Crop Health Guide

Mbere na mbere abahinzi

Contents

General Crop Health Management principles

Introduction:

- Many factors affect crop health, not just diseases and pests!
- Before assuming that a symptom you see in the field is caused by a pest or disease, it is important to consider all the other factors which might have caused the problem
- Also, these other factors, if controlled, can help to prevent pest and disease attacks, because they will make the crops stronger and therefore more resistant to attack
- Field Officers can ask farmers the following questions to see if one of these categories is causing their crop health problem. If it is, then the proper advice to give is also shown.

Soil health

- **Questions:**
  - o Is this field on a slope and does it have erosion problems?
  - o Do crops consistently grow poorly in this field, even if fertilizer is used?
- **Advice:**
  - o Apply a lot of compost, mulch and crop residues to improve soil structure and nutrient content
  - o Apply travertine, lime or ashes to reduce acidity, which also increases nutrients available for plants
  - o Leave field fallow occasionally as part of a good rotation, since crops drain the soil and it needs to "rest"
  - o Plant vegetative barriers and dig diversion ditches for run-off water to reduce erosion

Field selection:

- **Questions**
  - o What did you plant in this field for the past 3 seasons? Did you do proper crop rotation?
  - o Is the crop appropriate for the slope and soil type in your field?
- **Advice:**
  - o Never grow the same crop or crops in the same family 2 seasons in a row. If there is disease or a disease risk then wait even longer between planting the same crop, ideally 2 years or more
  - o Crops like maize and wheat need more nutrients than other crops so should be planted in more fertile fields, if possible
  - o If you have sloped land, consider planting crops like cassava, sweet potato, banana, fruit trees, grevellia or other timber trees, since they have strong root systems which help reduce soil erosion, they don't need to be replanted often so they reduce the need for tillage, and they can often tolerate acidity better than cereals and legumes

Planting method and timing:

- **Questions**
  - o What date did you plant this crop? Was it early or late in the season?
  - o Did you plant in rows? What spacing did you use? What hole depth?
  - o How many different crops are planted in this field and what is the space between them?
- **Advice**
  - o Try to plant earlier in the season, especially for maize and other long-maturing crops
    - Pest and disease pressure is normally lower in number early in the season, so crops planted earlier can become strong before the attacks begin and they are able to resist
    - Crops planted later may not mature before rains stop and can have poor grain or fruit development

- Plant in rows, using appropriate spacing and depth
  - Do not plant seed too deep (it might have trouble germinating) or too shallow (it may wash away in a rainstorm)
  - Consider TUBURA's planting guide; we have done trial to find the spacing which will give the highest yield
  - Plant with wider spacing if you are in a very dry area, because this reduces competition among the crops
- Consider intercropping, though with enough spacing in between the different crops so that they do not compete too much

Inputs:

- **Questions**
  - What type and amount of compost did you apply? How well decomposed was it?
  - What was the source of your seed? How old was it before planting? Was it saved from a field free of disease?
- **Advice**
  - Always apply compost to your field; it will boost yields in the short-term but also soil health and thus yields in the long-term, since it improves soil structure
  - Use well-decomposed compost, ideally a mix of manure and plant matter that has been sitting and decomposing for 3 months or more. If you do use poorly decomposed compost then it might contain bests and diseases and it will also not provide very many nutrients to your crops until it decomposes more
  - Use healthy seed that is not over 1 year old, that has been saved from only healthy plants or purchased from a trusted supplier. Otherwise your seed might contain diseases or be too old to grow well.
  - Apply the appropriate fertilizer type and quantity for you crop, because crops have different needs refer to the TUBURA planting guide
  - Specifically, always apply a planting fertilizer on maize but then also a top-dress fertilizer when the maize has 6-8 leaves. The plant needs a lot of extra N at that time period and won't grow well without it

Weather:

- **Questions**
  - Were there any extreme weather events this season—drought, hail, very heavy rain?
  - How was the rain during planting? At fertilizer top-dress? At flowering?
  - If there was a drought did you do anything to deal with it, like try to provide irrigate any of your crops?
- **Advice**
  - Plant early in the season to avoid problems with drought or heavy rain later
  - Plant fast-maturing crops (vegetables, potatoes) or varieties (PAN 4M21 maize)
  - Plant more perennials or semi-annuals (bananas, trees, manioc) since they are less sensitive to all extreme weather events
  - Irrigate when there is little rainfall, at least during flowering/pollination for all crops and urea application for cereals

Weeds:

- **Questions**
  - How often has the field been weeded this season?
  - What types of weeds do you observe in the field? How many are there?

- **Advice**

  o Do regular weed removal (3+ times per season) to prevent competition with crops for nutrients and water, and because they harbor insects which spread disease

  o Watch our especially for weeds which look like the host plant (they might be in the same family) and Striga (see pg. 14)

Pest & Disease:

- **Questions**

  o Do you have obvious signs of pests—presence of specific insects, birds or rodents in your field, holes in the plant where is has been chewed, eggs or droppings?

  o What type of disease do you have (after identifying from photos in this guide?): a fungal, viral or bacterial disease?

  o Did this field have a problem with the same pest or disease in the past? Did other fields around it have the same problem, in the past or today?

- **Advice:**

  o Scare birds away by being in the field often, especially in the morning, and making noise

  o Make traps for rodents

  o Consider different methods for controlling insect pests including physically removing and killing the insects, applying natural pesticides like ash + pilipili (see recipe below), applying chemical pesticide

  o Always plant seed only from plants, and ideally fields, which had no disease

  o Be careful during cultivation with a hoe no to damage plant roots, especially early in the season, because damages roots are likely to get infected with soil-borne diseases

  o For viral diseases

  - There are no chemicals that help to deal with this type of disease
  - Once a plant is infected with a virus you cannot do anything and must uproot and destroy it
  - These are often spread by insects, so controlling insects is crucial
  - If possible you should plant a tolerant or resistant variety, but these do not exist for all diseases

  o For fungal diseases:

  - Plant with wider spacing or thin plants to reduce water on the leaves; do proper staking of climbing beans, tomatoes, other vine plants to increase air flow
  - Plant with mulch to reduce splashing of soil onto the plants
  - Consider application of fungicides like Dithane (Mancozeb), Ridomil (Metalaxyl + Mancozeb), Benomyl (Benlate), Copper Oxychloride.
  - Where disease risk is high, like in wet areas, begin applying fungicide even before you see disease symptoms

  o Bacterial diseases:

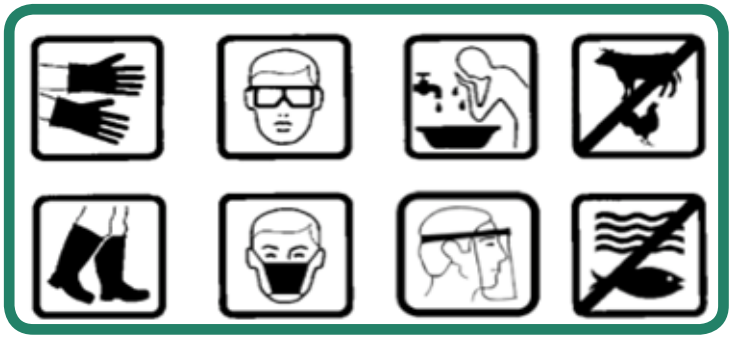
  - There are no chemicals that help to deal with this type of disease
  - This is probably the most difficult type of disease to get rid of once it appears, because the bacteria can live for a long time on residues and in the soil, so prevention is very crucial
  - Sterilize tools and even your boots after working in your field, or you can easily spread these diseases from one plant or field to another
  - When infected plants are identified they must be uprooted and destroyed (burned or fed to livestock, not composted, or the bacteria might remain in the compost and cause a new infection)

Ash-Pilipili Natural Pesticide

- Buy chili powder or pick ripe chilis from your own garden
- Dry the chili and make a powder by either grinding or pounding.
- Collect cold wood ash from the fireplace (remove large pieces)
- Mix 2 mironko of ash with 5 bottle caps of pepper powder
- Put the mixture in an old plastic bottle with small holes cut in the bottom
- Sprinkle directly onto attacked part of plant
- Repeat over several days if needed

Tips for Safe Pesticide Use

- Remember that pesticide is a poison! It can kill bad insects or fungus, but it can also hurt people, livestock and good insects like bees if you are not careful
- Store pesticides in a cool place, closed tightly, keep away from children and animals
- Never touch pesticide directly with your hands!
  - If you accidentally touch pesticide wash your hands or affected body part immediately
  - If you get pesticide in your eyes wash with cold water for 15 minutes
- During both mixing and spraying wear protective clothing
  - Gloves, long sleeves, pants and boots are crucial
  - Ideally you should also wear a mask to cover your mouth and eyes
- If possible, apply pesticide using a pump
  - This is not only safer, but it helps you to use less quantity of pesticide and save money
  - If you have no pump, use long grasses, at least 80 cm long, to reduce risk of touching the pesticide
- Be careful during pesticide application:
  - Do not apply fungicide if you plan to harvest within 10 days or less
  - Do not apply insecticide if you plan to harvest within 32 days or less
  - Keep anyone without protective gear away from the field, especially children and animals
  - Do not spray against the wind—it might fly back and hit you!
  - Do not spray during flowering or when bees are very active in the field, you might kill them and reduce your yields because of low pollination
  - Try to spray when you do not expect rain in the next 8-10 hours, so the pesticide won't be washed away immediately
  - Don't spray if your field is very close to a river or lake, since pesticide can get into it and someone might drink it later and become sick
- After application:
  - Wash all your clothes and your body with soap as soon as possible
  - Rinse out the sprayer or bucket you used 3 times
  - Dispose of any excess liquid in a safe area, away from rivers, lakes and animals
  - Do not let anyone walk in the field where you applied pesticide for 2 full days after application



Maize

Note: Sorghum, wheat, sugarcane and rice are in the same family and thus affected by similar problems

Nutrient Deficiency*

*Important nutrients lacking in the soil due to untreated acidity, erosion which has reduced soil quality, inadequate compost application, inadequate fertilizer application. These photos show maize as an example, but other crops can also have this problem, and symptoms will be somewhat similar

Nitrogen (N)

Symptoms:

- Pale green or yellow young plants, often stunted
- Dramatic yellowing of leaves on older plants, especially concentrated in the center of leaf
- Cobs with tips lacking grain

Prevention or Treatment:

- Use correct, adequate fertilizer at the right time (DAP at planting, Urea top-dress at 6-8 leaf stage)
- Apply compost and travertine at planting, they help plant to take up N
- Do good crop rotation—skip other cereal crops for at least 1 season. Best to plant legumes next, which add N to soil

Phosphorous (P)

Symptoms:

- Plants stunted, leaves have purple discoloration
- At high altitudes maize often looks purple closer to maturity; this is not P deficiency and is usually not a problem

Prevention or Treatment:

- DAP contains this nutrient; make sure to apply it at planting

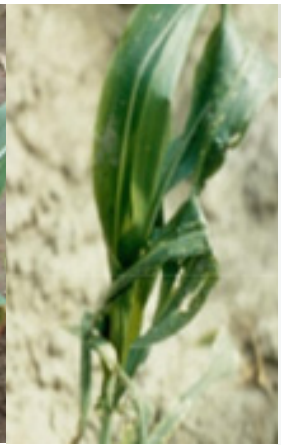
Potassium (K)

Symptoms:

- Leaves yellowing and drying from the outside edges (reverse of N deficiency, which starts in center)

Prevention or Treatment:

- Apply good-quality compost
- Consider applying a fertilizer with K, like NPK 17 or KCl



Calcium (Ca)

Symptoms:

- Leaf tips have light green or white spots
- Leaves hooked, folded, stuck together, especially young leaves
- Leaf edges weak, rip easily

Prevention or Treatment: Apply travertine or lime

Magnesium (Mg)

Symptoms:

- Distinct yellow and green striping on leaves.
- Be careful not to confuse with MSV (pg. 12)

Prevention or Treatment: Apply lime or travertine, especially dolomitic lime

Sulfur (S)

- Pale green upper leaves, dark green lower leaves
- Yellowing of leaves between the veins

Copper (Cu)

- Stems soft and weak, new leaves emerge yellow

Bore (B)

- Leaves have strange, bumpy texture

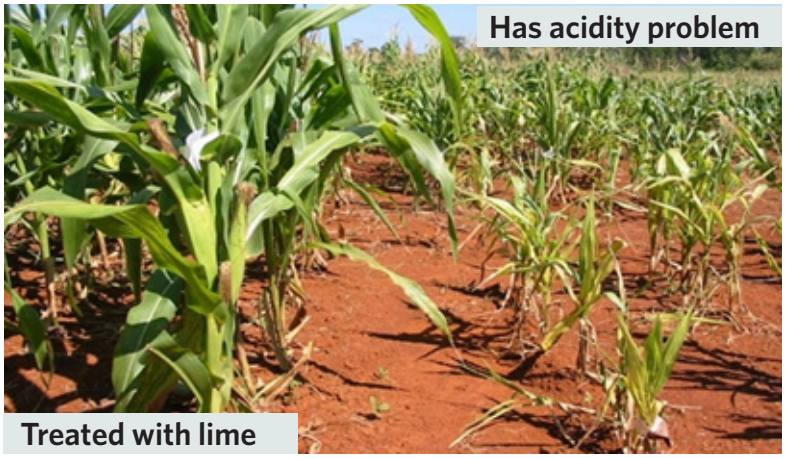
Prevention or Treatment for S, Zn, B or Cu deficiency:

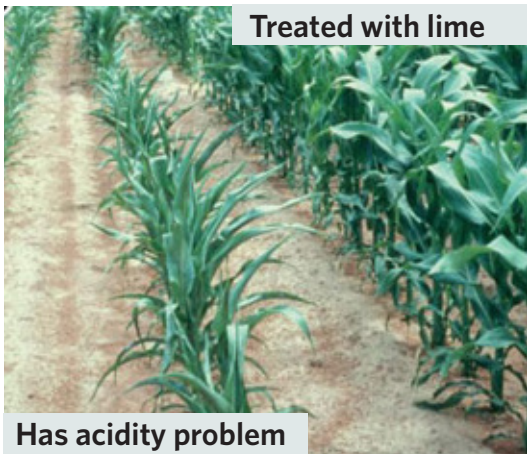
- Use higher quantity, better quality compost—compost often contains these micronutrients
- Consider a special fertilizer with the nutrient that you need added
- Retain maize residues in the field if they are disease-free
- Apply lime or travertine to reduce acidity, as this will make micronutrients more available to plants

Soil Acidity

Symptoms:

- Acidity in the soil causes many other problems, like nutrient deficiency (especially of N, P, K, Ca, Mg and S) and increased risk from drought because root systems are weak
- That means the symptoms of acidity are often the same as these other problems
- When acidity weakens plants it also makes them more susceptible to pest and disease attack
- Generally you probably have an acidity problem if:
  - Plants grow poorly, have yellow leaves and are weak
  - This problem persists despite the application of fertilizers
  - Often it is most common in areas with high rainfall and on steep slopes





Prevention or Treatment:

- Always apply a lot of organic matter to the soil (manure, compost, crop residues, mulch)
- Make efforts to reduce soil erosion, like planting grass barriers or digging ditches to divert run-off
- Do good crop rotation with different families of crops, and leave the field fallow every few years if possible
- Apply lime or travertine (5 kg/are in the planting hole or 25 kg/are broadcast)
- Apply ashes in your field (whatever quantity is available, broadcast)

Drought Stress

Symptoms:

- There was a lack of rain at a key time in the plant growth cycle, especially at urea application or flowering/pollination
- Leaves are rolling up, lower leaves are dried
- Plants are severely stunted
- Lack of water prevents nutrient uptake, so you can begin to see other nutrient deficiency signs as well, especially N and K deficiency
- Cobs very small and grains poorly formed

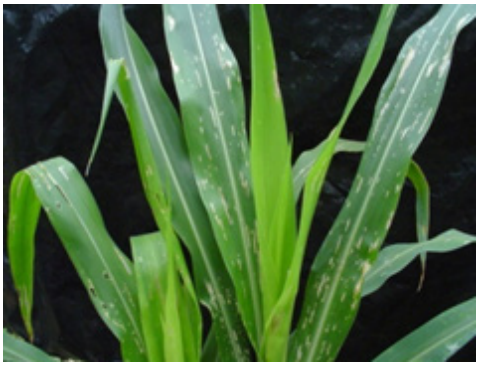
Prevention or Treatment:

- Plant earlier in the season and try to plant fast-maturing varieties
- Maintain groundcover, using intercrops or mulch, to keep soil moist
- Irrigate at key stages of growth if there is no rain: at time of urea application and during flowering/pollination
- In areas with common drought, plant with wider spacing

Stem Borer

Symptoms:

- First sign is usually white spots on leaves
- Another early sign is holes in leaf in a clear line, as leaf opens
- Later- holes in the stems or leaves completely wrinkled and chewed-up looking
- This happens when the borer enters the maize stalk; you should try to prevent that from happening using early control methods
- You may also see the caterpillar, which is pink in color, around 3 cm long



Prevention:

- Plant maize earlier in the season
- You can consider planting Napier grass (urubingo) on field edges to draw insects away, and intercropping with desmodium, which repels the insects
- Destroy any infected residues
- Do good crop rotation—skip at least one season before planting maize, sorghum, wheat, or sugarcane in the same fields even before you have an infection, and if you have an infection skip 3 seasons

Treatment:

- Begin treatment when you first start to see the holes in the leaves, before they get into the stem
- Concentrate application of any pesticide on the funnel at center of the stalk, where the leaves emerge
- You can consider natural pesticides like soapy water or ash-pilipili mix if you have no chemicals
- Chemical application is strongly recommended because this pest can be so destructive
- The best is Rocket (Cypermethrin + Profenofos), followed by Cypermethrin
- - 3 Fanta caps/20 liters of water, spray affected plants and those nearby
- Other chemicals to consider are Azadirachtin, Lambda-cyhalothrin (Lamdex, Lamdagreen, Lamdaline) and Imidacloprid (Confidor)

Maize Streak Virus (MSV)

Symptoms:

- Thin lines of pale yellow or white on the leaves
- Once infected these young plants will not yield any cobs and will probably die
- Plants affected later in the season, especially after cob formation, will see little to no yield loss
- Be careful not to confuse with Magnesium deficiency (see pg 9

Prevention:

- Plant varieties tolerant of the disease, like PAN 4M21
- Keep the field clear of weeds, which harbor the leafhoppers which spread this disease
- Do good crop rotation—skip at least one season before planting maize, sorghum, wheat, or sugarcane in the same fields even before you have an infection, and if you have an infection skip 3 seasons

Treatment:

- Once infected, you cannot cure an individual plant
- Remove all young infected plants from the field and destroy them (burn or feed to livestock, do not compost), so they cannot spread the disease
- No chemical is recommended here, even for leafhopper control

Northern Corn Leaf Blight

Symptoms:

- Oval-shaped gray or brown lesions develop on the leaves
- It is caused by a fungus which spreads by contact with infected plants and plant residues
- Warm temperatures and wet conditions make it worse
- Only worry if there is a heavy infection in your field before flowering and cob formation; after that it is not a problem

Prevention:

- Plant early in the season
- Plant tolerant varieties like PAN 4M21
- Destroy infected residues after harvest
- Do good crop rotation—skip at least one season before planting maize, sorghum, wheat, or sugarcane in the same fields even before you have an infection, and if you have an infection skip 3 seasons

Treatment:

- No need to do anything if infection is mild or comes later in the season
- If severe, you can apply a fungicide like Benomyl (Benlate), Metalaxyl (Apron Xl) or Mancozeb (Dithane). Use 20 g (1 heaped spoon) per 20 liters of water to spray 1 are

Maize Lethal Necrosis Diseases (MLND)

Symptoms:

- Difficult to identify because early on it looks similar to other maize problems like N deficiency, MSV, and drought
- Leaves yellowing from the center of the maize plant outward
- Drying of the leaf edges
- Maize flowers and cobs drying up prematurely
- Cobs with very poor grain formation
- When very severe the plant decays and smells rotten






Prevention:

- Plant early in the season, right when rains begin
- Do good crop rotation—skip at least one season before planting maize, sorghum, wheat, or sugarcane in the same fields even before you have an infection, and if you have an infection skip 3 seasons
- Destroy any infected residues at the end of the season
- Avoid planting too much maize in B season, when the risk is higher
- Do good weeding to reduce insect attacks in your field
- Control thirps and beetles if you see them in the field, because they spread the viruses which cause this disease
  - Can use Cypermethrin, Rocket, Dudu Cyper, Lambda-cyhalothrin or Imidachloprid
  - Apply 6-10 mL (2-3 Fanta caps) of pesticide per 20 L water for around 1 are, depending on the level of attack

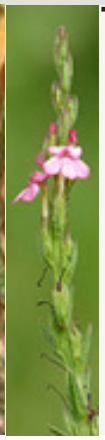
Treatment:

- If you can clearly identify an infected plant early, uproot it and destroy immediately (Do not compost! Burn or feed to livestock, unless very rotten, then it is unhealthy for them)
- If you identify close to harvest, go ahead and harvest the maize cobs but then destroy the residues

Striga Weed

Symptoms:

- A weed with purple, pink or white flowers growing among a field of maize or sorghum; increasingly common in Eastern Province
- The weed attaches to the roots of the crop and sucks out nutrients, reducing yields

Treatment & Prevention:

- Pull out this weeds as soon as it appears, before flowering
- Apply high quantity of compost and correct fertilizer; this will reduce the risk of Striga
- Intercrop with desmodium —the striga will attack it instead of the maize

Wheat

Rust

Symptoms:

- Flour Spot of different color upper leaves
- Leaves with serious problem dried.
- This disease is always exist in high whether condition mixed with cold of between 16-22 degree and the attached crop always have poor grain

Prevention & Treatment:

- Plant resistant seed and on time.
- Apply chemical on seed like Thiram
- Do a good rotation
- Made a pile of residues.
- Apply some of those chemical :
  - Azoxystrobin (Othello): g 50/20L of water
  - Tebuconazole like Orius: g 20/20L of water
  - Copper Oxychloride (Nordox, Funguran): g 30/ 20L of water

Septoria Tritici Blotch (STB)

Symptoms:

- The main symptoms are grey lesions deformed and on the extreme of the lesions are dark.
- The disease is always start on old leaves
- If the disease exist in the field before planting there are high risk of total loss.
- Its normal decrease the yield of wheat.
- This disease always exists in the drought.

Prevention & Treatment:

- Plant resistant seed and on time.
- Apply chemical on seed like Thiram
- Do a good rotation
- Made a pile of residues.
- Apply chemical on seed : Thiram 80%
- Mix 2 g of chemical (Thiram) 1 kg of seed.

Grain weevils

Symptoms:

- These insects suck on the coffee grain and made eggs inside coffee grain the larvae grow in
- Can cause blackening of flower buds, fall of immature berries, rotting of beans within the coffee grain and eaten the corps of grain.
- Some grain weevils and lavers eat broken and damaged grain

Prevention & Treatment:

- Cleaning the store.
- Using good bags for storage: PICS
- Apply chemical on grain using Malathion + Permethrin (like Super Scanner)
- Mix 2.5g of chemical (malathion +permethrin) in 1 kg of seed .

Rice

Blast Fungus

Symptoms:

- Grey or white lesions, often diamond shaped, form on leaves
- Dead tissue develops in a border around the lesions
- If affected later in the season the necks weaken and grains droop
- Even a later season infection can cause 100% losses

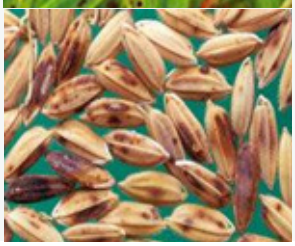
Prevention & Treatment:

- Sow seeds early, though after the onset of rains
- Apply N fertilizer in split applications; applying too much at once can make blast worse
- Flood the field as often as possible
- Apply a fungicide at the time of heading. For 1 are:
  - Tricyclazole (20 g/20 L water)
  - OR Carbendazim (60 g/20 L water)
  - OR Iprobenfos (10 mL/20 L water)
- Apply 3 times at 10 day intervals

Brown Spot/Helminthosporium

Symptoms:

- Brown spots on the leaves; easy to confuse with blast, but spots are usually smaller
- Later, brown spots on grains
- Common in poorly-drained and low-fertility soils and when not enough fertilizer is applied
- Fungus spores spread by wind or physical contact
- Attack can happen at any stage of plant growth



Prevention & Treatment:

- Remove infected plants and weeds
- Plant seeds from healthy plants and treat seed before planting with hot water or benomyl fungicide
- If you have a severe infection, spray the field with fungicide.
- For 1 are:
  - Mancozeb (Dithane) (40 g/20 L water)
  - OR Tricyclazole (20 g/20 L water)

Rice Fly

Symptoms:

- This insect lays eggs and the larvae eat the leaves of rice plants
- Symptoms looks similar to stem borer in maize: white dots on leaves, holes on leaves

Prevention & Treatment:

- Do good weeding
- Burn residues after harvest
- Spray with Rocket (Cypermethrin + Profinofos) or Cypermethrtin: 4 Fanta caps per 20 L water for 1 are

Birds

Prevention & Treatment:

- Can be a big problem between grain formation and harvest, eating 30% or more of the grains
- Visit your rice field often, especially in the morning and evening, to scare birds away by making loud noises
- Consider putting shiny cassette tape or other materials in the field or building a scarecrow

Bean

Anthracnose Fungus

Symptoms:

- Germination, seedlings die back
- Veins on underside of leaf turn red then black
- Red-brown streaks develop on stems, leaves
- Black-red craters develop on pods




Fusarium Root Rot Fungus

Symptoms:

- Seedlings growing poorly, wilt, die back early
- When you uproot the plants you see that roots are developing poorly and are black, rotting



Aschochyta Fungus

Symptoms:

- Large concentric circles of dead tissue develop on the leaves
- Brown, dead sections develop on the pods



Angular Leaf Spot Fungus

Symptoms:

- Small lesions develop on the leaves and stems, usually grey or light brown at the beginning
- Later the tissues begin to die and get larger, by 9 days often they have a distinct angular shape



All Bean Fungal Diseases:

Prevention:

- Plant a variety resistant to the diseases; maybe improved varieties introduced by RAB are resistant
- Plant only clean seed, from a trusted supplier or harvested from plants with no disease
- Do good crop rotation: skip at least 1 season between legumes before infection and 3 seasons if you have seen an infection
- Do not plant seed too deeply, use wider spacing, use a lot of stakes for climbing beans
- When using a hoe to weed be careful not to damage roots, it increases infection risk
- Avoid walking in your field and especially weeding when the soil is wet
- Apply mulch in field to reduce splashing of soil on the plants by rain
- Clean tools between work in different bean fields

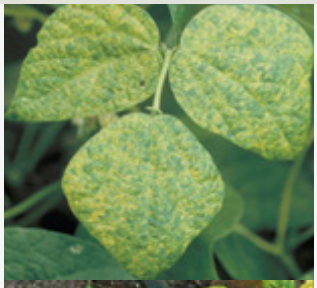
Treatment:

- Remove infected plant residues and destroy (feed to cow or burn)
- Dig small ditches in the field to drain water
- Do "hilling" near base of plants to stimulate healthy root growth
- Replant the seed, maybe at a shallower depth
- If severe, you can apply a fungicide. The best is Benomyl (Benlate). Use 20 g (1 heaped spoon) per 20 liters of water to spray 1 are

Bean Mosaic Virus

Symptoms:

- Mottle or mosaic pattern on leaves of light and dark green patches
- Is only serious problem if affects larger proportion of plants before pod formation




Prevention & Treatment

- Uproot any infected plants that you see and destroy
- Control aphids, which spread the virus
- Do good crop rotation: skip at least 1 season between legumes before infection and 3 seasons if you have seen an infection
- Plant resistant varieties

Common Bean Blight Bacteria

Symptoms:

- Dark angular patches develop on the leaves
- They develop yellow edges and grow to form large dead patches

Prevention & Treatment

- Consider same prevention recommendations as for Fungal diseases (previous page)
- Uproot and destroy all infected plants
- Do good crop rotation: skip at least 1 season between legumes before infection and 3 seasons if you have seen an infection
- Be careful to plant only seed from disease-free plants

Bean Fly

Symptoms:

- The first sign is small yellow spots on the leaves
- Flies lay eggs on the leaves and when they hatch maggots travel down to the stem and begin eating
- This causes the base of the stem to swell and crack and prevents root formation
- At this point plants may wilt and begin dying

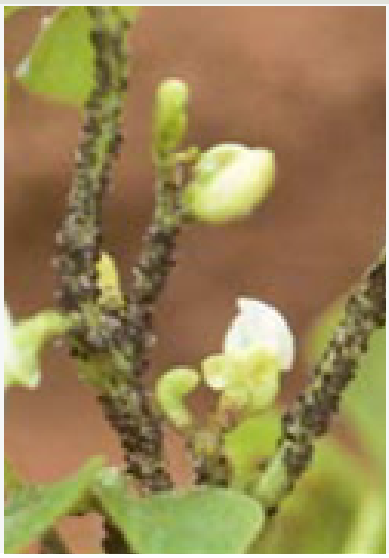
Treatment:

- Build up the soil around the base of the plants to promote growth of new, strong roots
- If you have a very severe infection you can apply Cypermethrin or Imidaclo-prid, 1 ½ Fanta caps in 10 liters of water per are

Aphids

Symptoms:

- Small black insects clustered on underside of bean leaves and bases of stems
- Only worry if there is a very severe infestation before or during flowering. They can re-duce yields directly and spread mosaic virus
- Infestations later in the season will not reduce yields



Treatment

- Apply a pilipili-ash mixture, soapy water, or water mixed with urine
- OR Apply Cypermethrin or Imidacloprid: 1 ½ Fanta caps in 10 liters of water per are
- You might not need to spray at all; only do so in cases of severe infection or if you have high virus pressure in your area

Soybean

Rust

Symptoms:

- The symptoms are found mainly on the underside of the leaf and can become surrounded by a circle of chlorosis.
- Attached leafs had small flour dark red specks under the leaf epidermis, and rust colored pustules.
- Attached leafs had also yellow specks at the top of the leaf and defoliation have also been reported

Treatment

- Plant selected seed.
- Use tolerant varieties.
- Apply chemical on seed like Carbendazim.
- If the soybean was attached use chemical like Azoxystrobin or Benomyl.
- Carbendazim: 800 g/1 kg of seed
- Azoxystrobin: 10gr/20L of water
- Benomyl: 20g/20L of water

Mosaic Virus

Symptoms:

- Leaves curl up become deformed leaves
- When the disease severe the plant is stunted

Treatment

- Plant seed only from healthy plants
- Do good crop rotation—avoid planting plants in this family (bean, soybean, groundnuts) in same field for 2 years
- After germination during first weeding, pile soil around the base of the plant roots in a hill
- You should uproot the attacked plant immediately, in order to fight transmission of virus.

Armyworm

Symptoms:

- Attached plant by caterpillar, results in very tattered-looking leaves with all but the main veins being consumed
- The caterpillar may make a small shelter for itself, attaching leaves to one another; they will look like they have been tied with thread
- You may see the symptoms in flowering period and in too much sun.

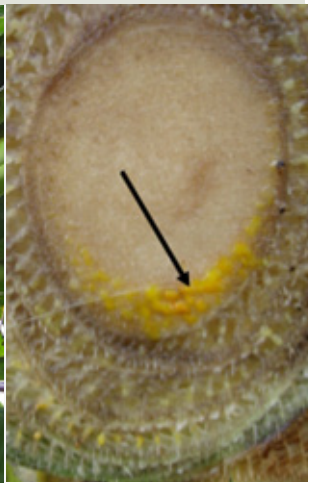
Treatment

- Plant on time.
- Apply pesticides like:
  - Cypermethrin or Rocket: 20 mL/20 L of water.
  - Lamda-Cyhalothrin: 20 ml/20 L of water
  - Azadirachtin: 20 ml/20 L of water
  - Acetamiprid: 10ml/ 20L of water

Banana Xanthomas Wilt (BXW) Bacteria

Symptoms:

- Leaves yellow and wilt too early
- Fruits mature and turn yellow too early and in an uneven way
- When cut the stem may release a yellow ooze
- The male flower may wilt and rot



Prevention:

- Do not plant bananas in an area with a lot of this disease in the present or recent past. A plant might be infected and not yet be showing symptoms
- Plant only banana suckers taken from disease-free plants; better to use laboratory plants or those brought in from a region where the disease does not exist
- If you have a severe infection you should clear-cut the diseased plants, plant a legume crop for 6 months, and only consider replanting bananas after that time
- Always purify your machetes and other tools after using them on a banana plant before moving to another, since the disease can spread by contact with liquid from an infected plant:

  - Apply JIK on a rag and wipe all parts of the blade

  - OR hold each part of the blade in the fires for 10 seconds
- Remove the male flower immediately after fruit formation is complete, using a forked stick, to reduce risk of transfer by bees
- Unfortunately there are not varieties resistant to this disease; even FHIA 25 and FHIA 17 are susceptible

Treatment:

- Once infected there is nothing you can do to save the banana mat. Even if just one stem is infected, the others will become infected as well in the next few months.
- You should uproot the entire mat immediately and destroy it (feed to livestock, burn anything remaining)

Fusarium Wilt Fungus

Symptoms:

- Leaves turn bright yellow and droop down; looks like the plant is wearing a yellow "skirt"
- When cut open, the stem has dark, discolored stripes
- Once infected the mat will not give fruits
- Eventually the plant will dry up completely and die




Prevention:

- Never plant a banana sucker from a mat which had this disease or was in a field near an infected plant; even if the particular sucker has no symptoms it is very likely to be infected
- Never take suckers from a cell with the infection and plant in a cell without the infection; even if you think the plant is not diseased it might be, and then you will carry the disease to a new area
- Avoid growing banana varieties that are particularly susceptible: Kamaramasenge, Gros Michel, Kisubi, Kayinja
- Consider planting resistant varieties. This includes FHIA 17, FHIA 25, Cavendish, and many common highland beer and cooking varieties
- Consider buying tissue culture plants grown in a laboratory (FAIM and TUBURA both sell these)

Treatment:

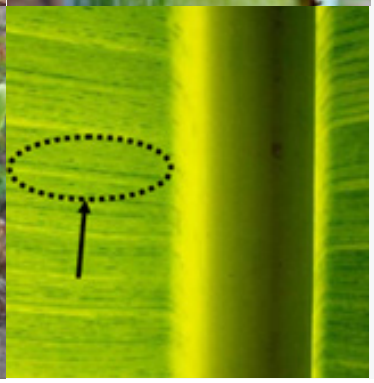
- Once infected there is nothing you can do to save the banana mat. Even if just one stem is infected, the others will become infected as well in the next few months.
- You should uproot the entire mat immediately, including all its suckers, and destroy it (feed to livestock, burn anything remaining)

Banana Bunchy Top Virus (BBTV)

Symptoms:

- If infected early, a plant or sucker will not grow normally but will instead be stunted and develop many an excess of leaves, such that it looks like a "bouquet"
- Sometimes the margins of the leaves will turn white and bleached-looking
- If an older plants gets the infection it will not have the characteristic "bouquet" appearance
- In these more mature plants symptoms will be dark rectangular spots on the lower stem and petiole, as well as dark and light green striping on the leaves
- This disease is less severe than BXW and Fusarium in most of Rwanda, but has appeared in Bugarama valley



Prevention:

- Never plant a banana sucker from a mat which had this disease or was in a field near an infected plant
- Control aphids, which spread the disease, by applying a pilipili-ash mixture, soapy water, or urine mixed with water or Cypermethrin in case of a very bad attack

Treatment:

- Once infected there is nothing you can do to save the banana mat. Even if just one stem is infected, the others will become infected as well in the next few months.
- You should uproot the entire mat immediately, including all its suckers, and destroy it (feed to livestock, burn anything remaining)

Banana Weevil

Symptoms:

- Adult insects are black insects which lay eggs at the base of the bananas stem
- Larvae hatch and burrow into the corm, forming tunnels
- This can cause stunted growth, reduced suckering and death of suckers.
- Severe damage can cause the stem to snap, especially on plants with flowers or in high wind

Prevention & Treatment:

- After harvest chop old stems into small pieces and spread out so weevils cannot breed inside
- Cut a stem in half and lay face down. Beetles will move underneath and you can collect and kill them

Cassava

Cassava Mosaic Virus

Symptoms:

- Mottle or mosaic pattern of white or yellow patches develop on the leaves
- Leaves become wrinkled, textured, and bumpy
- Affects all leaves, not just those on the bottom of the plant

Prevention & Treatment:

- Check your field 2+ times per week, uproot infected plants and destroy
- Especially important to control in first 2-3 weeks after planting
- Only take cuttings from disease-free plants
- Plant resistant varieties like Cyizere, Garunkusubire, Seruseke, Ndamirabana, Mbakungahaze, or Mavoka
- Boil cuttings before planting
- Control whiteflies, which spread the disease, by applying soapy water; best in late afternoon

Cassava Brown Streak Virus

Symptoms:

- Leaves develop a yellow mosaic pattern but texture still smooth
- This pattern will be more distinct on older, bottom leaves than on younger ones on top of the plant
- Large sections inside the tubers become brown and rotten

Prevention and Treatment:

- Only plant cuttings taken from disease-free plants
- Plant resistant varieties like Nase 14 or tolerant ones like Garunkusubire
- Control aphids, mites and whiteflies which spread the disease
- Uproot and destroy plants with symptoms
- Harvest early to prevent further spread of the disease and losses to tuber rotting
- Note: Soil moisture does not cause this disease!

Mealy Bugs

Symptoms:

- Observation of soft, white insects on the leaves. They especially attack young leaves
- If attack is severe the plants become stunted and leaves begin to wilt and fall off

Prevention and Treatment:

- Plant on time
- Only plant cuttings taken from disease-free plan
- Boil cutting in water at 60°C in 20min before planting.
- You should uproot the entire cassava immediately and destroy it, put it in deeper holes and cover with soil at least of 50cm.

Potato, Tomato, Eggplant, Hot Pepper, Green Pepper

Bacterial Wilt

Crops Affected: Potatoes, tomatoes, eggplant and peppers

Symptoms:

- Plants begin showing signs of wilting in the evening but recovering by morning, starting with the youngest leaves
- Eventually the plants do not recover and a permanently wilted and yellowed
- Tubers of affected potato plants have a brown ring when cut open and the outside may develop soft, rotten spots
- Tubers may be infected but not show signs immediately, symptoms may develop several weeks after sprouting

Potato symptoms

Tomato symptoms

Pepper symptoms

Eggplant symptoms

Prevention:

- Be careful when walking in your field and weeding, this might spread the disease. Clean your tools and shoes
- Plant with wider spacing- 80 cm x 30 cm
- Apply lime or travertine (25 kg/are) to your field every 2 years
- On tomatoes: consider applying urea top-dress, it can reduce the disease(one Fanta cup of urea adding to NPK)
- Do good crop rotation: skip at least 1 season between another crop in this family (potato, pepper, eggplant, tomato) before infection and 3 seasons if you have seen an infection
- Only plant seed saved from fields without this disease. For potatoes, carefully select and only plant tubers with no signs of the disease (small soft or rotting spots)

Treatment

- Once a plant is infected there is nothing you can do, and no pesticide can fight the disease
- Reduce the spread of the disease by uprooting and destroying infected plants immediately
- No chemical will help

Late Blight Fungus

Crops Affected: Potatoes, tomatoes, eggplant and peppers

Symptoms:

- Leaves develop light gray spots that look "wet." These may develop yellow edges, then the tissues will begin to die
- Growing points and stems may also turn gray or brown and die back
- Tubers of affected potato plants will turn darker the outside and become brown and dry on the inside
- Fruit of infected tomatoes, peppers and eggplant will develop large brown and white rotten spots

Potato symptoms




Tomato symptoms



Prevention

- Symptoms are more likely to become apparent later in the season, but at that point it will be too late. You need to take preventative measures from the beginning of the season.
- Do good crop rotation: skip at least 1 season between another crop in this family (potato, pepper, eggplant, tomato) before infection and 3 seasons if you have seen an infection
- Only plant seed saved from fields without this disease and carefully select tubers without symptoms
- Plant later in the season, near the end of the rains, like in April
- Consider planting resistant varieties of potato like Kirundo, Kinigi, Mabondo, Victoria
- Plant with wider spacing, thin plants, and do weeding often to increase airflow in the field.
- Pile dirt around the base of the plants at each weeding to improve drainage and stimulate healthy root growth
- Begin spraying the crop with a fungicide even before infection, to prevent the disease:
  - Spray with Mancozeb (Dithane), 40 g or 2 heaping spoons per 20 liters water for 1 are
  - Begin spraying 2 weeks after germination. Spray 1 time per 1-3 weeks, more frequently if rains heavy

Treatment

- Continue spraying with fungicide each week. You can continue with Dithane, but it is better to switch to Metalaxyl + Mancozeb (Ridomil) if possible (same dose)
- Uproot and destroy infected plants; in a field with a lot of infection destroy all residues at the end of the season

Anthracnose Fungus

Crops Affected: Tomatoes, eggplant and peppers

Symptoms: Infection appears on the fruits in the form of black and grey sunken lesions

Prevention (similar to Late Blight):

- Mulch the field to reduce soil splashing on the plants
- Plant at wider spacing or thin the plants
- Make sure that fruits never come in direct contact with the soil (staking can help with this)
- Only plant seed saved from plants free of disease, and plant in a well-drained field (like on a small slope)
- Do good crop rotation: skip at least 1 season between another crop in this family (potato, pepper, eggplant, tomato) before infection and 3 seasons if you have seen an infection
- Do not touch plants when they are wet and if you irrigate do not apply water to fruits and leaves
- Be careful at weeding not to touch the roots or stems, sterilizer your tools
- Destroy residues at the end of the season if there was any infection in the field
- Consider preventative spraying with Mancozeb if you there is a lot of rain

Treatment:

- Collect infected fruits and destroy them (do not leave in the field, do not put in compost)
- If the disease is common in your area and you expect an infection:
  - Spray with Mancozeb (Dithane), 40 g or 2 heaping spoons per 20 liters water for 1 are
  - Begin spraying 2-4 weeks after germination. Spray 1 time per week for the full season if possible
- If you see symptoms spray with Metalaxyl + Mancozeb (Ridomil) if you can, or continue with Dithane (same dose)

Bacterial Spot

Crops Affected: Tomatoes and peppers

Symptoms:

- Small yellow-green lesions develop on leaves, later becoming larger and turning a tan or brown red color
- Spots are usually angular in shape, not round
- Small grey spots also develop on fruits

Prevention & Treatment:

- Plant only seed from disease-free plants or from a trusted seed vendor
- Do good crop rotation: skip at least 1 season between another crop in this family (potato, pepper, eggplant, tomato) before infection and 3 seasons if you have seen an infection + destroy infected residues
- Disease is worst in warm, wet areas; under these conditions and if there is a history of the disease, consider preventative spraying with a copper-based chemical (Copper Oxychloride, Nordox, Funguran)

Leafroll virus

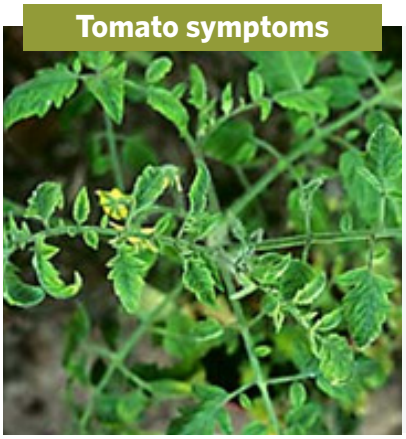
Crops Affected: Potato, tomato, eggplant, pepper

Symptoms:

- Starting with the youngest plant leaves, edges of leaves start to curl inward toward the center of the leaf
- Yellowing or whitening of the leaves my also occur, beginning from the edges

Potato symptoms

Tomato symptoms



Prevention and treatment:

- Plant only seed from disease-free plants or from a trusted seed vendor
- Destroy infected residues
- Do good crop rotation
- Plant onions in the field with you crop or next season; they repel aphids
- Control aphids, which spread the disease, with an ash-pilipili mixture, soapy water, or Cypertmethrin

Leafminer

Crops Affected: Potato, tomato

Symptoms:

- Adult lays eggs in leaf, larva hatches
- Pales lines show up on the leaf where the larva is tunneling

Prevention and Treatment

- Fertilize well- strong plants resist attack
- Destroy infected residues and weeds
- Do good crop rotation
- Plant carrots in the field next season; leafminers don't like them
- When you see a tunnel, pinch the leaf between your fingers along the tunnel length to kill the larva
- Do not spray with an insecticide- they will kill bugs that eat leafminers and none in Rwanda kill leafminers

Cutworms

Crops Affected: Potato, tomato, eggplant, pepper

Symptoms:

- Plants eaten across at the base, or under the soil
- Presence of black or tan larvae in the field
- If infection persists and is severe, worms can also start eating potato tubers

Prevention and Treatment:

- Clear grasses from field edges 10 days before planting
- Do good weeding during
- Inspect the field in early morning, shaking plants to remove worms and kill them
- If severe, consider spraying Methomyl, 15 mL in 1 liter water for 1 are

Cabbage

Cabbage Butterfly/Pieris

Symptoms:

- White butterflies present in the field
- Groups of small yellow eggs on leaves
- Yellow and black caterpillars present on the plants
- Holes in leaves, especially on leaf edges, as caterpillars begin to feed
- In case of a severe infection they can defoliate the entire plant

Prevention:

- Do good weeding of your field

Treatment:

- In the mornings walk around looking at your field, inspecting the cabbage leaves for eggs and caterpillars. If you find them, remove by hand and kill them.
- Consider applying a natural pesticide made with leaves from tomato, potato, eggplant or peppers:
  - Take 1 kg of leaves and rip them into small pieces, mix with 10 liters of water
  - Allow the mixture to sit for 2 full days, then strain out the leaves from the liquid
  - Spray or hand-apply the liquid on 1 are of cabbage

  In case of a very severe infection, apply chemical pesticides containing Pyrethrin, Cypermethrin, Rocket (Cypermethrin + Profinofos) or Lambda-cyhalothrin (Lamdex, Lamdagreen, Lamdaline)
  - Apply 1-2 Fanta caps to 10 liters of water to treat 1 are of cabbage

Cutworms

Symptoms:

- Plants, especially seedlings, cut at base of stem or just under to soil
- Presence of black or tan worms observed in the field

Prevention:

- Clear grasses from field edges 10 days before planting
- Plant sunflowers on field edge
- Do good weeding during

When should you worry?

- At germination or transplanting, then during tuber formation

Treatment:

- Inspect the field in early morning, shaking plants to remove worms and kill them
- If severe, consider spraying Cypermethrin, Rocket, Dudu Cyper, or Lambda- cyhalothrin
- Per are: 6-7 Fanta caps per 10 L water for Dudu Cyper 1-2 Fanta caps per 10 L water for others

Cabbage Black Rot Bacteria

Symptoms:

- Patches form on leaves which are yellow or tan, usually starting from the tips of the leaves in a V-shape
- Leaf veins and stems may turn black
- Heads from these plants will rot rapidly after harvest
- Infection comes from soil; risk is higher in warm, wet conditions

Prevention:

- Plant only clean seed from disease-free plants
- Do good crop rotation—skip at least one season before planting cabbage in the same fields even before you have an infection, and if you have an infection skip 3 seasons
- Do not do any weeding, hoeing or other work in the field when the soil is very wet
- Sanitize tools after working in a field, especially if it has this disease or did in the past

Treatment: Once infected there is no treatment; uproot and destroy infected plants and do good crop rotation the following season

Aphids

Symptoms:

- Small insects, often pale colored, clustered on the cabbage leaves
- Often they appear around the time of transplanting

Treatment

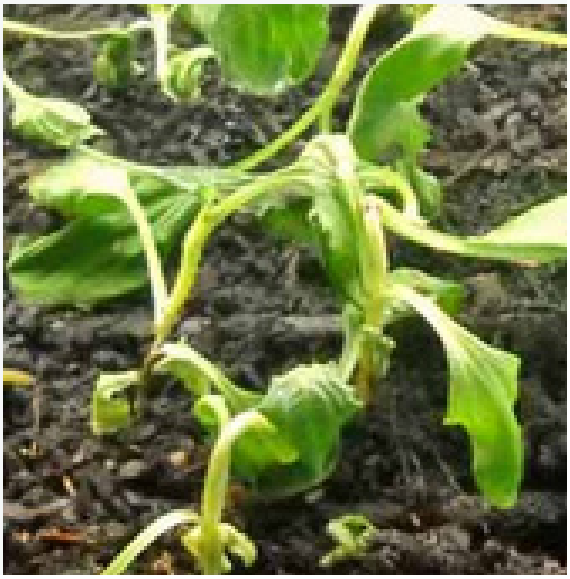
- First try applying a pilipili-ash mixture, soapy water, or water mixed with urine
- If that doesn't work you can apply Cypermethrin or Imidacloprid: 1 ½ Fanta caps in 10 liters of water per are
- Destroy any crop residues immediately after harvest

All Nursery Plants

Damping-off of Seedlings

Symptoms:

- Young seedlings wilt, rot and die after germination in the nursery or just after transplanting
- Causes are multiple, but often a fungus
- Prevention:
- Plant at wider spacing or thin the seedlings
- Reduce watering
- Always transplant seedlings in the evening or when it is cool. Apply well-decomposed compost and mulch and water
- Plant in well-drained soil and with spacing that is not too tight
- Consider applying a fungicide like Mancozeb (Dithane) or Benomyl (Benlate) after transplanting.
  - Use 2 spoons of chemical in 10 liters water for 1 are



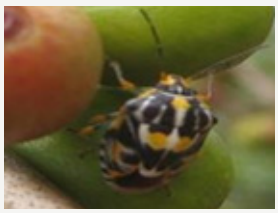
Coffee

NOTE: SPEAK TO YOUR SECTOR AGRONOMIST ABOUT HOW TO GET COFFEE PESTICIDES; THEY MAY BE ABLE TO SUPPLY FOR FREE

Antestia Stink Bug

Symptoms:

- These insects suck on the growing tips of branches, the flowers and the berries
- Can cause blackening of flower buds, fall of immature berries, rotting of beans within the berry



Prevention & Treatment

- Antestia likes dense foliage, so cut back some brances to thin the canopy
- Monitor your trees closely for signs of antestia—adult bugs and also white eggs—and destroy
- If you see an average of 1 or more bugs per tree in your plantation you should spray with a pesticide
- Alpha-Cypermethrin (Fastac) is recommended (6 mL/20 L water). Lamda-cyalothirn, Imidacloprid or Methmyl can also work
- Best to spray in October or November after flowering

Coffee Berry Borer

Symptoms:

- Small black beetles enter green cherries on the tree, lays 30-50 eggs. Larvae hatch and eat the berry from the inside
- Berries turn a blue-green color and have holes
- Berries may fall from tree prematurely

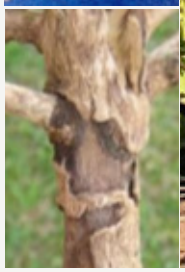
Prevention & Treatment

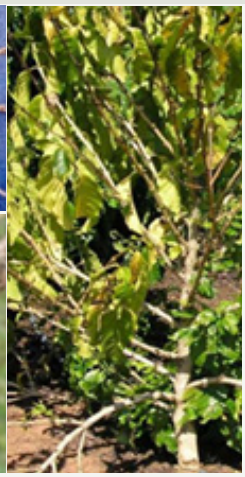
- Pick cherries regularly from the trees if they have these symptoms, from pick all from the ground—this will help reduce breeding of the insect
- Any berries still on the tree at the end of the season should be removed and burned
- Consider making traps: paint a bottle red, cut flaps in 2 sides, put water in the bottom, hang from the tree
- If attack is severe, consider spraying with chemical. Fastac (Alpha Cypermethrin) is best. Use 6 mL/20 L water.

White stem borer

Symptoms:

- Adult beetles lay eggs in the bark of the tree, larvae hatch and live inside the tree, eating from the inside for 2 years
- Rings in the bark will begin to form
- Eventually leaves will start turning yellow and the tree will die





Prevention & Treatment

- Renovate your coffee plantation (cut back trees to stump and allow to regrow) fairly regularly
- Use a sack or an old dry maize cob to rub off the rough bark at the base of trees, making it smooth, just before rainy season. This reduces egg-laying sites
- Remove insects using wire
- If attack is severe consider spraying chemicals. Rocket (Cypermethrin + Profenofos) is best, but Atestia bug pesticdes can work, too

Scales and mealybugs

Symptoms:

- Furry white insects or smooth green insects gathered around the stems of the trees
- Presence of ants, which help protect the scales
- Especially common during drought periods

Prevention & Treatment

- Use compost and fertilizer to make your plants stronger
- Apply ashes around the base of the tree
- Cut off branches which touch the ground and very infected parts of the tree
- Pesticides are not very effective

Coffee Leaf Rust

Symptoms:

- Orange-red powdery spots develop on leaves
- Leaves may begin dropping off
- Eventually if very severe entire branches might drop off

Coffee Berry Disease

Symptoms:

- Brown and gray scabs develop on the green coffee cherries
- Eventually the berries may turn black and dry completely

Prevention & Treatment
(for both rust and coffee berry disease)

- Plant with appropriately wide spacing (2 m x 2m)
- Regularly keep branches pruned back to increase airflow in the plantation, especially after long wet periods
- If the disease is very severe, apply pesticide:
- Cabrio (8 mL/20 L water for 20-25 trees)
- Cuprous oxide, copper oxychloride, Nordox or Funguran (5.5 g/20 L water for 20-25 trees)
- Any berries still on the tree at the end of the season should be removed and burned

Die Back

Symptoms:

- Plant leaves turn yellow, starting with lower leaves
- Eventually leaves fall off completely
- Some berries dry up and turn black, fall off the tree
- These symptoms have numerous causes including nutrient deficiency, drought, acidicty of the soil, and sometimes insect attack

Prevention & Treatment:

- Provide good nutrition to your trees as described below and do some irrigation in very dry conditions
- At the beginning of every rainy season apply NPK 17 or NPK 22, 200 g (1 ½ Salsa cans) per tree in a circle around the base
- Also apply lime or travertine to coffee trees every A season, 1-3 heaping Salsa cans per tree

Tree Tomato

Powdery Mildew Fungus

Symptoms:

- White or light brown-colored dust appears on leaves, young stems, and top of the plant.
- Later the leaves turn yellow, curl up and fall off the plant
- Flowers start to become yellow and dry
- Later, flowers turn black and then die completely

Prevention & Treatment

- Respect proper spacing when planting: 2 m x 2 m between plants
- Remove all affected leaves and throw away from the field
- Use fungicides like: Copper Oxycloride (Nordox, Fungoran) or Mancozeb -Metalaxyl (Ridomil)
  - Use 1 heaping spoon per 10 liters to spray 10 trees

Mosaic Virus

Symptoms:

- Growth is stunted
- Leaves wrinkle, curl up and turn yellow

Transmission:

- Spread by infected seeds, white flies and aphids

Prevention

- Remove and bury all plants affected by virus
- Apply adequate fertilizers for the plants to resist diseases
- Plant good quality seed from only healthy plants
- Control aphids and whiteflies
- No treatment exists after plant is infected with virus

Aphids

Symptoms:

- Aphids suck the leaves and weaken the plant
- You may see necrotic spots on young leaves
- They also spread mosaic virus

Whiteflies

Symptoms:

- Like aphids, they suck on the plant leaves and spread mosaic virus
- Leaves may begin to turn yellow if severely attacked

Treatment

(for both Aphids and Whiteflies)

- Regularly remove old, dry leaves from the plants to allow sunlight to penetrate
- Preserve predators of aphids, like beetles
- Consider using cage traps with gum inside to capture whiteflies
- If attack is severe, try applying a pilipili-ash mixture, soapy water, or water mixed with urine
- If that doesn't work you can apply Cypermethrin or Imidacloprid: 1 ½ Fanta caps in 10 liters of water per are
- Keep changing pesticides to avoid developing resistance

Passion Fruit

Passion Fruit Woodiness Virus

Symptoms:

- Fruit bark is hard like a stone and swollen.
- Fruits are very small and dry up, containing no juice. They may split open.
- Leaves develop lesions because of virus
- Plant attacked by this disease becomes stunted

Prevention & Treatment:

- Use clean planting material
- Clean pruning tools
- Use resistant hybrids, or rootstocks of yellow passion fruit
- Removing diseased vines from the field
- Do proper weeding
- Do not plant bananas, cucumbers, watermelon or squash near passion fruit fields

Cucumber Mosaic Virus

Symptoms:

- Leaves curl up and become deformed, especially on the top of the plant
- Leaves may turn yellow
- Overall plant growth is stunted
- Mature Fruits develop green lesions or yellow lesions.

Prevention & Treatment:

- Disease is transmitted in planting grain
- Virus cause this disease should be in bananas, cucumbers, watermelon or squash and other plant of the same family.
- Disease should propagate by insect, materials or workers.
- If the disease exists you can't prune in order to avoid disease, because the disease is spread in all plant.
- You need to tear out affected plant because it should reduce propagation of disease in whole field.

Brown spot fungus

Symptoms:

- Brown spots develop on leaves and fruits, with a concentric ring pattern
- Spots develop on the fruit and fruits rot
- When severely attacked leaves and fruits fall prematurely and vines begin to die back

Prevention & Treatment:

- Collect and dispose of fallen diseased fruits, leaves and vines
- Do proper staking of the vines
- Prune vines to reduce density and thus reduce humidity on the crop
- Spray with a fungicide like copper oxychloride, Nordox of Fungoran
- During humid weather and when the vines are growing rapidly, spray more frequently

Anthracnose

Symptoms:

- Stems dry up starting from the tips of the vine or wherever the fungus touched the plant
- Stems turn black.
- Leaves dry up slowly, resembling a drought problem, and at the end the plant dies
- Fruit also curly and them dried
- Leaves and fruits dry up and may fall off the vine.

Prevention & Treatment:

- Cut off and dispose of all infected vines and fruits
- Do proper staking of the vines
- Prune vines to reduce density and thus reduce humidity on the crop
- Spray with a fungicide like Mancozeb (Dithane) or Benomyl (Benlate).
- Use 40 g (2 large, heaping spoons) per 20 L of water
- During humid weather and when the vines are growing rapidly, spray more frequently

Thrips

Symptoms:

- Small insects that feed on leaves, flowers and fruits
- Attacked parts of the plant will shrivel, and fruits or flowers will fall off
- Young plants will be stunted
- Fruits that do not fall off may develop lesions which make them unmarketable

Prevention & Treatment:

- Till the land with a hoe each season to kill the insects which are living in the soil
- Do good weeding
- Intercrop the passion fruit with other plants to reduce infection
- Take steps to control the insects as soon as you begin to see signs or symptoms
- Spray with pesticide- best is Azadirachtin, can also try Pyrethrin

Mango

Anthracnose

Symptoms:

- Leaves develop brown, dead spots and curl up on the edges
- Black, rotten spots develop on fruits. Might develop before or after harvest
- Problem is worse in periods of heavy rain

Prevention & Treatment:

- Cut off and gather infected leaves, branches and fruits and destroy
- Thin branches to increase airflow in canopy
- Apply Mancozeb (Dithane) prior to harvest or earlier in the season if the infection is bad (40 g or 2 large spoons per 20 mL of water), spray enough to coat leaves and fruits
- Within 24 hours of harvest, submerge fruits in hot water with dithane added

Powdery Mildew

Symptoms:

- Infected flower stalks and buds, leaves and fruits can become covered with a white, powdery substance
- Later leaves can shrivel and fall off
- Worse in cool, wet areas or when rain at flowering is heavy

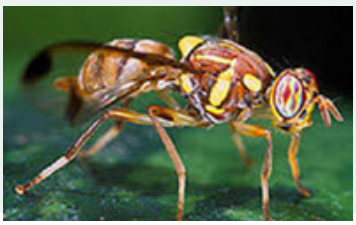
Prevention & Treatment:

- Apply NPK 17 to trees each year to keep them strong
- Cut off and gather infected leaves, branches and fruits and destroy
- Thin branches to increase airflow in canopy
- Apply Mancozeb (Dithane) prior to harvest or earlier in the season if the infection is bad (40 g or 2 large spoons per 20 L of water), spray enough to coat leaves

Mango Fruit Fly

Symptoms:

- Adult fly lays eggs under surface of skin of fruit, larvae hatch and each fruit from inside
- Mushy spots develop on the fruit and grow larger and darker over time



Prevention & Treatment:

- Gather all infected fruits and destroy them
- Make a bait spray by mixing sugar water and malathion powder and applying 200 mL per tree in large drops canopy. The flies will be attracted to eat the drops and then will die
- Dip harvested fruits in hot water

TUBURA
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