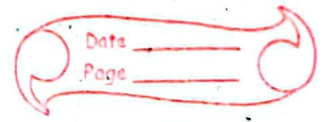


Virus



Introduction to botany and Plant diversity

The pure ~~and~~ branch of biology include following:-

Morphology:- form and external features.

Anatomy:- internal structure.

Histology:- tissue

Cytology:- form and ~~an~~ structure of cell

cell biology:- form, structure and function of cell.

→ The term biology was coined by Linnaeus and Treviranus.

Aristotle:- Father of zoology, biology

- Founder of embryology

- 1st attempt to classify plant and animal was done.

Book:- Historia animalia.

Theophrastus:- Father of botany

Termed lichen.

Book:- Historia Plantarum

Taxonomy:- identification, classification and nomenclature.

The branch of botany that deals with identification, nomenclature and classification of organism.

→ Term taxonomy coined by De Candolle.

Carolus Linnaeus:-

→ father of binomial system of nomenclature.

→ father of taxonomy.

→ father of modern botany.

→ term systematics

- 2-kingdom system of classification
- Artificial system of classification.
 - studied few morphological character → **Stamen.**
- Sexual system of classification.

Books:-

- System Nature
- Species plantarum
- Philosophia botanica

Taxonomic Hierarchy:- If the organism are classified into different taxon on the basis of their character, then it is taxonomic hierarchy.

Taxon:-

Kingdom	@ Keep Dish/Pots clean otherwise Family Get Sick.
Division / Phylum	
Class	
Order	
Family	
Genus	Taxon:- it is classificatory unit of any rank.
Species (smallest unit of classification)	

Species:- it is the lowest, basic and fundamental unit of classification.

→ **termed by John Ray** → give 'key' for identification of organism.

for two org. to be same species

Condition:- They should freely interbreed with each other and produce fertile offsprings.

Systematics - taxonomy + evolution.

System of classification.

1) Artificial system of classification

→ given by Linnaeus, Theophrastus, Aristotle.

→ based on few morphological characters → stems.

2) Natural system of classification:-

→ given by Bentham and Hooker. - Book :- **Genera plantarum**

→ based on all available characters of organism.

3) Phylogenetic system of classification

→ given by Engler and Prantl.

→ evolutionary history of organism.

Note: The first attempt to classify organism was done by **Aristotle**.

System of classification	introduced by	on the basis of
2 kingdom	C. Linnaeus	cell wall
3 kingdom	Ernst Haeckel	complexity of org. (uni / multicellular)
4 kingdom	Copeland	complexity of cell / no. of cell. (pro / eukaryote)
5 kingdom	R.H. Whittaker	mode of nutrition.
6 kingdom	Carl Woese et al and others	genetic material and DNA sequencing method.

① C. Haeckel

Books and Authors:-

História Plantarum :- Theophrastus.

História animalia :- Aristotle.

Origin of life :- Oparin

Origin of species :- Darwin

Genera plantarum :- Bentham and Hooker

Philosophy Zoologique :- Lamarck

Micrographia :- Robert Hooke.

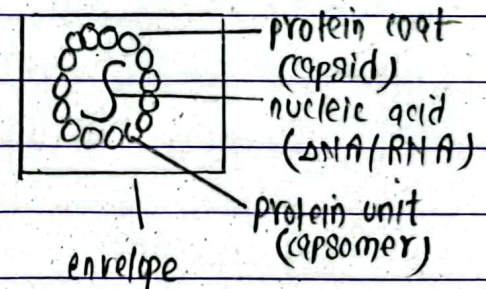
System Naturae, species plantarum, philosophia botanica -
Linnaeus.

Virus

→ Latin word - *visio* (poison/venom)

→ termed by Louis Pasteur.

→ Study of virus is virology.



General facts:-

→ Virus = nucleic acid + protein

→ acellular, sub-microscopic, nucleoproteinaeous particle/entity.

→ virus was 1st detected by W. Meyer (TMV)

→ 1st discovered by D.I. Ivanowsky (TMV)

→ 1st crystallized by W.M. Stanley - 1st crystallized virus.

History:- Beijerinck said virus as *contagium vivum fluidum* ⇒ infectious particle.

→ Wendell Meredith (W.M.) Stanley (1935) crystallized virus - TMV for the 1st time. So, he is known as father of Virology.

→ Edward Jenner discovered small pox + vaccination against small pox was 1stly discovered. So, he is known as father of vaccination.

→ Sabin et al discovered Polio virus.

Note: Small pox and polio vaccine virus was known from 6th century so called Prehistoric disease.

→ Louis Pasteur termed virus.

→ Father of microbiology

→ Sterilization

→ fermentation

→ Pasteurization

} cytological technique

→ Rabies vaccine discovered.

Characters of Virus:-

→ Virus is called obligatory particle bcoz it can't multiply outside the living host cell.

→ Virus is called living particle bcoz it possess both living and non-living character. So also known as transition zone, border line, biological puzzle.

→ Virus has no metabolism outside the host body. So, it is resistant to antibiotics.

Living character:-

- contains genetic material either DNA
- obligate parasite OR RNA
- can cause disease, can mutate
- can replicate by using host body.
- some virus contain enzyme (HIV virus)
- can be killed by radiation and heat.

Non-living character:-

- crystallization
- no metabolism (anabolism + catabolism)
- no cell, no growth, no protoplasm
- no enzyme system.
- outside the host body/cell, it becomes inactive.
- never die.

Size of virus:-

Range :- (10 - 300) nm

Note: bacteria :- (2-10) μ m

Smallest virus (2nm) :- coliphage E_2 (actually virioids).

Smallest plant virus (17nm) :- satellite Tobacco Necrosis

Smallest animal virus (10nm) :- foot and mouth virus of cattle.

Longest plant virus (300 x 18nm) :- Citrus tristeza.

Longest and most complex virus (400nm) :- Pox virus.

Shape of virus: 5 types

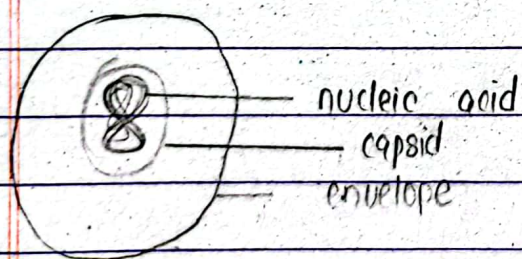
- Rod shaped :- TMV
- Tadpole shape :- Bacteriophage virus
- Spherical :- Influenza virus
- Bullet shaped :- Rabies virus
- brick shaped :- Small pox virus
- Note: Filament shape :- Ebola virus

Virus on the basis of hosts:-

wood + phage $\Rightarrow$ virus

- The virus which attacks on
- | | | | | | |
|----------|---|---------------|----------|---|-------------|
| plant | - | phytophage | E. coli | - | coliphage |
| animal | - | zoophage | BSA | - | cyanophage |
| fungi | - | mycophage | Mollusca | - | Malacophage |
| Yeast | - | zymophage | Human | - | Anthrophage |
| bacteria | - | bacteriophage | | | |

Structure of virus:- 3



1) Nucleic acid

2) Capsid

$\rightarrow$ protein coat of virus

$\rightarrow$ unit structure:- capsomeres which is genetically fixed.

- $\rightarrow$ TMV - 2130 capsomeres
 - $\rightarrow$ Host specification
 - $\rightarrow$ Antigenic property
- } functions

3) Envelope

- outermost, protein coat
- unit structure - peplomer
- naked virus - envelope absent Eg, bacteriophage, TMV.

Nucleic acid → infectious part

DNA ← RNA (Ribovirus)

- main type of nucleic acid in animal cell.
- main type of nucleic acid in plant cell.

→ dsDNA (common)
Colimovirus

→ ssDNA
Gemini virus

→ dsRNA
Reovirus.

→ ssRNA (common)
Retrovirus, Human immunodeficiency virus.

↓
It contains enzyme:-

- ★ RNA polymerase
- ★ Reverse transcriptase

Type of virus on the basis of genetic material.

1) dsDNA (also called Colimovirus)

- Tobacco mosaic virus
- Cauliflower mosaic virus.
- Mosaic virus.
- Bacteriophage.
- Cyanophage → Hepatitis B
- Coliphage T₂ → chicken pox.
- small pox.

Q. DCMBC

2) ssDNA (Geminivirus) :- E. coli phage, $\phi \times 174$

3) dsRNA (Reovirus)

single

→ Myxophaga virus

→ Rotavirus

→ Penicillium virus @ MRP.

4) ssRNA (Retrovirus)

middle east respiratory syndrome.

→ HIV virus, Measles, Mumps, SARS, MERS, avian flu, non-avian flu, influenza, all hepatitis except B, corona virus, Zika virus, ~~Ebola~~, yellow fever, Dengue, etc.
Ebola

Multiplication cycle:- 5 process

adsorption → penetration → biosynthesis → maturation →
lysis.

1) Lytic cycle:- bacterial cell disintegrate

→ virulent and pathogenic cycle.

2) Lysogenic cycle:-

→ also known as temperate phage, prophage.

→ non virulent and non-pathogenic cycle.

Tobacco Mosaic Virus

→ 1st discovered, 1st crystallized virus.

→ genetic material :- ssRNA

→ rod shape

→ no. of capsomeres = 2130.

→ envelope absent.

Bacteriophage:

- tadpole shape, ds DNA
- Structures:- 4 parts:-
 - a) Head :- Hexagonal shape
 - b) collar :-
 - c) neck :-
 - d) Tail :- 6 tail fibres present

secretes → lysozyme enzyme. that helps in penetration in host cell.

Virus/virion:- nucleic acid + protein

Interferon:- it is protein synthesized by host body against viral action.
glycoprotein. vertebrates.
Eg, birds, man.

Virion:- complete form of virus, natural stage of virus which is capable of infection.

Viriod:- only RNA hunk, naked, without protein coat
→ smallest infectious agent, ss RNA, low mol. wt.
→ causes potato spindle tuber disease (PST), hepatitis-B.
→ persistent to death (cucumber pale fruit)

Virusoid:- smallest fragments of RNA, non-infectious.

Prion:- only proteins. It causes:
infectious form of protein - Mad cow disease.
present within cell - Creutzfeldt Jacob disease.
nucleic acid absent - Parkinsonism.
- Kuru laughing disease.

Plant disease caused by virus

- tobacco mosaic disease
- leaf roll of papaya.
- potato leaf roll.
- grassy shoot of sugarcane.
- bunchy top of banana
- ~~but~~ bunchy top of papaya caused by Mycoplasma. @ MY PAPA
- Mosaic of sugarcane.

Animal disease caused by virus

- Influenza, chicken pox, small pox, measles, mumps, rabies, AIDS, SARS, dengue fever, yellow fever, polio, all hepatitis virus, warts, etc.

Generally, plant virus are ssRNA.

Exception of ds DNA

- cauliflower mosaic virus
- mirabilis mosaic virus
- tobacco mosaic virus