

## Onion Management: Insects, Diseases, and New Research in Plasticulture

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As a rule of thumb, healthy large onion foliage transplants into large onion bulbs. Bulbing is stimulated by the longest day of the year, June 21<sup>st</sup>. To achieve healthy large foliage, onions should be planted as early as possible in the spring, and anything that will help to push the onion plants along (e.g. optimum nutrients, warm soil, adequate soil moisture, no competition from weeds, etc.) at this early stage should be beneficial. During bulbing, a consistent supply of adequate moisture is best. Ideally, onion foliage should dry down naturally rather than from disease or insect damage or other plant stresses.

### **Insects:**

The most common and problematic insect pest of small-scale onion production is onion thrips (OT). OT feeding reduces the photosynthetic capacity of the onion plant, which can reduce yield and bulb size by 30% or more. Once OT populations exceed 50 OT per plant, they can be very challenging to control. OT generate very quickly and are favored by hot and dry conditions.

**Scouting for onion thrips:** Start scouting in early- to mid-June. Note that transplants imported from the south may be infested with OT and may need to be sprayed sooner. OT are tiny slender insects. Nymphs are yellow and 0.5 to 1.2 mm in length and adults are brown, up to 2 mm in length. Look deep into the leaf axils to find the first OT of the season. Count the total number of OT and divide by the total number of leaves per plant to get the number of OT per leaf. Insecticide sprays should be started at 1 to 3 OT per leaf, depending on the insecticide used.

**Cultural control practices:** The first line of defense against OT is insecticides. However, there are cultural practices that are complimentary to an insecticide spray program. In Cornell studies, silver and straw mulches have been shown to delay buildup of OT resulting in delayed onset of the first insecticide spray and increased time interval between sprays. Similarly, kaolin clay has provided only mediocre OT control and may have to be reapplied frequently as it is easily washed off by rain.

**Use the best insecticides:** Movento (available as a Section 18 in NY) and Radiant are the most highly effective insecticides labeled to control OT. Radiant has excellent residual activity lasting > 7 days. Movento is systemic and has residual activity of > 10 days, but it is not very effective against adult OT. For this reason, Movento is strategically placed during the first half of the season when adult populations are lower than they are late in the season. Agri-Mek (available as a Section 18 in NY) provides good control of OT and has residual activity of 5-7 days. Lannate provides mediocre control of OT, OPs like PennCap-M provide poor control and pyrethroids like Warrior have failed to control OT in Cornell trials. The Cornell recommendations for OT control provide a sequence and strategy that takes into consideration the strengths and weaknesses of the available insecticides and applies them in a responsible manner to avoid the development of resistance in order to provide an effective, sustainable and economical OT management plan.

**2011 Cornell spray recommendations for OT:**

- 1) 2 sprays of Movento 5 fl oz, each at 1 OT per leaf\*
- 2) 2 sprays of Agri-Mek 0.15EC 14 fl oz, 7 days apart (note: 30 day PHI)
- 3) 2 sprays of Lannate 3 pts, 7 days apart
- 4) 2 sprays of Radiant 6-8 fl oz, each at 3 OT per leaf

\*If 3 weeks after the first spray of Movento, the OT population does not reach 1 OT per leaf, skip to Agri-Mek. If after using Movento or Agri-Mek, there are only 2-3 weeks remaining before onions are pulled, skip to Radiant.

**For small-scale growers:** OT populations may not be resistant to pyrethroids or OPs in these areas as they are in muck areas where large-scale onion production occurs. Start spraying these insecticides at 1 OT per leaf. If after 7 days, OT numbers are higher than 1 OT per leaf, switch to another chemical class.

**For organic growers:** Entrust is the most effective OMRI-approved insecticide and should be applied at 1 OT per leaf. It should not be applied more than twice before switching to another chemical class. Cultural practices may be incorporated.

**Other important points:** It is very common to not see a knockdown in OT until after the second consecutive spray of an insecticide. Use the highest rate of penetrating surfactant with Movento, Agri-Mek and Radiant.

**Diseases:**

The most important diseases of small-scale onion production are purple blotch, downy mildew and bacterial bulb decay.

**Purple Blotch:** PB usually develops and spreads during July and August as plants begin to mature. PB lesions can girdle onion leaves resulting in leaf dieback and in severe cases, onions can die standing up. When scouting, look for boat-shaped target-spot lesions about 0.5 to 1.0 inch in length on the outer 2-3 leaves of the plant. Lesions can be tan-ish or purplish, sometimes blackish in color, on green leaf tissue. Start spraying for PB in early July or at first sign of disease. In the most recent Cornell fungicide trials (2005-2007), half rate of Scala (9 oz) + half rate of Bravo (1.5 pt), Switch, Rovral and Endura were the top 4 best treatments for control of PB. All of these fungicides also control Botrytis leaf blight, another common leaf disease of onion. Other fungicides that can be used to manage PB include Quadris Top, Pristine, Cabrio and Inspire Super. Note that mancozeb and Bravo are weak against PB. Generally, fungicide sprays for PB need to be continued weekly for the rest of the season.

**Downy mildew:** DM is sporadic and generally only occurs in cool and wet years or very late in the season. It can be very destructive causing severe leaf dieback and onions often die standing up. Early detection of DM is very tricky. Middle-aged leaves first turn pale, then yellowish, and elongated patches may have grayish-violet fuzzy spores on green leaf tissue. Sporulation is most easily observed when dew is present. In older infections, the initial infection site becomes necrotic and is quickly invaded by PB and secondary pathogens with black spores. Infected leaves will die back very quickly. Once DM is detected, apply Ridomil Gold + mancozeb (Penncozeb, Manzate, Dithane) alternated with a high rate of Quadris Top + mancozeb. Other fungicides labeled for DM in onions include Reason, Revus, Presidio (new), Aliette, Acrobat, Forum, Phostrol/Prophyt. Know that once a plant is infected with DM that it will lose the affected leaves to dieback. The fungicide program is to prevent further spread from the infected

plants to healthy ones, so that the whole field is not destroyed. Expect original DM hot spots to worsen, despite fungicide sprays. To assess whether DM is being contained, look for lack of new infections, and lack of spores on old lesions.

**Bacterial bulb decay:** A complex of several bacterial organisms including from the Geneses *Burkholderia*, *Pantoea* and *Enterobacter* have been found to cause bacterial bulb decay of onion, which are commonly soil borne. Symptoms first appear as leaf blights on the youngest center leaves of the plant and result in yellowing or bleaching and wilting of these leaves. The infection progresses down the leaves and neck, and eventually into the bulb. Affected bulb scales become soft and water-soaked and are yellow-brown in appearance. Cooper bactericides and Oxidate provide mediocre to poor control of bacterial diseases in onion. New research in plasticulture has shown that some very simple and economical adjustments to cultural practices can go a long way towards reducing bacterial diseases of onions.

### **New Research in Plasticulture:**

In small-scale production, onions are typically grown from transplants on 3 foot wide black plastic mulch beds with 2 to 4 rows per bed. Onions are harvested by hand starting in early July and throughout the summer and sold at roadside stands, farmer's markets and produce auctions. Recent Cornell-led studies have demonstrated that narrow plant spacing and alternatives to black plastic mulch can significantly reduce bacterial bulb decay, increase marketable yield and increase profitability of small-scale intensively grown onions.

**Narrow plant spacing:** Cornell studies showed that when plant spacing was reduced from 6" or 8" to 4" with 3 or 4 rows per 3-foot plastic mulch bed (row spacing: 4 rows = 6"; 3 rows = 8"), this provided 53 to 64% control of bacterial bulb decay at harvest. Marketable yield also increased by 1.4 to 2.4 times, representing an increased net economic return of \$43 to \$258 per 100 feet of bed, due to increased weight of marketable jumbo-sized bulbs. Wide plant spacing produces big bushy plants with more leaves, thicker necks, delayed maturity and bigger bulbs, which are more prone to rotting. Narrowing plant spacing produces plants with fewer leaves and narrower necks that mature earlier and therefore are less conducive to bacterial bulb decay.

**Alternatives to black plastic:** Cornell studies showed that silver plastic, biodegradable black plastic and bare ground reduced bacterial bulb decay by 59%, 71% and 75%, respectively. Reflective silver plastic mulch, biodegradable black plastic and bare ground had significantly 1.8 to 2.8 times higher marketable yield than black plastic. Reflective silver and biodegradable black plastics had significantly 3.7 and 3.6 times, respectively, higher jumbo weight than black plastic, which resulted in an increased net return of \$96 to \$215 per 100 feet of bed compared to black plastic. Despite significantly reduced incidence of bacterial bulb decay, onions grown on bare ground did not yield higher than black plastic due to extreme competition from weeds; for bare ground to be effective, weeds must be adequately controlled. All of the alternatives to black plastic had significantly lower soil temperatures compared to the black plastic; we suspect that the higher temperatures of the black plastic are more favorable for development of bacterial diseases. For more information, visit <http://blogs.cce.cornell.edu/cvp/>, from the side menu, click on "crops,..." and then "onions", or contact Christy Hoeping.