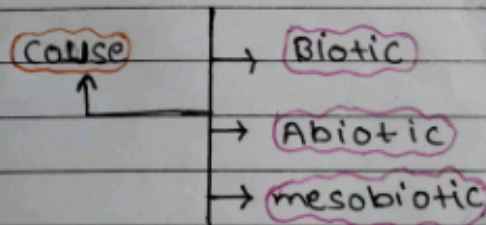
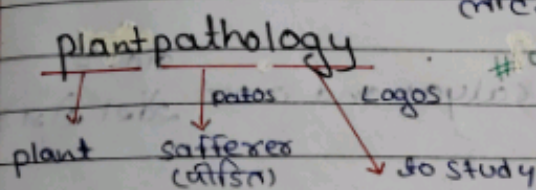


FUNDAMENTALS OF PLANT PATHOLOGY



1. Biotic → fungi

Bacteria

algae

mycoplasma

phytoplasma

parasitic plants

यूकेरियोटिक

प्रोटिस्टा

→ Bacteria

→ Phytoplasma

→ micoplasma

2. Abiotic → (A) environmental factors

Temperature

Humidity

wind

rainfall

air, water, soil

light

10) Nutrient deficiency

11) Boron deficiency → Browning of cauliflower

12) Nitrogen (N) → Buttoning of cauliflower

13) Calcium (Ca) → Blossom and root (BER)

→ Zinc deficiency in cauliflower causes blossom and root rot (BER).
→ Calcium (Ca) deficiency in cauliflower causes blossom and root rot (BER).
→ Zinc deficiency in cauliflower causes blossom and root rot (BER).

14) Cu → Dieback of citrus

15) Mo → Whiptail (Cuped)

16) Mesobiotic → virus
Viroids
Virusoid
Prions

→ Yeast → Saccharomyces cerevisiae (Baker's yeast)

17) Plant pathology → Plant pathology is the branch of biological, botanical and agricultural science which deals with cause, etiology, resulting losses and their economic management of plant diseases.

→ Objective of plant pathology

1) To study about cause of diseases

(2) To study about pathogens

(3) To study about host pathogen interaction

(4) To study about management of plant diseases

② ETIOLOGY → To study about cause or origin of a disease

- # resulting losses
- # ecological management

Disease → French word

↓ lack ↓ comfort

③ Disease → Any malfunctioning of host cells or tissues due to continuous irritation caused by a pathogenic agent leads to the development of symptoms

④ Physiol. Disorder non-infectious plant diseases caused by abiotic factors such as adverse environmental conditions are termed as physiological disorder

↪ Disorder is a state of lack of order or disturbance in the normal structure or function of an organism

⑤ Symptoms ^(disease) → morphological or physiological changes of the plants as a result of disease or disorder

⑥ Signs → The presence of a pathogen or its parts on the host surface

→ **pathogen** → Disease causing agent

→ **pathogenicity** → The ability of a pathogen to cause disease

→ **pathogenesis** → The process of disease development in the host is called pathogenesis

(A) **Events of pathogenesis**

- (1) Arrival of pathogen
- (2) chemical dialogue between host & pathogen
- (3) entry of pathogen
- (4) Infection
- (5) Invasion
- (6) colonization
- (7) reproduction ^(dormant)
- (8) Dissemination

⑦ **Virulence** → The ^{degree} of pathogenicity is called Virulence.

8 Aggressiveness → "the capacity of a pathogen to invade and colonize the host and to reproduce in it"

9 Heterotroph → "An organism living on organic food substance, as the primary source of nutrition"

10 pathotroph → "the organisms that obtain their nutrients from the host plant."

Heterotrophic

Biotroph saprotroph

Hemibiotroph

11 Biotroph → "organisms that obtain nutrients from living host cells without killing them"

12 saprotroph → "organisms that obtain their nutrients from dead and decaying organic matter"

13 Hemibiotroph (semi-biotroph) → "organisms that first feed on living host cells and later feed on dead host tissues"

Example → fungus

[14] parasite → "organism that depend upon another organism for food and shelter"
Example → cuscute (amarbel)

[15] Saprophytic (शैत्यप्रायी) → "organisms that depend upon dead plant material for food and shelter"

→ it has two type

- Facultative optional (वैकल्पिक)
- obligate optional (निर्बिना)

[16] Facultative saprophyte → "These organisms are basically parasitic but under certain conditions they change into saprophytes"
Example → (Fungus) Rhizoctonia solani
Drechslera

Facito

[17] Facultative parasite → "these organisms are basically saprophytic but under certain conditions they change into parasites"

Example → Ustilago maydis (corn smut fungus)

[18] Pest → "any organism that causes loss or damage to living beings is called a pest"

(19) Disease cycle → "Disease cycle" is a sequence of events including inoculation, penetration, infection, invasion, reproduction and dissemination.

(20) epidemiology → "epidemiology is the study of interactions between the host, pathogen and environment in relation to the development of plant disease."

1 monocyclic disease (simple interest disease) → "The pathogen completes only one disease cycle in a single cropping season."

Example → smut, wilt, Root rot, Bunt of wheat

2. polycyclic disease (compound interest disease) → "The pathogen completes more than one disease cycle in a single cropping season"

Example → Late blight of potato

Apple scab,
powdery mildew

rust of wheat

3. polyetic diseases → polyetic disease are those diseases that require more than one year to complete their disease cycle

Example → citrus canker, fire blight, Apple scab, Dutch elm disease, Chestnut blight, Pierce's disease, crown gall, verticillium

(13)

[29] predisposition → "the set of conditions that make the plant more susceptible to attack by a pathogen"

→

Steps of pathogenesis

(A) ① inoculation → enables the contact of a pathogen with the host surface.

①

② inoculum → inoculum is any part of a pathogen that can initiate infection

②

③ primary inoculum → primary inoculum is the part of a pathogen that originates from dormant structures and is responsible for initiating the first infection in a new growing season

③

Example → wheat rust, potato late blight
Apple scab, rice blast

④

② secondary inoculum → it is produced from primary infection for

Example → conidia, zoospores.

⑤

③ propagule → propagula is a single unit of a plant or pathogen used for reproduction or propagation

→

→

⑥

(B) recognition between host and pathogen

→ host plants also send signals for recognition by the pathogen on its surface such as waxes, cuticle and other surface chemicals.

① Infection → Infection is the establishment of a parasitic relationship between a host and a pathogen.

② Systemic infection → In this type of infection, the pathogen starts from one point and spreads from one point and spreads throughout the whole plant body.

③ Localized infection → In this type of infection the growth of the pathogen is confined to the point of initial infection.

④ Incubation period → Incubation period is the time period between the penetration of the pathogen into the host and the first appearance of symptoms.

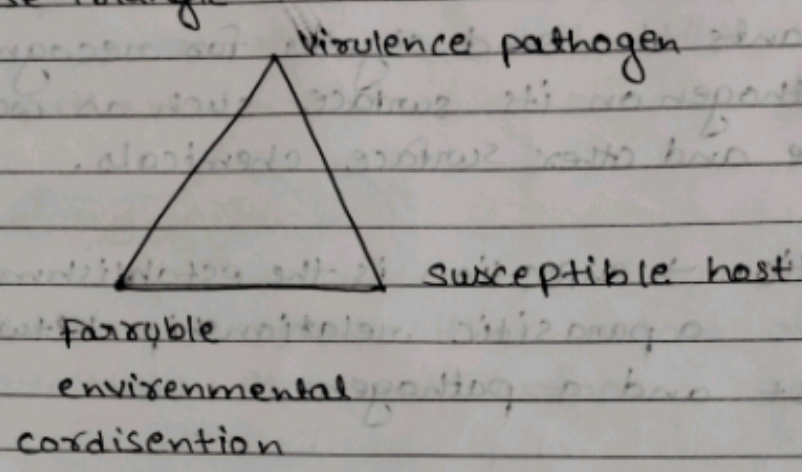
⑤ Invasion → Invasion is the growth and spread of the pathogen within the host body.

→ colonization

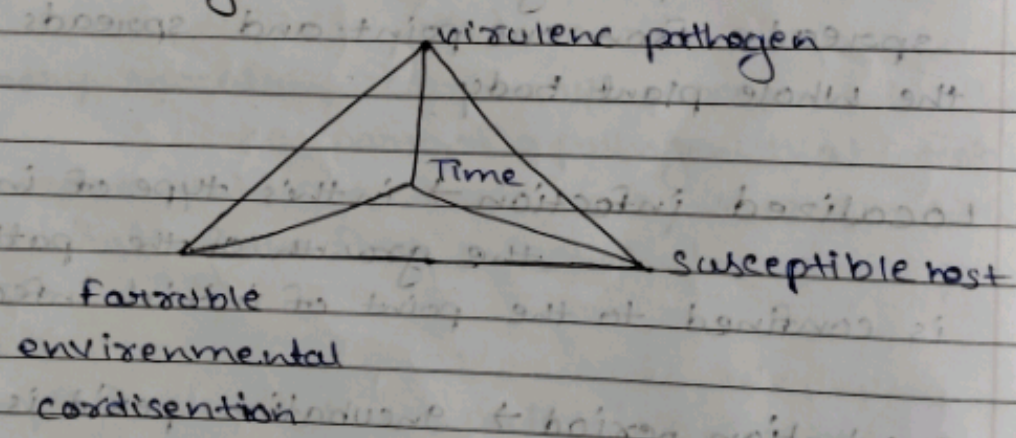
→ reproduction

⑥ Dispersion → Dispersion is the spread of inoculum of a pathogen.

#(A) Disease triangle



#(B) Disease Triangle don



out
steps

WRITE - 0
PAGE NO.
DATE:

CLASSIFICATION OF DISEASE

(A) Based on type of symptoms

- (A) Blight
- (B) Smut
- (C) rust
- (D) wilt
- (E) rot

(B) Based on type of organ affected

- (A) Fruit rot
- (B) root rot
- (C) leaf rot
- (D) leaf blight
- (E) stem blight
- (F) Bud rot

(C) Based on type of crop affected

- (A) cereal crop Disease
- (B) pulse crop Disease
- (C) oil seed Disease
- (D) forage crop Disease
- (E) fruit crop Disease
- (F) vegetable crop disease
- (G) ornamental crop disease
- (H) horticulture crop disease

(D) Based on cause →

• Infections diseases

- (A) Fungal Disease
- (B) viral Disease
- (C) Bacteriological Disease
- (D) viroid Disease
- (E) nematode Disease
- (F) phytoplasmal Disease
- (G) Algal Disease
- (H) parasitic Disease
- (I) protozoa Disease

• non Infections Disease

(E) Based on occurrence

- (A) endemic Disease
- (B) sporadic Disease
- (C) epidemic / epiphytotic Disease
- (D) pandemic Disease

(A) endemic Disease → Endemic disease is a disease that persists in a particular area and affects a crop regularly year after year

Example → 1 Black wart disease of potato
cause → Synchytrium endobioticum

Darjiling of district of west Bangle

2 potato cyst Disease Globodera

cause → matoshinensis
nilgiri hills region

(B) sporadic disease → When a disease appears in irregular basis in random areas, that is called sporadic disease.

Example → 1. Downy mildew of pearl millet (fungus)
Cause → Sclero spora graminicola

(2) Urbatta / Agarbatti diseases (rice)

Reason → ephelis oryzae

(C) epidemic / (epiphytotic) → When a disease appears in devastating form and covers a huge area, for example → Throughout the state or country, causing huge loss, is called epidemic (epiphytotic) disease.

Example → Black rust of wheat → puccinia graminis
Tritici

(2) Brown leaf spot of rice → Helmintho Sporum
oryzae 1943 Fleming (Bangle)

(B) pandemic Disease → When a Disease occurs over a large area of land, covers several countries or continents, and continues to

spread, it is called a pandemic disease.

Example → Late Blight of potato
phytophthora infestans
1845 famine Irish famine

→ Estimate the animal losses caused by pest

1. Disease 14.1%

2. Insec 10.2%

3. Weeds 12.2%

→ Important plant Disease

1. Late light of potato (1845)

cause phytophthora infestans

2. coffee rust 1867-1870 (Sri Lanka)

cause Hemileia vastatrix

3. Downy mildew of grapes (1880 France)

cause plasmopara viticola

4. Bacterial leaf blight of rice (1963 BIHAR)

cause xanthomonas oryzae pv. oryzae

5. Southern corn blight (1970)

cause Bipolaris maydis (Helminthosporium maydis)

HISATRE HISTORY

(1) "Theophrastus is the father of botany"

Book

- ↳ nutrition of plants
- ↳ A reason for vegetative growth

(2) Albertus magnus → parasitic plant
mistletoe
witchweed

अमर

- (*) Example → (1) Total stem parasite → Dodder, ~~amra~~, cuscuta
(2) Semi stem parasite → Loranthus, mistletoe
(3) Total root parasite → Orobanche
(4) semi root parasite → Striga

→ in 1660, the first disease regulatory legislation was introduced in France to cut and destroy the barberry plant

→ "Ergotism / S.T Holy Fire disease was observed by Denis Thoullez in 1570"

"Turkey x disease"

OAT → ergot → claviceps purpurea - produces toxic chemicals.

Science of Identification
nomenclature classification

(3) Carolus van Linnhoeus → father of Taxonomy

→ Book written

(1) Systema naturae } classification of plant

(2) Species plantarum } Based on morphological characters (mainly reproductive parts like flowers)

Binomial nomenclature

x (Example → *Triticum* (genus)
aestivum (species)) x

- He organized plants into groups in a systematic way

→ He gave the scientific system of classification of plants

Further of Binomial nomenclature (Linnaeus)

Example → *Triticum aestivum*
(genus) (species)

Contribution of Linnaeus pupils in mycology

C.H. Persoon

- Synopsis methodica fungorum (Book)
- worked on classification of fungi

E.M. Fries

- Systema mycologium (Book)
- Developed a more advanced system of fungal classification (How can be classification of fungus)

mycology To study about fungus

father of mycology → pier Antonio micheli
He was from Italy

In 1729, he published his important work

wrong
Theory

Spontaneous Generation Theory

This theory states:

- Life arises automatically from non living organic matter
- Example: rotten leaves (dead leaves) → microorganisms grow

Vircho

According to him

- omnis cellula e cellula
(every cell comes from pre-existing cell)
(koi bhi org apne ap nhi bnta. — Hamesha
uske se hi bnta hai)

Nature decide
ki kaun survive karaga

PAGE NO.

DATE:

Theory of natural selection (Charles Darwin)

- Origin of species (Book)
- published in 1859
- Ex: Dodo bird could not adapt to environmental changes, humans hunted them. They become extinct (Dodo)
- organisms that fails to adapt to environmental conditions are eliminated (become extinct) while those that adapt survive and reproduce

Great grand father

(Matthew Tillet) → known as the "great grand father of phytopathology"

- Disease studied
 - Bunt of wheat
 - symptoms
- wheat grains become black and powdery
- seed are infected with fungal spores
- Experiment
- use of infected sub, sowed
- result: plant grown were infected

Control methods

seed treatment

- seed were treated with
- seed Lime (CaCO_3) + sulfur, sowed
- result: Disease was controlled.

salt water treatment method

- salt was dissolved in water
- Infected seeds were placed in it
- observation
 - Infected seeds sank floated
 - Healthy seeds sank
- Action
 - floating seeds were removed
 - Healthy seeds used for sowing
- result: Disease reduced

- rust fungi (parasitic fungi)
 - on plants it disease - - -
 - and produced → (ofst utat erdt) on leaf or stem
- ↓ Type

1. Autacious rust fungi complete their entire life cycle on a single host plant

2. Heteroecious rust fungi
life cycle → on 2 Host
ex → (wheat + Barberry)
puccinia graminis

- L.R Tulasne and R.R Tulasne
 - selecta fungorum carpologica (Book)
 - work on chemicals
 - management of Diseases
 - reconstructor of mycology

5 different stages of autocious rust

stage	name
0	pycniospore
I	Aeciospore
II	uridaspore
III	Teliospore
IV	Basidiospore