tion tends to decrease as the concentration of sorbitol increases and in acidic solution reaches 7.5 per cent sorbitol—almost the theoretical value. The higher concentrations of sorbitol have absorptions strong enough to begin to prevent exact reading.

It is known from the work of F. J. Bandelin and J. V. Tuschhoff², which was also confirmed by our experiments, that sorbitol in higher concentration exerts a marked stabilizing effect upon L-ascorbic acid in aqueous solution. But a similar effect was observed by us also with D-mannitol, which otherwise seems to have no influence on ultra-violet absorption of ascorbic acid. Thus the two effects, protective and enhancing ultra-violet absorption, cannot be readily accumulated and explained as the whole.

No definite theoretical explanation of the above phenomena can be given at present since the facts are relatively new and still under study. Further work will be done to cover other sugar derivatives and enediols at different values of pH, time and temperature.

The hypotheses about stabilizing effect on one of the possible forms of ascorbic acid can be tentatively put forward, although the persistence of increased absorption also in acid medium (pH ~ 2) is rather difficult to explain, in view of proton migration which takes place at pH 4.

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¹ Laurent, T. C., and Wertheim, E. M., *Acta Chem. Scand.*, **6**, 678 (1952).

² *J. Amer. Pharm. Assoc.*, **44**, 241 (1955).

Value of the pF Scale for Water in an Ecological Study of an Insect living in Soil

EVANS¹ demonstrated that the energy with which the soil holds water could be correlated with the loss of weight of wireworms; the energy-level was suitably expressed by Schofield's² pF scale. Evans and McL. Guild³ then demonstrated that the rate of production and size of cocoons of earthworms were determined not by the amount of water present in the soil but by the force with which the water was held. Despite these observations the pF scale as a measure of available water for biological processes has scarcely been used in ecological studies of animals that live in soil. Wallace's⁴ paper on the effect of hydrostatic pressure deficiency on motility of larvae of *Heterodera schachtii* Schmidt is the only other similar study that I know.

A number of field and laboratory experiments on *Aphodius howitti* Hope, a cockchafer which inhabits sandy and loamy soils in South Australia, have suggested that oviposition is influenced by the amount of water in the soil but that expressing the results on a water-content basis for a number of soils is unsatisfactory.

The experiments were carried out with a sand and a clay loam, typical of areas in which the species is found. In one experiment beetles were confined to the two soils at various water-content levels and the numbers of eggs laid were recorded. When the results were plotted against water content of soil the numbers of eggs laid in the sand and in the clay loam could be represented by curves which were similar in form but were widely apart and hence could not be compared directly; however, when plotted against the

Fig. 1. The numbers of eggs laid by *Aphodius howitti* in relation to pF of soil. The water contents of the two soils in relation to pF are included for reference.

pF of the soil water the curves were found to correspond closely (Fig. 1). It therefore appears that the ovipositional response is a function of the force with which the water is held rather than the amount of water present in the soil. The mean number of eggs in a batch did not vary significantly, the larger number of eggs laid in the range of optimum pF being due to more beetles laying all their eggs rather than all the beetles laying more eggs.

Beetles were then given a choice of four different levels of water content in a series of experiments with both soils. In every case the largest aggregation of beetles and eggs was recorded at a water content corresponding to pF 2.8, irrespective of soil type. This pF value also proved to be the optimum for survival of the adults.

The consistency with which pF 2.8 was recorded as the optimum demonstrates the usefulness of the pF scale for comparing the behaviour of adults in different soils.

An investigation of the absorption of water by eggs and their survival in the two soils at various water-content levels showed further that the pF scale could be conveniently applied to other stages of the life-cycle. An analysis of variance yielded significant differences between pFs, but no significant difference between soils.

The use of the pF scale has led to a better understanding of the effect of water on the types of places in which *Aphodius howitti* lives and its effect on the distribution and abundance of the species in South Australia. It is probable that it could be used to similar advantage in ecological studies of other animals that live in soil.

The details of this work will be published later.
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University of Adelaide. June 15.

¹ Evans, A. C., *Ann. App. Biol.*, **31**, 235 (1944).

² Schofield, R. K., *Trans. Third Int. Congr. Soil Sci.*, **2**, 37 (1935).

³ Evans, A. C., and McL. Guild, W. J., *Ann. App. Biol.*, **35**, 471 (1948).

⁴ Wallace, H. R., *Ann. App. Biol.*, **43**, 477 (1955).