The effect of bean yellow mosaic virus and peanut stunt virus on poly $(A)^+$ RNA-mediated protein synthesis in pea

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One of the hypotheses describing the regulation of plant defence against viral infection assumed the mechanism of competition between plant and viral mRNAs during translation (2). To study this phenomenon we have chosen to examine the interaction of pea (*Pisum sativum*) and two different viruses common worldwide to this host plant: bean yellow mosaic virus (BYMV) (1) and peanut stunt virus (PSV) (5). Reactions were performed in the *in vitro* translation system from rabbit reticulocytes specially adopted to suit the translational requirements of both plant and viral mRNAs.

Poly $(A)^+$ RNA was isolated from leaves of two cultivars of pea: the BYMV-susceptible cv. Kaliski and BYMV-resistant cv. Heros. The poly $(A)^+$ RNA was then translated in the presence of viral messengers: either the RNA of the BYMV-type strain (BYMV-T) (1), or RNA from the apparently more virulent Polish isolate coded BYMV-LP-1 (4). The images of the translation products differed in the amount of particular peptides in each of the following combinations:

cv. Kaliski poly $(A)^+$ RNA + BYMV-LP-1 RNA : synthesis of most plant proteins was diminished;

cv. Kaliski poly $(A)^+$ RNA + BYMV-T RNA : no significant influence on the amount of plant products was observed;

cv. Heros poly $(A)^+$ RNA + BYMV-T RNA or BYMV-LP-1 RNA : no effect of the virus RNA was evident in either case.

As a control on the quantitative level of protein synthesis, only the plant poly $(A)^+$ RNA fraction was translated in each experiment.

A different approach was used to investigate the infection of pea with PSV. Pea plants of the cv. Fidelio were inoculated with either a mild or a severe strain of the virus. When symptoms appeared, poly $(A)^+$ RNA was extracted from leaves exhibiting systemic symptoms. When translated *in vitro,* the plant messengers directed synthesis of number of peptides. The quantitative level of the peptides varied according to the particular virus strain used to inoculate the pea plants. It was found that poly $(A)^+$ RNAs from plants preinoculated with the severe PSV strain were significantly less efficient in bringing about protein biosynthesis than the poly $(A)^+$ RNAs from plants preinoculated with the mild PSV strain. The translational activity of mRNAs isolated from healthy pea plants was used as a control.

The results obtained in both experiments are consistent with the hypothesis that translational control is implicated in the plant defence mechanism against viral infection.

Similar conclusions can be drawn from some other results. Using the rabbit reticulocyte translational system, Evans and Boulter (3) proved *in vitro* competition in regard to the translation of cowpea chlorotic mottle virus RNA and plant mRNAs coding for storage proteins of pea cotyledons. They considered a competitive model of host-plant resistance against the virus as influencing its seed-transmissibility limitation. Chroboczek *et al.* (2) supported this hypothesis on the basis of *in vitro* experiments using *Viciafaba* poly (A)-containing mRNA fraction against brome mosaic virus and tobacco mosaic virus in wheat cell-free system. In conclusion, results from several species are consistent with translational competition as a mechanism of plant and viral gene regulation and expression, when a plant cell is invaded by the pathogen.

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