

Hampden-Sydney Inspection of Plant Borne Fungal Species

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Abstract

This study aims to assist and aid in identifying the various plant borne fungal diseases on campus. The goal of this research is to help pave the way for a healthier and greener campus as fungal diseases pose a risk of weakening local plants to the point they become unable to fend off other diseases, droughts, or weather that may affect them over time. This study serves to document that the campus has a wide selection of plants that are both local and non-local, but more importantly a just as diverse selection of fungal diseases. The primary classification that gardeners would use to diagnose the symptoms is called brown spotting with one case of gall likely caused by the fungal disease already infecting that specimen. The study concludes that more extensive work and methods must be used to further identify local causes of fungal disease and better cataloging of the extensive variation of HSC's plant life.

Background Information

Hampden-Sydney College is a large and primarily wooded campus that is home to a wide range of organisms. Noticeably though most trees at Hampden-Sydney are not free from strange blemishes and other unique symptoms of various plant borne fungal diseases. However, compared to other campuses that I have toured or have been to I notice a drastic difference in the wellbeing and health of the plants on campus here. Which led to the drafting and finalization of this paper. As fungal pathogens are capable of not only killing off plants but also weakening them to other diseases that may occur while the plant is infected (Doehlemann, Ökmen, Zhu, Sharon 2017). A particular case is the example of the Virginian chestnut tree which was driven to near extinction by a fungal pathogen that came about to kill its host wholly rather than simply weaken it (Powell 2022). So in an attempt to mitigate that from happening once again here on our campus this paper should highlight the plants of the campus including their afflictions with methods of prevention and correction.

Materials and Methods

Surveying Hampden-Sydney's campus it became abundantly clear that the grounds have a series of cultivated and exotic plants. In addition to some local plants the campus has a rather large population of nonlocal but noninvasive species of plants. Through the use of local forums and plant identification software such as PictureThis, I identified various plants throughout Hampden-Sydney's campus. In addition to identification, picture samples were taken for further examination and the ability to cross reference other images. Once identified

the samples undergo cross examination to identify the potential fungal infections amongst the plants.

American Holly//*Coniothyrium ilicinum* or *Phacidium*.



American Holly, scientifically known as *Ilex opaca*, is an evergreen tree or shrub that is native to the eastern and southeastern United States. It is a member of the Holly family (Aquifoliaceae) and is recognized for its distinctive glossy, spiky, and deep green leaves, as well as its vibrant red berries. This plant is popular for its ornamental value, often used in landscaping and holiday decorations.

Coniothyrium ilicinum is a fungal species which belongs to the class Dothideomycetes and the order

Pleosporales. Commonly associated with causing leaf spot diseases on various species of hollies, including the American Holly (*Ilex opaca*). This fungal pathogen is known for its impact on holly foliage, leading to the development of leaf spots, lesions, and defoliation. (Brown 1965).

Managing *Coniothyrium ilicinum* can be done through making sure there is proper space between the plants to allow for better airflow, ensuring that there is minimal if any overhead watering of the plant, and disposing of infected leaves to prevent further spread of the disease to other plants and other leaves.

Coniothyrium ilicinum tends to thrive in humid and moist climates so it is unsurprising to see it here in Virginia as throughout the year particularly during spring and summer we can experience the proper growing conditions for this disease to thrive amongst american holly plants.

Sweetgum//*Cercospora liquidambaris*.

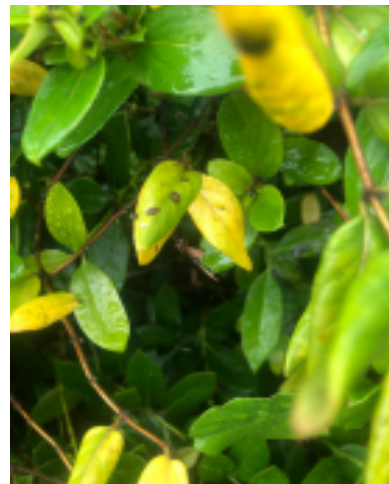


Sweetgum refers to *Liquidambar styraciflua*, a deciduous tree commonly found in North America. It is also known by various other names, including sweetgum tree, American sweetgum, redgum, liquid amber, and star-leaved gum. It is known for its spiky fruit which it drops which can be a real nuisance. However, the plant is considered relatively attractive for its leaf shape and bark colorization.

Cercospora liquidambaris is a fungal disease known to infect and cause brown spotting on the sweetgum tree. It is within the *Cercospora* genus, which includes many plant pathogenic fungi. Additionally it has similar symptoms of that of diseases within the *Cladosporium* species which also infects a wide variety of plants.

Cercospora leaf spot thrives in warm and humid conditions which Virginia certainly has. The spores of the fungus are typically spread by splashing water, rain, or gusts of wind. Management of this disease takes practices such as improving air circulation around the tree, avoiding overhead watering, and maintaining good tree health through proper watering, fertilization, and pruning. Fungicides can be used in the case of severe infections however, a severe infection would entail most if not the entire tree to be covered in this disease. The sample above has a very mild case of the disease and should be monitored but poses low risk of serious infection. (McElrone 2010)

Japanese Honeysuckle//*Insolibasidium deformans*.



Japanese Honeysuckle, scientifically known as *Lonicera japonica*, is a species of flowering plant in the honeysuckle family (Caprifoliaceae). It is native to East Asia, including Japan, China, and Korea, but has been widely introduced and naturalized in various parts of the world, including North America, Europe, and Australia. As well as our campus Hampden-Sydney College in Virginia.

Insolibasidium deformans is a fungal leaf blight that initially grows on new leaves during the season of spring. Symptoms include yellowing leaves, premature leaf dropping, and have silvery white coloration on the lower surface of the leaf caused by the fungus.

Like the other diseases above this one additionally is proportionally spread from high humidity and density in the plant. Due to the plant's ability to grow in dense groups and use its vines to cover large scopes of ground this fungal disease can lead to severe outbreaks across the entire plant. Beyond additional moderation and maintenance of the plant keeping it trimmed and the raking of dead leaves,

copper fungicides can also be used to potentially solve



or prevent future spreading of the disease. (Boyce 2023)

Black Cherry//*Blumeriella jaapii*.

Black Cherry, known as *Prunus serotina*, is a cherry tree native to North America. It is also sometimes referred to as Wild Cherry. The tree is known for its glossy leaves, clusters of small white flowers, and the dark red to black cherries it produces seasonally. The cherries are edible and have a sweet taste, but they are often quite tart until fully ripe. Black Cherry wood is also valued for its use in furniture and woodworking due to its durability and rich color.

Blumeriella jaapii, formerly known as *Coccomyces hiemalis*, is a fungal pathogen that causes a disease known as "cherry leaf spot." This fungal disease affects cherry trees, including both sweet cherry (*Prunus avium*), sour cherry (*Prunus cerasus*) varieties, and as displayed above black cherry (*Prunus serotina*). It is most prevalent in temperate regions and can cause defoliation, reduced fruit quality, and overall weakening of affected trees. Striving in warm and humid locations it is spread from wind and rain leading to the fungal spores being transported to other cherry trees or other leaves. (Green 2006)

The disease is often regularly managed to prevent a moderate or significant decline in fruit growth. However, on the campus of Hampden-Sydney College we do not particularly harvest this small cluster of black cherries. Though if this is incorrect the disease can be treated through pruning of infected leaves and proper soil management.

Poison Ivy//*Colletotrichum gloeosporioides*.

Poison ivy (*Toxicodendron radicans*) is a North American plant species that is well known for its

cause in allergic reactions common amongst humans.



It is within the same family as poison oak and poison sumac. This plant causes skin rashes which are commonly referred to as poison ivy rashes. The sap of poison ivy contains a substance called urushiol, which is the primary cause of the allergic reaction. Contact with urushiol can lead to redness, itching, inflammation, and blistering of the skin. It is important to note that the urushiol can actually stick to objects or other surfaces which will lead to the forementioned rashes.

There are no common fungal infections, specifically poison ivy rather a wide range of potential infectors had to be considered. However, *Colletotrichum gloeosporioides* is a plant pathogen that is known to cause anthracnose, a common group of fungal diseases that affect a wide range of plant species. Which causes discoloration and premature droppage of leaves. To prevent this disease it takes proper pruning and the use of fungicide. Though in the case of poison ivy there may be a legitimate reason to not manage this fungal pathogen to potentially allow nature to simply remove it from the location it inhabits. (Sharma 2015) Lastly there is a concern with the location of this poison ivy patch as it is adjacent to a path of high student traffic and congestion which could ultimately lead to a spreading of not only the poison ivy rash but the adaptable and multi-contagious Anthracnose disease.

Kousa Dogwood//*Discula destructiva*.

Kousa Dogwood, known as *Cornus kousa* scientifically is a medium-sized flowering tree or large shrub that is native to East Asia, including Japan, China, and Korea. It is a member of the dogwood family (Cornaceae). Kousa Dogwood is valued for its ornamental qualities, including its attractive flowers, unique fruit, and colorful foliage in the fall. Because of its desired aesthetic qualities it is unsurprising that it has been introduced here at Hampden-Sydney.

Discula destructiva a fungal pathogen responsible for causing a serious disease known as "dogwood anthracnose." This disease affects various species of dogwood trees, including the native Flowering Dogwood (*Cornus florida*) in eastern North America and Kousa Dogwood which leads to irregularly shaped lesions on the leaves which can lead to premature leaf droppage.



The disease can lead to a high impact on local dogwood trees as it is particularly competent at killing its host by severely weakening it. The management of this disease comes in primarily preventive efforts such as planting disease resistant variants of the dogwood tree, whilst also making sure the tree is watered well with good fertilizer to promote good soil health. With



the reactionary efforts involving taking prompt actions if the disease is spotted which involves pruning infected leaves and fungicide usage. (Mantooth 2017)

Southern Red-Oak//*Tubakia dryina*.

Southern Red Oak, scientifically known as

Quercus falcata, is a species of oak tree native to the southeastern United States. It is a member of the beech family and is commonly found in a variety of habitats, including forests, woodlands, and urban areas. It is known for its attractive foliage, distinctive bark, and importance as a timber tree. It is used for lumber production and for aesthetic improvements to areas. It is a species of tree that is viable in many ways including environmentally and economically.

Tubakia dryina is a fungal pathogen that causes a disease known as "oak leaf blister" or "oak leaf blight." The disease affects oak trees and is characterized by the development of raised, blister-like lesions on the leaves. Including discolorization of the leaves which can lead to early leaf dropping of the tree. The lesions themselves can vary in size and color, often starting as pale green or yellowish spots and eventually turning reddish-brown. This disease can be also confused with Gall which can be caused from various things including other fungal diseases that leave plants susceptible to the illnesses that cause Gall. Often caused by egg laying insects, these blemishes need to be monitored as they can be a sign of other local illnesses in plants within the surrounding area. (Morales-Rodriguez 2021)

Management of this disease can involve the raking of fallen leaves to prevent overwintering of spores that can cause prolonged diseases. This raking in addition to proper upkeep of the soil and tree health can minimize the risk of further infection of surrounding trees but additionally keep the infected tree alive and healthy to fend off other contagious or risky diseases that may end in its death.

Chinese Photinia//*Entomosporium*.



"Chinese Photinia" is actually a *Photinia × fraseri*, a hybrid plant that is popular for its attractive foliage and vibrant red new growth. It is commonly

used as an ornamental shrub in landscapes and gardens. With cultivation being widespread as different variations can exist in every next generation of growth. So without a means to trace the history of the plant it cannot be exactly identified beyond the common name of the hybrid. Chinese Photinia is generally considered easy to grow and can tolerate a range of soil types and conditions. However, it's important to note that this plant can be susceptible to fungal disease.

Entomosporium is another genus of fungi that includes several species known to cause a plant disease called entomosporium leaf spot or entomosporium blight. The fungal disease affects a wide selection of plants, such as ornamental shrubs and trees. Commonly affected plants are the Photinia genus, including Chinese Photinia (*Photinia × fraseri*). The disease causes vibrant red and purple spots to form on the plant leading to warpage of the leaf which can lead to defoliation. Not only does Chinese Photinia act as a host plant for the fungal disease, it can also spread to other plants in the rose family.

Management for entomosporium leaf spot include efforts like planting various disease-resistant cultivars, creating proper air circulation around plants, also avoiding overhead irrigation, and lastly promptly removing and disposing of infected leaves. (Lambe 1980)

Eastern Red Cedar// Gymnosporangium juniperi-virginianae.



Eastern Red Cedar, also scientifically known as *Juniperus virginiana*, a coniferous evergreen tree native to eastern North America. In contrast to its common name, it is not a true cedar but rather a species of juniper tree. Eastern Red Cedar is known for its hardy nature, adaptability, and its ecological, economic, and cultural significance. The plant is also potentially invasive places it can out compete local wildlife and is able to disrupt the local ecology in locations of open and old fields.

Gymnosporangium juniperi-virginianae or

otherwise commonly known as cedar apple rust is a fungal pathogen that affects trees in the Rosaceae family also the Juniper and Cedar trees. It is a rust fungus that incorporates two different host plants throughout its lifecycle. This alien orange sprouting that comes from the crab apple or juniper fruit are galls that release spores upon being confronted with high winds, rain, or becoming so heavy that they fall from the trees. The infection incorporates all three above-mentioned organisms as the spores spread over the seasons affecting the different organisms one at a time before repeating the cycle again.

Management involves the pruning of infected fruits and the planting of disease resistant variants. However, fungicides can be used to prevent the disease from spreading to susceptible hosts during times of high disease risk when climate factors become right. Management is necessary to promote proper health of the plants as this disease leaves the plant weaker to other environmental threats (Pearson 1980).

Conclusion

Hampden-Sydney is an ecologically diverse campus that requires much more expansive investigation of the plants and local fungal pathogens. What was assumed to be a simple task of analyzing the various plants on campus became a much larger task of identifying the sheer diversity the campus maintains.

Additionally what originally was a concern of potential fungal outbreak that could lead to widespread death of trees and other plants on campus turned out to be significantly less problematic as the infections may exist but they exist in a minor state that can be easily maintained if the effort is put forward. Overall the risk of problematic plant borne illnesses is one Hampden-Sydney ought to consider but not one it should be entirely concerned over.

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