Effectiveness, cost and advantages of the method

Triple-action IPM experiments conducted in shaded coffee plantations, on trees with a tall growth habit, have shown that it is possible to reduce CBB infestation by over 90% compared to control plots. Branch stripping and trapping account for more than 70% of that reduction. The contribution made by pruning and rehabilitating the coffee plantation can reach 20%.

Of the three IPM operations, only trapping requires any true investment. It is essential to have enough traps and dispensers to ensure that the system works effectively for four months per year. Over that period, the approximate amount of attractant consumed is 38 ml per trap, corresponding to the content of two dispensers. Traps and dispensers vary in cost depending on the type of manufacture and the value of the raw material used. Two types of traps exist, one manufactured industrially (BROCAP®) and the other "home-made" and there are two types of dispensers, one subjected to quality controls, the other not.

The cost of branch stripping corresponds to the wage paid to staff assigned to that task for a given period. This operation is self-funding through sales of the residual berries gathered.

The cost of agronomic operations such as pruning and plot rehabilitation is part of the annual plantation upkeep costs.

A coffee berry borer control method

**Triple-Action IPM**

The coffee berry borer (CBB), Hypothenemus hampei Ferrari, is the most destructive insect pest in coffee growing worldwide. It colonizes ripening fruits, multiplies, and soon destroys a large proportion of harvests.

As part of long-standing regional cooperation in central America, CIRAD and its coffee research partners have developed a simple, effective and economical IPM method that provides a solution to the CBB problem: triple-action IPM.

**Contact**

Bernard Dufour
CIRAD
Controlling pests and diseases in tree crops
Research Unit
Avenue Agropolis,
34398 Montpellier Cedex 5
France
Tel: +33 4 67 61 58 39
Fax: +33 4 67 61 58 39
bernard.dufour@cirad.fr

For further information

This simplified protection applies to geographical zones where there is a single annual harvest, i.e. in the tropical fringe where the climate consists of two clearly distinct dry and wet seasons. It is more efficient in shaded coffee plantations than in “full sunlight”, as trapping is more effective where there is shade. The protection programme begins after branch stripping and ends once the main CBB migrations are complete.

**Triple-Action IPM strategy**

**With branch stripping**, migrating CBB cannot take refuge in residual berries, so they cannot redisperse to colonize young berries (figure 1). In addition, if very young berries arising from early flowering are also picked during this operation, branch stripping achieves its maximum effect.

**With trapping**, it is mainly females from residual berries on the ground that are captured. The capturing system is therefore maintained at least until all CBB have emerged from such berries (figure 2).

**With agronomic control**, the performance of the previous techniques is improved.

1. **Branch stripping** consists in picking and eliminating all unripe, ripe and dry fruits still on the coffee trees after harvesting and pruning (figure 3).

   It is not necessary to gather berries fallen to the ground, as the traps will take care of capturing and killing any CBB emerging from them.

2. **Trapping (with attractant)** is used to catch CBB during their migratory flights, which begin with the first rainfall.

   Traps are installed at the beginning of March and removed at the end of June. The recommended minimum number of traps is 18 per hectare (figure 4). Some countries, such as Costa Rica, have adopted 20 per hectare.

   The traps are inspected every fortnight, captured CBB are removed, the capture containers are cleaned then filled with water. It is important to check that the dispensers are working properly and contain enough attractant.

3. **Agronomic control** comprises coffee tree pruning, shade tree pruning and cleaning of the coffee plantation.

   - The coffee trees are pruned immediately after harvesting. The aim is to reduce the number of bearing branches to its optimum level and thereby maintain satisfactory production. Removing branches and reducing the foliage ensures good aeration of the coffee tree and boosts sunlight penetration (figure 5). Consequently, fallen fruits dry out more quickly and development of the CBB populations surviving in such fruits gradually comes to a complete halt.

   - Pruning shade trees at the same time, or at another time of year, produces the same collateral effects (figure 6).

   - Cleaning the coffee plantation facilitates stripping and trapping operations. It consists in eradicating weeds and clearing pruning waste from the coffee tree rows, turning it into firewood and removing it from the plots (figure 7).

**Technical operations**

1. **Residual berries containing CBB (ground and branches).**
2. **Emptying berries (emergence and migration of females).**
3. **Empty berries (without any living CBB stages).**
4. **Unripe berries exposed to CBB colonization.**

   **1. After the harvest, CBB develop inside any berries remaining on the coffee tree branches and in those fallen to the ground.**

   **2. With the first rainfall, adult CBB females emerge and fly off.**

   **3. Usually, the first colonizing females do not find any appetizing fruits. Some of them will therefore die and the rest will take refuge in dry berries remaining on branches.**

   **4. As time goes by, young fruits develop and become attractive to surviving CBB.**

**Figure 1. Colonization of young berries by females emerging from residual berries.**

**Figure 2. Residual berries on the ground harbouring females that are easily caught.**

**Figure 3. Dry berries that need to be removed from branches during stripping.**

**Figure 4. Installation of BROCAP® CBB traps.**

**Figure 5. Coffee tree pruning.**

**Figure 6. Shade tree pruning.**

**Figure 7. Rehabilitation of the coffee plantation (cleaning).**

**The BROCAP® Trap, an effective IPM tool**

With its design adapted to the insect’s biology, and its powerful attractant, the trap takes part in the reduction of CBB populations in coffee plantations.

BROCAP® is a model developed by CIRAD and PROCAFE.