Duke, Edward J. University of North Carolina, Chapel Hill, N.C. Comparison of third-instar larval lymph protein content in seven species of Drosophila.

Recently (Hubby and Throckmorton, 1965) a study has been made, using vertical acrylamide electrophoresis, of the evolutionary relationships between adult soluble proteins within the virilis group of Drosophila. Presented here is an inter-species survey of late third-instar larval lymph protein content, as shown by starch-gel electrophoresis, of the following seven species of the genus Drosophila: melanogaster, simulans, immigrans, hydei, virilis, funebris, and subobscura. In addition, pooled samples of melanogaster, funebris and subobscura species caught in the wild in various parts of Ireland, were examined for lymph protein content.

The results of the survey are shown in fig. 1. As expected, melanogaster and simulans had very similar patterns, with the complete absence of fraction 5 in the latter, constituting the major difference between the two. This protein band was found to be present in pooled samples of all twenty-six laboratory and wild stocks of melanogaster studied. It is possible that fractions 13 and 14 in melanogaster are very similar to fractions 3 and 13 in simulans (fig. 1) except that the electrophoretic mobilities are slightly altered. The protein patterns obtained for the other five species varied quite significantly from the above two species and from each other. Drosophila immigrans exhibited the least number of fractions having only two main bands not counting the "front" (fig. 1). The other four species all exhibited approximately six to nine fractions of differing concentration and composition.

The protein patterns exhibited by cultures of melanogaster, funebris, and subobscura started from individuals caught in different parts of Ireland, were in close agreement with those of the laboratory bred stocks, and only minor differences were observed. In the case of funebris for instance, protein fraction C of the laboratory stock (see fig. 1) was found to be split into two in the wild stocks. A survey of indivudual larvae has shown that the wild stock contained a mixture of individuals having the single and double band phenotypes.

The degree of difference and similarity between the larval lymph protein patterns of the different species can be correlated, to some extent, with their chromosomal arrangement. Those species with a primitive six chromosome pair configuration differ significantly in lymph protein pattern from immigrans, similans and melanogaster which have four pairs. D. simulans and D. melanogaster are more evolved than D. immigrans and exhibit much more diversification of protein fractions. There is, however, quite a close resemblance between the pattern obtained from the Pacific 7 strain of D. melanogaster (see Duke, 1965) and that of D. immigrans. Four protein fractions of the D. immigrans pattern have similar electrophoretic mobility to fractions exhibited by D. melanogaster (fig. 1). By comparison, the lymph protein patterns from the four species containing six chromosome pairs are significantly different from those already described. D. subobscura, although having only two protein bands of exactly similar mobility to melanogaster fractions, has four others of very close mobility (see fig. 1). Four fractions in the lymph of D. hydei resemble those of D. melanogaster in electrophoretic mobilities. It may be significant that D. hydei alone of these four species contains the more evolved V-shaped chromosome. The patterns of D. virilis and D. funebris are least like that of D. melanogaster. Generally speaking, therefore, the patterns of lymph protein content of the seven species studied, corresponded with the evolutionary trends within the genus as indicated by their characteristic chromosome configurations. These electrophoretic data should be firstly considered as an extra taxonomic aid in the systematics of Drosophila, and secondly as a basis for future work in a more refined biochemical approach to problems of evolution.

References: Duke, E. J. (1965). Further studies on the inheritance of lymph proteins in Drosophila. Gen. Res. Camb. (in press).
Hubby, J. L. and Throckmorton, L. H. 1965. Protein differences in Drosophila, II. Comparitive species genetics and evolutionary problems. Gen. 52:203-215

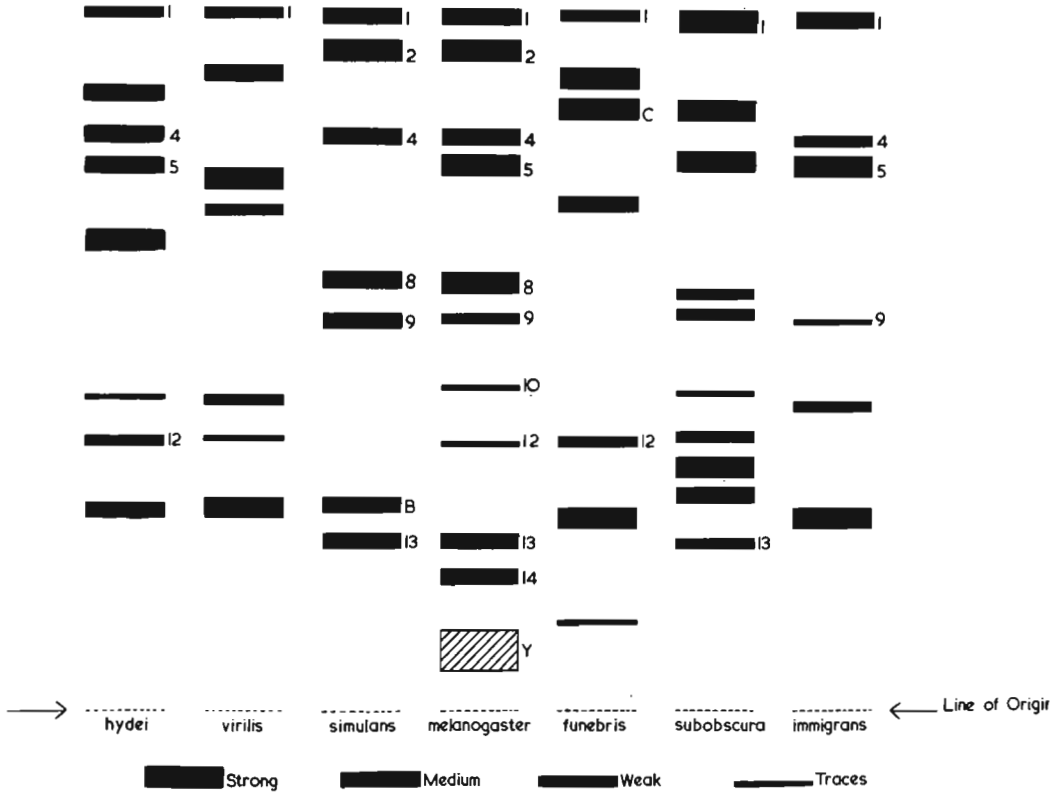

Fig. 1

Druger, M. Syracuse University, New York. The distribution of genetic potential for wing venation abnormalities in a natural population of D. pseudoobscura.

Egg samples from 25 strains derived from single females captured at Pinon Flats, Mount San Jacinto, California, were placed at 16°C and at 25°C for development. In each strain more than 1000 flies were sampled over a five generation period beginning with the F_3. A variety of defects were detected, including missing posterior crossvein (cve), missing longitudinal vein (lv) and extra venation (ev). The potential for producing these defects is not restricted to only a few strains but is widespread throughout the population.

Table 1: Distribution of wing venation defects

No. of Strains	lv	cve	ev
6	+	+	+
1	+	+	0
6	0	+	+
3	+	0	+
0	+	0	0
1	0	+	0
7	0	0	+
1	0	0	0