



The Plant Doctor's LANDSCAPE TIPS

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THE TRELLIS RUST EPIPHYTOTIC



Photo 1: It is difficult to argue that the early spring flowering of ornamental pear trees represents a nice break from the seemingly endless Michigan winters. Pears were planted in great frequency, perhaps overplanted (?), with the demise of ash trees from the Emerald Ash Borer.



Photos 2A & 2B: Trellis Rust can appear somewhat spectacular, as though the leaves of the pear are decorated with Christmas ornaments in the early summer after a spring infection (2A, top photo). High rates of infection may kill the leaves (2B, bottom photo), which also kills the fungus . . . a suicide of sorts.

INTRODUCTION

Ornamental pear (*Pyrus calleryana*) is widely planted in Michigan landscapes, especially after the Emerald Ash Borer destroyed *Fraxinus* sp. (ash) as a viable landscape tree (Photo 1). Trellis Rust (TR), a.k.a. European Pear Rust, caused by the fungus *Gymnosporangium sabinae*, is increasing to epiphytotic proportions in Michigan. "Epiphytotic" is a Plant Pathology term meaning "plant disease epidemic". In Michigan, TR seems to be limited to the southeastern portion of the state at this time. Due to its proclivity to spread great distances by wind dispersal of spores and by infected plant material, it is only a matter of time before it is found in most areas of the state.

Evidence of Trellis Rust is initially disclosed by yellow to orange leaf lesions on pear leaves (Photo 2A) in the spring and summer; severely blighted foliage may die (Photo 2B). Alternatively, TR may



Photo 3: Another spectacular appearance of Trellis Rust is the bloom of its "juniper galls" in the early spring; at this stage, the fungus is producing spores that are wind-disseminated to the pear. This photo also shows a relative size comparison to a quarter . . . proof that money sometimes grows on trees, especially for those landscapers and arborists who are asked to treat TR.

be conspicuous as orange rust galls on Juniper (Photo 3) in the early spring. Of particular concern for us is that Trellis Rust can attack pear twigs, causing them to be killed (Photos 4A & 4B). Twig cankers and death can lead to decline in pear trees to such an extent that the trees may be considered nonviable as landscape trees. In SE Michigan, many arborists are reporting that the disease is so severe that trees often have to be removed.

TRELLIS RUST & FAKE NEWS

With the term "Fake News" being loosely thrown around these days to include everything our politicians and we as voters can't agree upon, it is only fitting that TR would also be peppered with "Fake News". Because of the devastating nature of TR, I've been receiving more and

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Photo 4A: Trellis Rust may cause cankers on twigs; note the rusty, yellow lesion on this pear twig.

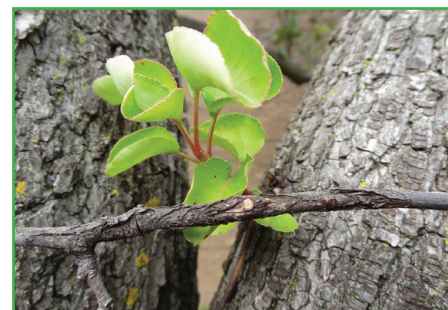


Photo 4B: Twig cankers formed in previous years may girdle pear twigs, leading to decline of the tree.



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more questions from arborists and the public alike. There are several attributes about TR that are published on the web that are simply not true. Following are several quotes directed to me by interested individuals who took them directly from the web.

Web Quote #1: "The affected leaves should be removed as soon as found. This should be done as carefully as possible, bearing in mind that the released rust spores are easily spread in the wind over large distances. The earlier you can do this will lessen this possibility. All removed material should be burnt, and not put on a compost heap."

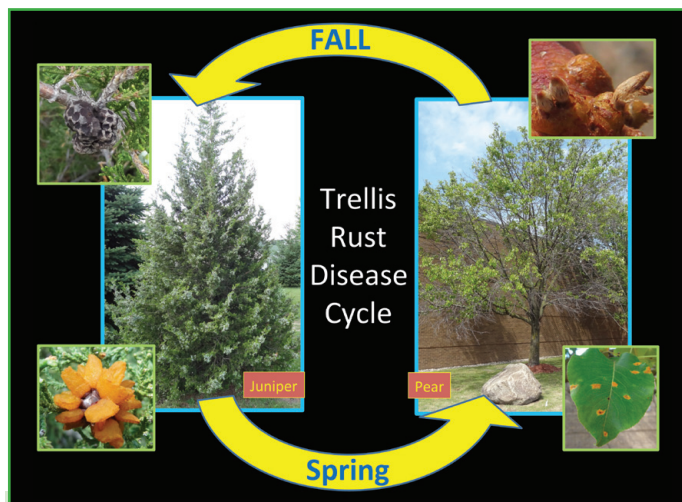
Web Quote #2: "Hand pick leaves with rust as soon as you see them, and dispose of them (not in the compost!)"

Web Quote #3: "On the pear trees, it's the leaves rather than the wood that play a role in the lifecycle of this fungus, so there's no need to disfigure your trees by pruning. However do try to gather up and dispose of any fallen pear foliage and fruit; do not add them to your compost. One suggestion is to pluck them off the tree before they fall, but this is impractical for widespread infection."

While these efforts of handpicking infected leaves might be regarded as noble, they are generally impractical if not downright futile and ridiculous. Removing infected leaves, at least in most cases I've seen, would leave the tree as bald as Telly Savalas, for those of you who are old enough to remember the star of the TV series, Kojak. Another piece of Fake News that seems to be rather prominent on the web is, "Do not put infected leaves in the compost pile". Because the TR fungus is an obligate parasite, it cannot survive overwinter in fallen pear leaves and infect pear trees the following spring in the manner that the apple scab fungus infects crabapple and the tar spot fungus infects maple, from last year's fallen leaves. The TR fungus simply doesn't survive on fallen pear leaves (Photo 5); it transfers to its alternate "living" host plant, juniper, in the fall for overwintering survival; please see Schematic #1 for the disease cycle of TR. And, picking infected pear leaves will not spread the disease through wind dissemination of spores as implied in Web Quote #1. Incidentally, some reports claim that the TR fungus may survive overwinter in infected pear twig cankers, with subsequent infections of the pear tree the following year from these pear cankers (Photos 4A & 4B); this is something I have not yet witnessed.

TRELLIS RUST DISEASE CYCLE

Although Trellis Rust is considered "complex" (two host plants), its disease cycle is relatively simple (refer to Schematic #1). Infections from the "blooming galls" on juniper (lower left) occur by spore dispersal to pear (lower right); lesions on pear leaves are initially yellow but turn orangish-red later in the season. Spores are subsequently released from tiny "trellises" on the underside of pear leaves in the fall (upper right) . . . and are wind-borne to junipers. Overwintering galls (upper left) form on juniper in the fall/winter. Some of these recently formed galls are virtually inconspicuous on juniper twigs until they "bloom" in the spring (Photo 6); older galls



Schematic #1: The Disease Cycle of Trellis Rust on pear and juniper is outlined in this schematic.



Photo 5: Contrary to "Fake News" on the Web, as an obligate parasite (pathogen), the Trellis Rust fungus does not survive overwinter on fallen leaves; hence, it is safe to put "infected" leaves in compost piles or wherever one desires.



Photo 6: First year galls on juniper are virtually inconspicuous . . . until they "bloom" in the spring. Trying to find these tiny galls before they bloom is extremely difficult if not impossible. Even with their small size, these tiny galls are capable of producing millions of spores.

can become larger and hence more visible (Photo 3 & Schematic #1, upper left), remaining active for several years. In the spring, these overwintering galls on juniper "bloom" at about the same time as pear flowering and leaf emergence, causing wind-blown spore dispersal to the pear, thus repeating the cycle.

TRELLIS RUST DISSEMINATION

Trellis Rust may be spread geographically by two major means:

1. **Air-Borne Spore Dispersal** from infected trees (either juniper or pear-see Schematic #1). Spores of the fungus may be carried by wind for many miles. The most immediate threat from TR is to nearby plants where spore infections are

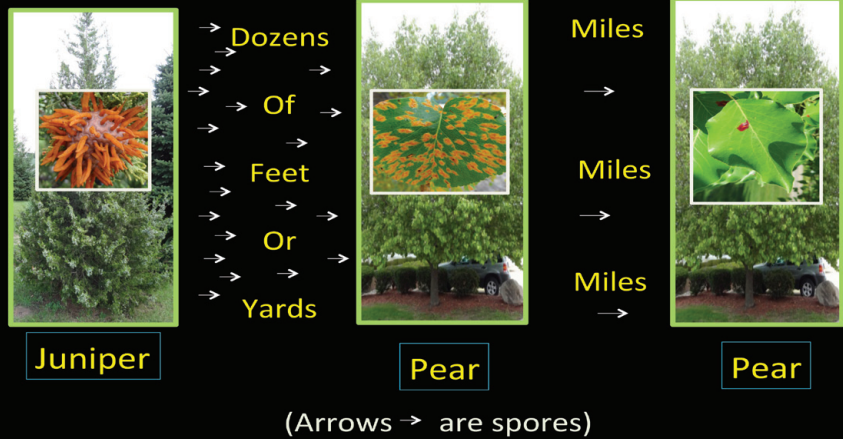


Photo 7: Planting pears and junipers in close proximity will likely result in the eventual decline of pear trees from Trellis Rust. Interestingly, junipers are not harmed by the disease . . . enacting primarily as symptomless carrier. Photo credit: Gary Olgart.



Photo 8: This photo was taken on October 23, 2017; it shows the “trellises” that release spores that were/will be wind-borne to junipers. Because the tree was planted in the landscape within the previous two months, the tree was infected in the nursery the previous spring. Photo Credit: Chris King, Westside Forestry.

Spore Dispersal of Trellis Rust



Schematic #2: The small arrows represent spores that are wind-blown from juniper galls to pear trees. The spores are passively carried by the wind; the spores cannot fly and deliberately seek out pear trees. Based on the prolific nature of Trellis Rust, believe it or not, most spores perish because they do not come in contact with pear trees. The greater the distance the spores are carried, the fewer the number of lesions that are likely to form on distant pear leaves and twigs.

at their highest concentration (Photo 7). When spore dispersal happens over great distances, sparse infections will initially occur because there is a dilution effect from the distance traveled (see Schematic #2). Once TR invades a new area by wind-borne spore dispersal, there will be a gradual buildup of the disease over several years.

- 2. Transportation of Infected Trees** (either juniper or pear), for example, from infected nursery stock (Photo 8). The transportation of infected nursery stock will cause many new epicenters of the disease to develop more quickly in areas where it might take several years to reach the same area and build up by wind-borne spore dispersal.

TRELLIS RUST MANAGEMENT

Trellis Rust can be managed by several measures: 1) Plant Resistance, 2) Host Plant Separation, 3) Prune Out Juniper Galls, and 4) Fungicide Treatments.

- 1. Plant Resistance: Know Your Plant (Varieties):** All species of *Pyrus* (ornamental or fruit) are apparently susceptible to Trellis Rust. Planting members of the genetics involving *Juniperus virginiana* are generally regarded to be susceptible (Table #1). Interestingly, varieties such as ‘Skyrocket’ that contain *J. virginiana* genetics and that are purported to be resistant to cedar apple rust, may be resistant to TR – we just don’t have enough information at this time to make that call. *Juniperus* species believed to be resistant to TR are *J. squamata*, *J. communis* and *J. horizontalis*.

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Table 1: Trellis Rust

Host Resistance & Susceptibility

• Pear Susceptibility	• Juniper Resistance
<ul style="list-style-type: none"> • <i>Pyrus calleryana</i> (ornamental) <ul style="list-style-type: none"> – ‘Bradford’ – ‘Chanticleer’ (Cleveland Select) • <i>Pyrus communis</i> (fruit) 	<ul style="list-style-type: none"> • <i>Juniperus squamata</i> • <i>Juniperus horizontalis</i> • <i>Juniperus communis</i> • (<i>Juniperus virginiana</i> – susceptible)

Table 1: The susceptibility of Trellis Rust on species of pears and junipers is summarized. In general, all *Pyrus* species are affected. In general, *Juniperus virginiana* hosts are susceptible; some selections such as ‘Skyrocket’ are purported to be resistant to Cedar-Apple Rust and may also be resistant to Trellis Rust. We will know more with time.



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2. **Host Plant Separation:** Trellis Rust suffers from separation anxiety, just like some humans do for each other or their pets. The greater the separation of the two host plants, the less TR. Separation by dozens of feet to hundreds of feet or dozens of yards will likely result in significant TR. Separation by portions of miles to miles will result in far less TR . . . probably not enough to cause decline in pear trees.
3. **Prune Out Juniper Galls:** When juniper galls are conspicuous (Schematic 1, upper left), it may be advisable to prune them out. Unfortunately for us, many of the TR “juniper galls” are so tiny that they are virtually invisible . . . until they “bloom” in the spring (Photo 6). Elimination of such juniper galls may prove daunting if not “fruitless.”

Fungicide Treatments: According to some arborists, fungicide treatments have shown some promise. Recent communications with arborists show that treatment with propiconazole has mixed results, that treatment with Mancozeb has promising results and that Triadimefon (example: Bayleton) has shown promising results. I prefer a mixture of a systemic with a contact fungicide for broader control possibilities. Trunk injections may also work, but I have not heard of any specific definitive results. Of significant importance is timing. TR responds to heat units much like insects do. If the first of several fungicide applications to pear in the spring is missed, the infection will continue unchecked. For example, the spring of 2017 was at least two weeks ahead of either 2015 or 2016. The timing of the first treatment should be at bud break if not slightly before (green tip). Another possible attack of the TR disease cycle (Schematic #1) is to treat nearby junipers in the fall. The timing of juniper treatments is thought to be mid-September to mid-October.

NURSERY ALERT! With Pear Trellis Rust increasing in prominence in Michigan, nursery owners may want to consider reducing their stock of pear trees as a viable landscape tree. Much like the Emerald Ash Borer eliminated the propagation of ash trees, the widespread use of *Pyrus* may be in its waning years. It may also be important to concentrate more on propagating species of juniper that are resistant to TR.

LANDSCAPE ARCHITECT ALERT! If we want to establish landscapes that are less trouble prone with fewer maintenance inputs, it is vitally important that landscape designs are modified to respect the challenges to plant health that Trellis Rust poses. The days of planting susceptible junipers in close proximity to pears should be behind us (Photo 7). 

The author, MSU and MGIA do not endorse any particular products. If using pesticides, be sure to read and follow label directions.