Pest	Cultural Practices	Chemical Control
Botrytis Leaf Blight (*Botrytis squamosal*)	• Practice crop rotation field sanitation • Use clean seeds pre-treated with fungicides. • No excessive use of fertilizers high in N • Handle produce carefully at harvesting and ensure proper curing procedures. • Coloured onion varieties are more tolerant than white onions.	• Start fungicide applications three weeks after planting to reduce incidence of disease. • Apply Bellis® in rotation with Dithane M-45® • Bellis® 0.5g to 3.8L water . Apply Bellis® as a preventive treatment at 10 –14 day intervals with a maximum of 3 applications per season. PHI 7 days • Dithane M-45® **See rates for Purple blotch.** • Phyton 27® **See rates for Purple blotch.** • **0.5g = 1/10 of a teaspoon**
Downy mildew *Peronospora destructor*	• Use optimal spacing which reduces plant density and level of humidity in the field. • Remove and destroy crop debris. • Practice crop rotation	• Fungicide applications should begin on plants two to three months old as soon as disease conditions prevail. • Weekly application of Dithane M-45® **See rates for Purple blotch.** • Rotate with the systemic fungicide Ridomil MZ® 15ml – 20ml to 3.8L water. PHI 7days. • Top Cop with Sulfur® **See rates for Purple blotch.** • Champion® **See rates for Purple blotch.** • Bravo® **See rates for Purple blotch.**
Bacterial soft rot *Erwinia* spp.	• Plants should not be irrigated heavily just before harvest, as moisture favours disease development. • Remove and destroy diseased plants	• Weekly application of copper based fungicides (Champion 77WP®, Top Cop with Sulfur® and Phyton 27®). • **See rates for Purple blotch.**
Root knot nematode *Meloidogyne* spp.	**Non-chemical approach** **Soil testing must be conducted prior to establishing fields to determine** (1) Presence of pathogenic nematodes (2) If nematode population densities are high enough to cause economic loss. The results will be able to guide management options which may include • Deep ploughing of soils one to five times for a 2-month period before planting onion. Use transplants to establish onion crop. • Two months of soil solarization during the hot dry summer months • Do not plant onions after *Cucurbits* (melon), *Legume* (peas) or *Solanaceous* (pepper) crops which were infested with plant pathogenic nematodes. Practice crop rotation.	

Onion Pest Management Technical Guide

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Diseases of Onion

Purple Blotch (*Alternaria porri*)

Figure 1: Circular purple spots of Purple Blotch

Description: Small whitish, sunken and irregular spots appear on the leaves. These spots increase in size, become purple in the centre and is bordered by a yellow ring. After 3-4 weeks of infection the leaves turn yellow and fall. Infection can spread to the bulb causing then to become dry and papery. Development of the disease is favoured by humid conditions caused by rain, over-irrigation or dews.

Bacterial Soft-rot (*Erwinia* spp.):

This disease usually begins at the neck of the bulb where the plant tissue first becomes water soaked and later becomes soft and mushy with an offensive dour.

Figure 2: Foliar collapse (Left) and Soft rot of young & mature bulbs (Right)

Botrytis Leaf spot (*Botrytis squamosal*):

Grey-white lesions, about 3 mm in diameter, occur on leaves. Spots have greenish borders that at times appear to be water soaked. When the spots are numerous, the tip of the leaf dies back. Bulb infection takes place in the field and progresses after harvest. The disease spreads rapidly during periods of continuous rain.

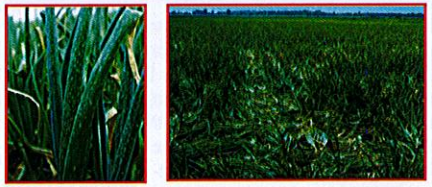


Figure 3: Botrytis leaf blight (Left), Field severely affected by Botrytis leaf blight (Right)

Downy Mildew (*Peronospora destructor*):

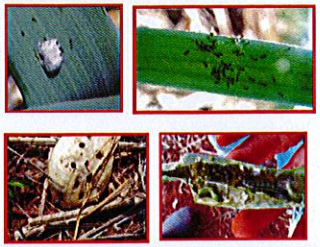
Figure 4: Downy mildew

White to light green spots on leaves, which later darken. A fuzzy, grey growth is seen on the leaf surface, particularly during periods of high humidity. Lesions enlarge and leaf tissue dies. Lesions may resemble those caused by the purple blotch fungus. Fields should be monitored closely, particularly during prolonged cool, wet weather, when the disease is more likely to occur. Dense stands and overhead sprinkler irrigation encourage development of the disease.

Insect Pests of Onion

Beet Armyworm *Spodoptera exigua*

Eggs are cylindrical, greenish to white in colour, covered with whitish scales; egg mass with 50 to 150 eggs (Figure 5). The young worms are pale green or yellow in colour while the older larvae are darker when viewed from above and possess a dark lateral stripe. Pupae/cocoons are light to dark brown in colour and are found in the soil. Moths/bats have forewings which are mottled grey and brown, and normally with an irregular banding pattern and a light coloured bean-shaped spot. Larvae feed on both foliage and fruit of many crops. Young larvae feed gregariously and move in swarms. As they mature the larvae become solitary and eat large irregular holes in foliage & bulbs and produce frass.



Figs. 5: Beet Armyworm Egg mass & Young worms (Top); Feeding damage of mature worms & frass (Bottom)

Thrips (*Thrips tabaci*)

The young stages are white to pale yellow in colour. The adults are 2 mm long; pale yellow to dark brown in colour and have fully developed wings which at rest are folded along the back of the insect. Immature and adult thrips prefer to feed on young leaves in the inner neck of plants by rasping the leaves and sucking the juice, leaving whitish to silvery patches on the leaves.

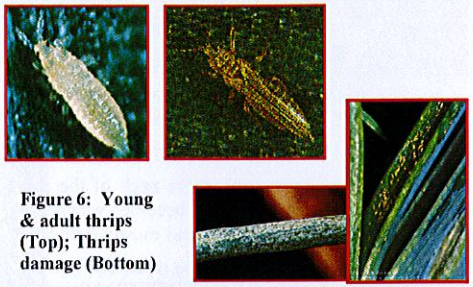


Figure 6: Young & adult thrips (Top); Thrips damage (Bottom)

Leafminer (*Liriomyza* spp.)

The maggots are bright yellow to yellow green in colour. The adult is a small grey fly with black and yellow splotches. Females lay eggs underneath the leaf surface where the larvae emerge, develop & feed, creating a snake-like leaf mine that gradually increases in width as the larvae grows. Damage may result in premature death of the foliage, impacting on the cosmetic appearance of the onions and reducing the photosynthetic activity of leaves.

Figure 7: Larva in mine & mature larva (Top); Adult fly of leafminer & damage by leafminer (Bottom)

Nematodes (*Meloidogyne* spp.)

Above-ground symptoms include stunting, delayed maturity, thicker necks and smaller size bulbs which results in reduced marketable yield and other symptoms characteristic of nutrient deficiency. Below ground symptoms on infected roots are slight root galling (knots) or root thickenings of various sizes and shapes and extensive root branching.

Figure 8: Small bulb and extensive root branching (Left) & healthy bulb and roots (Right)

Pest	Cultural Practices	Chemical Control
Beet Armyworm *Spodoptera exigua*	• Practice crop rotation • Practice good field sanitation, weed control & water management • Preserve natural enemies or farmers friends (wasps, spiders and birds) • Use beet armyworm pheromone traps for monitoring adult moths • Monitor crop twice/week for early detection of eggs and young worms. • Hand pick worms and egg mass for low populations in small acreages • Apply treatments when there are 5 worms to 25 plants. Treat young worms before they enter the leaves.	• Target very young worms by alternating Bt formulations (*Bacillus thuringiensis*), e.g. Xentari®, Dipel ® or Agree® with abamectin formulations e.g. (Cure® or Newmectin®). • Agree: 5.7g to 3.8L water. PHI* None • Cure® 5ml to 3.8L water. PHI 3 -7 days • Target older worms by alternating Danitol® and Match®. • Danitol® 5-10ml to 3.8L water. PHI 14 days • Match® 10ml to 3.8L water. PHI 20 days • Timing of spray application and good leaf coverage are critical. • **PHI = Pre Harvest Interval** • **3.8L = 1 gallon** • **5ml = 1 teaspoon** • **5.7g = 2ml = 1/2 teaspoon**
Thrips *Thrips tabaci*	• Practice a crop free period of 2-3 weeks to break the thrips lifecycle. • Provide adequate irrigation & crop nutrition. • Preserve natural enemies • Practice good field sanitation & weed control • Monitor adults by using yellow or white sticky traps. • Inspect the newest leaves of 5 plants; Apply treatments when there are 3 thrips per green leaf or 20% of the plants infested with thrips	• Rely on use of bio-rational insecticides. • Rotate Cure®, Newmectin® Diazinon® or Malathion®. • Malathion® 15ml to 3.8L water. PHI 7 days • Diazinon® 15ml to 3.8L water. PHI 14 days • Apply approved insecticides at recommended dose rates. • When spraying provide good leaf coverage and target base of leaves • **15ml = 1 tablespoon**
Leaf Miner *Liriomyza huidobrensi*	• Avoid planting the crop close to other host crops such as lettuce or celery. • Preserve natural enemies (parasitic wasps etc.).	• Pest can be controlled by spraying with insecticide Trigard® in rotation with other approved insecticides. • Trigard: 5.7g – 15g to 3.8L water • Good leaf coverage is important. • Spraying should be targeted to the base of leaves, where pest is concentrated
Purple Blotch *Alternaria porri*	• Use tolerant varieties. • Practice crop rotation • Maintain good field sanitation & weed management • Ensure good plant nutrition. • Use optimal spacing which reduces plant density and level of humidity in the field. • Avoid overhead irrigation	• Rotate Champion ®15 ml to 3.8L water*, Top Cop with Sulfur® 90ml to 3.8L water* or Phyton 27® 5ml - 8ml to 3.8L water **with** Dithane M45® **6.08g -8g to 3.8 L water **or** Bravo® 15ml to 3.8L water. **PHI:** Champion® 7 days; Phyton® None; Dithane® 14 days; Bravo® 14 days *Begin application when plants are 10 to 15 cm high and repeat at 7 to 10 day intervals. **Same active ingredient as Mancozeb 80WP® and Sancozeb® Phyton®: Water should be between pH of 4 to 5. Use pH PLUS to reduce the pH and hardness of water. • **90ml = 6 tablespoons 6g = 1 teaspoon**