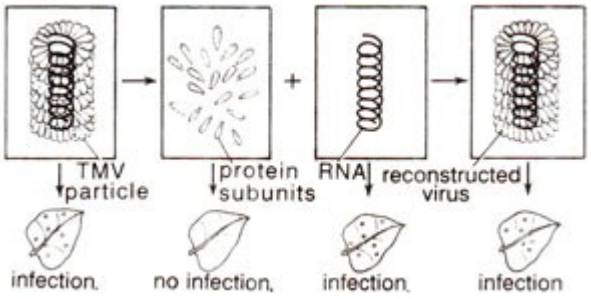
RNA as the Genetic Material

The genome of viruses may be DNA or RNA. Most of the plant viruses have RNA as their hereditary material. Fraenkel-Conrat (1957) conducted experiments on tobacco mosaic virus (TMV) to demonstrate that in some viruses RNA acts as genetic material.

TMV is a small virus composed of a single molecule of spring-like RNA encapsulated in a cylindrical protein coat. Different strains of TMV can be identified on the basis of differences in the chemical composition of their protein coats and difference in symptoms on the tobacco leaves. By using the appropriate chemical treatments, proteins and RNA of TMV can be separated.

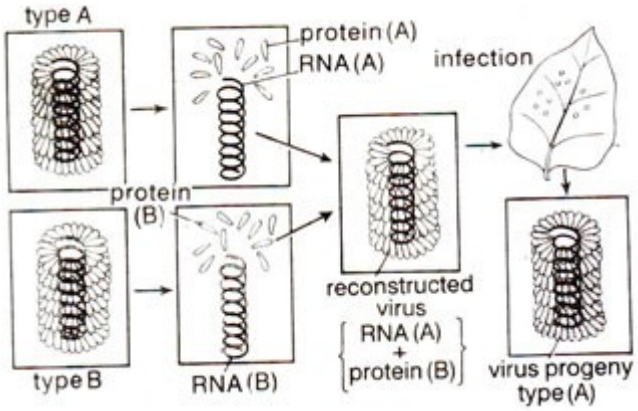
Fraenkel-Conrat experimentally proved that in the absence of DNA, RNA acts as the genetic material.

In one experiment protein and RNA components of the TMV were separated and both were used to infect the tobacco leaf separately. It was observed that in case of protein subunits, there was no symptoms on the leaf and no progeny viruses were obtained. RNA part caused the infection and symptoms appeared on the tobacco leaf. Fresh progeny of TMV was also obtained.



In the other experiment, two strains of TMV (type A and type B) showing different symptoms (one causing spots in random pattern and the other in a definite ring form) were taken. There Protein and RNA parts were separated and chimera (hybrid) viruses were synthesized using RNA of type A and protein of type B and vice-versa. These chimera/hybrid viruses were used to infect the tobacco leaves. It was observed that symptoms on the leaf always belonged to the virus strain from which RNA was taken. Fresh progeny also belonged to the same strain. (When the hybrid or reconstituted viruses were rubbed into live tobacco leaves, the progeny viruses produced were always found to be phenotypically and genotypically identical to the parental type from where the RNA had been isolated.)

These experiments proved that the genetic information of TMV is stored in the RNA and not in the protein.



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