INSECT AND MITE PESTS

Leafminers

- Mining lines on leaves, note feeding and egg laying punctures (1), mined causing by feeding maggots (1 and 2) and maggot ready to pupate (yellow) and pupa (brown) (2).

Whiteflies

- Whitleys on leaf (1). Close-up of whitefly immature stages (2) and an adult (3). Whiteflies cause damage by sucking plant sap and by transmitting virus diseases such as the Tomato Yellow Leaf Curl Virus.

Tomato Bugs

- Immature stages of the tomato bug (1). Close-up of an adult bug (2). They cause damage by sucking plant sap. Feeding causes brown rings on stems, petals, growing points and leaves. Affected leaves become brittle and crinkled.

Thrips

- Severe damage by thrips on a leaflet (1). Close-up of an adult (2). Damage to flowers (3). Thrips (4) and thrips damage on a leaf (5). Some thrips are vectors of virus diseases such as the Tomato Spotted Wilt Virus.

Fruitworms


Spider Mites

- A colony of red spider mites on a leaflet (1). Close-up of spitter mines (2). Plant severely infected by tobacco spitter mines (3); note extensive webbing produced by mines. Severely damaged plants (4). Damaged fruits (5).

Pest and Disease Management

Nursery stage

- Prepare the nursery site far away from tomato fields to avoid spread of pests and diseases into the nursery.

- Prepare the seedbed properly. Use forest compost and/or compost. Burn plant trash on the surface of the seedbed for at least one hour and after cooling, mix soil with compost or livestock manure at a rate of 20 litre-container per square metre. In semi-arid areas, solanise seedbeds.

- Use certified disease-free seed of suitable varieties. Use varieties tolerant or resistant to pests and diseases. For example: Fortune Maker (resistant to fusarium and bacterial wilt); Rio Grande (resistant to early blight and Cercospora leaf spot); Kentom (resistant to bacterial wilt, root-knot nematodes and Tomato Mosaic Virus); Tengu 97 (resistant to late blight, fusarium with Tomato Mosaic Virus and root knot nematodes); Menu (resistant to late blight, Tomato Mosaic Virus and fruit rot; Insecticidal speckles); Shengena (resistant to late blight and Tomato Mosaic Virus); Taiwan F1 (resistant to bacterial wilt); Roma VF (resistant to fusarium and verticilium wilt, root knot nematodes and red spider mites); and Roma VF (resistant to fusarium and verticilium wilt).

- Treat own seed with an appropriate fungicide and insecticide to protect it against pests and diseases.

- Avoid sowing seeds densely; space at 5 x 5 cm; if necessary thin seedlings at first true-leaf stage and transplant in another bed.

- Keep the seedbed weed-free. Avoid edge trimming of the field; keep the edge free of weeds and garbage.

- Irrigate the seedbed regularly but avoid over watering as it can induce damping-off diseases. Do not water late in the afternoon because extended wetness of leaf surfaces promotes foliar diseases.

- Reduce watering from third week to harden seedlings.

- Cover seedlings with insect-proof netting in areas where virus diseases are endemic. This will restrict infestation by insect vectors of viral diseases. Alternatively, spray or drench with appropriate insecticides.

- Inspect the nursery regularly for pests, diseases, weeds, nutritional disorders, soil moisture and general plant health. Remove weak and unhealthy looking seedlings.

Transplanting stage

- Avoid transplanting seedlings near an old tomato crop. Ensure that a new field is sited upwind, particularly where surface irrigation is used to avoid spread of soil-borne diseases.

- Use proper plant spacing as prescribed by seed companies.

- Plant border rows of coriander, fenugreek, marigold, millet, pigeon pea or sorghum. They act as windbreaks; fenugreek and coriander are repellant to whiteflies, and provide refuge for natural enemies.

- Apply organic manure, mixing it well with the soil before transplanting.

- Transplant seedlings late in the afternoon. This is important in dry areas to avoid transplanting stress.

Field stage

- Keep tomato field weed-free. Weeds may be alternative hosts of diseases and pests.

- Ensure proper fertilisation.

- Choose proper irrigation. Fruity and drier minimise foliar diseases (e.g. early and late blight) over-head irrigation reduces mites, thrips, aphids and powdery mildew. Avoid furrow irrigation where soil-borne diseases (e.g. bacterial wilt; fusarium with root knot nematodes) are a problem.

- If using furrow irrigation ensure that water flows from new to old fields to minimise spread of soil-borne diseases.

- Stake and prune indeterminate varieties, much determinate varieties to reduce early and late blight and bacterial diseases. In areas prone to bacterial diseases disinfect pruning knives with a commercial detergent (e.g. Tepoo) before working on a new plant.

- Do not work in tomato fields when plants are wet to avoid diseases of powdery mildew.

- Inspect fields regularly for pests, diseases, weeds, nutritional disorders, soil moisture and general plant health. Remove unhealthy looking plants from the fields.

- Ensure correct identification of problems.

- Use pesticides on need basis only. Avoid use of broad spectrum pesticides as they would kill natural enemies. Do not use highly toxic pesticides (WHO Class 1 and 2).

Fruiting period, harvest and after harvest

- Strictly follow pre-harvest intervals when applying pesticides after fruit set.

- Avoid damaging fruit when harvesting to minimise post-harvest diseases and to cater for market demand of blenheim-free produce.

- Place harvested crop in a cool shaded area to minimise dehydration of the produce.

- Reduce crop debts from fields after harvest to minimise carry-over of pests and diseases.

- Avoid overlapping of crops to minimise spread of pests and diseases from old to new crop.

- Practice crop rotation with crops unrelated to tomato to minimise soil-borne problems and also maintain soil fertility (e.g. brassicas, cereals, legumes, onions and fodder grasses)

- When necessary, use only pesticides locally registered for tomatoes or vegetables. Strictly follow label instructions, particularly pre-harvest intervals and safety requirements.


Natural enemies

- Conserve natural enemies

- Avoid or reduce use of pesticides. In particular broad-spectrum pesticides that kill a wide range of pests and also natural enemies. When pesticide use is necessary, select selective pesticides (e.g. BT products) or pesticides which are not harmful to natural enemies (e.g. neem-based products).

- Keep flowering plants for nectar and pollen, as sources of food for adults of some natural enemies.

- Maintain a mixed cropping system. A diversity of crops provides refuge and food for a wide range of natural enemies.

- Mulch, it provides an attractive environment for ground living natural enemies.

Diseases

- Bacterial canker, speck and spot

- Plant wilting without necrosis of the foliage (1). Water leaf for detection of bacterial leaf spot (2). Sprays and dusts oozing or discolored tissue.

- Fusarium Wilt

- One-sided wilting of tomato plant caused by infection with Fusarium (1). Browning of water conducting tissues (2 and 3).

- Early Blight

- Early blight on a tomato leaf (1) and on a fruit (2). Note concentric rings in the spots.

- Late Blight

- Note scarred appearance of leaves and stems. Affected leaves have a brown and rough surface.

- Powdery Mildew

- Powdery mildew on upper leaf surface; note talcum-like powder.

- Root-knot Nematodes

- Affected plants become stunted and yellow and have a tendency to wilt in hot weather. The roots are severely distorted, swollen and bear knots or galls.

- Viral Diseases

- Tomato Yellow Leaf Curl Virus (1); note thickening of the shoots and reduced size of leaves. Tomato Spotted Wilt Virus (2); note round spots on fruit. Tomato Mosaic Virus (3); note internal browning of the fruit. Cucumber Mosaic Virus (4); note shoestring symptoms on the leaves.

- Blossom-end Rot

- Blossom-end rot is caused by calcium deficiency. It starts as a water-soaked spot (1) which enlarges becoming brown (2); the surface of the spot becomes dark, sunken, leathery and dry (3), when wet secondary infection may occur (4).