ABSTRACT

Monthly monitoring of the coffee leaf miner (CLM), *Perileucoptera coffeella* (Guérin-Méneville, 1842), was carried out on two coffee farms, one each at Oxford and Mt. Hill, during May 1992 - May 1994, and every four to six months thereafter. The infestation level of the CLM - which is the number of leaves mined expressed as a percentage of the total number of leaves - fluctuated in a cyclic pattern with peaks in May 1992 (85.6%) and January 1993 (64.9%) at Oxford, and in September (14.1%) and May 1992 (11.4%) in Mt. Hill; the lowest levels were in June 1993 (12.1%) and May 1994 (11.9%) at Oxford, and April 1993 (2.0%) at Mt. Hill. Low infestation followed periods of high rainfall. The population fell to between 0 and 5% between July 1994 and March 1998 at the plantations but is increasing again due to El Niño-induced drought.

The mean monthly infestation pattern within plantations at Oxford varied between 39.1 and 45.9%, which was lower in plots bordering the river bank than the central ones and those surrounded by trees of var. *caturra*. In Mt. Hill, infestation in plots was not significantly ($P > 0.05$) different and ranged between 5.4 and 5.8%.

There was a significant ($P < 0.001$) difference in the mean infestation of different strata of the trees; at Oxford, it was upper (51.2%) > middle (41.7%) > lower (36.5%) and at Mt. Hill, it was lower (8.0%) > middle (4.3%) > upper (4.2%), respectively. The mean infestation was also significantly ($P = 0.008$) more in the north (44.5%) ≡ east (43.7%) ≡

south (42.4%) ≡ west (41.8%) at Oxford and north (6.2%) > south (5.4%) > east (5.2%) > west (5.1%) at Mt. Hill (significant at $P < 0.001$).

Only 32.7% and 37.0% of leaves fallen from trees of *C. arabica* var. *typica* and *caturra*, respectively, were mined. There was no correlation in leaf retention time between uninfested leaves and infested leaves with < 25% leaf area damaged (LAD) by the CLM. The maximum area mined was 36.0% on leaves of var. *typica* and 42.5% on var. *caturra* leaves. Feeding by CLM larvae resulted in a mean weekly increase in the size of mines by 1.47% on var. *caturra* and 1.68% on var. *typica* leaves.

Thermally-inflicted simulation of CLM damage confirmed a significant effect of LAD and increased leaf abscission, though the threshold was 15% due to an experimental artifact. Irrigation with or without fertilizer increased the leaf retention time significantly ($P < 0.005$) when compared with the control trees in the unshaded block; the increase was not significant ($P > 0.05$) in the shaded block.

LAD had significant ($P = 0.038$) adverse effects on coffee yield. Berries harvested with 5% simulated LAD on 10 and 33% of the leaves weighed and average of 7.7 kg/tree and 7.6 kg/tree, respectively, compared with control trees which produced 6.7 kg/tree; those with 50% LAD yielded 2.2 kg/tree. The infestation level of the tree did not, by itself, significantly ($P > 0.05$) affect the yield.

In establishing the economic threshold (ET) for the CLM, the damage index, D - which was the product of the LAD and infestation level- was created. A threshold of 300 for the damage index was used to obtain an ET of 15% LAD at 20% tree infestation.

Fourteen species of parasitoids - two braconids, eight eulophids, two pteromalids, and two other unclassified species - emerged from CLM-infested field-collected leaves. The level of parasitism ranged between 2.44 and 62.86% and varied significantly ($P = 0.05$) among some plantations.

Decis 2.5EC (deltamethrin), Karate 2.5EC (λ cyhalothrin), Furadan 10G (carbofuran) and Miral 500CS (isazofos) applied by farmers gave no significant ($P > 0.05$) reduction in the CLM infestation. Field trials with Miral 500CS, Basudin 600 (diazinon), Chlorpyrifos 2E and crude extracts of *Artocarpus altilis* (breadfruit), *Blighia sapida* (ackee) and *Azadirachta indica* (neem) revealed that only Miral and ackee oil had any significant ($P < 0.05$) toxic effect on larvae of the CLM. None of the insecticides had a significant ($P > 0.05$) effect on the level of infestation. The feeding activity of the CLM was inhibited for two weeks by ackee oil and for at least three weeks by neem, Miral and Basudin.

The persistence ($t_{½}$ in days) on coffee leaves and soil (data in parentheses) of test insecticides was chlorpyrifos - 1.1 (5.8); isazofos - 1.3 (3.1); diazinon - 1.8 (7.3); dimethoate - 2.1 (3.2); deltamethrin - 5.9 (1.8); λ

cyhalothrin - 12.7 (6.5). The insecticides did not have prolonged, adverse effects the soil fauna.

Based on the results obtained, an integrated pest management (IPM) strategy is proposed. It involves the monitoring of the pest and making assessments of the infestation level of the trees, as well as the mean LAD. This information can then be used to calculate D (damage index), which can then be used to determine what management action, if any, should be taken, bearing in mind that the ET is set at D = 300. Management measures include tree pruning, irrigation, fertilization, use of drought-resistant root stock, conservation of parasitoids and application of plant extracts.