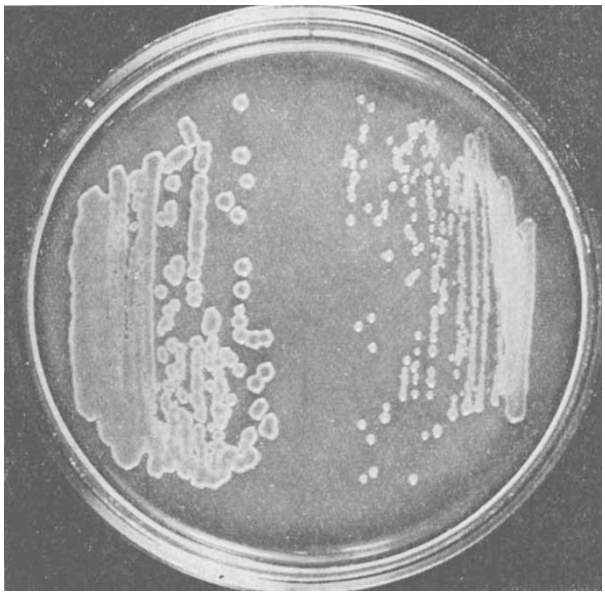

Fig. 1. Growth of *E. carotovora* (left) and *E. carotovora* variety 'Atroseptica' (right) after 48 h of incubation at 27° C.

well defined group difficult to separate with absolute certainty.

It was noted[8] that after 24 h of incubation at 27° C on heart infusion agar, well separated colonies of *E. carotovora* and *E. carotovora* variety 'Aroideae' appear larger than those of *E. carotovora* variety 'Atroseptica', and the following agar medium was devised to emphasize this difference in colony size: 28 g of nutrient agar ('Oxoid *C.M.*3'); 5 g of yeast extract ('Difco'); 5 g of glucose; 1 l. of distilled water. The medium is autoclaved at 15 lb. pressure for 15 min and cooled to 60° C. Sterile 0·5 per cent, 2,3,5-triphenyl tetrazolium chloride (10 ml.) is added to the 1 l. of medium and 15 ml. samples are poured into sterile Petri dishes. After drying the surface of the medium overnight at a temperature of 37° C, aqueous suspensions of the bacterial isolates are spread over the surface so that single colonies can develop (Fig. 1). After 24 h of incubation at 27° C the single colonies of either *E. carotovora* or *E. carotovora* variety 'Aroideae' reduce the triphenyl tetrazolium chloride to insoluble red formazan, develop pink to red–purple centres and attain a diameter of about 1·5 mm. The single colonies of *E. carotovora* variety 'Atroseptica' remain colourless and less than 0·5 mm in diameter. After 48 h of incubation the *E. carotovora* variety 'Atroseptica' isolates reduce the triphenyl tetrazolium chloride, but the single colonies remain small and this differentiates them from the larger and more deeply coloured colonies of either *E. carotovora* or *E. carotovora* variety 'Aroideae' (Fig. 1).

Comparisons of growth on the above medium with and without triphenyl tetrazolium chloride showed no difference, apart from colour, in colony morphology; the addition of triphenyl tetrazolium chloride merely makes observations easier by bringing about this change in colony colour.

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Resistance to Water Transport in Plants—a Misconception?

Professor Levitt[1] argues that the chief resistance to water transfer through the soil–plant–atmosphere continuum is in the liquid path through the plant, and not in the gaseous path from plant to atmosphere as concluded by Gradmann[2] and van den Honert[3]. The basis of his argument is that while water potentials are appropriate to transfer of the liquid through the plant, vapour pressures should be used in the Ohm's law analogue of the flow from plant to atmosphere, because gas diffuses in response to a vapour pressure gradient.

As water vapour pressure is uniquely related to water potential, either may be used to express energy differences in the Ohm's law analogue. Unfortunately, the permissible expression of both water potentials and water vapour concentrations in terms of pressures introduces a trap. Although Levitt's comparison of resistances appears dimensionally correct, it is, unlike those of Gradmann and van den Honert, actually between the hydraulic resistance of the plant, and the diffusive resistance from plant to atmosphere. Philip[4] has recently drawn attention to the considerable differences between these factors which are normally expressed in this context in units of [time] and [time/length] respectively.

For this reason, Levitt's argument cannot be accepted as demonstrating a misconception by Gradmann and van den Honert.

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Resistance to Water Transport in Plants—Whose Misconception?

Levitt[1] has re-interpreted an analogue proposed by Gradmann and van den Honert, and concluded that the chief resistance to flow through a plant is in the liquid and not in the vapour phase.

It is now generally conceded that the Gradmann–van den Honert analogue is satisfactory only in the most general terms. This is mainly because of differences in the nature of the potentials and resistances in each segment of the pathway, particularly between leaf and air, where there is a phase change from liquid to vapour. Even so, the original conclusions remain valid[2]. These are that control is exercised in the vapour phase, where the stomata are located, and that control elsewhere would result in desiccation of the plant beyond the control zone.

A good test of Levitt's conclusion about the importance of liquid phase resistance is to consider what happens when it is removed. Levitt states that leaf water potentials are normally higher than —50 bars. In fact, few plants survive at potentials below this value[2]. If the roots of a plant are in pure free water and the resistance to flow in the liquid phase is somehow made negligible, the water potential of the leaf cells will rise to values approaching zero. A change in water potential from —50 bars to zero will bring about a change in water vapour pressure[3] at the surfaces of the leaf cells of only about 5 per cent, or 1·5 torr in the example Levitt quotes. Since, in Levitt's example, the drop in water vapour pressure from the cell surfaces to the external air was 15 torr, removing all resistance to water flow in the liquid phase could not increase transpiration by more than about 10 per cent.

This paper was written while one of us (J. V. L.) was on leave of absence from the National Institute of Agricultural