

Tomato Diseases and Pests in Burkina Faso



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ABBREVIATIONS

Climate data	
PMin	Minimum precipitation (mm)
PMax	Maximum precipitation (mm)
TMin	Minimum temperature (°C)
TMax	Maximum temperature (°C)
EMin	Minimum evapotranspiration (%)
EMax	Maximum evapotranspiration (%)
VMin	Minimum wind speed (m/s)
VMax	Maximum wind speed (m/s)

INTRODUCTION

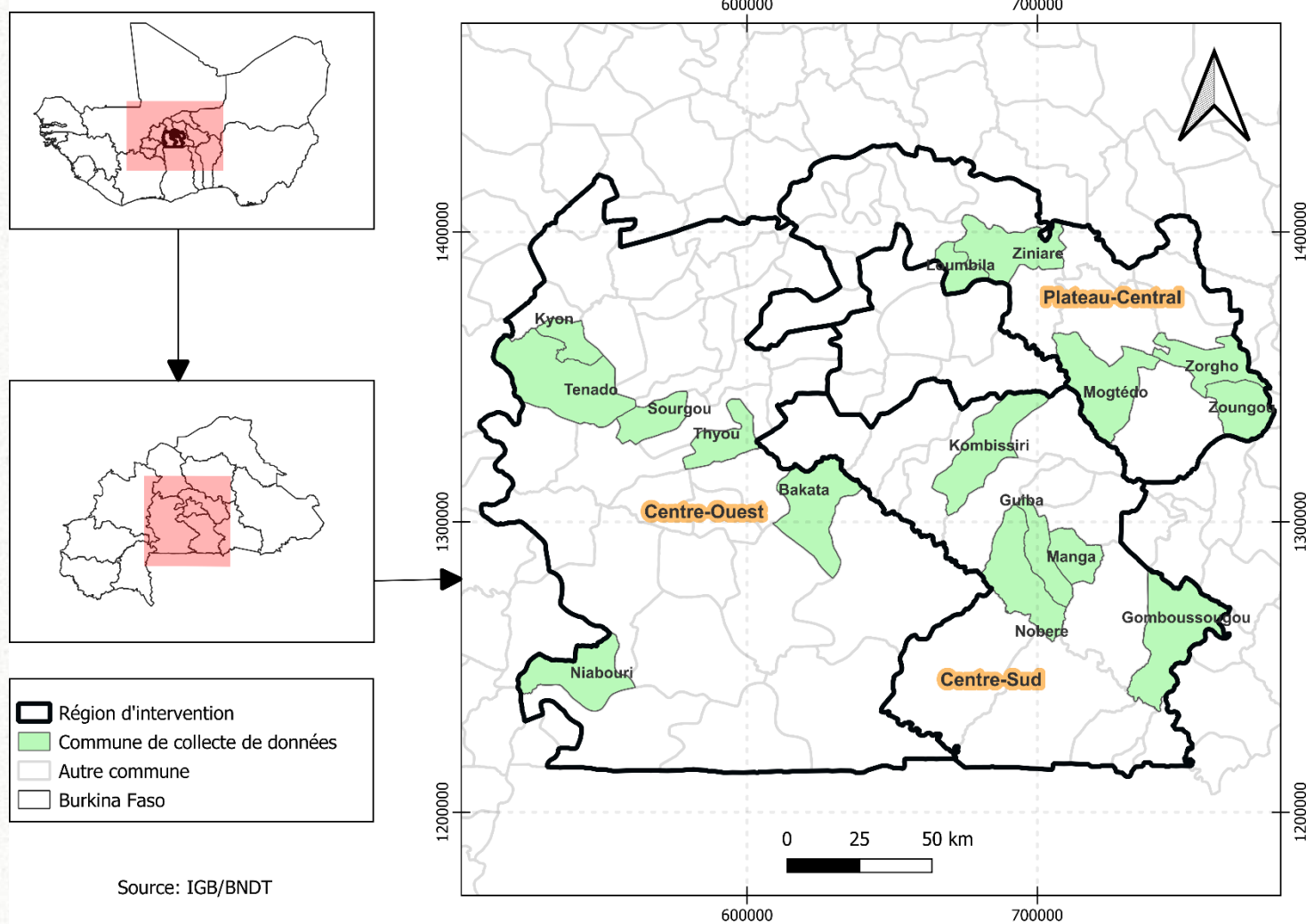
Food security is achieved when all human beings, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO, 2020). However, in Burkina Faso, despite the fact that agriculture accounts for over 80% of the population, access to sufficient, healthy food is a major issue. This food deficit is largely due to the effects of climate change (drought and flooding) and the security crisis of recent years.

To address this food deficit, the government of Burkina Faso is committed to developing market garden crops, which contribute significantly to food security and the fight against unemployment (MAHRH, 2007; MEF, 2010). Tomatoes are the second most important vegetable crop after onions and generate significant income for producers. The net income earned by a grower cultivating 1 ha of tomato is 376,141.70 FCFA (€ 573.78) in undeveloped areas and 594,356.40 FCFA (€ 906.65) in developed areas (MAHRH, 2007). The monetary value of tomatoes is estimated at 17 million FCFA (over € 25,000), or 21% of market garden sales in Burkina Faso (MAHRH, 2007). However, this crop faces numerous constraints, including pest attacks. Indeed, crop diseases and pests can cause yield losses ranging from 50 to 100% if no suitable control methods are applied at the right time.

To contribute to the management of these pests, WASCAL in collaboration with the Ministry of Agriculture and Afrique Geosciences initiated the project **"Precision Pest and Disease Management System based on Multidimensional Big Data"**. This project, acquired with the financial support of the European Union through the Innovation Fund of the Organization of African, Caribbean and Pacific States (OACPS), has made it possible to collect data on diseases and pests on tomato, onion and maize farms in the Centre-Ouest, Centre-Sud and Plateau-Central regions with the aim of developing digital solutions for the management of pests and diseases of these crops in Burkina Faso.

This document summarizes the main pests and diseases present in the tomato fields of the study area and the different means of control.

STUDY AREA



Data collection sites

MAIN PESTS (1/8)



Helicoverpa armigera

Climate data	Pmin	Pmax	TMin	Tmax	Emin	Emax	Vmin	Vmax
	0	15.2691	25.2058	32.6938	0.0002	0.0041	0.4526	3.3434



Characteristics

The adult is a stout butterfly with a broad thorax. The forewings have a series of dots around the edges and a black comma-shaped mark in the middle of the underside of each forewing.

The hindwings, on the other hand, are lighter in color, with a broad dark-brown border at the apical end; they have yellowish margins and strongly marked veins. Adult males are greenish-gray, while females are orange-brown and can also be identified by a tuft of hairs on the tip of the abdomen (Damanpre et al., 2021).

The caterpillars are grayish, then yellowish along their entire length, with the exception of the head capsule, which is dark brown. From stage 4 onwards, the caterpillar has a slightly rough integumentary texture, a broad whitish stripe with the stigmas clearly visible on the flanks, and brown or black dots. In its final stage (stage 5 or 6, depending on climatic conditions), the caterpillar is greenish or yellowish in color and measures between 30 and 40 mm (Damanpre et al., 2021).

It's the caterpillar that gnaws leaves, cuts flower clusters and perforates fruit. The same caterpillar can attack several fruits, usually in the same bunch. You may notice that the flowers on your tomato plants fall off, or that the fruit rots when young (Reisig et al., 2022).

MAIN PESTS (2/8)



Helicoverpa armigera

Means of control

Preventive control

- Deep ploughing to destroy pupae;
- Avoid high transplanting densities to aerate plants, but also to promote product penetration during spraying;
- Make regular visual inspections of flowers, leaves and fruit during the flowering-fruiting phase and early in the morning to identify caterpillars;
- Collect infested fruit in plastic bags, seal and place in the sun. This will kill the caterpillars;
- Clean plots thoroughly and eliminate weeds that may harbor pests;
- Burn plant residues that may harbour caterpillars and pupae after harvesting;
- Combine tomatoes with repellent plants (onion, basil);
- Rotate tomato crops with non-host crops; e.g: lettuces, onions.
- The use of light traps or pheromone traps for trapping adults and direct observation to detect eggs and neonates are of great importance for successful control.

Curative control

- The effectiveness of most insecticides depends on the stage of development of the larva. It would therefore be preferable to target early-stage larvae. Molecules such as emamectin benzoate, indoxacarb, methomyl and diamides give good results in Burkina Faso;
- Alternate products to avoid the development of resistance in pests;
- For small caterpillars, a contact insecticide can be used;
- If caterpillars are inside tomatoes, use a systemic insecticide (Cherif et al., 2019).

MAIN PESTS (3/8)



Tuta absoluta

Climate data	Emin	Emax	Pmin	Pmax	TMin	Tmax	Vmin	Vmax
	0.0002	0.0030	0	15.8703	25.3120	32.5844	0.4526	3.6456



Characteristics

Adults are ash-gray butterflies with a few black spots and a wingspan of 10-11 mm.

They have long, thread-like antennae with alternating light and dark segments; They hide under plant leaves during the day. However, it can be observed very early in the morning (6 to 8 a.m.).

Egg-laying generally takes place on young buds and leaves; Eggs are creamy white when laid and yellow-orange during development (Tadele et al., 2017). They are deposited in isolation on the lower or upper surfaces of leaves, tender parts of the plant or on the sepals of immature fruit.

On leaves, the attack is characterized by the appearance of whitish galleries (only the leaf epidermis remains, the parenchyma having been consumed by the larvae), each containing a caterpillar and its droppings. Over time, the galleries become necrotic and brown. Galleries can be seen on stems.

Fruits show necrosis on the calyx and exit holes on the surface of the integument. Fruits are susceptible to attack from formation to maturity (Son et al., 2017).

MAIN PESTS (4/8)



Tuta absoluta

Preventive control

- Deep ploughing to destroy pupae;
- Protect nurseries with insect netting;
- Make regular visual inspections of plants. If the first symptoms are observed, remove and burn affected plants, then treat.
- Reject plants with suspect symptoms;
- Use sex pheromone traps. They provide information on the presence of the pest and can be used to assess the potential risk of infestation in the plot;
- Remove all leaves, stems and fruit containing mines using hermetically sealed plastic bags;
- Regularly weed plots, eliminating all weeds and host plants in and around the plots;
- Rotate with non-host crops or combine with repellent plants (onion, basil) (Cherif et al., 2019).

Curative control

- Treat as soon as eggs or small caterpillars are observed. Use neem or *Bacillus thuringiensis*-based biopesticides;
- For chemical control, use insecticides based on abamectin, emamectin benzoate, spinosad, spinetoram or chlorpyrifos ethyl.
- Alternate products to avoid the development of resistance in pests (Desneux et al., 2022).

MAIN PESTS (5/8)



Red spiders (*Tetranychus spp*)

Climate data	Emin	Emax	Pmin	Pmax	TMin	Tmax	Vmin	Vmax
	0.0001	0.0044	0	14.6564	23.3804	33.7438	1.1833	3.3458



Characteristics

Mites are visible to the naked eye on the underside of leaves. Leaves appear dotted with white spots. In the event of heavy attacks, a fine, dense web develops on the leaves, starting on the underside. These eventually dry out and fall off (Ayman et al., 2015).

MAIN PESTS (6/8)



Red spiders (*Tetranychus spp*)

Preventive control

- Avoid excess nitrogen, which encourages the development of mites;
- Monitor and protect the nursery;
- Avoid growing during hot, dry periods;
- Use sprinkler irrigation to loosen colonies and increase leaf humidity, as spider mites thrive in dry conditions;
- Immediately destroy crop residues to prevent population build-up in the field;
- Avoid placing plants in the shade of trees, as the attack always starts under trees;
- Do not allow weeds, especially Solanaceae, to grow around the field;
- Plant hedges around fields to reduce adult migration between fields (Meijer et al., 2022).

Curative control

- Natural preparations based on soap or neem used as soon as the first mites appear are effective.
- Use abamectin- or profenofos-based acaricides (Muzemu et al., 2011).
- Pesticides should be applied as soon as the first symptoms appear, before they spin their web.

MAIN PESTS (7/8)



Virosis

Climate data	Emin	Emax	Pmin	Pmax	TMin	Tmax	Vmin	Vmax
	0.0001	0.0040	0	12.2187	27.5683	35.1064	0.4526	4.0536



Characteristics

The disease manifests itself as curling of the leaves, which sometimes fade to a pale pink.

Fumagin is present on leaves and fruit.

Plants become dwarfed in the event of heavy, early attacks.

The vector, *Bemisia tabaci*, is a very tiny biting-sucking insect, 1 to 3 mm long, covered in a white waxy dust with a floury appearance, hence the name "white flies". It attacks nursery plants in the first two weeks after transplanting (Romba et al., 2018).

MAIN PESTS (8/8)



Virose

Preventive control

- Avoid combining plants from the same family, e.g. tomatoes and peppers.
- Use resistant varieties (hybrid varieties most often marked F1) and protect the nursery with mosquito netting;
- Plant in such a way as to avoid hot spells and overlapping crops;
- Avoid high transplanting densities to aerate plants, but also to facilitate product penetration during treatments;
- Combine tomato cultivation with non-host plants (onion, basil) to reduce infestations (Romba et al., 2018).

Curative control

- Destroy weeds and diseased plants.
- Treat with biopesticides as soon as 3 to 5 adults per leaf are observed;
- Alternate insecticides (contact and systemic) to prevent the development of resistance in pests;
- Pesticides based on the following molecules can give good results: acetamiprid, bifenthrin, buprofezin, imidacloprid, amitraz, fenpropathrin, fenoxycarb, deltamethrin, azadirachtin and pymetrozine (ROMBA et al., 2020).

MAIN DISEASES (1/5)



Fusarium oxysporum

Climate data	Emin	Emax	Pmin	Pmax	TMin	Tmax	Vmin	Vmax
	0.0001	0.0026	0	4.9657	28.8028	34.8216	0.7828	3.8764



Characteristics

- It is a telluric fungus, capable of parasitizing a wide range of hosts. On cultivated plants, it is responsible for several symptoms such as seedling damping-off, root rot, browning and wilting leading to desiccation.
- It can be transmitted by seed, which is the main route by which the fungus is introduced into new production areas.
- The fungus enters the plant through the roots, causing vascular tissue obstruction and stem necrosis. It produces toxins that are transported to the leaves, which turn yellow and/or orange. Water from the roots no longer reaches the upper leaves, internal tissues dry out and discolor, and plants wither and die.

Control methods

Losses caused by *Fusarium* can be minimized by:

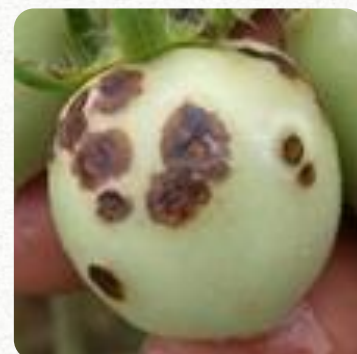
- A long rotation of at least 4 years with a non-host plant.
- It is also important to use healthy certified seed.
- Soaking seedlings in a systemic fungicide before transplanting (Ruffin et al., 2020).
- Avoiding excess nitrogen in mineral fertilization, combined with good organic fertilization.
- However, the most important control measure remains the use of resistant varieties.

MAIN DISEASES (2/5)



Alternariose Spp.

Climate data	Emin	Emax	Pmin	Pmax	TMin	Tmax	Vmin	Vmax
	0.0002	0.0033	0	5.3641	6.1733	34.3980	0.4526	9.5129



Characteristics

- The first signs of the disease can be seen on leaves and flower stalks. Necrotic spots form in concentric rings, often surrounded by a yellow ring;
- Lesions on leaves and fruit form a concave brown area;
- It starts on the leaves, then attacks the stems and finally the fruit during ripening (Adama et al., 2021).

Control methods

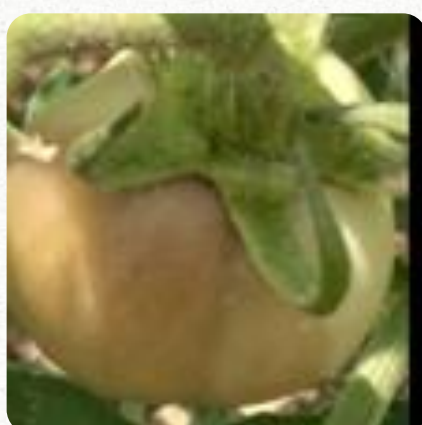
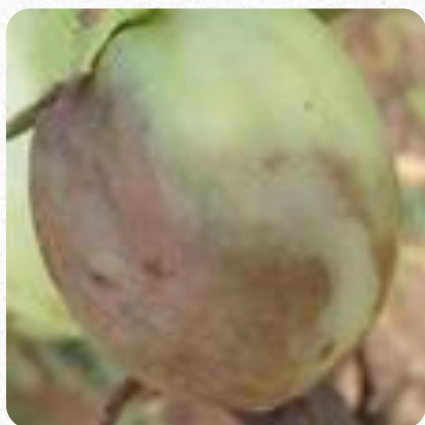
- Cultural practices that can reduce the level of Alternaria infection include sowing clean, uninfected tomato seeds.
- The use of manure or compost also helps control telluric tomato diseases.
- Good field drainage and reduced planting density.
- The use of chemical pesticides based on dithiocarbamate, iprodione, chlorothalonil, fudioxonil, pyraclostrobin or azoxystrobin effectively reduces the severity of the disease.
- However, the use of a single type of fungicide throughout the growing season is not recommended, as it increases plant susceptibility to the disease.
- Biopesticides (*Trichoderma harzianum*) and extracts of garlic (*Allium sativum*) and neem oil (*Azadirachta indica*) in addition to lemongrass and purslane extracts are used (Sirima et al., 2020).
- Commonly used pesticides are Calthio C (25% thiram and 25% Chlorpyrifos-ethyl), Apron Star 45 WS (20% Thiamethoxam, 20% Mefenoxam and 2% Difenoconazole) and Topsin 70 WG (70.4% Thiophanate-methyl).

MAIN DISEASES (3/5)



Downy mildew

Climate data	Emin	Emax	Pmin	Pmax	TMin	Tmax	Vmin	Vmax
	0.0001	0.0026	0	4.9657	28.8028	34.8216	0.7828	3.8764



Characteristics

- Downy mildew is caused by *Peronospora destructor* Berk.
- Fruit losses due to mildew can vary from 30% to 70% when the environment is conducive to the disease.
- Fruits rot and become water-soaked.
- Spores are present in plant debris left on the ground and are easily dispersed by wind and splashing water droplets (Van der Heyden et al., 2020).
- This disease favors secondary attacks by *Alternaria* and *Stemphylium*.

Control methods

- Cultural control involves adopting good cultural practices to reduce pest pressure (good nursery, planting density, irrigation, destruction of crop residues, crop rotation).
- The use of healthy seeds and/or seeds pre-treated with a fungicide.
- Control methods include azoxystrobin, mancozeb, potassium bicarbonate or hydrogen peroxide (Fontem et al., 2006).

MAIN DISEASES (4/5)



Bacterial wilt

Climate data	Emin	Emax	Pmin	Pmax	TMin	Tmax	Vmin	Vmax
	0.0001	0.0026	0	4.9657	28.8028	34.8216	0.7828	3.8764



Characteristics

- Plant wilting and death;
- Browning of conductor vessels (Ruffin et al., 2020).

Control methods

- Use quality seeds;
- Treat seeds with recommended fungicides;
- Destroy plant residues;
- Maintain a long rotation of 3 to 5 years and avoid excess nitrogen (Ruffin et al., 2020).

MAIN DISEASES (5/5)



Blossom end rot

Climate data	Emin	Emax	Pmin	Pmax	TMin	Tmax	Vmin	Vmax
	0.0002	0.0033	0	5.3641	6.1733	34.3980	0.4526	9.5129



Characteristics

- Necrotic spots in concentric rings, often surrounded by a yellow ring;
- Lesions on leaves and fruit form a brown concave zone. It starts with the leaves, then attacks the stems and finally the fruit during ripening (Oumarou et al., 2023).

Control methods

- Use quality seeds;
- Treat seeds with recommended fungicides;
- Destroy plant residues;
- Carry out a long rotation of 3 to 5 years (Oumarou et al., 2023).

CONCLUSION

The brochure presents an inventory of diseases and pests affecting tomato cultivation in the Centre-Ouest, Centre-Sud and Plateau-Central regions, during the wet and dry seasons of the 2022-2023 crop year.

It highlights preventive and curative control methods, helping to boost growers' knowledge of these issues and facilitating the management of tomato pests and diseases in Burkina Faso.

FUNDING

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