

Tobacco mosaic virus

9. 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 cross through a membrane filter (where most of the bacteria can be trapped) and called this organism as filterable Agent [FA] and 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. →

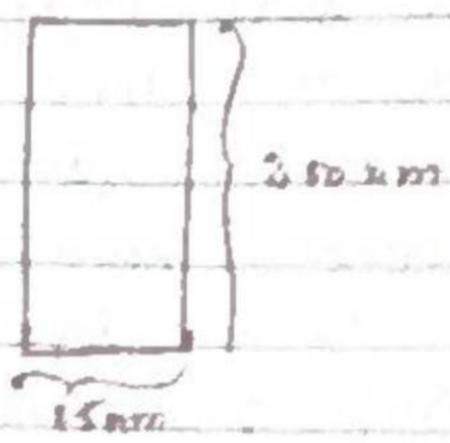
1. It is made up of nucleio protein.
2. The protein component was henceforth called as capsid and (one unit capsomere).
3. The nucleic acid fraction was represented by single stranded RNA.
4. The protein and nucleic acid are arranged in such a manner that it represents a rod shaped structure.
= T.M.V.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

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

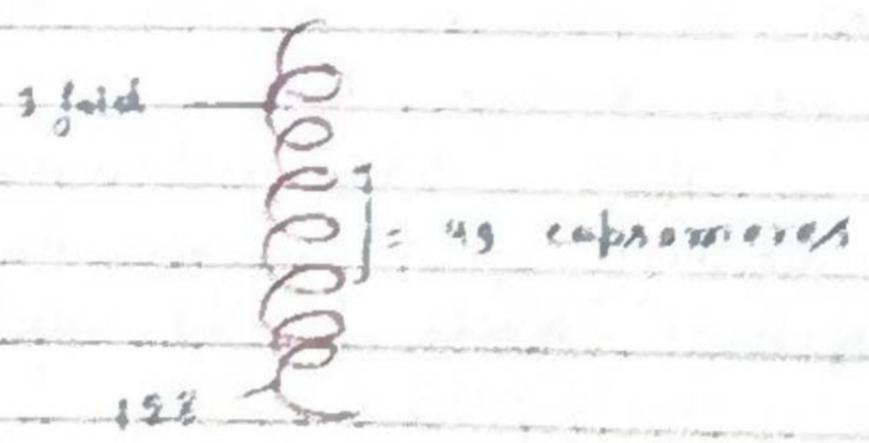
(b) Under lower magnification of EM, a rod like str.

could be scanned.

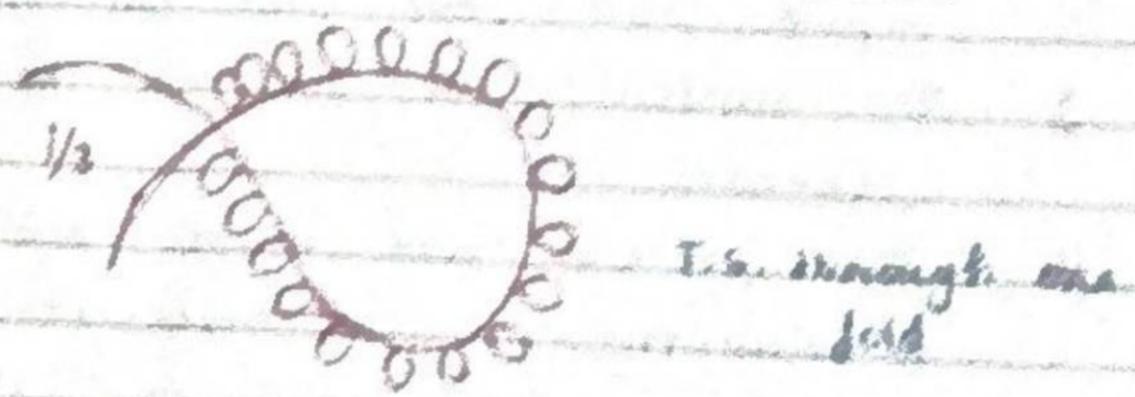
(c) A reel shaped virus measuring 200 nm in length and 15 nm in breadth.



(d) That RNA is single stranded but in a T.M.V. particle it is arranged in a folded or spiral manner which gives it the shape of a rod.



(e) The capsomeres remain embedded in this spiral folded RNA. In such a manner that about 49 capsomeres can be counted in three folds and for one fold the number comes to 16 2/3.



(f) All together there are 2128 capsomeres distributed in about 131 folds.

(g) The capsomere remains as (capsid) is a long chain of amino acid (168) which remains folded in a manner that it is...

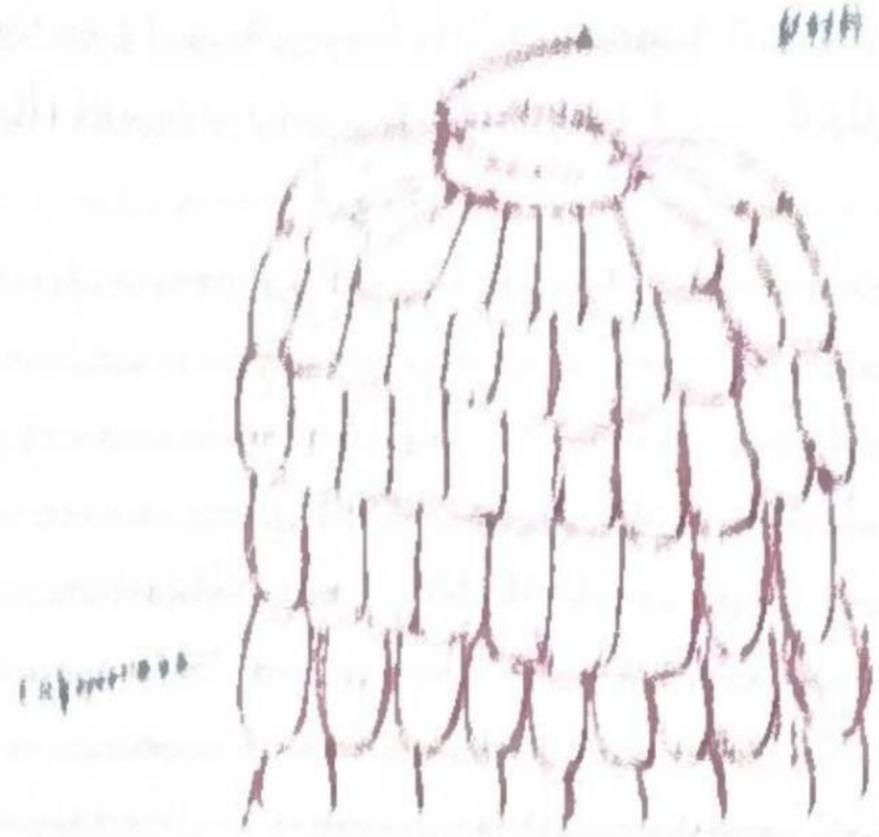
Primary xylem



Secondary xylem

- (i) The pith is highly folded and carries a series of parallel or lamellar structures.
- (ii) It shows high magnification this looks a series of groups.

Pith



Primary xylem
Secondary xylem
Vascular cambium

- The nature of the cambium is such a nature that the cambium remains embedded in the stem and

MODE OF REPRODUCTION OR REPLICATION

- The latex 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 abrasions caused by biting insect by host plant.
 - Through mechanically injured part caused by grazing animals.
- The latex vessel bundle gets lodged into

the host cell.

→ The nucleic acid component of the virus called the genome of infection. So, it is a pre-requisite that the virus component must get broken inside the host.

⇒ The catalytic enzyme is produced by host DNA which 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 synthesized in the host cell.

This replicase enzyme favors the synthesis of

→ New viral capsomere

→ New viral RNA

So, the newly synthesized molecules assemble to create a new viral particle.

⇒ Some of the viral RNA may slip to the adjacent cell to cause RNA mediated transformation. This is the cause of systematic infection due to viral infection.

⇒ The newly synthesized virus can get into another healthy cell by the means described above to infect to new host plant.

Diagrams