Fig. 1. Phages with different plaque forms, isolated from orchard soils using a single propagating strain, NA3, of *Ps. mors-prunorum* (actual size)

fied and several soil samples could be handled simultaneously. Heat treatment (58° C. for 30 min.) was also tried as an alternative to filtration, but led to inactivation of the phages.

In a test of the method on twelve soil samples taken from beneath cherry, plum and apricot trees in several different localities, phages were isolated from nine of the samples. The isolates were classified into three groups on the basis plaque morphology (Fig. 1), namely, large (2 mm.) circular plaques with a 'halo'; medium sized (1 mm.) irregularly-shaped plaques; small (0.5 mm.) pin-point plaques. These groups, which have been further differentiated by cross-resistance tests, were obtained using a single enrichment strain, NA3, of *Ps. mors-prunorum*.

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Occurrence of Soft Rot Bacteria in Scottish Soils

A METHOD of isolating soft rot bacteria from soil using immature potato tubers as a form of enrichment medium was described by Kerr¹. He found that of twenty Scottish soils examined all contained Gram-negative bacteria capable of rotting potato tuber slices.

When the term 'soft rot bacteria' is employed most workers generally assume that this implies 'coliform soft rot bacteria', that is, *Erwinia carotovora* and related species. With this assumption is associated the prevalent view that soft rot coliforms are commonly present in soils, and can be isolated readily from them. On this basis it is usually considered that the organisms isolated by Kerr were *Erwinia* spp., although he did not identify the genus to which his isolates belonged.

A study of the soft rot bacteria in Scottish soils was undertaken in connexion with investigations on black leg disease of potato, caused by *E. atroseptica*. During the years 1956 and 1957, seventeen soil samples, taken from different localities, and including peaty, shale, sandy and clay types, all under current

cropping, were tested for the presence of soft rot bacteria. Kerr's technique was used, and soil suspensions were plated out directly on the salicin agar described by Noble and Graham², and on the pectate gel mentioned by Dowson³. A number of isolates were obtained from each soil sample by all three methods, which were capable of rotting potato tuber slices at 26° C. Most of these were Gram-negative bacteria, and further examination showed them to be members of the genus *Pseudomonas*. Many of these pseudomonads do not produce a fluorescent pigment on meat infusion agar, but will do so in a medium containing inorganic salts plus an organic acid such as gluconic acid, treated with 8-hydroxy-quinoline to reduce the heavy metal content, after the method devised by Paton⁴. Such organisms are therefore easily confused with coliforms unless adequate tests are applied.

In other experiments, heavy suspensions of a mixture of two strains of *E. atroseptica* were poured on to 500 gm. of various soils (sandy, clay, shale, peat and unsterilized John Innes compost) contained in Kilner jars with loose-fitting lids. The jars were buried up to the neck in soil in the open during November 1955 and 1956, while others were kept at room temperature. Using Kerr's method and the salicin agar technique, isolations from all jars, in May 1956 and 1957, yielded only soft rot organisms of the genus *Pseudomonas*, none of which could be specifically identified. Similar pseudomonads have been obtained from naturally rotting tissues of a number of plants, including potato, carrot, leek, celery and cauliflower.

Some Gram-positive organisms were associated with rotting when Kerr's technique was used for isolation, and all were members of the genus *Bacillus*. *B. polymyxa* (Voges-Proskauer positive) was fairly common, but *B. macerans* (Voges-Proskauer-negative) was obtained on two occasions only.

It is concluded that in enrichment cultures from Scottish soils the dominant soft rot organisms are pseudomonads, and not coliform bacteria.

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Pectin-decomposing Strains of *Pseudomonas*

THE ability of certain members of the genus *Pseudomonas* to cause a soft rot of plant tissue or to degrade pectin preparations has been known for some time¹. It is surprising that this character of the pseudomonads has not been given more attention, considering the very common occurrence of members of this genus in Nature and the economic importance of soft rots in plant tissue.

While investigating cases of tomato stem necrosis or soft rot, commonly ascribed to *Erwinia carotovora*, it became evident that the coliform types of pectolytic bacteria could not be determined in the majority of specimens. The isolates most frequently obtained were members of the genus *Pseudomonas* as characterized by Dowson². Two or more members of this