Alternate Plant Protection Products (PPPs) for Management of Shot Hole Borer and Low Country Live Wood Termite

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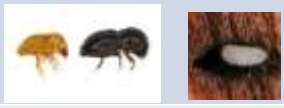
Pest Status

	Shot Hole Borer (SHB)	Low Country Live Wood Termite (LCLWT)
Pest		
	Euwallacia (Xyleborus) fornicatus	*Glyptotermes dilatatus* (Bugnion & Popoff)
Distribution	All tea growing regions with heavy infestation levels	Areas below 600 m with varying densities
Stages	Nursery, young and mature tea	Mature tea from 1st Prune onwards
Damage since	1890	1910
Economic damage	➢ Poor establishment ➢30% yield loss from 25% infestation levels ➢Disrupted bush architecture ➢Poor recovery after pruning ➢ Bush debilitation ➢ Reduce lifespan of tea bush (30-40 years) to 5-20 years	➢Poor recovery after pruning ➢ Bush debilitation ➢ Death of tea bush ➢ 50% yield loss at 50% infestation level ➢ Reduce lifespan of tea bush (30-40 years) to 5-20 years
Control	Due to concealed habit of the pest , a single method is not appropriate and several methods are to be integrated for effective pest management.	

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Damage

Trunk Injection and Root Feeding of Chemicals




Current Integrated Management Approach

Method	Shot Hole Borer (PM 2)	Low Country Live Wood Termite (PM 3)
Resistant / Tolerant Cultivars	***	*
Sanitary pruning	Shaving off infested parts	Removal of rotted stumps from 1st pruning
GAPs	Proper fertilization	-
	Soil management and crop health	Soil management and crop health
Alternate host plants	***	*
Biological control	-	-
Chemical control	-	-
Prophylactic treatments	Spraying chemicals at susceptible stages: Fenthion	Application of wound dressings on prune cuts: Bacor 3PA or Candarsan

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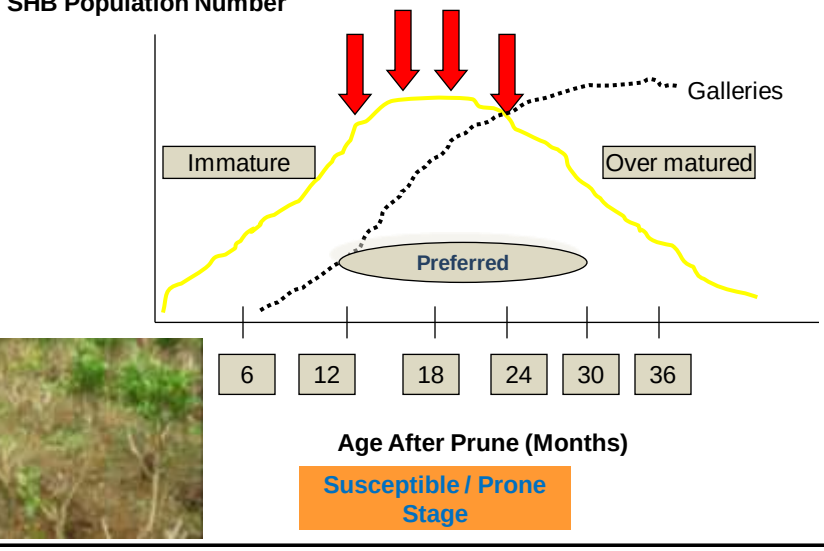
TRI Approach in Screening Alternate PPPs

- Market acceptance: Consumer concerns
  EU / Japan positive list / MRLs / ETC Annex IV
- ROP register and local market availability
- Cost effectiveness
- Non target effects
- Environment safety
- Other certification requisites in the industry
- User friendliness
- Worker safety

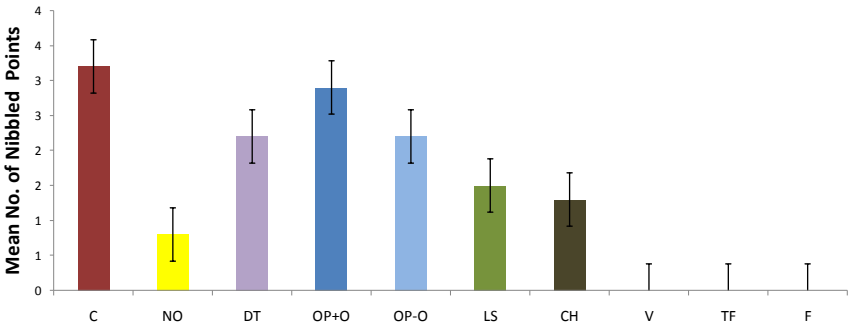
Prophylactic Stem Protection: 8-13 months from prune

Stem Protection Though Sprays



Susceptible / Prone Stage

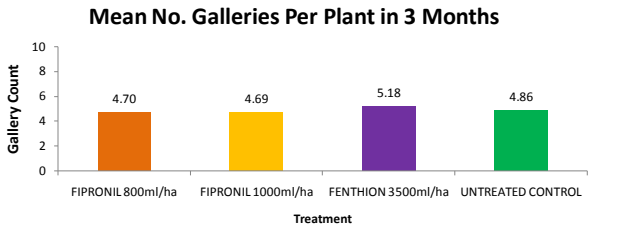
Protection of Stems by PPPs

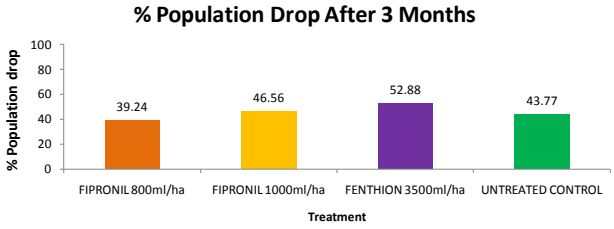


C: Untreated Control
NO: Shot Guard (Neem Oil)
DT: Shot Guard (Dorana Oil)
OP: Oil Palm Waste

LS: Lime Sulphur (1:1)
CH: Chemifix
V: Varnish
TF: Tangle Foot
F: Fenthion

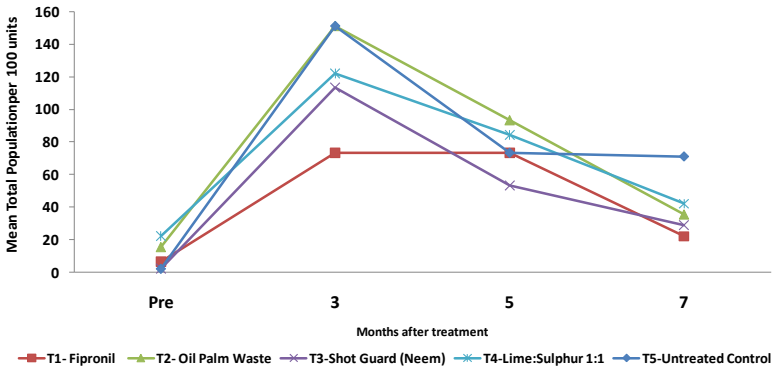
Fipronil as an Alternate PPP





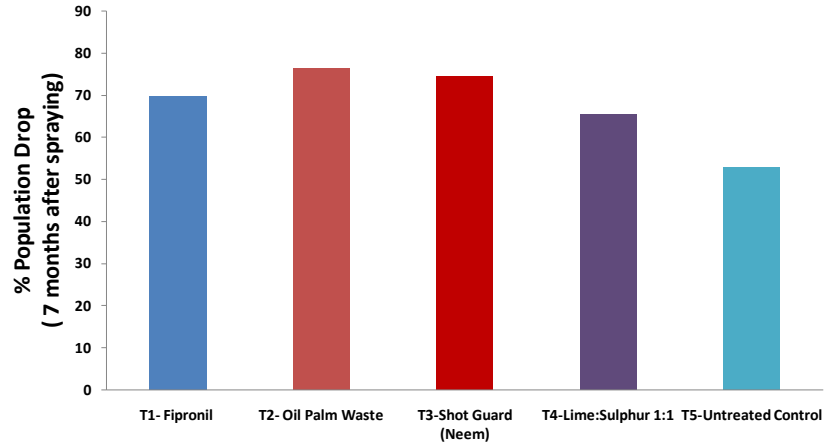
Mean Total Population

Location: Hapugastenna Estate



SHB Population Drop

Location: Hapugastenna Estate



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Recommendations

Stage	Fipronil (Regent 50 SC)	Lime : Sulphur (1 : 1)
Nursery: *for 1000 plants per application*	10 ml in 8 L water	400g in 8 L water
Young. Immature Tea & New Clearings: *Per ha per application*		
Spray I: (6-10 months after planting)	200 ml in 250 L water	12.5 kg in 250 L water
Spray II: (2nd and 3rd year plants)	400 ml in 500 L water	25 kg in 500 L water
Mature Tea:		
Per ha per application	Hold until EU approval	50 kg in 1000 L water

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LIME

Cost (Rs. per Application)

Stage	Fipronil (Regent 50 SC)	Lime : Sulphur (1 : 1) (50g : 50g in 1 L water)
Nursery:	62.50	22.75
for 1000 plants per application		
Young. Immature Tea & New Clearings: *Per ha per application*		
Spray I: (6-10 months after planting)	1250	710.93
Spray II: (2nd and 3rd year plants)	2500	1421.87
Mature Tea:		
Per ha per application	5000	2843.75

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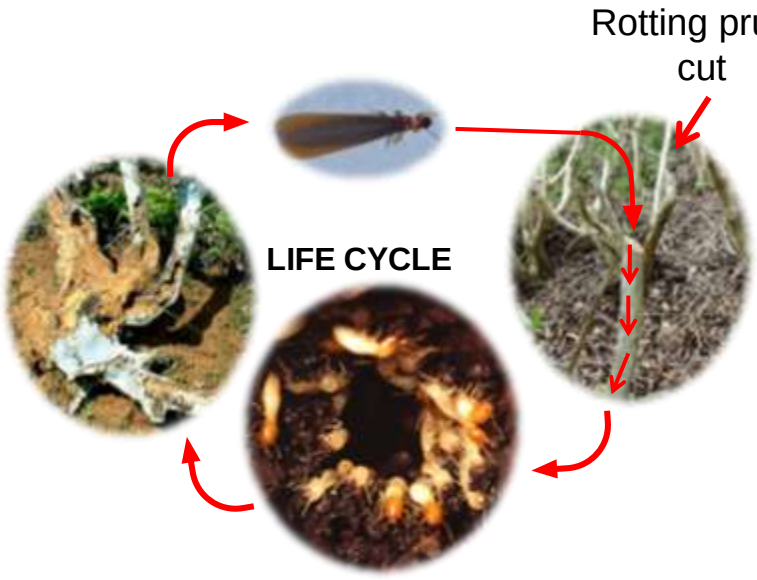
Special Considerations:

- Prophylactic chemical treatment is a must which helps safe guard tea stems at vulnerable stage from SHB.
- Mortality is limited.
- Application timing is critical with respect to weather pattern and avoid spraying during rainy period to assure persistency and bioefficacy.
- Leave minimum of 4 hours between spraying and rains.
- Wet the susceptible stems and branches thoroughly avoid spraying on to leaves and target only to stems.
- PHI: Minimum of 7 days
- Personal Protective Equipment (PPE) is important.

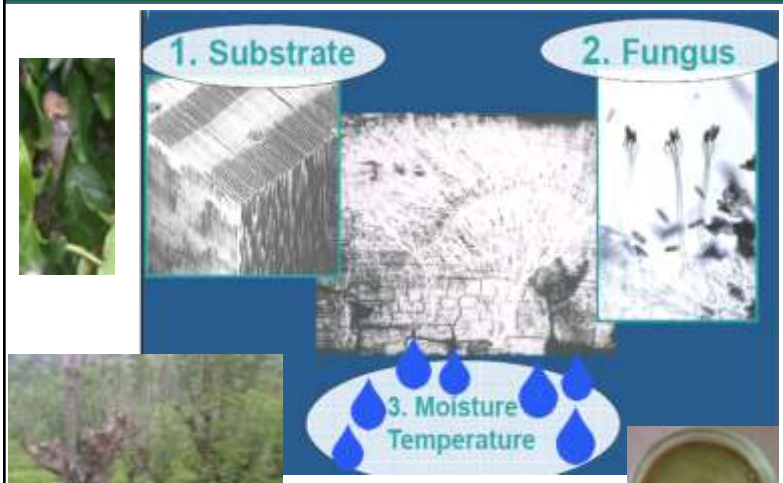
Additional Attention:

- Proper timing of spraying, PHI and worker safety etc. are highlighted in the use of the PPPs.
- Strict adherence to surgical pruning of infested stems and branches for sanitation.
- Burial of pruning.
- GAPs on crop and soil management ensuring plant health.
- Adjusting important cultural practices etc. in the IPM of SHB.
- Avoid diversionary hosts of SHB in the vicinity of tea growing lands.

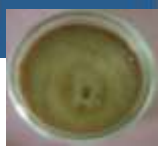
Low Country Live Wood Termite



Process of Wood Decay



- Sap staining
- Wood staining
- Mold
- Wood destroying



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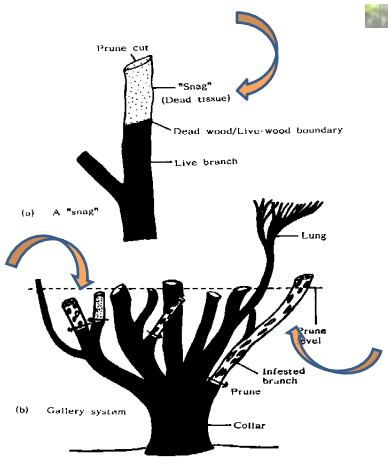
LCLWT Entry Through Rotted Prune Cut Wounds

Importance of Prune Cut Wound Dressings



Prune Cut Wound Dressings Screened Against LCLWT

Dressings and Paints	Code
Candarsan	C
Candarsan + Wax	C+W
Brunolium 15%	B15
Brunolium 15% + Wax	B15+W
Brunolium 3%	B3
Brunolium 3% + Wax	B3+W
Candarsan + Brunolium 3%	C+B3
Candarsan + Brunolium 3% + Wax	C+B3+W
Post office red enamel paint	EP
Untreated Control	UC

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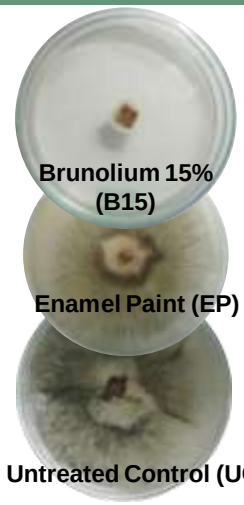
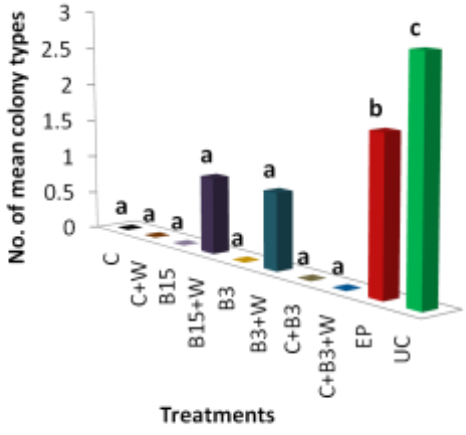
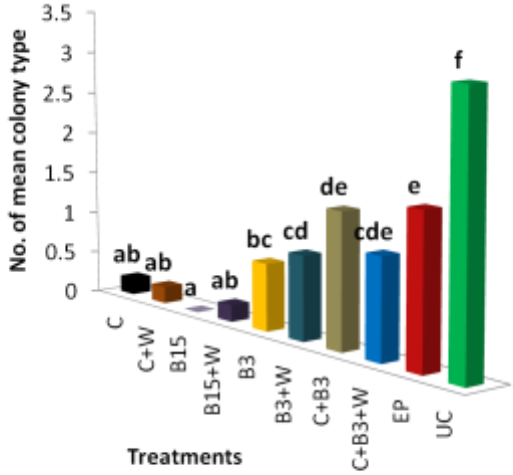
Mean Number of Fungal Colony Types Under Laboratory Conditions





(Means with same letter are not significantly different at p=0.05 level)

Mean Number of Fungal Colony Types Under Field Condition



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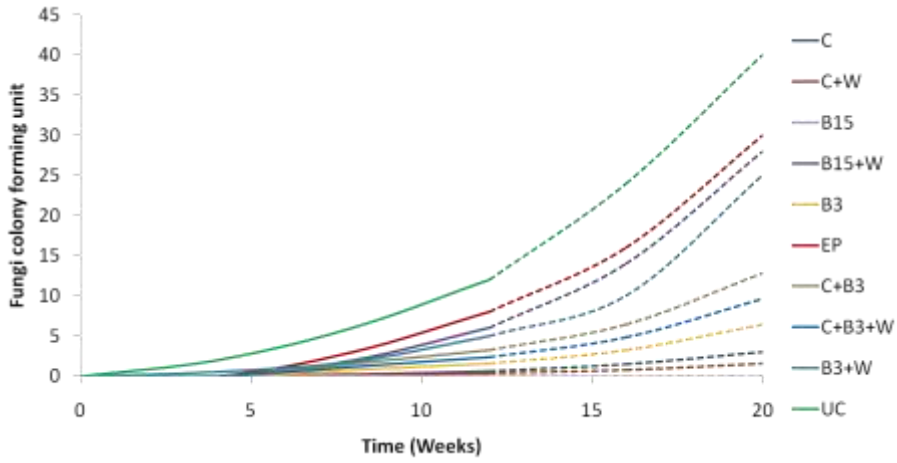
Field Persistency of Dressings and Paints



Wound Cut Dressings:

- Dressings were superior than paints in protecting prune cuts.
- Brunolium 15% showed significantly greater fungicidal properties owing to its phenolic compounds

Other benefits:

- Brunolium is comparatively cost effective: Rs. 3000.00 per ha
- Persistency of Brunolium in the environment is high
- Physical appearance is acceptable
- Long persistence will repel insects in the field

Further work:

- Screening Brunolium against scavenging termites and *Indrebella* on *Gliricedia*

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