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IDENTITY

Latin name	<i>Fusarium oxysporum</i>
Common name	The slow decline disease
Taxonomic classification	Fungi: Hypocreales: Tuberculariaceae: <i>Fusarium</i>



Figure 1 - Symptoms of *Fusarium oxysporum*

MORPHOLOGY

Description:

- Imperfect, vascular fungus.
- Appearance of a flattened cone.
- Relatively loose, greyish-white aerial mycelium can take on other pigmentations (purple, mauve).
- Large amount of asexual spores produced by sporodochia or sclerotia.
- Microconidia: ellipsoidal single-cell or bicellular fusiforms or reniforms made up of 3-5 cells.
- Microconidia of variable sizes: 20µm in length (13-20µm x 2-3µm).
- Spores: grouped together in the form of dry false heads at the end of extended microconidiophores.
- Chlamydospores: round spores made up of one or two cells at the centre of hyphae.

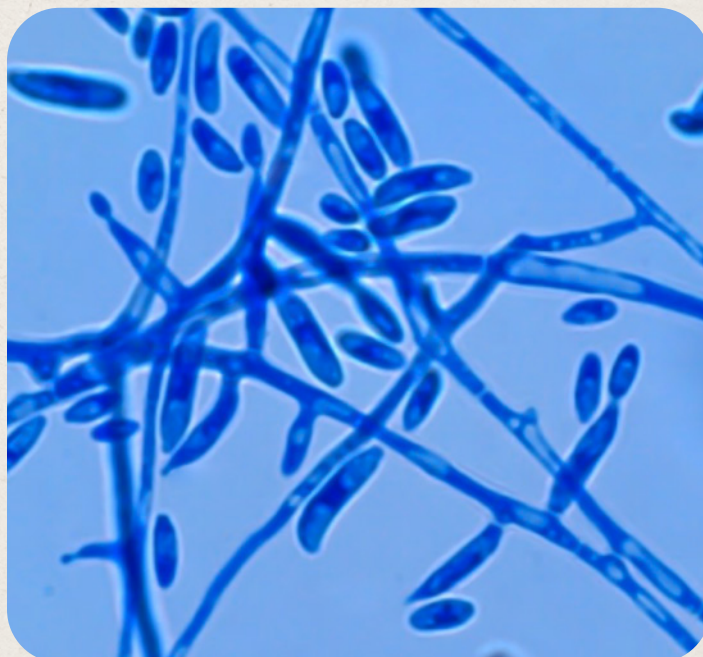


Figure 2 - Microscopic view, *Fusarium oxysporum*

LIFE CYCLE

- *Fusarium oxysporum* is not an obligate parasite.
- In the absence of a host plant:
 - It is saprophytic, feeding on plant debris and organic matter.
 - This fungus remains in the ground in the form of resting spores (chlamydospores) in a dormant state.
- Upon contact with a host:
 - The chlamydospores germinate and the young filaments penetrate the roots.
- After getting inside the host cells:
 - The mycelium branches out and colonises all neighbouring cells.
 - The mycelium hyphae spread inside the cells by colonising the cortex and the xylem tissue in the stem via microconidia which are then easily transported by sap to all other parts of the plant.
- On the surface of the leaves:
 - Fruiting bodies known as sporodochia are formed, which produce macroconidia that go on to contaminate other plants after being transported by the wind, water or insects.

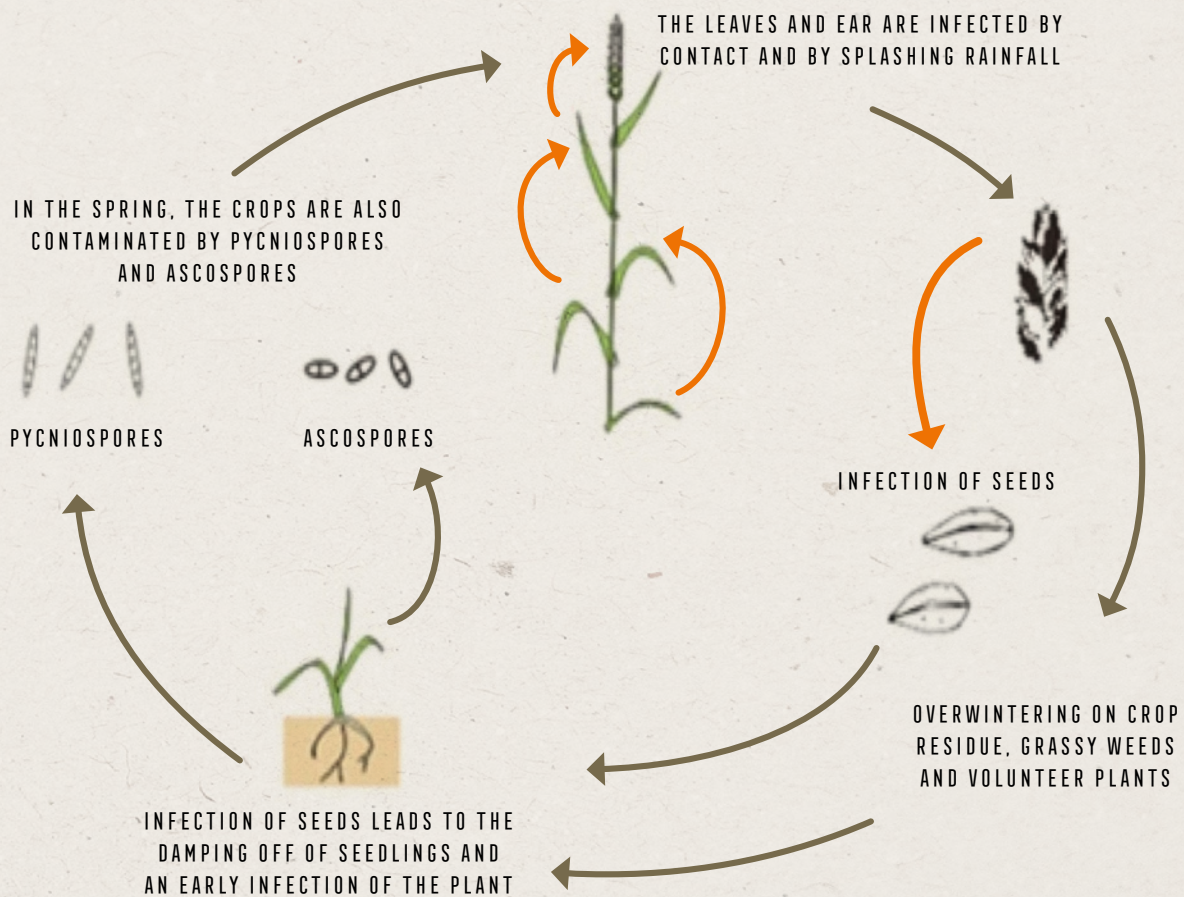


Figure 3 - *Fusarium* development cycle

CONDITIONS CONDUCIVE TO ITS DEVELOPMENT

- Environment:
 - Shade is key in determining the severity of the disease.
 - A lack of light weakens the plants, making them more susceptible to attacks from *F. oxysporum*.
 - The salinity of the air and soil has an effect on the biology and life cycle of the fungus.
 - The presence of root-knot nematodes makes it easier for the *Fusarium* fungus to attack.
- Period conducive to the development of the disease:
 - Climatic variables, such as rainfall, soil and air humidity, sunlight and temperature are factors which affect the development of *Fusarium*, influencing germination and infection.
 - *Fusarium* infestation develops best between 27°C and 28°C.

SYMPTOMS AND DAMAGE

Symptoms on support trees and pepper plants:

- Yellowing of leaves, starting from the base.
- Plants lose vigour.
- Gradual defoliation.
- Fall in productivity.
- Death of plants.

MONITORING STRATEGY

Slow decline disease is relatively widespread in the Penja region and its symptoms can be easily confused with the symptoms of white root diseases caused by *Fomes lignosus* and the symptoms of root rot disease caused by *Phytophthora*.

Each plot is inspected thoroughly. The pepper plants and support trees are observed to identify symptoms of fusarium infestation as well as the presence of root-knot nematodes on the roots, which increase the likelihood of the disease developing.

During the inspection, it is important to remember that slow decline disease can stretch over a period of four to five years and attacked plants look like they are recovering at the start of the rainy season.

Swift detection of the symptoms of fusarium infestation enables 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:**
 - Regularly prune the pepper plants, support plants and trees in the orchard to reduce shade.
 - Do not combine pepper plants with crops that host root-knot nematodes (banana tree, plantain tree, maize, etc.).
 - Ensure good mineral nutrition for plants to guarantee their robustness.
- **Organic control:** although harnessing the abilities of certain natural enemies (*Acremonium atra*, *Cylindrocarpon* sp., *Gliocladium roseum*, *Streptomyces* sp., *Trichoderma viride*) to combat *Fusarium oxysporum* f. sp. *lycopersici* has been deemed a relatively successful approach, the results obtained raise questions regarding the mechanisms of action of such micro-organisms and pathogens, the dynamics of populations of micro-organisms introduced to the soil and the epidemiology of diseases. Moreover, no fungus has been observed as consistently constituting a natural enemy and, for some, the positive effect may be more due to random chance than actual effectiveness.
- **Control using plant protection products:** it should be noted that no product is currently approved in Cameroon to combat fusarium infestation in pepper plants (List of pesticides approved in Cameroon consulted on 4 March 2021). Some commercially-available solutions authorised for combating fusarium and other fungal diseases in cacao trees and oil palm trees (see table below) could be used on Penja pepper trees subject to prior authorisation from the competent authorities.

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
Myclobutanil 400g/kg	40g l/hl or 400ppm of active matter	Myclobutanil: Not approved	Crown disease/ oil palm	Myclobutanil: 0.05*
Copper oxide 60% + Metalaxyl-M 6%	200 g of cp/ha	Copper oxide: Approved Metalaxyl-m: Approved	Brown rot/ cacao tree	Copper oxide: 40 Metalaxyl-m: 0.1*

(*) cp: Commercial product

(*) Indicates the lower limit of the analytical determination

APPENDIX: OBSERVATION AND MONITORING SHEET

Campaign:

Date:

Plot code:

Vegetative stage:

Date of last treatment:

Product(s) used:

Observations:

INFESTATION LEVEL

Fusarium infestation:

Comments: