Effect of Leaf Roll Virus Infection on the Soluble Nitrogen Composition of Potato Tubers

In an attempt to verify and extend the findings of Andreae and Thompson[1] to a range of potato varieties, an apparent relationship between glutamic acid, glutamine, and virus infection has been noted. The diseased tissue used was primary infected material which had been obtained from grafts.

Microscopic examination of the tissue did not reveal the presence of necrotic lesions, which, because of the gross physiological changes involved in their formation, might conceivably be expected to produce, as secondary effects, similar biochemical differences to those found. Alcoholic extracts were prepared according to Dent, Stepka and Steward[2], taking the same weight of healthy and diseased tuber tissue (20 gm.) for each extraction. A preliminary survey of seven varieties was made by applying equal volumes of the extracts to a one-dimensional paper chromatogram (see photograph) run in phenol : water, 75 : 25 w/v. A standard set of amino-acids containing aspartic and glutamic acids, glutamine and tyrosine was run in the first, eighth and seventeenth positions. One of these compounds, glutamine, contained impurities which confuse the picture in the aspartic – glutamic acid region. In four of the seven varieties the diseased tissue appears to contain higher concentrations of glutamic acid, glutamine and asparagine. Two-dimensional chromatograms, run with *n*-butanol : acetic acid as the second solvent, showed that the amounts of alanine present were insufficient to account for the large differences appearing in the glutamine region of the single-dimensional chromatogram, but that other amino-acids, for example, serine, accounted for the apparent differences in asparagine content.

Analyses of five further varieties by two-dimensional chromatography have shown that the differences in glutamic acid and glutamine are the most consistent. Diseased tissue had two to three times the glutamine concentration of healthy tissue, while glutamic acid differences were much smaller although covering the same varietal range. Tyrosine and tryptophane, however, showed no consistent differences over the varietal range tested. A very noteworthy biochemical difference occurs in Arran Pilot tubers, in which the total amino-nitrogen in diseased tissue appears to be reduced to approximately one-third of that present in healthy tissue.

In view of the importance recently assigned to glutamic acid and the γ-glutamyl group of glutamine by Hanes, Hird and Isherwood[3], in respect of trans-peptidation reactions, these observations may have significance beyond the fact that they show promise of providing the basis for a simple and rapid diagnostic test for leaf-roll virus in potato tubers.

A fuller account of this work will be published elsewhere. I acknowledge gratefully the co-operation of Mr. C. M. Driver, who provided the material, and Miss C. M. Smart, who performed the grafts and microscopic examination of the material.

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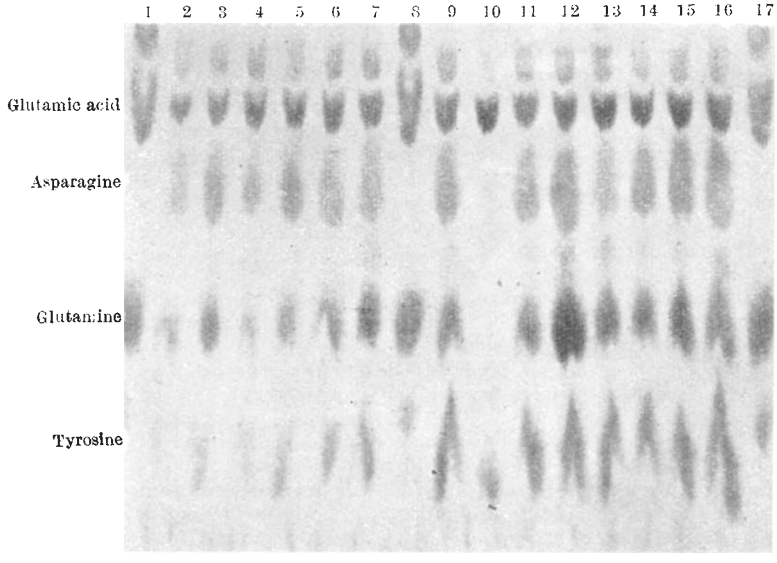
[1] Andreae, W. A., and Thompson, K. L., *Nature*, **166**, 73 (1950).
[2] Dent, C. E., Stepka, W., and Steward, F. C., *Nature*, **160**, 682 (1947).
[3] Hanes, C. S., Hird, F. J. R., and Isherwood, F. A., *Nature*, **166**, 288 (1950); *Biochem. J.*, **51**, 25 (1952).



Chromatogram of soluble nitrogen fraction of healthy and diseased potato tubers. (1), (8) and (17) are standard amino-acids. The following pairs are for each variety, healthy and diseased, respectively: (2, 3) Arran Banner; (4, 5) Arran Chief; (6, 7) Arran Consul; (9, 10) Arran Pilot; (11, 12) Chippewa; (13, 14) Craig's Defiance; (15, 16) Dunbar Standard

Bacterial Degradation of Choline

During work on the production of trimethylamine by organisms isolated from the flora of the whale, it was found that some types were able to produce this substance from choline[1]. Similar observations on organisms from other sources had been made previously, the products of the degradation of choline characterized as trimethylamine and ethylene glycol, and the enzyme responsible named 'choline deaminase'[2]. No kinetic information was available, nor had the specificity of the enzyme been determined, though it had been reported that certain Enterobacteriaceæ produce trimethylamine from acetylcholine but not from betaine[3], so investigation of these questions seemed likely to prove fruitful.

The organism used was a strain of *Aerobacter aerogenes*, recently isolated from whale tissue, chosen in preference to the other choline-splitting species, which were either anaerobes or slowly growing aerobes. Its enzyme system proves to be specific for choline and acetylcholine. Ethyltrimethylammonium hydroxide and tetramethylammonium hydroxide may be attacked very slightly; but with the small quantities involved it is difficult to tell whether the trimethylamine has increased or not. It is without action on *iso*-choline, betaine, phosphorylcholine or dimethylaminoethanol.