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A mutation in the NIB cistron of *Potato virus Y* confers virulence towards the *Pvr4* resistance of pepper and a high competitiveness cost in susceptible cultivar

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The *Pvr4* resistance of pepper against potyviruses is highly durable in field conditions but *Potato virus Y* (PVY) virulent variants can be selected in laboratory conditions. To understand this discrepancy, we studied the molecular mechanisms which generated these variants and their consequences on viral fitness. We found that the region coding for the NIB protein (RNA-dependent RNA polymerase) of PVY was the avirulence factor corresponding to *Pvr4* and that a single non-synonymous nucleotide substitution in that region was sufficient for virulence. This substitution imposed a high competitiveness cost to the virus against an avirulent PVY variant in plants devoid of *Pvr4*. In addition, during serial passages in susceptible pepper plants, the only observed possibility of the virulent mutant to increase its fitness was through the reversion of the virulence mutation, strengthening the high durability potential of the *Pvr4* resistance. This is in accordance with the high evolutionary constraint exerted on the NIB protein of PVY and other potyviruses and with a model predicting the durability of virus resistances as a function of the evolutionary constraint applied on corresponding avirulence factors.