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# Efficiency of synthetic pesticide, bio-pesticide and natural extracts on control of Tea Mosquito Bug *(Helopeltis theivora)* at tea garden in Terai region of West Bengal, India

Tea Science

**KEYWORDS:** Tea garden, Tea Mosquito Bug, Pesticides.

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## ABSTRACT

*The control of tea mosquito bug attack against synthetic pesticide, bio-pesticide and natural extracts in Terai region were studied. In three pesticide treatment Thiamethoxam 25% WG (Synthetic pesticide) is found to be most effective pesticide to control the tea mosquito bug attack. Verticillium lecanii Liquid (Bio-pesticide) effective to some extent and Neem oil (Natural extracts) was less effective to control tea mosquito bug attack.*

**Introduction:** Adults and nymphs of tea moaquito bug (*Helopeltis thevora* ) sucks the sap of the young leaves, buds and tender stems by puncturing the tissues (Borthakur and Singh,2002). While feeding, the pest injects a toxin that causes necrosis of the area around the feeding spot. The area turns blackish and dries up. In a severe attack bushes look scorched, cease to produce shoots and yield is drastically reduced (Anonymous,1994; Barua, 2008). The month of attack is from February to November (Sinha, 2010). Adults lay whitish eggs on midrib of the leaves (Kabir and Das, 2015). The eggs are provided with two long filaments, the 'respiratory horns' situated at the margin of operculum (Muraleedharan, 1991). A tea mosquito bug may lay 4-5 eggs/day (Singh, 2005). The incubation period is 10-13 days. Life cycle is completed in 10-35 days. Nymphal period lasts for 22-23 days. Nymphs are dirty yellow in colour. The adults have a black head, pale yellow and black thorax, yellow and greenish black abdomen (Kabir and Das, 2015). It was observed that tea mosquito bug attack accrue about 35% of total pest occurrence in Terai region of West Bengal (Sarkar and Kabir, 2016).

**Systematic position of Tea Mosquito Bug:**

**Kingdom:** Animalia
**Phylum:** Arthropoda
**Class:** Insecta
**Order:** Hemiptera
**Sub-order:**Heteroptera
**Family:** Miridae
**Sub-family:**Bryocorinae
**Genus:** *Helopeltis*
**Species:** *theivora*

**Materials and Methods:**

**Location of the experiment:** The experiment was conducted at Sukna Tea Estate Section number 39 and Sukna Tea Estate Section number 42. Sukna Tea Estate is located in Latitude 26°46'2"N, Longitude 88°23'54"E and altitude is 478 feet above sea level.

**Experimental design and Layout:** Two different locations were taken for two field trials. In both the tea fields, 24 plots were taken and each plot contained 24 bushes. Area of the each plot was 10.08 square meters. Each field trial contained one untreated control and three treatments. There were total 4 treatments and each treatment had 6 replications (Sarkar and Kabir, 2016).

Treatment 1 (T1): Untreated Control
Treatment 2 (T2): Thiamethoxam 25% WG (CHAMP)
Treatment3 (T3): *Verticillium lecanii* Liquid (Bio-pesticide)
Treatment4 (T4): Neem oil (MULTINEEM)

The experiments were laid out in Randomised Block Design (RBD).

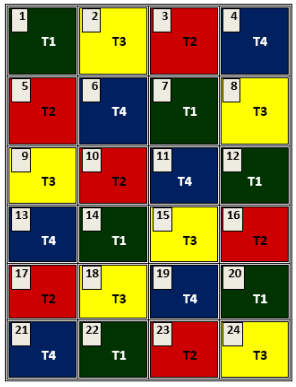


**Figure 1: Lay out location A (Sukna Tea Estate Section number 39)**

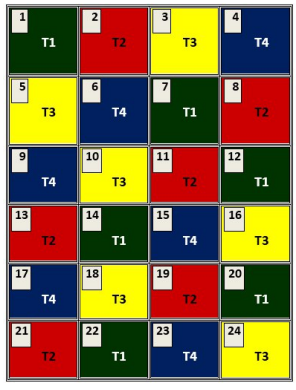


**Figure 2: Lay out location B (Sukna Tea Estate Section number 42)**

**Collection of pre-treatment Tea Mosquito Bug affected leaves:**
Hundred leaves were collected in each plot and plucking of leaves was random.

**Doses of the pesticides:**
Thiamethoxam 25% WG (CHAMP) @ 0.25g/litre
*Verticillium lecanii* Liquid (Bio-pesticide) @ 1ml/litre
Neem oil (MULTINEEM) @ 1ml/litre

**Collection of post-treatment Tea Mosquito Bug affected leaves:**
After 7 days of treatment, first observation was taken. In first observation hundred leaves were collected in each plot from plucked leaves randomly. After 14 days of treatment, second observation was taken using the same method.

**Results and Discussion:**
Before spray (pre-treatment) infested leaves number and total punch marks in each plot were counted from hundred numbers of leaves which were collected from each plot. After treating with pesticides (post-treatment), same procedure was followed. Then infested leaves number and total punch marks in each plot of pre-treatment and post-treatment were compared.

**Table 1: Location A (Sukna Tea Estate Section number 39)**

| Untreated Control | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Observations | Plot Numbers | | | | | | | | | | | | Total infested leaves out of 600 leaves | Total punch marks out of 600 leaves | Punch / Leaf |
| | Replication 1 | | Replication 2 | | Replication 3 | | Replication 4 | | Replication 5 | | Replication 6 | | | | |
| | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | | | |
| Pre-treatment | 21 | 324 | 18 | 286 | 20 | 267 | 22 | 312 | 19 | 302 | 24 | 293 | 124 | 1784 | 14.39 |
| 1st Observation | 24 | 328 | 21 | 318 | 20 | 302 | 21 | 325 | 22 | 354 | 23 | 342 | 131 | 1969 | 15.03 |
| 2nd Observation | 27 | 463 | 24 | 372 | 24 | 376 | 25 | 411 | 23 | 394 | 26 | 403 | 149 | 2419 | 16.23 |

**Table 2: Location A (Sukna Tea Estate Section number 39)**

| Thiamethoxam 25% WG (CHAMP) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Observations | Plot Numbers | | | | | | | | | | | | Total infested leaves out of 600 leaves | Total punch marks out of 600 leaves | Punch / Leaf |
| | Replication 1 | | Replication 2 | | Replication 3 | | Replication 4 | | Replication 5 | | Replication 6 | | | | |
| | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | | | |
| Pre-treatment | 19 | 273 | 22 | 338 | 23 | 341 | 18 | 281 | 24 | 386 | 21 | 317 | 127 | 1936 | 15.24 |
| 1st Observation | 16 | 232 | 17 | 228 | 18 | 257 | 16 | 192 | 18 | 246 | 19 | 261 | 104 | 1386 | 13.33 |
| 2nd Observation | 14 | 156 | 16 | 184 | 15 | 187 | 14 | 149 | 16 | 208 | 16 | 213 | 91 | 1097 | 12.05 |

**Table 3: Location A (Sukna Tea Estate Section number 39)**

| *Verticillium lecanii* Liquid (Bio-pesticide) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Observations | Plot Numbers | | | | | | | | | | | | Total infested leaves out of 600 leaves | Total punch marks out of 600 leaves | Punch / Leaf |
| | Replication 1 | | Replication 2 | | Replication 3 | | Replication 4 | | Replication 5 | | Replication 6 | | | | |
| | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | | | |
| Pre-treatment | 22 | 336 | 19 | 301 | 24 | 387 | 21 | 359 | 23 | 344 | 22 | 356 | 131 | 2083 | 15.90 |
| 1st Observation | 19 | 276 | 17 | 255 | 20 | 297 | 18 | 263 | 20 | 303 | 19 | 271 | 113 | 1665 | 14.73 |
| 2nd Observation | 18 | 243 | 17 | 221 | 18 | 238 | 17 | 226 | 19 | 263 | 18 | 257 | 107 | 1448 | 13.53 |

**Table 4: Location A (Sukna Tea Estate Section number 39)**

| Neem oil (MULTINEEM) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Observations | Plot Numbers | | | | | | | | | | | | Total infested leaves out of 600 leaves | Total punch marks out of 600 leaves | Punch / Leaf |
| | Replication 1 | | Replication 2 | | Replication 3 | | Replication 4 | | Replication 5 | | Replication 6 | | | | |
| | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | | | |
| Pre- | 20 | 309 | 23 | 321 | 24 | 343 | 21 | 319 | 23 | 334 | 25 | 365 | 136 | 1991 | 14.64 |
| 1st | 18 | 261 | 20 | 281 | 21 | 284 | 18 | 269 | 21 | 291 | 20 | 273 | 118 | 1659 | 14.06 |
| 2nd | 17 | 228 | 18 | 239 | 19 | 262 | 18 | 246 | 19 | 257 | 19 | 263 | 110 | 1495 | 13.59 |

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**Table 5: Location B (Sukna Tea Estate Section number 42)**

| Untreated Control | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Observations | Plot Numbers | | | | | | | | | | | | Total infested leaves out of 600 leaves | Total punch marks out of 600 leaves | Punch / Leaf |
| | Replication 1 | | Replication 2 | | Replication 3 | | Replication 4 | | Replication 5 | | Replication 6 | | | | |
| | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | | | |
| Pre-treatment | 19 | 256 | 18 | 245 | 18 | 236 | 17 | 216 | 16 | 203 | 18 | 239 | 106 | 1395 | 13.16 |
| 1st Observation | 19 | 272 | 20 | 287 | 19 | 261 | 19 | 268 | 18 | 223 | 19 | 259 | 114 | 1570 | 13.77 |
| 2nd Observation | 20 | 298 | 22 | 318 | 21 | 312 | 23 | 347 | 22 | 323 | 21 | 316 | 129 | 1914 | 14.84 |

**Table 6: Location B (Sukna Tea Estate Section number 42)**

| Thiamethoxam 25% WG (CHAMP) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Observations | Plot Numbers | | | | | | | | | | | | Total infested leaves out of 600 leaves | Total punch marks out of 600 leaves | Punch / Leaf |
| | Replication 1 | | Replication 2 | | Replication 3 | | Replication 4 | | Replication 5 | | Replication 6 | | | | |
| | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | | | |
| Pre-treatment | 17 | 211 | 19 | 234 | 18 | 218 | 16 | 201 | 18 | 227 | 17 | 208 | 105 | 1299 | 12.37 |
| 1st Observation | 15 | 162 | 16 | 175 | 16 | 172 | 15 | 151 | 14 | 126 | 17 | 192 | 93 | 978 | 10.52 |
| 2nd Observation | 12 | 107 | 14 | 127 | 12 | 110 | 15 | 139 | 13 | 112 | 13 | 121 | 79 | 716 | 9.06 |

**Table 7: Location B (Sukna Tea Estate Section number 42)**

| *Verticillium lecanii* Liquid (Bio-pesticide) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Observations | Plot Numbers | | | | | | | | | | | | Total infested leaves out of 600 leaves | Total punch marks out of 600 leaves | Punch / Leaf |
| | Replication 1 | | Replication 2 | | Replication 3 | | Replication 4 | | Replication 5 | | Replication 6 | | | | |
| | No. of infested leaves out of 100 | Total punch marks out of 100 | No. of infested leaves out of 100 | Total punch marks out of 100 | No. of infested leaves out of 100 | Total punch marks out of 100 | No. of infested leaves out of 100 | Total punch marks out of 100 | No. of infested leaves out of 100 | Total punch marks out of 100 | No. of infested leaves out of 100 | Total punch marks out of 100 | | | |
| Pre-treatment | 18 | 247 | 16 | 226 | 15 | 213 | 17 | 234 | 18 | 253 | 19 | 261 | 103 | 1434 | 13.92 |
| 1st Observation | 16 | 211 | 14 | 165 | 15 | 186 | 16 | 209 | 17 | 227 | 15 | 193 | 93 | 1191 | 12.81 |
| 2nd Observation | 15 | 183 | 12 | 122 | 12 | 130 | 14 | 169 | 16 | 196 | 14 | 172 | 83 | 972 | 11.71 |

**Table 8: Location B (Sukna Tea Estate Section number 42)**

| Neem oil (MULTINEEM) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Observations | Plot Numbers | | | | | | | | | | | | Total infested leaves out of 600 leaves | Total punch marks out of 600 leaves | Punch / Leaf |
| | Replication 1 | | Replication 2 | | Replication 3 | | Replication 4 | | Replication 5 | | Replication 6 | | | | |
| | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | No. of infested leaves out of 100 leaves | Total punch marks out of 100 leaves | | | |
| Pre-treatment | 18 | 267 | 16 | 235 | 19 | 289 | 17 | 253 | 18 | 258 | 20 | 301 | 108 | 1603 | 14.84 |
| 1st Observation | 16 | 226 | 15 | 218 | 15 | 208 | 16 | 234 | 17 | 241 | 18 | 256 | 97 | 1383 | 14.26 |
| 2nd Observation | 16 | 220 | 13 | 174 | 14 | 197 | 13 | 182 | 15 | 207 | 14 | 191 | 85 | 1171 | 13.78 |

**Table 9: Mean values punch/leaf of pre-treatment, post-treatment 1st observation and post-treatment 2nd observation in both locations**

| Treatments | Pre-treatment (Punch / Leaf) | | | Post-treatment 1st observation (Punch / Leaf) | | | Post-treatment 2nd observation (Punch / Leaf) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Location A | Location B | Mean | Location A | Location B | Mean | Location A | Location B | Mean |
| Untreated Control | 14.39 | 13.16 | 13.77 | 15.03 | 13.77 | 14.40 | 16.23 | 14.84 | 15.53 |
| Thiamethoxam 25% WG (CHAMP) | 15.24 | 12.37 | 13.80 | 13.33 | 10.52 | 11.92 | 12.05 | 9.06 | 10.55 |
| *Verticillium lecanii* Liquid (Bio-pesticide) | 15.90 | 13.52 | 14.71 | 14.73 | 12.81 | 13.77 | 13.53 | 11.71 | 12.62 |
| Neem oil (MULTINEEM) | 14.64 | 14.84 | 14.74 | 14.06 | 14.26 | 14.16 | 13.59 | 13.78 | 13.68 |

**Table 10: Increasing decreasing percentage of punch/leaf in post-treatment 1st observation and post-treatment 2nd observation compare to pre-treatment**

| Treatments | 1st observation | | | 2nd observation | | |
|---|---|---|---|---|---|---|
| | Pre-treatment | Post-treatment | Increasing decreasing percentage of punch/leaf | Pre-treatment | Post-treatment | Increasing decreasing percentage of punch/leaf |
| Untreated Control | 13.77 | 14.40 | -4.57 | 13.77 | 15.53 | -12.78 |
| Thiamethoxam 25% WG (CHAMP) | 13.80 | 11.92 | 13.62 | 13.80 | 10.55 | 23.55 |
| *Verticillium lecanii* Liquid (Bio-pesticide) | 14.71 | 13.77 | 6.39 | 14.71 | 12.62 | 14.21 |
| Neem oil (MULTINEEM) | 14.74 | 14.16 | 3.93 | 14.74 | 13.68 | 7.19 |

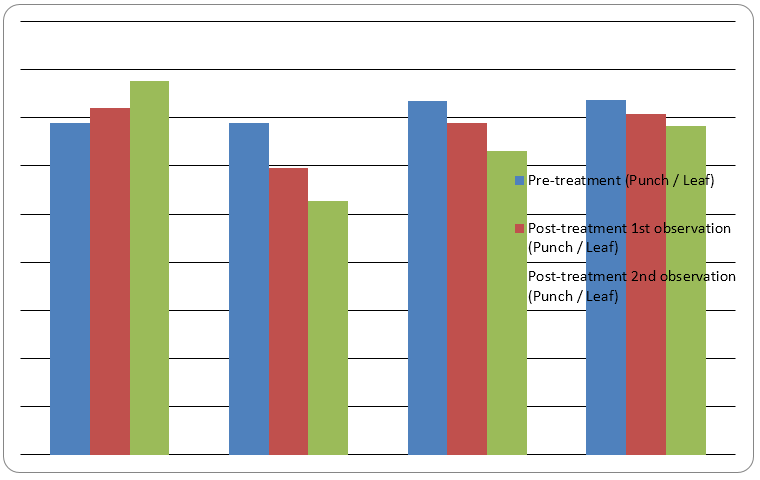


**Figure 3: Comparison of pre-treatment and post-treatment 1st observation and post-treatment 2nd observation punch/ leaf mean values**

**Conclusion:** Among four treatments, in untreated control punch/leaf made by tea mosquito bug was increased 4.57% in 1st observation and 12.78% in 2nd observation. Thiamethoxam 25% WG decrease punch/leaf 13.62% in 1st observation and 23.55% in 2nd observation. It was also observed that *Verticillium lecanii* Liquid decrease punch/leaf 6.39% and 14.21% respectively in 1st observation and 2nd observation. It was found that Neem oil decrease 3.93% and 7.19% punch/leaf in 1st observation and 2nd observation respectively.

Hence, Thiamethoxam 25% WG (Synthetic pesticide) is most effective pesticide to control the tea mosquito bug attack. *Verticillium lecanii* Liquid (Bio-pesticide) effective to some extent and Neem oil (Natural extracts) was less effective to control tea mosquito bug attack.

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