## Tomato Bollworm (African ball worm)

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>IPM option</th>
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<tbody>
<tr>
<td><img src="image1.png" alt="Symptoms Image" /></td>
<td><strong>Cultural control (prevention)</strong></td>
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</table>
| ![Symptoms Image](image2.png) | - Remove and destroy infected fruit and infested plants after harvest  
- Plough soil after harvesting to expose pupae to sunlight and natural enemies.  
- Use of ABW resistant varieties of tomato such as 'Melka salsa' and 'Melka shola'  
- Use a trap crop such as Maize and sorghum  
- Field inspection, use of pheromone traps, etc.  
- Adequate monitoring and identification of different life stages and damage symptoms. |
| ![Symptoms Image](image3.png) | **Non-chemical control** |
| ![Symptoms Image](image4.png) | - Hand picking and destruction of eggs is feasible at low infestations  
- Use of aqueous extracts of neem seed (30 kg per ha) at flowering and fruiting periods |
| ![Symptoms Image](image5.png) | **Use recommended and registered pesticide** |
| ![Symptoms Image](image6.png) | Use pesticide only when the pest population passes economic threshold level and appropriate rate and time.  
- Belt (Flubendiamide 480 g/L)  
- Coragen (Chlorantraniliprole 200 g/L)  
- Tracer (Spinosad 480g/L)  
- Radiant (Spinetoram 250g/L)  
- Azatin (Azadirachtin 0.03%) |
Tomato leaf minor

### Symptoms

- [Image of tomato leaf with symptoms]

### IPM option

**Cultural control (prevention)**

- Rotation with non-solanaceous crops
- Destruction of infested plants & post-harvest plant debris
- Removal of wild host plants
- Removal of egg infested leaves (check large mines in the leaf)
- Selective removal (burning) of infested plant parts.
- Monitoring (field inspection, use of pheromone traps, etc)

**Use recommended and registered chemicals**

- Azatin (Azadirachtin 0.03%)
- Belt (Flubendiamide 480 g/L)
- Coragen (Chlorantraniliprole 200 g/L)
- Tracer (Spinosad 480g/L)
- Radiant (Spinetoram 250g/L)
Tomato white flies

**Symptoms**

**IPM options**

*Cultural control (prevention)*

- Adjust sowing and transplanting time
- Avoid the season when whiteflies are more likely to occur
- Removing weeds in advance of planting
- Tomato fields should also be kept weed-free.

*Non-chemical control*

- Use of aqueous extracts of neem seed (30 kg per ha) at flowering and fruiting periods

*Use recommended and registered pesticide*

- Actara 25 WG (Thiamethoxam 250 g/kg)
- Confidor SL 200 (Imidacloprid 200 g/L)
- Cybolt 2.5 ULV (Flucythrinate 2.5% ULV)
- Fastac 100 g/L EC (Alphacypermethrin)
Tomato Powdery mildew

**Symptoms**

**IPM options**

*Cultural control (prevention)*
- Use of tolerant/resistant varieties
- Follow wider plant spacing
- Stake plants to improve air circulation
- Proper and early weeding.
- Apply fertilizer at a regular interval, because high nitrogen encourages mildew
- Avoid plant stress which favors mildew

*Use recommended and registered pesticide such as:*
- Sulphure fungicides,
- Bayleton,
- **Bumper** (propiconazole)
- **Flint, Gem 500 SC** (Trifloxystrobin + Tebuconazole )
- Copper Hydroxide or Copper oxychloride
Early blight of Tomato

Symptoms

IPM options

**Cultural control (prevention)**

- Crop rotation using non solanaceous crop species
- Use tolerant/resistant varieties
- Use of pathogen free seed
- Destroy tomato/potato debris
- Remove alternate hosts/volunteer plants before planting
- Follow wider planting space
- Closely monitor crops (lower portion & underside of leaves) for disease symptoms.
- Stake plants to improve air circulation
- Adjust irrigating time to early morning and don’t over irrigate
- Seed treatment using seed dressing fungicides (Apron star)

**Use recommended and registered pesticide**

Apply additional sprays with shorter and regular intervals.

- Mancozeb 80% WP
- Mancozeb 64% + Metalaxyl (Mefenoxam) 8% WP/WG
- Copper Hydroxide or Copper oxychloride
Late blight of Tomato

**Symptoms**

- [Image showing symptoms]

**IPM options**

**Cultural control (prevention)**

- Use tolerant/resistant varieties
- Destroy tomato/potato debris
- Remove alternate hosts/volunteer plant before planting
- Crop rotation with non solanaceous crops
- Transplanting of healthy seedlings
- Follow wider planting space
- Closely monitor crops (lower portion & underside of leaves) for disease symptoms
- Stake plants to improve air circulation
- Adjust watering time to early morning and don’t over water.

**Use recommended and registered pesticide**

- Application of registered fungicides (Ridomil Gold, Agrolaxyl, Mancozeb).
- Copper Hydroxide or Copper oxychloride.
# Tomato bacteria spot

<table>
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<tr>
<td><img src="image1" alt="Symptoms Image" /></td>
<td><strong>Cultural control (prevention)</strong></td>
</tr>
<tr>
<td><img src="image2" alt="Symptoms Image" /></td>
<td>- Rotate crops (non-solanaceous families such as tomato and pepper)</td>
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<tr>
<td><img src="image3" alt="Symptoms Image" /></td>
<td>- Use Good quality seed</td>
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<tr>
<td><img src="image4" alt="Symptoms Image" /></td>
<td>- Avoid too much water</td>
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<tr>
<td><img src="image5" alt="Symptoms Image" /></td>
<td>- Preventative application of fungicides (after planting seeds, before transplanting, before and after rains).</td>
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<tr>
<td><img src="image6" alt="Symptoms Image" /></td>
<td>- Preventative sprays a week after transplanting, early flowering or fruit setting</td>
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<tr>
<td><img src="image7" alt="Symptoms Image" /></td>
<td>- Reduce spray intervals by half during rainy season.</td>
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**Use recommended and registered pesticide**

- Mancozeb 80% WP,
- Copper based fungicides; Cu(HO)\(_2\), Copper oxychloride
Tomato Viruses

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<tr>
<td>![Symptom Image 1]</td>
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<tr>
<td>![Symptom Image 2]</td>
<td>• Crop rotation</td>
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<tr>
<td>![Symptom Image 3]</td>
<td>• Use seeds from known source</td>
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<td></td>
<td>• Use Resistant/tolerant varieties</td>
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<td></td>
<td>• Use of healthy seedlings</td>
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<td></td>
<td>• Field sanitation</td>
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<td></td>
<td>• Roughing of infected plants</td>
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<td></td>
<td>• Avoidance of volunteer solanaceous crops and weeds</td>
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<td></td>
<td>• Discourage tobacco smokers during seedling raising and cultivation</td>
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</table>

**Use recommended and registered pesticide**

- Insecticide spray against vectors
Tomato: Damping-off

## Symptoms

- [Image of tomato plant symptoms]

## IPM Options

### Cultural control (prevention)

- Use raised seedbed
- Use disease free seeds
- Seed treatment (Apron star, Thiram)
- Soil solarisation using polythene sheets
- Burning of fire wood or stalks on seedbed
- Avoid over irrigation

### Use recommended and registered pesticide

- Fungicides (Ridomil Gold, Agrolaxyl)
Tomato: Root-knot nematode

Symptoms

IPM options

**Cultural control (prevention)**

- Use crop rotation with non-host plant (cereals and grass species).
- Fallowing is also play a role in reducing nematode population
- Leanings of surrounding fields or disinfecting
- Soil fumigants or non-volatile registered nematicides
Potato: Late blight

Symptoms

IPM options

**Cultural control (prevention)**
- Use tolerant/resistant varieties like guassa variety
- Use disease free tubers
- Destroy tomato/potato debris
- Crop rotation for 2-3 years with crops like maize,
- Deep ploughing during dry season
- Recommended use of fertilizers and irrigations
- Rouging of diseased plants
- Remove alternate hosts (volunteer plants) before planting
- Follow wider planting space
- Closely monitor of disease symptoms
- Irrigate early morning and avoid over irrigation

**Use recommended and registered pesticides**
- Mancozeb 80% WP
- Mancozeb 64% + Metalaxyl (Mefenoxam) 8% WP/WG
- Copper Hydroxide or Copper oxychloride
- Application of stable bleaching powder (12kg/ha)
- Avoid applying pesticide at rainy seasons
### Potato Bacterial wilt

#### Symptoms

#### IPM options

**Cultural control (prevention)**

- Keep crop rotation
- Use clean seed and farm tools
- Avoid planting on infected plot
- Restrict movement in the potato field
- Avoid using infected irrigation water
- Remove the whole infected plant part carefully, put in the sack and finally buried it
- Add ashes at uprooted place
Cabbage diamond back moth

Symptoms

IMP options

**Cultural control (prevention)**
- Crop rotation with non-brassica
- Intercropping with tomato and onion
- Conserve natural enemies (predators and parasitoids) in the field
- Proper scouting (2 times/week) of the adult and larvae at seedling, thinning and just before heading

**Use recommended and registered pesticides such as:**
- Azatin (Azadirachtin 0.03%)
- Deltamethrin 25 g/l
- Belt (Flubendiamide 480 g/L)
- Coragen (Chlorantraniliprole 200 g/L)
- Radiant (Spinetoram 250g/L)
- Tracer (Spinosad 480g/L)

**N.B.**
- Use pesticide when it reaches at threshold level
- One caterpillar/plant with 60 sample plants from 0.25 ha is economical
Cabbage Aphids

SYMPTOMS

IMP OPTIONS

**Cultural control (prevention)**

- Crop rotation with non-host plants
- Destruction and removal of crop residues immediately after harvesting
- Remove alternate hosts and weeds in the surrounding areas
- Intercropping brassicas with other crops such as beans
- Field scouting every week

**Conserve natural enemies in the field**

- Parasitic wasps such as the braconid Diaeretiella rapae; and predators (ladybird beetles, hoverflies, lacewings etc.).

**Non-chemical control**

- Neem seed extracts (15 to 30 kg /ha) have given effective control of the pest with minimal effect

**Use recommended and registered pesticide**

- Apply insecticide only if population is high on young
- Allow thorough spraying due to waxy nature of the pest
- Delta Gold (Deltamethrin 25 g/l )
- Fastac EC (Alpha-cypermethrin 100 g/l )
- Azatin (Azadirachtin 0.03%)
- Cobalt (Lambda-cyhalothrin 50 g/l)
Cabbage Black rot

Symptoms

IPM Options

Cultural control (prevention)
- Crop rotation with non-crucifer plants
- Use disease free seed or planting material
- Use of resistant varieties
- Seed treatment
- Locate seed beds away from production area
- Provide optimal water amount to seedlings
- Inspect seedlings routinely. If symptoms are found early, destroy it immediately
- Control insects and crucifer weeds

Use recommended and registered pesticides
- Use recommended and registered fungicides such as (Copper fungicides)
- Copper Hydroxide or Copper oxichloride
Onion thrips

Symptoms

IPM Option

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**Cultural control (prevention)**

- Avoid planting onion in succession
- Destruction of crop residues and plowing fields after harvesting
- Proper removal of volunteer plants (Solanaceae families)
- Intercropping onion with carrot or cabbage
- Removal of weeds that may harbor thrips
- Scouting and monitoring the crop
- Reduce the amount of nitrogen at planting will reduce population of thrips larvae

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**Non-chemical control**

- Use yellow sticky traps
- Use neem seed preparations (30 kg per ha)

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**Use recommended and registered pesticide:**

- Use pesticide when it reach threshold e.g. Radiant;- 3 trips/leaf
- Initiate insecticide application at low population level.
  - Azatin (Azadirachtin 0.03%)
  - Cobalt (Lambda-cyhalothrin 50 g/l)
  - Radiant (Spinetoram 250g/L)
  - Delta Gold (Deltametrin)
Onion downy mildew

Symptom

IPM Options

**Cultural control (prevention)**

- Crop rotation
- Use disease resistant/tolerant varieties
- Use disease free seed or seedlings
- Field monitoring and adequate diagnosis of diseases symptoms
- Do regular weeding to avoid volunteer plants
- Allow proper air circulation and reduce duration of leaf wetness

**Use recommended and registered pesticide**

- Mancozeb 80% WP
- Mancozeb 64% + Metalaxyl (Mefenoxam) 8% WP/WG
- Copper Hydroxide or Copper oxychloride

NB.

- Spray at the first sign of the disease
- Allow thorough coverage of foliage for effective control
- Spray regularly (7 days interval) if the disease is severe
Onion purple blotch

**Symptom**

**IPM options**

*Use recommended and registered fungicide such as:*

- Ridomil Gold,
- Mancozeb 50% WP at 3 kg/ha as protective and
- Ridomil Gold MZ 68 % WP at 2.5 kg/ha as curative reduced severity of Purple blotch.

*Cultural control (prevention)*

- Crop rotation
- Use disease free seeds
- Seed treatment (Apron star)
**Onion root rot (white rot)**

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**Cultural control (prevention)**

- Crop rotation with non-allium crops for 2-3 years is important to reduce pathogen build up.
- Burn infected plant debris (don’t use on compost heap)
- Use clean seedlings (bulbs) from known origins
- Sock onion bulb seed in the pesticide
- move soil materials from infected fields
Pepper powdery mildew

**Symptoms**

- Crop ration
- Use resistance varieties
- Field sanitation, including removal of volunteer plants and weeds
- Regular monitoring, especially during warm-wet weather

**Cultural control (prevention)**

**Use recommended and registered fungicides**

- Sulphure fungicides,
- Bayleton,
- Bumper (propiconazole)
- Flint, Gem 500 SC (Trifloxystrobin + Tebuconazole)
- Copper Hydroxide or Copper oxychloride
- Have a good coverage spraying for effective control
Pepper root rot

Symptoms

IPM option

*Cultural control (prevention)*

- Select less susceptible varieties
- Use disease free seeds or transplants
- Prepare raised field and seedbed
- Drain the soil water before planting
- Avoid planting when the soil is cool
- Use water sprinklers in seedling preparation
- Apply light irrigation to avoid overwatering

*Use recommended and registered fungicides:*

- Mancozeb 64% + Metalaxyl 8%
Pepper cut worm

**Symptoms**

- Photo of pepper cut worms in soil

**IPM options**

**Cultural control (prevention)**
- Regular and consistent field monitoring from seedling emergence stage
- Monitoring is good late afternoon or in the evening when they are active
- Check the damage early in the morning when it is fresh
- With the damage symptoms dig around the plants with a depth of 5 cm in the soil to find the cut worms
- Remove weeds and plant residues that

**Use natural enemies**
- Preserve natural predators, parasites and birds that feed on cutworms

**Pesticide control**
- Insecticide spray is not very effective
**Pepper Bollworm**

**Symptom**

**IPM options**

*Cultural control (prevention)*
- Remove and destroy infected fruit and infested plants after harvest (burn or make compost)
- Plough soil after harvesting to expose pupae to sunlight and natural enemies.
- Adequate identification/monitoring of different life stages and damage symptoms
- Monitoring (field inspection, use of pheromone traps, etc)
- Use a trap crop (e.g. African marigold) planted every 8 rows

*Use natural enemies*
- Conserve natural enemies (*Trichogramma pertiosum* or *T. achaeae, Macrolophus pygmaeus*)

*Use recommended and registered chemicals*
- Belt (Flubendiamide 480 g/L)
- Coragen (Chlorantraniliprole 200 g/L)
- Tracer (Spinosad 480g/L)
- Radiant (Spinetoram 250g/L)
- Azatin (Azadirachtin 0.03%)