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Pathogenesis-related proteins N, O, P, Q, R etc.: some properties and separations

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Extracts from the leaves of tobacco plants *(Nicotiana tabacum* cv. Xanthi-nc) which are reacting hypersensitively to infection with tobacco mosaic virus (TMV) contain the four well-known pathogenesis-related proteins PR-1a, −1b, −1c and − 2, and also five other major protease-resistant proteins which are absent, or present in small amounts in uninfected leaves. These five PRs have not been characterized well enough to be assigned names, according to the proposed system of PR-nomenclature, but, following Van Loon (1), they have been called N, O, P, Q and R in order of their decreasing mobility in electrophoresis. On examination by chromatofocusing, both P and R are further resolved into two components, and the two proteins present as minor constituents are referred to as P′ and R′. None of these proteins N-R′ appears to contain a protein subunit of similar size to those present in PR-1a, b and c and which can be characterized by electrophoresis in the presence of SDS. After electrophoresis, protein peaks (P+P′) and Q stain with the Schiff-periodate reagent as if they contained carbohydrate, and the same is probably true of peak (R+R′). P, Q and R′ are absorbed onto columns of chitin or colloidal chitin: they could not be identified with the chitinases that are present in these extacts and so they may well be lectins which specifically bind to N-acetylglucosamine residues.

When leaves of TMV-infected plants are exposed to $^{14}CO_2$ as lesions develop, radioactivity accumulates in PR-1a, −1b, −1c, −2, and also probably in (R+R′), as judged by the distribution of radioactivity in electrophoretic gels. Incorporation of ^{14}C into PR-1a was confirmed by extraction of the protein from the gels and re-electrophoresis in denaturing conditions. The incorporation into PR-1a was not substantially different when $^{14}CO_2$ was applied to the leaves before, at the same time as, or after inoculation with TMV. The difficulty of establishing conditions of 'pulse-labelling' with these leaves however, makes it difficult to judge if the proteins are stable metabolic end-products, or are actively 'turning-over'.

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