RUTGERS COOPERATIVE RESEARCH & EXTENSION AT THE NEW JERSEY AGRICULTURAL EXPERIMENT STATION

PLANT & PEST ADVISORY

LANDSCAPE, NURSERY & TURF EDITION $1.50 MAY 18, 2006

INSIDE

Tospoviruses in Greenhouse Crops

Ann B. Gould, Ph.D., Specialist in Plant Pathology

Greenhouse growers in New Jersey are certainly familiar with two virus diseases that affect a variety of ornamental and vegetable crops. These viruses, the *Impatiens necrotic spot virus* (INSV) and its close relative the *Tomato spotted wilt virus* (TSWV), belong to a group known as Tospoviruses. Tospoviruses are the only members of the plant virus family called the Bunyaviridae. A notable member of this family causes hantavirus pulmonary syndrome, a rodent-borne disease of mammals.

To refocus our attention on plants, however, the 18 viruses included in the *Tospovirus* genus cause diseases of significant economic importance on a worldwide scale. Hosts in more than 100 families are affected by one or more viruses in this group. Tospoviruses are particularly troublesome on species of ornamentals, vegetables, tobacco, and peanut and have caused devastating losses to various greenhouse crops. In 2006, growers in the northeast reported INSV on coleus, lobelia, and New Guinea impatiens (Greenhouse IPM Notes).

TSWV was first reported in Australia in 1915 and was for many years considered the only virus of its type. During the 1980s, this virus severely affected tomato, tobacco, and peanut crops in the southeastern United States, Europe, and South America. By the late 1980s, a new virus similar to TSWV was discovered. This virus, INSV, caused severe losses in the floral crop industry throughout the United States and Europe. Within the last 15 years, more members of the *Tospovirus* genus have been described, some of which affect peanuts in India, cucurbits in Japan and Taiwan, and vegetables and ornamentals in the Brazil, Israel, and the United States.

Symptoms

Symptoms of diseases caused by INSV and TSWV vary greatly because so many species of greenhouse crops can be infected with the viruses. In general, very young plants (less than six weeks of age) infected with these viruses may decline and die rapidly. In older plants, symptoms appear as mottling, vein clearing, wavy lines, concentric rings, and distortion of leaves, purple lesions on stems, color break on flowers, and stunting and death of entire plants. Ultimately, symptom expression depends on growing conditions, and the species, age, and health of the host plant. Symptoms caused by INSV and TSWV can often by confused with symptoms caused by other viral, fungal, or

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bacterial plant pathogens or by environmental (abiotic) disorders or injury.

Host Range

Many of the plant species known to harbor the INSV and TSWV viruses are ornamental bedding plants, cut flowers, potted crops, and perennials. These hosts include: ageratum, African violet, amaryllis, anemone, aster, begonia, calceolaria, calendula, calla lily, campanula, Christmas pepper, china aster, chrysanthemum, cineraria, coleus, columbine, cosmos, cyclamen, dahlia, delphinium, dusty miller, exacum, evening primrose, forget-me-not, gaillardia, geranium, gerbera, gladiolus, gloxinia, gypsophila, hydrangea, impatiens, lobelia, lupine, marigold, morning glory, nasturtium, New Guinea impatiens, nonstop begonia, peony, petunia, phlox drummondi, poppy, primrose, ranunculus, Rieger begonia, salvia, sinningia, snapdragon, stephanotis, stock, tiger lily, verbena, zinnia.

Vegetables known to harbor these viruses include bean, cauliflower, celery, cowpea, cucumber, eggplant, endive, lettuce, pepper, potato, spinach, and tomato. Weed hosts include bindweed, burdock, buttercup, chickweed, clover, jimsonweed, lamb's quarters, morning glory, nightshade, pigweed, shepherd's purse, and wild tobacco.

Transmission

Tospoviruses are spread by insects called thrips (thysanoptera: thripidae). INSV and TSWV are spread in New Jersey greenhouses by two species of thrips, the **western flower thrips** (*Frankliniella occidentalis*) and the **onion thrips** (*Thrips tabaci*). Thrips larvae acquire virus by feeding on infected plants. The virus multiplies in the insect and is transmitted to healthy plants by the adult thrips, which remains infective its entire life. Plants begin to show symptoms 5 to 14 days after becoming infected.

Management

There is no cure for plants once they become infected with INSV or TSWV. Since infected plants must be destroyed, the best control for these virus diseases is prevention.

- Inspect all incoming stock for thrips and symptoms of disease. To check for thrips, tap plants over a white piece of paper or cloth. If possible, keep incoming stock separate from existing stock until you are certain the new stock is free of both thrips and disease. Hosts such as gebera daisy, brachycome, and phlox hybrids may serve as indicator plants in greenhouses.
- Remove and destroy all infected plants since they cannot be cured and can serve as a source of inoculum to other plants.
- Keep seed and vegetatively propagated plants separate. Although these viruses are not transmitted through seed, they can be spread by taking cuttings from infected plants.
- Try to control or break thrips infestations between the fall and spring.
- Because many weeds harbor both thrips and virus, eliminate and discard weeds both inside and outside the greenhouse.
- Continually monitor thrips populations on a weekly basis with sticky cards. One to three sticky cards should be placed just above the plant canopy per 1000 square feet of bench space. Place other cards near vents and doors. Control thrips as warranted.

Diagnosis

Positive diagnosis is made by submitting plants with suspicious symptoms to a disease clinic, such as the Rutgers Plant Diagnostic Laboratory, capable of running special chemical tests.

Sources

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had some cytospora canker on spruce that was diagnosed on samples from Middlesex and Union Counties.

In other landscape samples, birch from a Middlesex County residential landscape had **birch leafminer** and a huge population of **spiny witch hazel gall aphids**. Part of the complex life cycle of these aphids is lived on the birch. Large colonies of wooly aphids can be found now on the undersides of birch leaves. Sometime in June, the aphids fly to witch hazel where their egg laying behavior results in spiny galls – very cool and easy to control on the birch with a summer weight oil or insecticidal soap. Last but not least, English ivy from Monmouth County had **anthracnose** and **Phyllosticta leaf spot**. We also had our obligatory pachysandra with **stem and leaf blight**.

Greenhouse and nursery

Last week it was **downy mildew of coleus** and this week **downy mildew of rose**. *Peronospora sparsa*, the cause of **downy mildew of rose**, was identified on several different varieties of rose that were submitted from a Monmouth County nursery. Another Monmouth County grower brought serviceberry with a nice infection of **quince rust**. Samples of Pieris from a Cumberland County nursery were diagnosed with **spruce spider mite**. ❑

Landscape IPM Pest Notes

Steven K. Rettke, Ornamental IPM Program Associate

✔ **FLETCHER SCALES ON YEW (*TAXUS*):** This soft scale is now laying eggs that will hatch in June. Monitor for hemispherical, 1/8 inch, yellow-brown adult scales. Also, look for dieback damage and needle yellowing. Small shrubs may be killed. Immature scales grow quickly and produce much honeydew, which results in foliage becoming covered with sooty mold. The crawlers are easy to control with one spray of 1% oil or soap.

✔ **BOXWOOD LEAFMINER (448-700 GDD):** Adults of this imported pest are orange-yellow mosquito-like flies about 1/8 inch in size. They can be seen swarming around boxwoods for a two-week period during mid-May (~290+ GDD)(shake bushes to detect flying adults). Yellowish, blister-like blotch mines on the under surface of leaves are caused from larvae feeding inside the leaves of American boxwood. Heavily mined foliage turns yellow and drops prematurely. Damage to new season growth does not become readily apparent until the fall, since the heaviest feeding is done in the fall and late winter months. When the egg-laying adults are seen, contact insecticides can provide good suppression. If numerous mines are found during the summer and fall, a systemic spray, acephate (Orthene) or imidacloprid (Merit) can be applied to kill larvae within the mines. The overwintering larvae are also susceptible to these controls during the late winter feeding period. Avid and Talstar are also labeled. Replace susceptible plants with resistant cultivars.

✔ **EUONYMUS SCALES (533-650 GDD = 1st generation):** The light yellow crawlers are often active during the early weeks of June or when the *Kousa* dogwood is in bloom. Variegated evergreen euonymus plants are especially vulnerable to scale. When allowed to build-up, defoliation results and a weakening of the plant occurs. A horticultural oil plus Orthene combination will provide best control management after the crawlers settle (before they turn white/gray). The Orthene will suppress the white males feeding on the leaves, while the oil reduces the brown females present on the stems. Imidacloprid (Merit) applications have only shown approximately a 40% suppression rate against armored scales.

✔ **PINE NEEDLE SCALE (298-448 GDD = 1st generation):** This armored scale insect is a common pest of pines, especially Scotch pine, mugo pine, Austrian pine and red pine, and occasionally on white pine, Norway and Colorado spruce. White oystershell shaped adult female covers are 1/8 inch and found only on needles. A long egg laying/crawler emergence period occurs from late May into mid-June, with a second generation in July (1290-1917 GDD). When the pink crawlers settle, they turn in color to yellowish tan, lose their legs, and never move again.

The crawler stage and early settling periods are the ideal time to control them with insecticidal soap or 2% horticultural oil (i.e., these materials also minimize harm to beneficial insects present). Research in Ohio showed that oil provided better control than did Orthene or Sevin. Control with these products will be good up until the time the crawlers begin to show some "white" or protective wax around the edges. In order to limit impact on beneficials, avoid broad-spectrum insecticides unless absolutely necessary.

✔ **GOUTY OAK GALLS** are woody galls up to 2" long, formed on the branches of many oaks. Large galls may girdle branches and cause significant dieback. They are caused by female wasps emerging from old galls in late May. They lay eggs in oak leaves; the hatched larvae feed and cause a blister-like gall to form along the leaf vein. In July, adults emerge again and lay eggs in twigs. The familiar woody galls will grow on these twigs over a period of 2 to 3 years.

Although pruning out galls is the only recommended control, realistically it is not very effective, since it is hard to get rid of all the overwintering galls in the area. Contact insecticides will kill emerging adults, yet timing and coverage is difficult, so overall control is minimal. Since most wasp attacks are at the tips of trees, leaf expansion makes it difficult to provide an effective pesticide residue. No research is available on injections or soil applications; but such treatments may not get into the gall to kill the wasp before adults emerge by the end of the month.

✔ **AZALEA LACEBUG (350-646 = GDD – 1st generation):** Spiny black nymphs will first become noticeable as the overwintering eggs begin to hatch. Adults will become active later in May, feeding and laying eggs on the underside of azalea foliage. Leaves appear stippled and off-colored. Look for black fecal spots on the underside of foliage or for the lacy winged adults. Azaleas planted in full sun and under drought stress exhibit the worst damage.

Control with acephate (Orthene) when active life stages are first seen. Note that while insecticidal soap and horticultural oil has offered good control (>85%), obtaining contact with lacebugs on the underside of foliage may prove difficult on small plants. Imidachloprid (Merit) has provided excellent results with residuals of more than a year.

✔ **PINE BARK ADELGIDS:** These common aphid-like insects are easily detected on the new candle growth of pines this month. They form a white cottony coating on the bark of white and Scots pine. Eggs laid during May, will hatch in June and the crawlers settle on the bark, branches and new pine candles. Damage is usually cosmetic (sometimes high populations can kill small

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branches). When customers react negatively to their presence, reduce this first generation with a strong blast of water, horticultural oil, or insecticidal soaps. These treatments should help conserve beneficial insects that are commonly associated with this pest.

✔ **PINE THRIPS:** These minute insects feed on pine needles by rasping the tissue with their sickle-like mouthparts and lapping up leaf sap. The damage they cause is discolored, crooked or curled needles on new growth with brownish wound spots. These wounded areas resemble fungal spot lesions. The orange brown thrips (1/16 inch long) are rarely seen and are *very fast*. The adults lay their eggs in May and there are several generations throughout the season. Control is often not necessary, but dry conditions favors the buildup of their populations. Sprays with Orthene plus 1% oil to will provide controls. Conserve also provides excellent suppression.

✔ **PINE SPITTLEBUG:** The native spittlebug attacks nearly all of our common pines, as well as Norway, white and red spruces, balsam fir, larch, eastern hemlock, and Douglas fir. Nymphs are covered with frothy honeydew called spittle. They are mostly black in color with a white abdomen and can be found under spittle on twigs in May and June. Inspect for adults feeding in the same location in July and August. Adults are about ¼ inch long and are mostly tan in color with whitish bands on the wings. Both adults and nymphs suck sap from the phloem vessels of twigs.

Damage is usually not serious with light infestations and chemical controls are not warranted. However, this insect can potentially increase the spread of the fungus *Sphaeropsis* (*Diplodia*) by producing wounds. On small pines, spittlebug populations may be manually removed. Adults are more active than the nymphs and may require an insect net to effectively keep them from twigs. If necessary, spray spittle masses with insecticidal soap.

✔ **SLUG DAMAGE:** Slug damage on herbaceous plants often appears "suddenly." Look for irregular holes in the *middle* of the leaf (not the edge of the leaf). If new growth emerges twisted or ragged, slugs may have fed on dormant buds. Carefully monitor hosta, daylily, and any annual/perennial bed that is heavily mulched. Consider removing some of the mulch to reduce slug habitat and apply slug bait if necessary.

✔ **BOXWOOD SPIDER MITES (GDD = 450 – 700):** This spider mite, which attacks all boxwoods, is neither a true cool or warm season mite since it is usually most active with intermediate temperatures during mid-spring and early summer. The adult is yellow-tan in color with long legs. When the boxwood mites are active, they can be found on both the top and bottom of new growth. Eggs are light yellow and overwinter on leaves and twigs. There are several generations a year. Boxwood mite feeding damage results in foliage with yellow to bronze stippling, which may resemble injury caused from thrips. With high mite populations, entire leaves may develop yellowish streaks and turn yellowish white; premature defoliation can occur.

Detected overwintering eggs are treated with dormant oils (2-3%). Although normally unnecessary, summer oils (1-2%) or insecticidal soaps are recommended to control mild mite populations. With high infestations, the use of a residual miticide such as Florimite, Avid, or a pyrethroid (e.g., Talstar, Mavrik, Scimitar) may be necessary.

✔ **WOOLLY BEECH APHID (GDD = 350 – 700):** Woolly beech aphids are found feeding on twigs or the undersides of leaves of beech (especially the European varieties of beech). Aphid bodies are covered with long, white waxy filaments that extrude from their bodies. Look for cast "skins" (old aphid skeletons) attached to the leaves that may give foliage a whitish appearance. Leaves are small, distorted and stunted, and new growth may stop completely. Honeydew and superficial sooty black mold may also be prevalent.

Natural enemies often hold these pests in check, and even huge populations often do not cause significant damage, even after consecutive years. Pesticides may be necessary at times. Some treatment choices include horticultural oil, imidicloprid (Merit), Scimitar, and fluvalinate (Mavrik).

✔ **ASH/LILAC BORER:** Adult lilac borer moths are flying. They attack lilac, and to a lesser degree, ash. Remember, ash is primarily attacked by the banded ash clearwing borer and is not active until late August or early September. So if you've been spraying ash in May when you see dieback and frass, you may have been spraying for the wrong pest!

Lilac borers lay eggs on the back of large stems of old lilacs. A spray of Astro (a pyrethroid) on the bark now will kill and prevent new larvae from tunneling within the bark (however, many eggs by this time may have already been laid and have hatched). A better option is to start renewal pruning over the next year or two to remove these old stems (plants will flower better, too). Beneficial nematodes should also control larvae once they're in the bark this summer.

✔ **TAXUS MEALYBUG:** Although yews have relatively few insect problems, this pest is sometimes found in significant numbers. They are present now in the branch forks and nodes. The adults are covered with white cottony wax. They produce honeydew, so look for the shiny sticky substance on the leaves and for the black sooty mold that will grow on the honeydew. The feeding will cause yellowing and dieback of branches. Monitor for the presence of beneficials. If a large population is present, then control with horticultural oil or soap. Orthene and Tempo 2 are examples of other labeled insecticides. ❑

Diseases of Turfgrass

Bruce B. Clarke, Ph.D., Specialist in Turfgrass Pathology

General

Yellow patch and **pink snow mold** are still apparent on some golf course greens, particularly in shaded areas. **Stripe smut**, **leaf spot**, and **red thread** are also common on landscape turf at this time. See recent issues of this newsletter for additional information to control these and other turfgrass diseases.

Anthracnose

This disease, caused by the fungus *Colletotrichum cereale* (previously referred as *C. graminicola*), will soon develop again on annual bluegrass greens in the region. This fungus typically attacks turf growing under stress (i.e., low soil fertility and/or heat and moisture stress). Low cutting height (e.g. below 0.125 inch) can also enhance symptom development. To identify **anthracnose** in the field, look for small black fruiting bodies with protruding black spines on leaves or stems. For best results, increase turf vigor with light applications of nitrogen, maintain adequate irrigation, reduce thatch, and avoid wounding (e.g. switch to smooth rollers on mowers). Recent research at Rutgers University has shown that anthracnose can also be significantly reduced, and acceptable greens speed (i.e., ball roll distance) maintained, by raising the height cut while increasing mowing frequency and rolling. For best results, apply Banner, chlorothalonil, Compass, ConSyst, Eagle, Endorse, Heritage, Insignia, Rubigan, Spectro, or thiophanate-methyl on a preventive basis per manufacturer's recommendations. Chipco Signature, Medallion, and Chipco 26GT can also effectively suppress this disease, but are most efficacious when used as a tank mix partner with the previously mentioned fungicides. To reduce the potential for fungicide resistance, tank mix or alternate fungicides with different modes of action every 14 to 28 days.

Dollar Spot

Dollar spot should soon develop on golf and landscape turf. To prevent this disease from causing severe damage to susceptible turf again in 2006, maintain adequate nitrogen fertility, water in the early morning hours, reduce thatch, avoid the sole use of any fungicide for prolonged periods of time (to reduce the possibility of fungicide resistance), and apply Banner, Bayleton, Chipco 26GT, chlorothalonil, ConSyst, Eagle, Emerald, mancozeb, Rubigan, Spectro, thiophanate-methyl, or vinclozolin. Repeat fungicides as needed through late-October.

Stripe smut

Symptoms of this disease, caused by the fungus *Ustilago striiformis,* are starting to appear in infested Kentucky bluegrass lawns. To identify stripe smut in the field, look for masses of black spores protruding through "shredded" leaf blades. Although fungicides are most effective when applied once in mid-October, present infections can be controlled now with one or two applications of a penetrant fungicide such as Banner, Bayleton, Eagle, Rubigan, or thiophanate-methyl. Follow label directions carefully for best results.

Turf Field Day

Mark your calendars now for this year's Rutgers Turfgrass Research Field Days which will be held on August 2, 2006 (Landscape Turf Research Field Day at Adelphia, NJ) and August 3, 2006 (Golf Turf Research Field Day at Hort Farm II, Ryders Lane, New Brunswick, NJ). Additional information and directions to each location will appear in future issues of this newsletter. ❑

Plant Diagnostic Laboratory Highlights

Richard J. Buckley, Laboratory Coordinator

Turf

There is nothing like a bit of cold rain to kick up some disease activity. **Pink snow mold** (Microdochium patch) has begun to flare-up on tri-state area golf courses every few days in tandem with the rain. Careful with the **snow mold** diagnostics – two superintendents swore they had **Pythium blight** that turned out to be **snow mold** when the turf got into the laboratory. The fungus that causes **pink snow mold**, *Microdochium nivale*, produces huge numbers of conidia that are dragged all over by the mowers**.** **Yellow patch** was also very active this week and was diagnosed on several turf samples from North Jersey golf courses. With an eye toward the summer months, the **anthracnose** watch is in on. The disease was diagnosed on samples from Virginia. Take a close look at those yellow annual bluegrass plants. Our first **take-all patch** sample was also recently confirmed on turf from a golf course in Pennsylvania.

Ornamentals

A number of Japanese maple samples were sent to the laboratory this week from Morris, Atlantic, and Cumberland Counties. In each case, the diagnosis was **cytospora canker**. **Cytospora canker** is a well known problem of spruce, but is also found on deciduous hosts – like maple and willow. Most canker diseases attack host plants that are predisposed to infection by stressful environmental conditions: heat, drought, and winter injury are the usual suspects. Japanese maples, of course, are subject to mild extremes (huh?) in the environment. It seems that if you simply sneeze in the direction of the tree, the leaves will scorch and drop. Those are the limbs that ultimately end up with cytospora canker. The best control for all cankers is early detection and proper pruning. We also

See Lab Highlights on page 2

Recycle Those Nursery Pots and Make Some Money

Growers and nurserymen can turn their used nursery pots, plastic flats, trays, and cell paks into revenue. Plastics recyclers are now offering payments for the scrap. Depending on the type of plastic, recyclers are offering 40-$100 per ton for the material. Why pay landfill-tipping fees starting at more than $55 when you can make money with a few simple steps.

The key factor for recycling is that each type of plastic is segregated on separate pallets. Most of the plastic has a code stamped on it (#6 denotes polystyrene, #5 denotes polypropylene and #2 for HDPE). All plastics, with the same code, regardless of size, style or color, can be placed on the same pallet. Plastics can be mixed on the truck as long as each pallet only holds one type of plastic. In cases where the type of plastic can't be identified, miscellaneous items can be placed on a separate pallet with a notation that the plastic needs to be sorted. Participants are encouraged to keep the same type of plastic code on a single pallet so they receive the highest price. When the plastics are commingled on a pallet, a lower price will be offered for that pallet.

All loose dirt should be knocked out of the tray or pot. Generally just hitting the back of the tray or pot will eliminate most of the dirt. Minimum amounts of dirt, clinging to the sides or bottom, are acceptable. Trays with ¼ inch or more of dirt, especially if the dirt is hardened, should be cleaned more thoroughly. It is important to keep the scrap as dry as possible, since any residual dirt can easily be removed during the grinding process.

The trays should be nested together as tight as possible. The stack should be placed on its side on the pallet to a maximum height of 7 feet. The pallet should then be stretch-wrapped. These steps should create a pallet that weighs about 800 pounds.

For loads of half a trailer or more, the plastics recyclers will generally make the pickup within a few days after notification. For shipments of only a few pallets, the plastic recyclers will generally try to combine the pickup with another nursery or landscaper in the area as a way to fill up the truck. According to the plastic recyclers, participants receive their payments approximately 3 weeks after pickup.

To learn more about the plastic nursery pot-recycling program visit www.nj.gov/agriculture/divisions/md/prog/recycling.html or contact Karen Kritz at 609-984-2506 or email karen.kritz@ag.state.nj.us. ❑

Weather Summary For The Week Ending 8 am Monday 5/15/ 6

	RAINFALL			TEMPERATURE				GDD BASE50		MON
WEATHER STATIONS	WEEK	TOTAL	DEP	MX	MN	AVG	DEP	TOT	DEP	%FC
CANOE BROOK	1.45	5.82	-4.69	72	49	60.	1	323	198	94
CHARLOTTEBURG	2.40	7.14	-3.21	72	47	58.	1	229	160	93
FLEMINGTON	1.21	7.04	-2.96	77	46	61.	2	312	177	96
NEWTON	missing									
FREEHOLD	1.89	6.66	-3.28	74	39	57.	-4	311	134	94
LONG BRANCH	1.30	7.13	-3.14	69	50	58.	-1	247	100	87
NEW BRUNSWICK	1.50	5.86	-3.84	75	48	60.	-1	352	150	100
TOMS RIVER	.99	5.51	-4.47	74	48	58.	-3	294	132	92
TRENTON	.91	5.93	-3.08	75	49	61.	-1	364	135	83
CAPE MAY COURT HOUSE	.65	3.73	-5.00	75	46	58.	-3	315	114	77
DOWNSTOWN	.61	4.44	-4.54	78	43	60.	-2	353	113	74
GLASSBORO	1.68	6.23	-3.29	79	50	62.	0	427	198	100
HAMMONTON	.86	4.83	-4.43	76	45	60.	-2	369	148	81
POMONA	1.52	5.34	-3.38	74	44	58.	-3	318	138	92
SEABROOK	1.06	5.59	-2.55	79	50	62.	0	472	228	91
SOUTH HARRISON	.50	4.77	-4.45	78	50	61	NA	435	NA	NA

WES KLINE — GDD BASE 40 PINEY HOLLOW
LAST WEEK 143 (Ending 5/8/06)
THIS WEEK 139 (Ending 5/15/06)

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