

Guidance note to the poster:

How to manage vegetable diseases the organic way

This note provides guidance for using the poster in a training set up. It leads through the different aspects presented on the poster and offers extended information for their presentation, as well as suggestions for the didactical implementation. For further reading, see suggested sources at the end of the guidance note.

Objectives of the poster

- Outline the main disease causing pathogens and how they affect plants
- Outline the approach to managing diseases in organic farming
- Highlight recommended strategies for managing diseases in organic farming
- Discuss appropriate regulation methods for disease control in local crops

Introduction



What is organic farming?

Organic farming is the way of producing good quality farm products in harmony with nature. Organic farmers optimise the growing conditions of crops by enhancing the natural fertility of the soil to ensure good nutrient and water supply, creating diverse cropping systems and promoting natural enemies of pests, recycling organic materials and manures and using natural inputs while renouncing chemical pesticides and fertilisers.



Exchange on organic farming principles

Ask the participants about their understanding of organic farming. What do organic farmers do with respect to selection of crop cultivars and animal breeds, soil fertility management, pest and disease management, animal husbandry and other aspects? Inform the participants which methods are acceptable in organic farming and which are prohibited.



Distinguishing the main disease causing agents

Most crop diseases are caused by fungi, bacteria or viruses. The disease causing agents interrupt or modify the vital functions of growing plants or of stored products.

Fungi cause the great majority of plant diseases. They are responsible for most cases of spotting, cankering, blighting, wilting, scabbing and rotting on different plant parts. Fungi can cause parts of plants or the entire plant to wither and die.

Bacterial infections result in the breakdown of the cell walls of plants, so that the plant starts to rot. Damaged plant tissue or the blocking of water uptake causes early death of the plant, and overgrowth of plant tissue causes tumours.

Viruses mostly cause leaves and other green plant parts to change in colour. Light green or yellow patches of various shades, shapes and sizes appear in affected leaves resulting in a general reduction of growth and vigour of the plant.



Understanding the main plant diseases

For managing diseases effectively, farmers need to know the characteristics of the main diseases. Show the participants samples or photos of infected plants. Invite them to characterise the diseases by asking the following questions:

- What causes the disease: a virus, bacteria or fungus?
- How is the disease transmitted: by seeds, air, water, insects, through the soil or by humans?
- Which stage of the plant is attacked: the seedling, the growing plant or the maturing plant?
- Which plant parts are attacked: roots, stems, leaves, flowers, fruits, seeds or the entire plant?
- What kind of damage does the disease cause: rotting, chlorosis, wilting, spots, etc.?
- When does it attack: in the dry or the wet season?
- In which environments is the disease most seen? humid or dry, closely spaced plants or widely spaced, monocrops, or mixed crops, etc.?

The three-step approach to organic disease management



Relying on preventive measures

When diseases occur in the fields, organic farmers try to identify their causes. Knowing the causes allows them to look for ways to prevent such damages in the future. Plant protection in organic farming does not begin with the occurrence of damages, but requires measures to be taken long before the crops are on the field.

The importance of preventive measures is increased by the fact that most approved plant protection products in organic farming only have a limited effect. Relying on optimum application of preventive measures also minimises the costs for direct control.

Prevention of introduction, spreading and multiplication of diseases considers soil and crop management, seed and planting material, and crop hygiene, as well as strengthening the plants to be more resilient against disease infection. Organic disease management can be seen as a three-step approach, whereby each step builds the foundation for the next one:

Step 1: Good crop growing conditions, healthy planting material, and strengthening of plants

Step 2: Field hygiene and disease monitoring

Step 3: Direct control with mineral and plant products



Comparison of plant and human health management

Invite the participants to identify the similarities and differences between plant health management and human health care. The two approaches can be elaborated in groups and discussed in a plenary session.

Approach to human health care:

- First step: Provision of sufficient and healthy food and water, and preservation of a healthy environment, hygiene (e.g. washing hands regularly and brushing teeth) and appropriate exercise to strengthen the body.
- Second step: Preventive intake of vitamins, antioxidants or probiotic agents and use of natural medicine against illness (e.g. traditional medicine, medical herbs and homeopathy).
- Third step: Direct treatment using antibiotics and other medicines to kill off infections.



Step 1: Managing the soil and the crops well

In the first step, organic farmers aim at providing the best possible conditions for plant growth, and at preventing the introduction and spreading of diseases. They do it by implementing the following practices:

Ensuring good crop growing conditions

- Building good soil fertility and ensuring appropriate fertilisation to encourage strong plants
- Ensuring proper soil preparation to promote a quick germination and a short juvenile phase
- Ensuring proper spacing in the field for good aeration and quick drying of the crop after rains

Limiting disease introduction and spreading

- Practicing a planned crop rotation to limit build-up of soil-borne diseases
- Using mature compost for suppression of soil-borne diseases
- Choosing varieties that are resistant or tolerant against the main diseases and are well-adapted to the local conditions



Exchange on soil and crop management

Ask the participants, which of the step 1 measures they apply in their fields. Discuss with them, how the growing conditions could be further improved in the local situation.

- Planting early in the rainy season before high air humidity enhances spreading of diseases
- Using disease-free seeds and other planting materials
- Using warm water seed treatments at 50 °C (optimum temperature should be checked for each seed type)
- Covering the seedbeds with a black plastic sheet prior to sowing (also called solarising) to kill soil-borne diseases
- Not applying mulches of infected plant residues



Strengthening the plants

Applying plant strengtheners as a protective measure can delay or reduce disease infestations as long as the disease pressure is low. In the case of a high disease pressure the effect of plant strengtheners is insufficient. It is presumed that certain plant strengthening agents can trigger defensive reactions of the plants against disease causing agents (induction of resistance).

Examples of plant strengthening agents in organic agriculture:

Algae extracts

Liquid or powdered extracts of brown and green algae have a fertilising and growth-promoting effect on the plants and increase their resistance to various diseases, when applied onto the leaves repeatedly (e. g. on spinach and onions).

Rock powder

When applied onto the leaves, rock powder causes the plants to form thickened cell walls, which makes it difficult for fungi to penetrate (e. g. late blight in potatoes and tomatoes and downy mildew in onions). Rock powder should not be applied to leafy vegetables.

Plant broths and manures

Among other plants, stinging nettle can be mixed with water to produce a broth (water extract of several hours) or manure (fermentation of several days) to support plant growth and development (e. g. in a highly diluted form together with horn meal).

Microorganism preparations

Selected strains of bacteria or fungi or mixtures of different species can promote the health and growth of plants through their metabolic excretions or compete with or parasitise harmful fungi.



Exchange on strengthening of plants

Ask the participants, whether they have experience with the use of plant strengthening products.

Ask the following questions:

- How do you strengthen your crops to make them more resilient against diseases?
- Have you produced farm-made plant strengtheners? Can you recommend a recipe?
- Have you used botanical or mineral products?
- Have you made any experiences with micro-organism preparations?



Step 2: Limiting disease spread through field and crop hygiene

Consistent crop hygiene can significantly slow down the spread of diseases. Crop hygiene includes the following measures:

- Regularly removing diseased plant parts and plants, and disposing them properly
- Avoiding injury to roots, stems and leaves
- Removing disease hosting weeds
- Ensuring good aeration of the plant stand through good spacing
- Avoiding overhead watering and irrigating early in the morning
- Mulching the soil surface
- Controlling the vectors of viruses such as aphids, white flies, etc.
- Cleaning all farm tools and equipment regularly

Regular monitoring of the diseases through scouting, for example, is essential to ensure timely direct control. Monitoring also improves the knowledge on disease symptoms and on influencing factors of spreading of diseases.



Step 3: Controlling diseases with direct measures

In situations of heavy infestations, direct measures are necessary to prevent economic crop losses. These practices are, however, only fully effective, if the measures in the first and second steps have been applied well.

The following measures can be used for the direct control of diseases:

Against fungi

- Hot water treatments of seeds and other planting materials to limit seed-borne diseases
- Copper
- Sulphur
- Potassium bicarbonate
- Plant extracts

Against bacteria

- Copper

Against viruses

- Control of virus vectors (e.g. thrips, aphids)

Copper

Copper is a broadly effective fungicide. It is sprayed primarily to control fungal diseases such as leaf spots, blights, anthracnoses, downy mildews and cankers. It is more rarely used against bacteria. Copper has the disadvantage of being accumulated in the soil. It should therefore only be used as a last resort, if all other measures are insufficient.



Deepening the discussion on direct control measures

Find out which direct control measures the participants are familiar with. Exchange on their experiences with these measures. Discuss with the participants what the advantages and disadvantages of the direct control measures are.

Explain and discuss the limits of natural fungicides (acting mainly preventively on a contact basis) compared to synthetic systemic fungicides that are transported within the plant with the plant sap (and protect new shoots and leaves from infection).

Bordeaux mixture can be produced on the farm from copper sulphate and burnt lime. Nowadays, commercial products with copper oxychloride and copper hydroxide are more commonly used. Some plants (e.g. certain varieties of grapes), and young plants and young leaves are sensitive to copper and care should be taken when using copper.

Sulphur

Sulphur sprays can be used to control powdery mildews, certain rusts, leaf blights and fruit rots. In contrary to copper, it is not accumulated in the soil, but can harm beneficial organisms. Sulphur is only available as commercial product. Lime sulphur is hazardous for the user and should only be applied with appropriate protective equipment.

Potassium bicarbonate

Potassium bicarbonate is made industrially from carbon dioxide gas and potassium hydroxide. The substance is harmless and non-toxic to humans and the environment. Potassium bicarbonate has a reduced spectrum of action and is effective against powdery mildews and other fungal diseases.

Farmers can use baking powder (sodium bicarbonate) as substitute for potassium hydroxide.

Plant extracts

Plant extracts such as the paw paw leaf extract papaine is reported to act against fungi, microbes, parasites and bacteria. Other plants with a reported protective effect against fungi and bacteria are, for example, African Marigold, garlic, Jatropha, and *Moringa olifera*.



Further readings

Organic farming definition

- www.ifoam.bio > Why Organic?
- www.organic-africa.net > Training manual > Module 1

Disease management

- www.organic-africa.net > Training manual > Module 4
- www.infonet-biovision.org > Plant Health Crops > Pests and Diseases

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