FACTSHEET

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ANTESTIA BUG ON ARABICA COFFEE IN EASTERN AFRICA

The Antestia bug (*Antestiopsis* spp.), or variegated coffee bug, is a significant pest in Arabica coffee *(Coffea arabica L.)*, especially in Eastern Africa. From nymphs to adults, all development instars, feed on most parts of the coffee bushes. They mainly consume coffee flower buds, shoots, leaves, and green berries, but the feeding can vary depending on the development stage and season.

An Antestia bug infestation can lead to a direct yield reduction of up to 40 %.

In general

- The pest appears around **March** and peaks in **May/June.**
- The pest can be found hiding in the leaf cover or flower clusters during the hottest hours of the day to avoid direct sunlight.
- They are most visible in the morning and evening, as well as on cloudy days.
- Their primary feeding times are between 10am – 12pm and 7pm – 8pm.
- They move with colonization flights within the plantation to find the optimum tree for egg laying, which usually happens in the warmer hours of the day.

Figure 1 shows the adult stage of *Antestiopsis thunbergii.* They are 7,5 to 9,5 mm long – with females bigger than males - and are recognized by their striking, variable pattern with black (or dark brown), orange, and white colors. However, the pattern and colors can change between different populations.

Coffee and other related species of the Rubiaceae family are the main host plants. Some wild Rubiaceae species can be found close to coffee plantations and may lead to the development and distribution of Antestia.

Figure 1: *Antestiopsis thunbergii*

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Nymph phase

The eggs are laid on the underside of coffee leaves in bundles of 12, and rarely can be found on berries or the trunk (see **Figure 2**).

The hatching usually happens after 4 to 15 days and is followed by 5 nymphal instars. Nymphs resemble the adults in color but have a more rounded shape and lack functional wings. The Antestia bug nymphs usually feed on unripe berries and avoids ripe ones identifying them through olfaction.

In **Table 1** the temperature limits (of survival) for *A. thunbergii* during different stages of development to adulthood are listed.

Climatic limits of *A. thunbergii*	
Minimum temperature (Tmin)	12,1°C
Maximum temperature (Tmax)	33,9°C
Optimum temperature	22,4–24,7°C

Table 1: Climatic limits of *A. thunbergii* regarding the development from egg to adult according to Azrag et al.

Figure 2: Eggs of Antestia bug © Wikimedia / Smartse

The climatic preferences and the distribution of different *Antestiopsis* species are described in the **Table 2**

Species	Regions	Elevation	Climate
A. thunbergii	Southernmost part of Cape Province in South Africa to the highlands of Kenya and Ethiopia	1,000–2,100 m asl; *A. thunbergii ghesquiettei* in all zones	Cooler climate preferred; In shaded plantations when present in lower elevations. Areas with less heavy rainfall
A. intricata	Broad west-east distribution from the western coast to the eastern horn of Africa (only species in West Africa)	1,000-1,600 m asl; low to mid-altitude coffee growing areas	Warm climate of forest areas; In unshaded plantations when present in higher elevations
A. facetoides	Eastern Kenya and Eastern Tanzania, including Zanzibar	1,000–1,600 m asl; Lower elevations, mixed with *A. thunbergii bechuana* at mid elevations	Warm climate; Areas with lower rainfall
A. clymeneis	Madagascar (on Arabica coffee and wild Rubiaceae)	Lower elevations	Warm climate
A. cruciata	Pakistan, India, Myanmar, Sri Lanka, Southern China, SE Asia; on coffee arabica & jasmine	*No detailed info has yet been found*	*No detailed info has yet been found*

Table 2: Summary of climatic and regional preferences or different Antestiopsis species according to Azrag et al. (2017, 2018), Babin (2018) and Greathead (1966)

FEEDING DAMAGE

The presence of even one or two bugs per tree on a plantation is considered an economic risk and this would require action to avoid economic crop losses.

The following are some of the damages the bugs cause while feeding:

- **Prevention of flowering = failure to set fruit:** The bug attacks flower buds and shoots, leading to the browning of the buds and the failure to set fruit.
- **Premature fruit drop & growth impairments:** Feeding on green berries leads to premature fruit drop. Feeding on the shoots leads to growth impairments reducing growth or producing a bunchy or matted growth, such as fan branching.
- **Entryway for harmful organisms i.e., Brown zebra coffee beans:**
  The feeding holes of Antestiopsis species may function as an entryway for other harmful organisms. For example, fungi like *Eremothecium coryli* and Ashbya *(= Eremothecium gossypii)* cause bean rot in developed berries. This leads to a brown or black appearance of the beans - also called „Brown zebra coffee beans“ - and is only visible after washing.
- **„Potato Taste Defect“ (PTD):**
  A potato-like smell and taste in raw and sometimes roasted coffee. The potato taste defect can be so substantial that even a small percentage of PTD beans can spoil the whole batch of coffee. This occurrence has led exporters and coffee companies to mistrust East African Arabica coffee.

Figure 3: An antestia bug on a coffee tree
© Tim Hill, Counter Culture Coffee

CONTROL MEASURES

Handpicking

One of the current management measures feasible for small numbers of Antestia infestation is handpicking the bugs. This is labor intensive but can be successful when done at certain times of the day when the beetles are most active. For example, in the morning when the warmth-loving species takes advantage of the first rays of sunlight.

At this time, you can find them on top of the coffee bushes, and they are easy to identify and to collect.

Pruning

Pruning is one of the most mentioned management practices against Antestiopsis species as it can reduce the number of bugs and, as stated by some sources, bushy coffee plants shelter many bugs. Scientists showed that the level of shading does not directly affect the populations but rather the resulting microclimate. Therefore, the interaction between temperature and moisture is important. To conclude, pruning is an essential measure for a good farming practice in coffee, but Antestia control should not solely depend on it.

Increasing the natural beneficial insects through a diverse ecosystem

A long-term solution for *Antestiopsis spp.* infestation is using natural and biological interactions by enhancing the natural enemies that compete with and prey on the Antestia bug.

Integrating a diverse ecosystem attracts numerous natural predators, rather than monocultural coffee plantations, where Antestia can easily reproduce and endure for extended periods. Certain natural predators of Antestia, like birds, mantis, spiders, chameleons, and various insects, live near the coffee bushes and feed on the Antestia bugs, their larvae or eggs. Several other natural enemy species also occur naturally in **agroforestry systems**, for example:

- Parasitic wasps of the *Aridelus* family attack Antestia nymphs and adults, reducing eggs to 50%. Antestia second larval instars are sensitive to natural enemies and are attacked regularly.
- Parasitic wasps like *Telenomus spp.* can be actively used for biological control of Antestia. *Telenomus seychellensis* is the most common and important wasp species. They lay their eggs inside *Antestiopsis* eggs, and when the wasp larvae attack the Antestia eggs, they turn black.
- Another parasitoid of Antestia is the common tachinid flies like *Bogosia rubens,* which feed on adult Antestia bugs.
- Banana plants attract *Corioxenos antestiae,* a natural parasitoid of the Antestia bug. They prey on the adult bugs of the most relevant *Antestiopsis* species.

One management practice is **intercropping** with certain plants. Cash crops, such as bananas, or other vegetation species, can be used. **Another long-term successful management practice is implementing an agroforestry system.**

Practical Example

In well-managed agroforestry systems, researchers observe low beetle numbers and damage. If necessary, a targeted neem application provides further support during high-infestation months (April + June). However, farm-specific conditions, such as altitude, and especially good system management, like pruning coffee bushes and shade trees, must be considered.

For more information on Naturland e.V. recommendations on agroforestry, see **Agroforestry - Naturland** or contact us at **membersupport@naturland.de**

Furthermore, the Naturland Academy Platform provides an online learning course on agroforestry systems free of charge **Agroforest-1-2023 | Naturland Academy.**

Application of botanical insecticides

Another method to control an Antestia infestation is the application of botanical insecticides. Neem and pyrethrum are particularly suitable for use in organic cultivation.

The advantage of using these products is that they can be produced locally, making them cheaper and more accessible than synthetic insecticides. Furthermore, they do not harm the environment or the farmer applying the botanical insecticide.

Some studies showed a high effectivity of pyrethrum extracts with mortality in adults and nymphs of around 80%. Application rate is crucial as insects can develop resistance.

Pyrethrum/Pyrethrine

- Toxic for all insects as well as for natural enemies of Antestia bug
- Especially effective in combination with pruning

Neem *(Azadirachta indica)*

- More than 300 species of insects can be controlled with neem products. All parts of the tree are biologically active.
- The active substance of neem, azadirachtin, serves as a pesticide with antifeedant and anti-reproductive characteristics. It is most present in neem seeds. Several application methods for neem are possible:
- Crude or semi-purified extracts of seeds give similar results compared to neem products solely based on azadirachtin compound. Furthermore, it needs more technical skills to produce a high concentration of azadirachtin.

  Several application methods for neem are possible:
- Neem oil, mixed with water, can be sprayed on the bushes.
- Applying fresh/dried seeds on the coffee farm.
- Applying powdered neem seeds (could be mixed with liquid to spray it on trees, not only on soil).
- Mixing neem leave powder with animal manure and spray.

The Coffee Research Foundation recommends using neem when there are more than 3 bugs per coffee bush in Tanzania. In Kenya, as few as 1 bug per bush in wetter areas and 2 bugs per bush in drier areas are the limit to start with a neem application.

FUTURE CONTROL MEASURES

Researchers work on future control measures that are currently not practicable. This includes studying local plants to extract their plant essential oils as botanical insecticides.

- Njihia (2018) study concentrated on using ripe coffee berries (mostly avoided by some *Antestiopsis* species) to extract certain volatiles that can be used as repellents
- The use of the entomopathogenic fungi *Beauvaria bassiana* to infest and kill Antestia bugs is a promising study. However, this method needs further investigation under field conditions and regarding its availability in East Africa (Abate, Wakgari, & Gobena, 2021).

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