

VegNet Vol. 14, No. 15. June 19, 2007

Ohio State University Extension Vegetable Crops On
the WEB at: <http://vegnet.osu.edu>

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Managing Diseases of Tomatoes in High Tunnels by Sally Miller, State Extension Specialist Vegetable Disease Management, Department of Plant Pathology, The Ohio State University

High tunnels offer Ohio farmers an opportunity to stretch the tomato season at both ends by allowing earlier planting, earlier first harvest, and extension of the growing season into the fall. High tunnel production includes elements of both field and greenhouse management. The protected culture of high tunnel production may result in lower incidence of diseases exacerbated by rainfall such as Septoria leaf spot and bacterial spot and speck. However, diseases that often occur in greenhouses, but are uncommon in open fields, may appear in high tunnels. Botrytis blight/gray mold (Figure 1), white mold (timber rot) (Figure 2) and leaf mold (Figure 3) are among the most important of these diseases. Late blight (Figure 4) may also occur under cool, moist conditions. These diseases can be managed by employing appropriate cultural tactics and by the judicious use of fungicides.



Figure 1. Botrytis blight/gray mold



Figure 2. Tomato white mold in high tunnel



Figure 3. Tomato leaf mold, upper surface (left); lower surface (right)



Figure 4. Late blight of tomato

Cultural tactics. All of these diseases are favored by high relative humidity in the tomato canopy. Wider plant spacing and improved ventilation help to reduce the incidence of these diseases. Proper sanitation is also important diseased tissue should be removed and destroyed. Workers should avoid handling plants when free moisture is present to reduce the spread of pathogen spores from diseased to healthy plants. Plants should be irrigated without applying water to the foliage. Further, tools used in training and pruning should be disinfected regularly.

Fungicides. According to the Ohio Department of

Agriculture, for purposes of pesticide application, high tunnels are considered to be the same as greenhouses. Therefore, regulations PERTAINING TO GREENHOUSES, AND THE DIRECTIONS FOR USE ON THE PESTICIDE LABELS, MUST BE FOLLOWED WHEN APPLYING PESTICIDES in high tunnels. Restricted use pesticides can only be used by Certified Pesticide Applicators with THE greenhouse CERTIFICATION ON THEIR APPLICATOR LICENSE. Restricted use pesticides are identified prominently on the label.

Pesticides that are not restricted use and are labeled for tomatoes but without specific greenhouse use directions may be used in high tunnels (and greenhouses) unless greenhouse use is expressly prohibited on the label. Thus, a specific label for greenhouse use is not required; but the label must be carefully read to be certain the greenhouse use is not restricted. For more information about fungicide usage allowances in high tunnels and greenhouses, please contact Jim Belt, Ohio Department of Agriculture (614-728-6389).

Copper products, and Manzate, Dithane and other EBDC fungicides may be used for management of leaf mold and late blight in greenhouses and high tunnels. The fungicide Gavel may be used for late blight suppression in protected culture, but Acrobat may only be used on field-grown tomatoes. Decree, Scala and Endura are labeled for Botrytis management in greenhouse tomatoes. A Section

18 emergency exemption for the use of Topsin M in open field, greenhouse and high tunnel production systems for white mold/timber rot management has been approved for the 2007 growing season. Some fungicides commonly used in open field tomato production, such as Bravo Weather Stik and Quadris, are not allowed in greenhouse or high tunnel systems.

All of the diseases mentioned are difficult to manage once they become established, and an integrated approach including cultural tactics as well as fungicides is necessary. Where white mold has been a problem in tomatoes or in previous crops, growers may consider applying the biocontrol agent Contans to soil after the tomato crop to reduce the viability and number of sclerotia of *Sclerotinia sclerotiorum*, the causal agent. Our studies in 2006 also showed that tomato plants grown in compost-amended soil in high tunnels had significantly less white mold than those grown in non-amended soil. Early blight was also reduced on tomatoes grown in compost-amended soil compared to those grown in non-amended soil in high tunnels.

Treatment	% Sclerotinia white mold	% early blig
No compost	26.9 a	8.3 a
Compost	5.8 b	5.7 b
P value	0.0033	<0.0001

Crop Reports by Ron Becker, Brad Bergefurd and Hal Kneen

Southeast OH, Meigs County. Scattered showers on Friday night, June 8, a little over one half inch of rainfall in thirty minutes or so. Still in drought conditions. Trickle irrigation continues especially on tomatoes, peppers, cukes, squash, vine and cole crops. Some sweet corn is being trickle irrigated but most on overhead irrigation. Corn tassels and young ears are showing on sweet corn, kernel pollination appears to be good.

Melons are forming. While in the fields found good numbers of wild honey bees and bumble bees.

Checked insect traps. No sign of corn earworm in helio trap or beet army worm in green and white canister trap, both values zero, year to date.

Fungicide sprays are minimal due to low humidity and almost non existant rainfall since mid April. Some growers along the Ohio River are seeing heavy dews on tomato plants in the early morning after being irrigated by trickle irrigation. Alternatin gsprays containing Tanos or Quadris, Maneb and Bravo are being applied in rotation in addition to copper sprays.

Wayne County Report. From: 6/15/07

This week we found several squash plants that had pythium and phytophthora in fields that had the diseases previously and have recently had flooding conditions. Cole crops had large numbers of Imported cabbage worm eggs, both recently laid (pale green) and nearly ready to hatch (dark yellow). Several fields needed to be sprayed due to the presence of both imported cabbage worm and diamond back moth larvae at threshold levels. Several potato fields were sprayed for potato beetle as well as potato leafhoppers. European corn borer is being found at low levels in sweet corn over 10 inches in height. We are also finding sweet corn fields with light to moderate billbug damage. Potato leafhoppers are being found in green beans with several fields needing to be sprayed. Cucumber beetles are being found at threshold levels in several fields of vine crops. Thrips are being found in onion fields at threshold levels (10–15 thrips per plant). Tomatoes and peppers have had little insect activity other than light flea beetle, however bacterial leaf spot was confirmed in a pepper field and early blight is being found at very low levels in tomatoes. Other insects being found on various crops include aphids, common stalk borer and two spotted spider mites.

Southern OH report. From 6-18-07

The continued drought remains on southern Ohio growers priority list with continued irrigation of most all crops through trickle, center pivot and big guns where available,

especially in sweet corn crops which are in full tassle and silking and ear enlargement stage of growth and for newly seeded crops for emergence due to powder like topsoil conditions. Pop up thunderstorms have been very spotty but those in storm paths have received anywhere from 2/10 of an inch up to 2 1/2 inches of rain in northeast Clinton county and the Jackson area with some areas reporting hail and wind damage to crops. Melons are sizing up nicely with many netted up and should be ready to harvest within 10 to 12 days. Harvest of high tunnel tomatoes is in full swing with wholesale prices approaching \$100 per bushel with very high demand by wholesale buyers. Harvest of blueberries, red raspberries and black raspberries has begun on a very limited basis. Harvest of field grown pickles, cucumbers, summer squash, green onions, radishes, spinach, cabbage, and broccoli continues. Some early planted plastic grown sweet corn should be ready for harvest within 10 days with growers reporting two full size ears per plant under fields with constant irrigation. The processing pickle crop is in need of a rainfall for the crop is at vine tip and flowers are begin to prematurely open probably due to the heat and drought stress. Harvest of the processing pickle crop should begin in about 2 weeks weather dependant. Spotted cucumber beetles and a few striped beetles are being caught in plant and phermone traps in Circleville area. Strawberry harvest is complete for the entire southern Ohio growing region, except for a few late

varieties such as Ovation and some Everbearing varieties still producing a few fruit. Growers are reporting overall, including plasticulture and matted row crops, about a half a strawberry crop harvested at the best due to the Easter freeze and frost damage and drought and high heat conditions experienced during the harvest season.

Plasticulture strawberry crops have been sprayed with Roundup to make way for double crops of pumpkins and squash to be transplanted or seeded into these plastic mulched beds with trickle irrigation. Harvest of the blueberry crop began last week as well as the first summer bearing red raspberries and black raspberries. Raspberry crops continue to show weekly cane and plant collapse as the crop nears harvest stage due to freeze damage sustained to the plants vascular system during the Easter freeze event. Spider mites are being found in strawberry and watermelon crops due to the continued dry conditions with applications of miticides being made where necessary. Growers that are seeing a bronzing discoloration to plant canopies should take a white piece of paper and smash the paper against the plant leaf, if spider mites are present there will be small red dots on the white paper which is one sign of a mite infestation. Use of a hand lens, microscope and/or a lab diagnosis are also suggested ways to diagnose an infestation. Growers who No till plant their pumpkin crops into rye remain concerned with this late date for they still cannot get their no till planters to penetrate the hard topsoil in rye fields

even with down pressure set at the maximum depth on no till planters and cannot get their pumpkin crop seeded. Some who have received some rainfall in pop up thunderstorms have resumed planting for this little moisture has softened the topsoil somewhat for planters are able to penetrate deep enough. Those that have seeded into rye fields up to 2 weeks ago are seeing very little as well as very spotty emergence due to the dry topsoil conditions and shallow planting depths in no till fields. Seeds dug up are just the way they were seeded 2 weeks ago and remain unsprouted due to the dry field conditions and lack of moisture. The rye crop may have wicked what little topsoil moisture that was in these fields which has reduced germination. Other growers have abandoned these rye fields and have planted their pumpkin crops into conventionally tilled fields where some topsoil remains and pumpkins are emerging with 5 to 7 days of planting. Other growers have seeded pumpkins as transplants in the greenhouse and have decided to transplant their pumpkin crop onto plastic mulched beds that are under trickle irrigation. Weed control remains an issue with no rainfall to activate pre emerge herbicides in most all vegetable crops. Cultivators continue to roll to stay ahead of weed flushes. Growers continue looking at all post emergent herbicide options and making applications where available. The trouble growers are experiencing with excessive cultivations is the loss of the already depleted topsoil moisture due to temperatures in

the mid to high nineties and constant brisk warm winds. These winds are also causing havoc with growers who are still laying plastic mulch and drip tape for late planted melons, tomatoes, peppers. The soil is so dry that plastic is being laid into very dry powder like soil conditions and the winds literally blow this soil off of the plastic tucks since no rainfall has occurred to seal these tucks in. Preliminary Fusarium wilt as well as Bacterial canker like symptoms have been reported to me in tomato crops over this past weekend, 6/16 and 6/17, and on farm diagnosis will be made today (6/18) and growers are encouraged to send plant samples to the PPDC lab, <http://ppdc.osu.edu/>, at OSU for lab diagnosis.