

Tobamoviruses

type member - tobacco mosaic virus

single stranded RNA viruses

genomic RNA is message-sense RNA [(+) strand]

linear genome of about 6000-6500 nt

genomic RNA is capped and has a non-polyadenylated 3' end

3' end of genomic RNA can assume a tRNA-like structure (can be aminoacylated by tRNA charging enzymes and modified by CCA-adding enzymes)

genomic RNA encodes 3-4 open reading frames

all are encoded by the same RNA strand

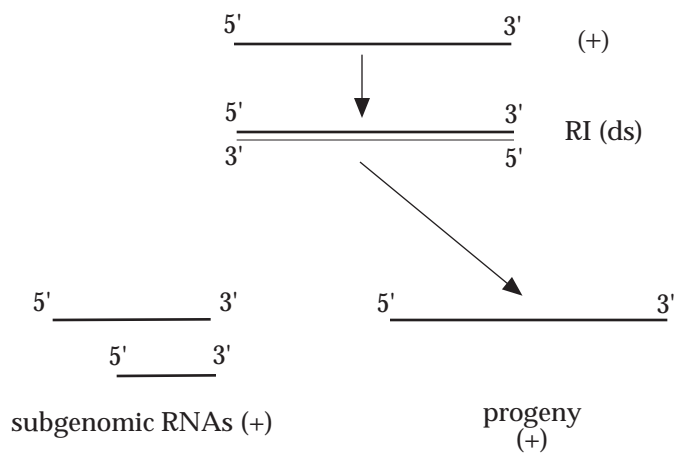
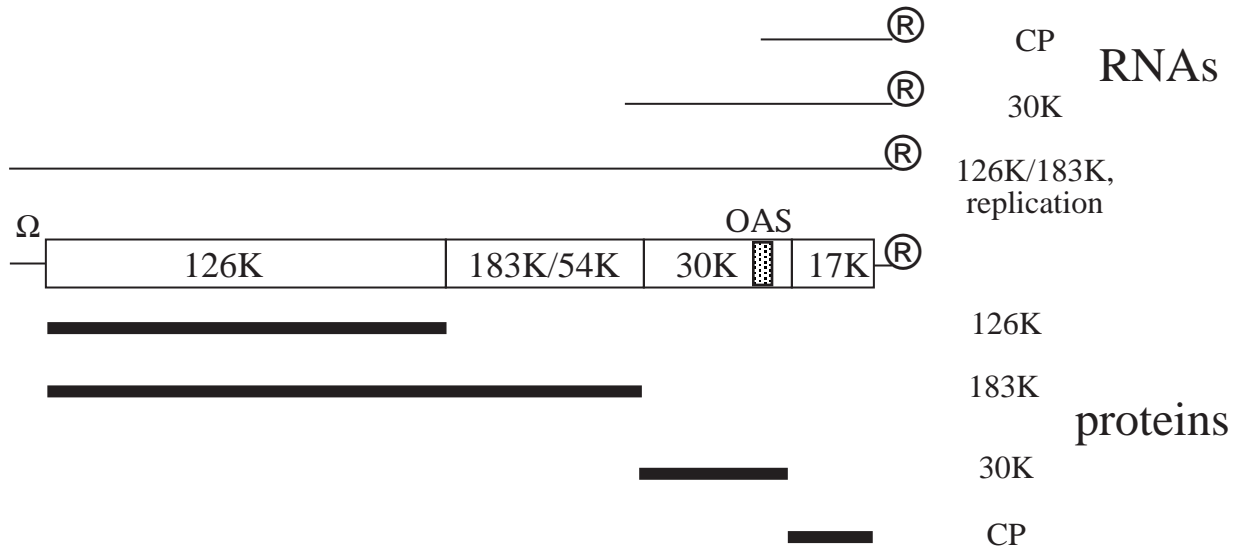
RNA genome encodes just 3-4 "transcripts", or subgenomic RNAs

Questions:

how are the possible open reading frames expressed (if they are)?

how does the RNA genome replicate?

how does the virus move from cell to cell, from infected to uninfected plant?



Functions of the open reading frames

126/183 kD protein: probable virus-encoded component of the replicase (RNA-dependent RNA polymerase); mutants are not viable, sequence shows significant homology with other known RNA-dependent RNA polymerases, 126 kD protein has capping activity

30 kD protein: cell-cell movement protein (short-distance movement); purified protein binds non-specifically to single stranded nucleic acids, mutants do not move from cell to cell (ts mutants have been identified and characterized, cloned wt 30 kD protein can complement movement mutants), protein is localized to plasmadesmata, protein can change (increase) plasmadesmatal exclusion limit

coat protein: sole protein component of the virus, a determinant of resistance (mutants affect hypersensitive response) and long-distance movement

Gene expression

three "mRNAs", and thus three "promoters"

promoters are recognized by the viral replicase, and mRNA synthesis is analogous to genome replication (no dsDNA intermediates)

genomic mRNA has 5' and 3' translational enhancers: 5' enhancer is a probable high-affinity internal ribosome binding site; 3' enhancer is functionally analogous to poly(A) tails, works in conjunction with the 5' enhancer (not with 5' cap structures)

different subgenomic mRNAs are expressed at different times in the infection process (seems to be determined by the "promoter")

Genome replication (and mRNA synthesis)

two step - synthesis of a genome-length (-) strand intermediate, then synthesis of genomic and subgenomic RNAs

3'-tRNA structure is important for replication ("telomeres"?)

host proteins are probably involved

