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College of Tropical Agriculture & Human Resources
University of Hawaii at Manoa

Cooperative Extension Service

U. S. DEPARTMENT OF AGRICULTURE COOPERATING

Tree Diseases

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What is a Disease?

- A Definition:
 - “Malfunctioning of host cells and tissues that results from their continuous irritation by a pathogenic agent or environmental factor and leads to the development of symptoms.”
(Agrios, 1988)
 - Results in abnormal changes in:
 - form, physiology, integrity, or behavior



Disease Types

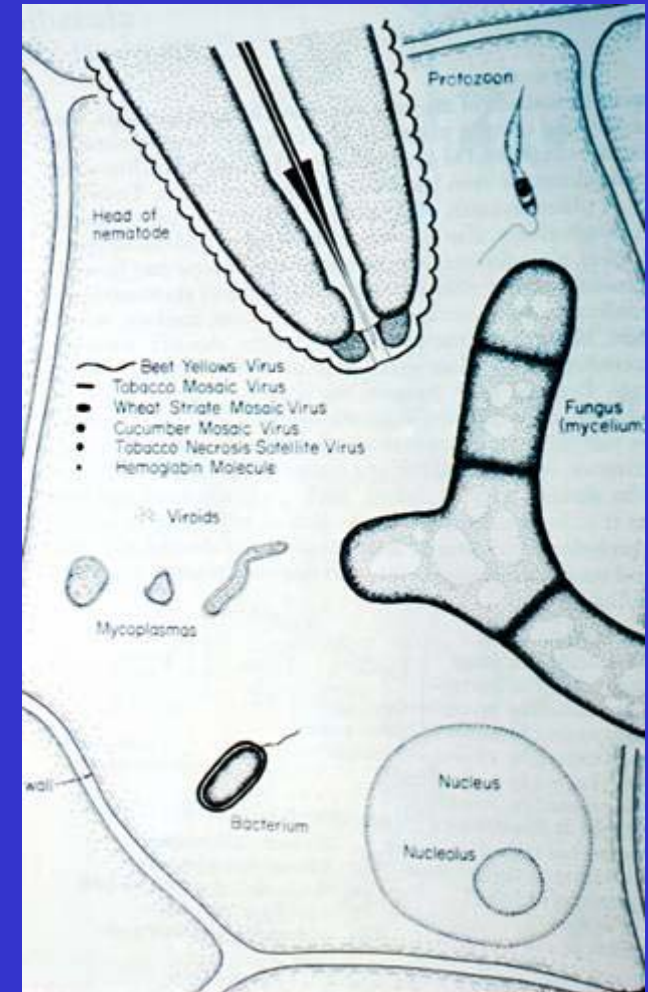
- Abiotic or non-infectious
 - Too much or lack of water
 - Nutrient deficiencies or toxicities
 - Too high or low temperatures
 - Lack of oxygen
 - Pesticide toxicities
 - Air pollution
 - Salt spray
 - Too little or too much light
 - Cultural practices





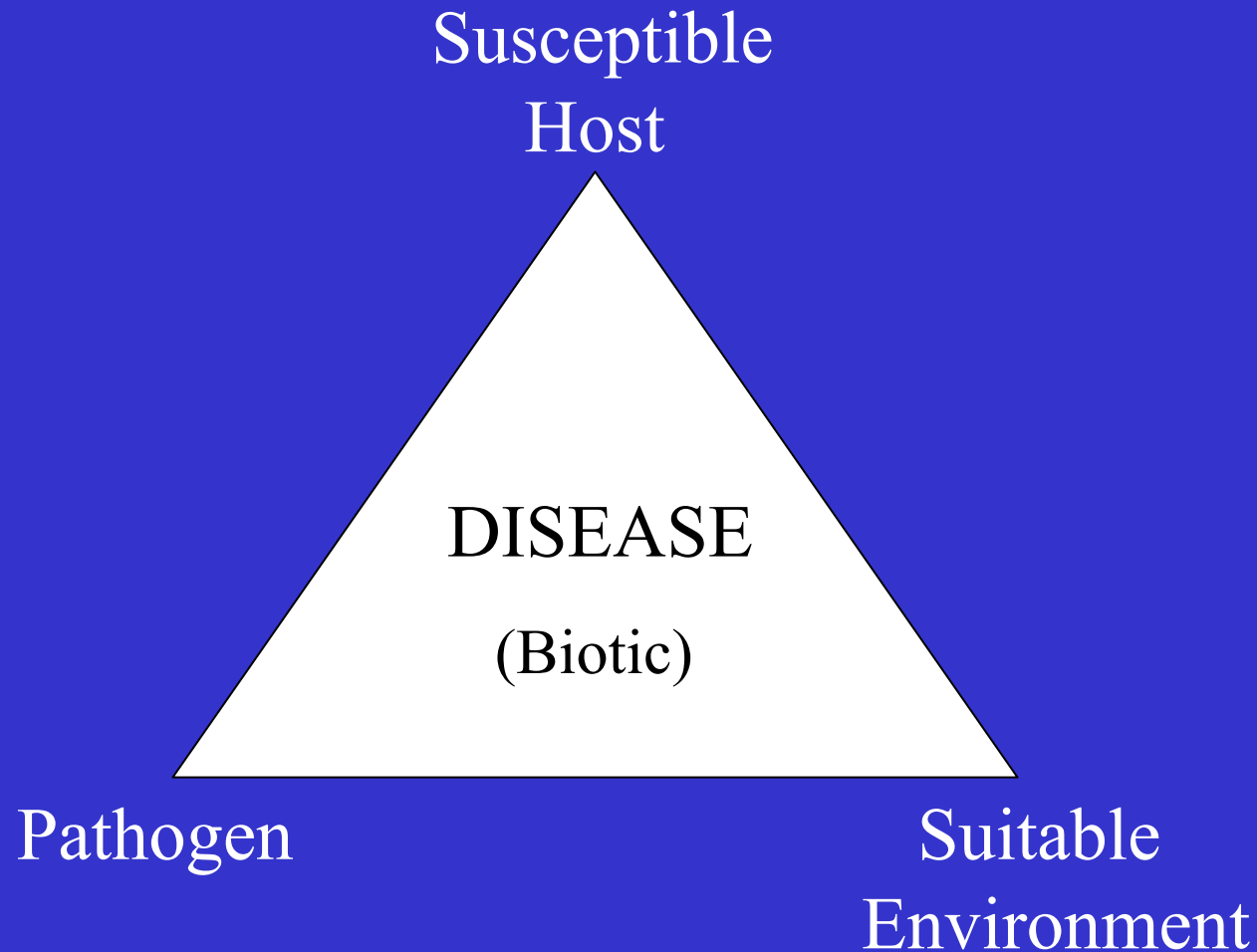
Disease Types (Cont'd)

- Biotic or infectious
 - Fungi
 - Viruses and viroids
 - Bacteria and phytoplasmas
 - Nematodes
 - Higher plants (mistletoe, dodder, witchweed, etc.)
 - Protozoa
 - Etc.





Disease Triangle





Disease Types (cont'd)

Another way of looking at disease types are whether they are native or exotic.

- Native diseases are usually not devastating because the pathogen and host developed in interaction with each other so typically the host has some level of resistance or tolerance.
 - E.g. rust and mistletoe of *A. koa*



Disease Types (Cont'd)

- Exotic diseases are introduced from a distant country.
- Many have been devastating; some changing the makeup of entire forests.
 - Classic examples of introduced tree diseases:
 - White pine blister rust, chestnut blight, Dutch elm disease (North America)
 - Pine wilt nematode, native to North America, causing much damage to Asian pine species in Asia.
- Exotic or native diseases on introduced species are a whole separate issue; can be very variable.
 - Reason for failure of some plantation spp.



Forest/Tree Disease Control Disease Triangle

Host Resistance

Chemical
Sprays usually
not an option

Management
of the
forest/stand
becomes key



DISEASE

Pathogen

Exclusion

Environment

Proper selection



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Some Examples of Tree Diseases in Hawaii: Stem Cankers

Chryphonectria
canker:

Cryphonectria
cubensis on *E.*
saligna and
E. grandis





Cryphonectria canker

Numerous, small, dark, fruiting bodies usually present on bark of infected trees





Foliar disease

Dothistroma needle cast

Monterey Pine

Dothistroma pini, a fungus that causes premature dropping of needles





A Native Disease in Native Forest: Ohia Decline

After several years of research by the U.S. Forest Service and U. of Hawaii, determined to be caused by “cohort senescence”.





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Koa Mistletoe

*Korthalsella
complanata*

Most common
native
mistletoe,
weakens tree
lowers wood
strength,
seeds spread
by birds.





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Koa Rust

Endoraecium acaciae





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Disease caused by poor soil / planting: Koa in Kamuela





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Koa in Kamuela





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Nematodes



On Koa

Rootknot nematode galls

Counts up to 8,000 rkn/pint of soil



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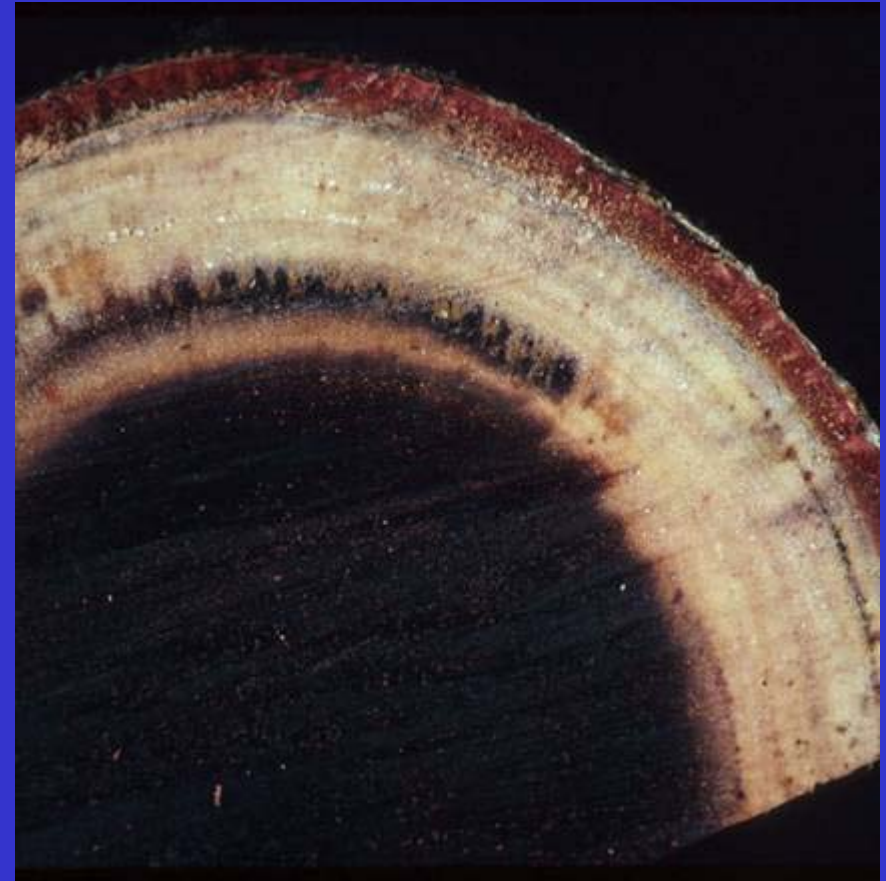
Vascular Disease: Koa Decline





Koa Decline

- The fungus invades the vascular tissue and reduces the translocation of water and nutrients
- 28° C (82 F) appears to be critical: higher favors fungus, lower favors host. (The critical temp may vary depending on seed source.)
(D. Gardner)





Summary

- In most forestry situations, chemicals sprays are not economical
- Must use other methods:
 - Exclusion of pathogens
 - Cultural practices:
 - spacing, site preparation, thinning, etc.
 - Selection of right species for site
 - Selection of resistant species or provenances
- Very important to understand environmental requirements of the tree species
- Reference: *Tree Diseases*. Wayne Nishijima. In: Growing Working Forest for Hawaii's Future.



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