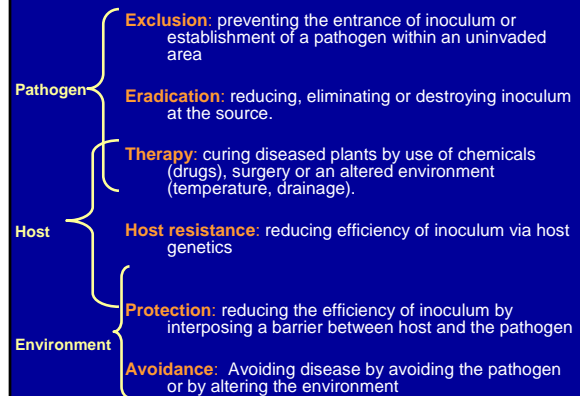


Several experiments and Disease of Week in lab tomorrow

- Quiz for Basidiomycetes (pp. 59-65) and Race I.D. of Wheat Stem Rust (p. 109-110) and, Intro material for Koch's Postulates (p. 17), Botrytis Predisposition (p. 97), Fungicide Resistance (p.105), and Mendelian Segregation Analysis of Disease Resistance Response (p 113).
- Initiate Koch's postulates experiment (a several week process)
- A couple experiments with the gray mold pathogen, *Botrytis cinerea*.
- Initiate genetic segregation analysis experiment.
- Start another 'Disease of the Week' unknown

Principles of Disease Control



Host Resistance

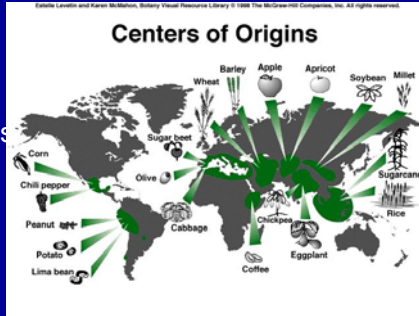
- Effective! 😊
- Environmentally sound 😊
- Can be long lasting 😊
- Low cost 😊
- Users do not require special knowledge or training 😊

How come host resistance isn't always used?

- The germplasm doesn't exist
- Resistance has become isolated genetically from desirable agronomic and horticultural traits

Sources of Resistance

- Wild plant of same species
- Wild plant of related species
- Land cultivars used in subsistence farming
- Geographic centers of diversity (origin)



How to breed for resistance?

- Traditional method: Backcross breeding

Disease resistant parent

Recurrent parent

(e.g., Disease susceptible but exceptionally high yielder)

X = original cross
x = 'backcross'

After third 3rd backcross generation, seed is 15/16 recurrent parent *and* disease resistant

Important:

Each backcross generation must be re-evaluated for resistance

How to breed for resistance

- **Biotechnology** (great promise for the future?)
 - cloned genes from plants
 - cloned genes from pathogens (pathogen-derived resistance)
 - cloned genes from other organisms

Host Resistance defined

- Defense mechanisms employed by plants, either pre-existing or induced, structural or biochemical
- Multiple mechanisms are typically involved, all of which reduce growth and/or development of the pathogen
- The resistance response can vary in intensity from complete to almost imperceptible

Resistance terminology:

Lots of terms are used but, generally, the terms can be divided into two groups

race specific
qualitative
major
monogenic
differential
'R-gene'
vertical 'Specific recognition'

non-race specific
quantitative
minor
polygenic
field resistance
horizontal
basal 'Concert' of defenses
'Durable'

Genetics of resistance:

- Major genes:** Genes whose effects are large enough to be discerned individually
Often 'qualitative' meaning they offer complete resistance, usually with **specific recognition (followed by hypersensitive response)**
- Minor genes:** Genes whose effects are so small that they *cannot* be observed individually
By definition, they provide partial /quantitative effects (cuticle thickness, rate of SAR induction)

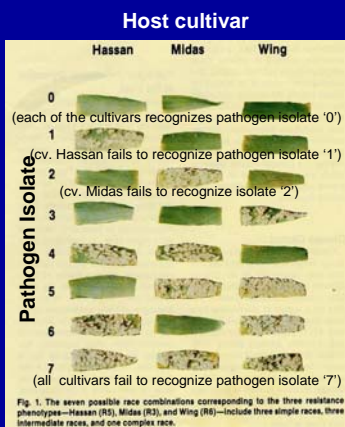
Genetics of resistance continued:

Race-specific resistance:

Resistance characterized by **specific recognition** (genetic interactions) between host genotypes and pathogen genotypes.

The ranking of cultivars from least to most resistant depends on the pathogen genotype (race) used.

This type of resistance is commonly 'all or nothing' (qualitative)



Genetics of resistance continued:

Non race-specific ('horizontal') resistance:

A host cultivars shows the same relative level of resistance to all pathogen isolates

When effective, this type of resistance commonly involves multiple genes, each with a small effect (quantitative)

Example:

