Genetic Variations of Phosphatases in Larvæ of *Drosophila melanogaster*

DURING the past few years a large number of protein polymorphisms have been described in different animal groups. This development is largely due to improvements in the techniques for protein separation, such as the method of starch-gel electrophoresis[1]. The combination of starch-gel electrophoresis with different enzyme staining methods has made it possible to examine also electrophoretic variations in various enzymes[2,3]. In *Drosophila melanogaster* two different protein polymorphisms have recently been described[4,5]. One of them concerns a genetic variation in a particular esterase from adult flies[4]. This communication reports a genetic phosphatase variation found in larvæ of *D. melanogaster*. Single larvæ of *D. melanogaster* were homogenized in a small drop of distilled water and this homogenate was absorbed in a small piece of filter paper (about 4 mm × 6 mm). These protein samples were examined by means of starch-gel electrophoresis. Two different types of discontinuous *tris* buffer systems were used[6,7]. After electrophoresis the gels were sliced and stained for phosphatase activity using α-naphthyl phosphate and fast blue *RR* salt in the gel buffer (*p*H 8·6).

When using the discontinuous buffer system by Poulik[6], homogenates from single larvæ showed usually one deeply staining phosphatase zone, although there were some variations in the intensity of the stain. There were two different electrophoretic variants of this zone (Fig. 1). In larvæ from the Philadelphia stocks Nos. *d* 32 and *b* 232, the phosphatase zone was faster than in those from the Philadelphia stocks Nos. *f* 41 and *b* 317.

Mixtures of homogenates from larvæ with fast and slow variants showed the presence of both components. Larvæ obtained from reciprocal crosses between the stocks *d* 32 × *f* 41 and *b* 232 × *b* 317 showed only one phosphatase zone of intermediate mobility (Fig. 1).

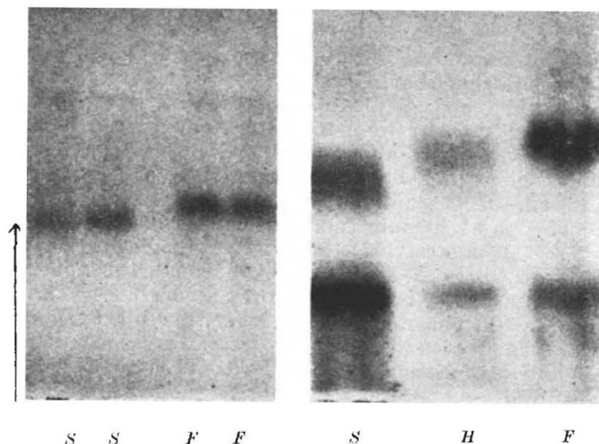

Fig. 1. Left, four single-larva zymograms showing slow (*S*) and fast (*F*) phosphatase variants, discontinuous *tris* buffer (cf. ref. 6). Right, zymograms of multiple larva homogenates (six larvæ in each sample) showing slow (*S*), hybrid (*H*) and fast (*F*) patterns. Note the non-variable slow phosphatase zone revealed by this discontinuous *tris* buffer system (cf. ref. 7). The arrow indicates the direction of migration

A comparison of homogenates from adult flies, pupæ, and larvæ revealed that the zone described here was absent in both pupæ and adults. In the pupæ, another phosphatase zone with a faster mobility than the larval zone appeared. This zone stained rather strongly and showed a tendency to increase in mobility in the later stages of pupation. When using another discontinuous buffer system[7] an additional phosphatase zone of relatively slow mobility was found in adults, pupæ and larvæ (Fig. 1). After incubation and staining in a buffer with a *p*H around 5, the larval phosphatase zones were not detectable, which indicates that they are alkaline phosphatases.

The phosphatase variations in *Drosophila* larvæ described here are readily distinguishable in single larva homogenates, which is of practical importance if this marker is to be used in investigations of larval populations. The difference between the fast and slow components is revealed even in a rather short electrophoretic run, whereas the discrimination of the intermediate component found in the hybrids requires a longer time of separation. The present preliminary results indicate that the slow and fast phosphatase variants are controlled by two autosomal alleles, which in a heterozygous combination interact to form a hybrid substance.

The stocks of *D. melanogaster* examined in this investigation were obtained from Dr. I. Oster, The National Science Foundation Stock Center at the Institute for Cancer Research, Philadelphia.

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SOIL SCIENCE

Relative Contribution of Iron and Aluminium in Phosphate Sorption by Acid Surface Soils

IT is a widely held view that oxides of iron and aluminium play important parts in phosphate sorption by acid soils. Several arguments in support of this are presented in reviews by Wild[1] and Hemwall[2]. The most direct argument is based on observations that phosphate sorption is reduced markedly when both oxides are removed by chemical extraction. Such observations, however, do not permit the relative contribution of each oxide to be assessed.

Williams, Scott and McDonald[3] suggested from correlative studies that phosphate sorption, in a range of Scottish acid surface soils, was more dependent on aluminium than iron.

Chang and Jackson[4] using a chemical fractionation procedure showed that added phosphate was equally partitioned between iron and aluminium. This method, however, does not distinguish clearly between these two forms of phosphate[5].

A more direct way of assessing the relative importance of iron and aluminium became possible following a recent study of the biological reduction method for the removal of iron[6]. It was found that this method removed iron from Scottish soils in amounts which were intermediate between those removed by acidified ammonium oxalate and by sodium dithionite–hydrochloric acid treatments. In contrast, however, only traces of aluminium were removed. The amounts represented only one-fourteenth of the aluminium extracted by oxalate and one-fifth of that extracted by dithionite. Thus, using this method, it became possible to study the effect of the fairly specific removal of iron on the ability of a soil to sorb phosphate.

Three Scottish soils were used in this present study. They are designated elsewhere as Basic igneous 1, Basic igneous 2 and Slate[6]. Their phosphate sorption capacities from normal $NH_4H_2PO_4$ at *p*H 4·0 (ref. 7) were 17·3, 8·7 and 11·8 m.mol. P_2O_5/100 g soil, respectively, the last two values approximating the average of 11·2 for a wide range of soils from north-east Scotland[3].

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