good crop husbandry is also essential for sustaining the productivity of the plantation.

Please refer the Advisory Circular No. PN 1 for details on other characteristics of clones.

The Tea Research Institute of Sri Lanka
Talawakelle