IDENTIFICATION SHEET

ARMILLARIA CAMERUNENSIS

Root rot

JUNE 2021

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IDENTITY

Latin name	*Armillaria camerunensis*
Common name	Root rot
Taxonomic classification	*Fungi*: *Agaricales*: *Physalacriaceae*: *Armillaria*

Figure 1 - *Armillaria camerunensis*

MORPHOLOGY

Description:

These fungi are saprotrophic organisms which mainly live in dead wood. However, some are parasites that can cause deep rot and root rot:

- These fungi appear in various clumps on wood at the base of trunks or on the roots.
- Species of *Armillaria*:
  - Sporophores: fleshy, producing white spores and a cotton-like or membranous veil, which usually forms a distinctive annulus on the stipe.
  - Rhizomorphs: (pseudoroots made up of clusters of hyphae) these can for extensive and long-lasting underground networks.

LIFE CYCLE

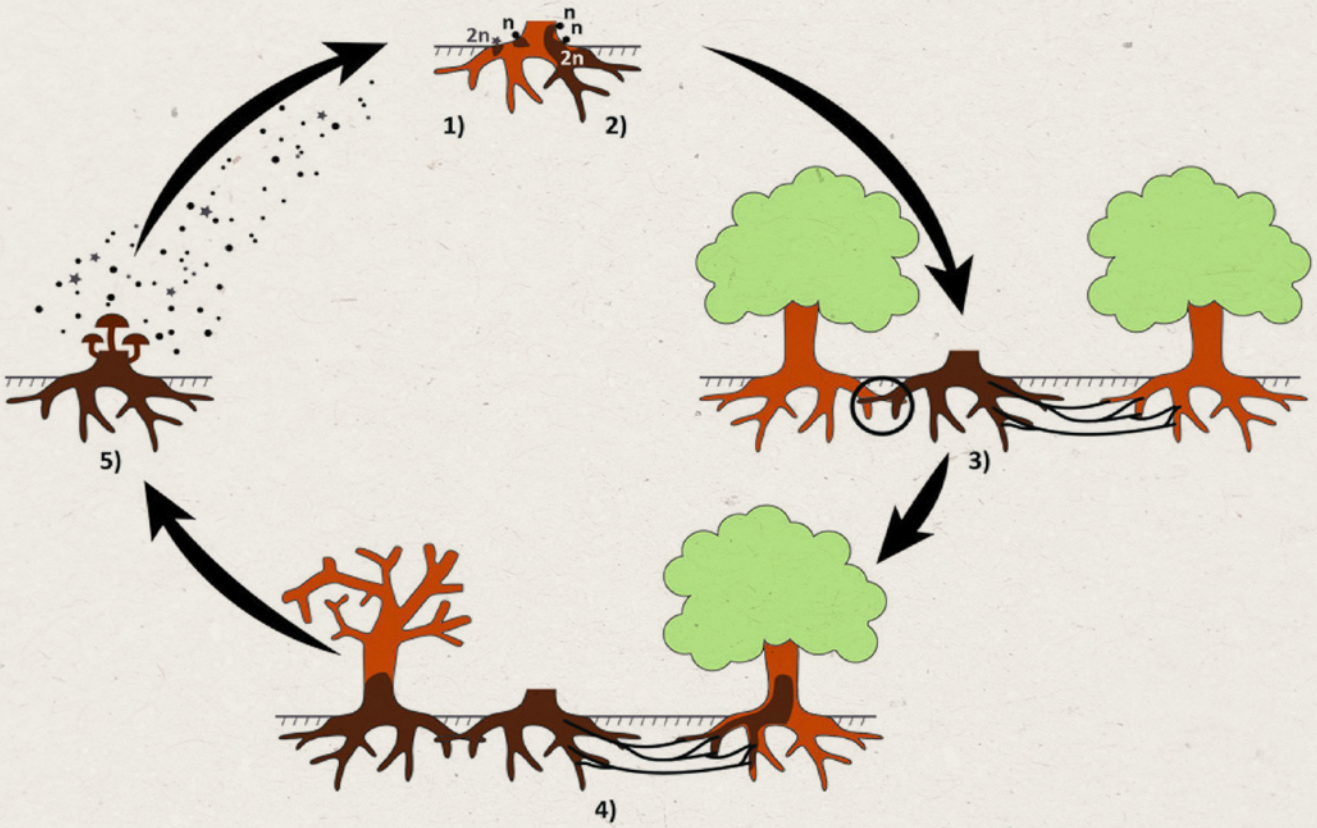

Figure 2 - Life cycle of *Armillaria*

1. The basidiospores germinate on a woody substrate (e.g. fragments of wood, tree stumps) originating from a haploid mycelium (n) (heterothallic species) or a diploid mycelium (2n) (homothallic species).
2. In heterothallic species, after mating between two compatible haploid mycelia, a diploid mycelium is formed. In heterothallic and homothallic species, the diploid mycelium colonises the woody substrate.
3. Healthy trees are infected when the roots come into contact with infected woody substrates or by rhizomorphs in the soil, which grow on infected woody substrates.
4. *Armillaria* invades the root system and lower trunk of infected trees, killing the cambium and/or causing heart rot.
5. The fruiting bodies develop on a dead/dying woody substrate and release basidiospores into the surrounding environment.

CONDITIONS CONDUCIVE TO ITS DEVELOPMENT

- Environment:
  - Infested trees on the farm.
  - Swathing between rows.
  - Tree stumps left over after deforestation.
- Period conducive to the development of the disease:
  - Rainy season (April to October).

SYMPTOMS AND DAMAGE

The symptoms are especially notable on support trees (*Spondias mombin)* in the Penja region:

- Healthy trees are infected when the roots come into contact with infected woody substrates or by rhizomorphs in the soil, which grow on woody substrates.
- Invasion of the root system and lower trunk in infected trees.
- Death of cambium.
- Heart rot.
- Light or pale wood: deterioration of essential compounds in the cell wall such as lignin and hemicellulose.
- Chlorosis in the needles and dieback of stalks and branches.

Figure 3 - Wood attacked by *Armillaria*

MONITORING STRATEGY

Each plot is inspected thoroughly, specifically the support trees of pepper plants and other trees on the plantation in order to identify the symptoms of attacks by *Armillaria camerunensis.*

Swift detection of symptoms will enable pepper plant producers to take timely decisions to reduce the level of infestation throughout the orchard.

▶ ***Penja pepper producers are advised to carry out this inspection using an observation and monitoring sheet provided in the appendix.***

GOOD FARMING PRACTICES TO COMBAT PROBLEM

- **Crop control:**
  - Get rid of old tree stumps after trees are felled on the farm.
  - Remove any offcuts of wood from felled trees.
  - Remove any dead trees from the farm.
  - Burn plant debris and dead trunks.
  - Remove and burn plants (support trees with symptoms of the disease).
  - Before setting up the farm, ensure that there are no tree stumps or felled trees in the vicinity.
- **Organic control:** no conclusive organic control method to combat *Armillaria camerunensis* has yet become widespread among producers.
- **Control using plant protection products:** it should be noted that no product is currently approved in Cameroon to combat *Armillaria camerunensis* in pepper plants (List of pesticides approved in Cameroon consulted on 4 March 2021). Some commercially-available solutions authorised for combating brown rot and other fungal diseases in cacao trees (see table below) could be used on Penja pepper plants subject to prior authorisation from the competent authorities. However, they are not particularly effective on *Armillaria camerunensis*.

Solutions	Method of use	Status as per Regulation (EC) No 1107/2009	Crop-pest combination for which the active substance is approved in Cameroon	EU MRL for pepper
Metalaxyl-M 120g/kg Oxychloride 600g/kg	800g cp/ha	**Metalaxyl-m:** Approved **Oxychloride:** Not available	Brown rot on cacao pods/ cacao trees	**Metalaxyl-m:** 0.1* **Oxychloride:** Not available
Oxychloride 60% + Métalaxyl-M 6%	200g of cp/ha	**Oxychloride:** Not available **Metalaxyl-m:** Approved	Phytophthora palmivora, phytophtora megakarya/cacao tree	**Oxychloride:** Not available **Metalaxyl-m:** 0.1*

(*) cp: Commercial product
(*) Indicates the lower limit of the analytical determination

APPENDIX: OBSERVATION AND MONITORING SHEET

Campaign: .....

Date: .....

Plot code: .....

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Vegetative stage: .....

Date of last treatment: .....

Product(s) used: .....

Observations: .....

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INFESTATION LEVEL

Armillaria camerunensis: .....

Comments: .....

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