the critical range, on a plot of growth versus concentration of 3-pyridine sulphonic acid is very steep. With these mutants, it has not been possible to demonstrate a significant increase in vitamin production in either the presence or absence of the analogue. In contrast to the 3-acetyl pyridine-selected mutants, 3-pyridine sulphonic acid resistance is not manifested phenotypically in a simple Mendelian fashion. Apparently 3-pyridine sulphonic acid resistance in the algal cell is different from that in *Escherichia coli*, in which Scherr and Rafelson[5] reported a substantial increase in the yield of nicotinic acid within the cells of 3-pyridine sulphonic acid-resistant mutants. The cause of the resistance to this analogue remains unknown in *Chlamydomonas*.

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[1] Adelberg, E. A., *J. Bact.*, **76**, 326 (1958).
[2] Gowans, C. S., *Z. Vererb.-Lehre*, **91**, 63 (1960).
[3] Barton-Wright, E. C., *The Microbiological Assay of the Vitamin B-complex and Amino Acids*, 46 (Pitman, New York, 1952).
[4] Nakamura, K., and Gowans, C. S. (unpublished results).
[5] Scherr, G. H., and Rafelson, jun., M. E., *J. App. Bact.*, **25**, 187 (1962).

GENETICS

Inheritance of a White-eye Mutation in the Onion Maggot Fly, *Hylemya antiqua* (Meig.)

DURING investigations of insecticidal resistance of the onion maggot, *Hylemya antiqua* (Meig.), a strain of flies resistant to *cyclo*diene insecticides was cultured in the laboratory. In one generation of about 8,000 flies, 4 males and 4 females were discovered which had white eyes in contrast to the typical red eyes. These 8 flies, which were less than 12 h old when discovered, were isolated from the others and later produced progeny which also had white eyes. Thus far this white-eyed strain has bred true through five generations. A number of experiments were afterwards conducted to determine the mode of inheritance of this white-eye characteristic by making appropriate crosses of white-eyed and red-eyed flies.

Adults were maintained at 23°–24° C, 60 ± 3 per cent relative humidity in screened cages with dimensions of approximately 30 cm × 30 cm × 30 cm and provided with honey, powdered brewer's yeast and water in separate dishes. Females commenced laying eggs 2–3 weeks after emerging. An oviposition site was provided in each cage by a clay pot 10 cm in diameter filled with well-watered organic muck soil containing two sprouting onion halves. Pots were removed from the cages and fresh ones added every 2–4 days depending on the number of eggs present. Additional halved onions were then added to the pots as food for the maggots. Maggots were reared at 24°–27° C, at which temperature they pupated after 16–19 days. Pupæ were removed from the pots, placed on moist soil in paper cups and covered with additional soil. Flies emerged after 6–9 days at 23°–24° C.

Six crosses were made: two crosses of parental red-eyed and white-eyed strains, two crosses of F_1 hybrids, and two back-crosses of F_1 hybrids with the white-eyed parental stock. Results are shown in Tables 1–3.

The first cross of red-eyed males with white-eyed females yielded mostly red-eyed progeny and the second cross of white-eyed males with red-eyed females produced all red-eyed flies (Table 1). The usual red-eyed condition appears, therefore, to be dominant over white eyes. Also, the gene for white eyes is not sex-linked. The few white-eyed flies produced from cross No. 1 suggest that one or more of the red-eyed males used in this cross carried recessive genes for white eyes. These males were obtained from the same parental stock in which the mutant white-eyed flies were discovered. It is therefore possible that a few of them were heterozygous. This explanation is corroborated by cross No. 2 and subsequent matings for which homozygous red-eyed flies were obtained from a different parental culture of flies bred for several generations without the appearance of white-eyed individuals.

Table 1. NO. AND EYE COLOUR OF PROGENY OF CROSSES OF RED-EYED AND WHITE-EYED *Hylemya antiqua* FLIES

	Cross		No. of progeny observed ♂♂	♀♀	Total
1	30 red ♂♂ × 25 white ♀♀	red	175	164	339
		white	5	3	8
2	18 white ♂♂ × 18 red ♀♀	red	261	259	520
		white	0	0	0

Table 2. NO. AND EYE COLOUR OF F_2 PROGENY FROM CROSSES OF F_1 HYBRID RED-EYED *Hylemya antiqua* FLIES

P_1		F_1 cross		No. of F_2 progeny observed ♂♂	♀♀	Total	Expected	Deviation* *S.E.r.*
Red ♂♂ × White ♀♀	3	40 red ♂♂ × 40 red ♀♀	red	229	177	406	411	0·49
			white	73	69	142	137	
White ♂♂ × Red ♀♀	4	30 red ♂♂ × 30 red ♀♀	red	255	155	410	405	0·50
			white	86	44	130	135	

* Deviation from the expected ratio is generally regarded as significant only if it is more than twice as large as the standard error of this ratio.

Table 2 shows the results of matings of red-eyed F_1 hybrid flies from crosses 1 and 2. In both cases, approximately three times as many red-eyed as white-eyed F_2 flies were produced, indicating further that red and white eye colour are due to allelic genes of which red acts as the dominant. Deviations from the expected 3 : 1 ratios are not significant.

As a further test, F_1 hybrid flies were back-crossed to the white-eyed parental stock. The results of two such matings are shown in Table 3. The numbers of red- and white-eyed progeny observed from these matings were close to the expected 1 : 1 ratio.

Table 3. NO. AND EYE COLOUR OF PROGENY FROM CROSSES OF F_1 HYBRID RED-EYED AND WHITE-EYED *Hylemya antiqua* FLIES

P_1		Cross		No. of progeny observed ♂♂	♀♀	Total	Expected	Deviation *S.E.r.*
Red ♂♂ × White ♀♀	5	30 white ♂♂ × 30 hybrid red ♀♀	red	133	119	252	265·5	1·17
			white	136	143	279	265·5	
White ♂♂ × Red ♀♀	6	30 hybrid red ♂♂ × 30 white ♀♀	red	109	107	216	207·5	0·83
			white	108	91	199	207·5	

It is apparent from these crosses that the occurrence of white eyes in *H. antiqua* adults is due to an autosomal recessive gene which is allelic to the gene or genes responsible for the typical red eye colour of the flies. The white-eyed condition may be symbolized by *ww* and the characteristic red-eyed type as *WW* or *Ww*. It is hoped that this white eye character will prove useful as a natural marker in future investigations of dispersal and mating behaviour of the species.

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Distribution of Serum Group-specific Components (Gc) in Afghanistan, Korean, Nigerian and Israeli Populations

SINCE the discovery of the serum Gc polymorphism by Hirschfeld[1] genetic investigations have confirmed that the three common Gc phenotypes, designated Gc 1–1, Gc 2–1, and Gc 2–2, are controlled by two autosomal co-dominant alleles Gc^1 and Gc^2. Two genetic variants, one in a Chippewa Indian population, the other in a population of Australian Aborigines, have been recognized and called