Tobacco mosaic virus

Q. Ultra structure & Reproduction (Replication) of a RNA virus.
OR
Ultra structure & Reproduction of tobacco mosaic virus.

Ans → Introduction → Adolf Mayer reported a mosaic disease symptom on tobacco leaf. To prove the causal organism of this disease a bacteria was identified. Iwanowski proved the cause of this disease not due to a bacteria but a new kind of organism which can crass through a membrane filter (where most of the bacteria can be trapped) and called this organism as filterable Agent [FA]
Stanley 1935 crystallized T.M.V. and recognised it as a separate class of microbe which was earlier known as virus.
After 1935 information will collected to no structure of T.M.V. and the method by which they reproduce inside a host cell.

Ultrastructure of T.M.V. →

1. It is made up of nucleio protein.
2. The protein component was henceforth called as capsid and (one unit capsomere)
3. The nucleic acid fraction was represented by single stranded RNA.
4. The protein and nucleic acid are arranged in such a manner that it represents a rod shaped structure = T.M.V is a rod shaped virus.
5. The arrangement of RNA and the capsomere = ultrastructure.

(a). The knowledge about this virus has come from scaning electron microscope and biochemistry that one could know about the ultra structure of T.M.V.

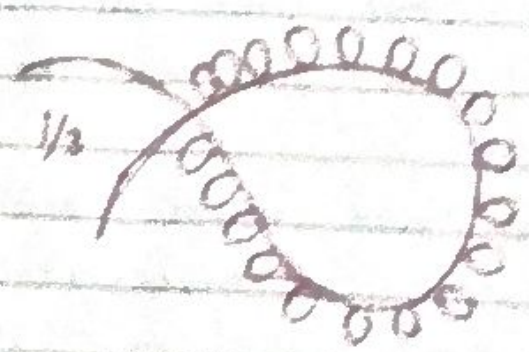
(b). Under lower magnification of EM, a rod like str.

could be scanned

(c) A rod shaped virus measuring 200 nm in length and 15 nm in breadth

(d) That RNA is single stranded but in a TMV particle it is arranged in a folded in spiral manner which gives it the shape of a rode

(e) The capsomeres remains embeded in this spirally folded RNA In such a manner that about 49 capsomeres can be counted in three folds and in one fold the number comes to 16⅓.



I.e. through one fold

(f) All together there are 2120 capsomere distributed in about 131 folds

(g) The capsomere monomer (protein) is a long chain of amino acid (162) which remains folded in

RNA

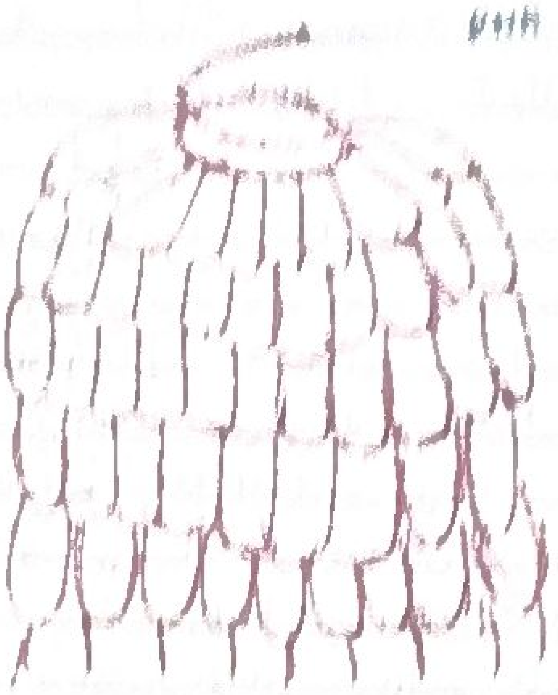
Primary etc

Secondary etc

(i) the RNA is highly folded and create a virus particle a helical structure

(ii) under high magnification this looked a bunch of grapes

RNA



capsomere

Vertical model of TMV showing structure of RNA capsid arrangement

• The union of the capsomeres and a RNA molecule is in such a manner that the capsomeres remains embedded in the RNA molecule and ...

MODE OF REPRODUCTION OR REPLICATION

→ The TMV enters into the host cytoplasm by any of the following methods

• Through insect vectors which feeds upon the cells sap of the tobacco plant.

• Through abrasion cause by biting insect by host plant.

• Through mechanically injured part caused by grazing animals.

→ The intact virus particle gets lodged into

the host cell.

⇒ The nucleic acid component of the virus can the one set of infection So, it is a pre requ that the virus component must get broken inside the host.

⇒ Nucleolytic enzyme is produce by host DNA whi breaks nucleic acid from the protein.

⇒ The viral RNA interacts with the host DNA and the result of which a special class of enzyme called REPLICASE is synthesis in the host cell.

This replicase enzyme favor the synth esis of

→ New viral capsomere
→ New viral RNA

Later the newly synthesis molecules assemble to create a new viral particle.

⇒ Some of the viral RNA may slip in the adjacent cell to cause DNA mediate transforma tion. This is the cause of systematic infection due to viral infection.

⇒ The newly synthesized virus can get into another healthy cell by the mine discribe above to infected to new host plant.

Dig:-